National Tidal & Sea Level Facility

Annual Report for 2002 for the UK National Tide Gauge Network and Some Related Activities

Edited by Elizabeth Bradshaw

Proudman Oceanographic Laboratory
NATURAL ENVIRONMENT RESEARCH COUNCIL

BODC British Oceanographic Data Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

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Department for Environment Food and Rural Affairs

Foreword

The UK National Tidal & Sea Level Facility (NTSLF) was established in 2002 as a grouping of the various sea level activities of the Proudman Oceanographic Laboratory (POL) and British Oceanographic Data Centre (BODC) in close collaboration with other groups (notably the University of Nottingham) which, like POL and BODC, are supported significantly in their work by the Department for Environment, Food and Rural Affairs (DEFRA). The establishment of the NTSLF was marked by a display at the 37th DEFRA Conference of River and Coastal Engineers 16-17 September 2002 at Keele University, and will be marked further by a scientific conference at the Royal Society 16-17 February 2003.

The UK's strategic need for an NTSLF should be quite clear to anyone, and it is also clear to us at least that POL/BODC is the best location at which to host it. However, by the start of the new millennium, which saw the public having greater access than before to data and information in general, it became obvious that we had to work harder to make the sea level information available at POL/BODC more readily accessible. At one level, this meant that all the old internal names, and their individual web pages, had to be rationalised under one (NTSLF) umbrella which could provide details of networks, data availability and products and supply news items, thereby demonstrating the value for public money channelled through DEFRA and the Natural Environment Research Council (NERC). The umbrella also provides a useful discipline for us in stressing that each element of our work, from network maintenance (Tide Gauge Inspectorate and POL Technology Group) through to data quality control and archiving in BODC, is inter-dependent and can not be operated in isolation.

Technical innovations were also occurring around 2002 which called for a new (NTSLF) approach. Data for all UK-owned tide gauges, both around the UK itself and at South Atlantic sites, were becoming capable of being provided freely on the web at no cost to the user. Such data are presently available from January 1990 onwards and progressively more historical data will be made web-accessible in the near future. Real-time data sets, developed first of all for POL's South Atlantic network and also for POL's Irish Sea Coastal Observatory, were also becoming available, pointing the way towards a large part of UK sea level data being available on the web in real-time.

A part of the NTSLF's function is to ensure that all work conducted is documented as far as possible, and the production of an Annual Report is an important contribution to that objective. This NTSLF Annual Report for 2002 is intended to be the first of a regular series. In some respects the report continues the "Class A Network Dataring Gauges Data Processing and Analysis" reports which POL published in the late 1980s and early 1990s, which were extremely useful but which could not be produced for some years owing to staff and technical difficulties. The new Annual Report, however, is more than just a National (or "A Class") Network data report, but emphasises that our NTSLF-related work in sea level monitoring extends beyond the UK, and into fields such as numerical modelling and advanced geodesy.

We would be grateful for your comments on this first attempt at an Annual Report and for any suggestions on how later ones can provide you with the summary information for the year that you would like. In addition, we would welcome requests for more detailed information; these can be addressed to us via our web site
http://www.pol.ac.uk/ntslf/.

A.E.Hill Director POL

Contributors to the Annual Report:

Libby Macleod	–	A brief history of the UK National Tide Gauge Network
Les Bradley	–	Instrument documentation and site information
Dave Smith	–	History of the UK National Network, maps and site information
Steve Loch	–	Calculating statistics in Edteva
Jane Williams	–	Storm surge modelling
Trevor Baker	–	Global Positioning System and tide gauges

Editor of the Annual report: Elizabeth Bradshaw

NTSLF Coordination Committee Members and Main Interests:

Trevor Baker, POL	-	GPS and Absolute Gravity Networks
Colin Bell, POL Applications	-	Tide Gauge Data Products
Juan Brown, BODC	-	Director BODC
David Blackman, POL	-	Tide Gauge Data Products
Elizabeth Bradshaw, BODC	-	Tide Gauge Data Sets
Richard Downer, BODC	-	Web Development and Management
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Ed Hill, POL	-	Director POL
Simon Holgate, PSMSL	-	Permanent Service for Mean Sea Level Aspects
Philip Knight, POL	-	Web Management
Lesley Rickards, BODC	-	Tide Gauge Data Sets
David Smith, POL	-	Leader Tide Gauge Inspectorate
Philip Woodworth, POL	-	Chair of Committee

Thanks also to all those involved in the maintenance of the network, the data retrieval, processing, quality control and delivery.

UK National Tide Gauge Network Annual Report 2002

A brief history of the UK National Tide Gauge Network

On 31st January 1953 severe gales, gusting in excess of 192 kph (120 mph), coincided with high water on a spring tide. The resulting storm surge ravaged a path of destruction down the east coast of Britain and up into the Thames estuary, leaving 307 people dead, 32,000 people homeless and thousands of livestock drowned. In the Netherlands the death toll reached 1,800.

In the aftermath of this devastating storm it was apparent that not only would sea defences have to be strengthened but adequate warning should be given to prevent such a threat turning into another disaster.

A government committee[1] under the chairmanship of Viscount Waverley was appointed to examine and report on the effects of such storm surges. An Oceanographic sub-committee was appointed, chaired by Prof. J Proudman. They identified the need to establish a network of 6 flood warning tide gauges, to be monitored by the 'Storm Tide Warning Service' based at the Meteorological Office. Also, another 32 sites were identified where tide gauges should be installed if they were not already operating for the purpose of oceanographic research.

Today the national network, funded by DEFRA, consists of 45 tide gauge sites monitored by the renamed 'Storm Tide Forecasting Service', still based at the Meteorological Office. The tide gauges are installed and maintained by the 'Tide Gauge Inspectorate' based at POL and the data collected from the gauges are screened and stored at the BODC.

[1] Waverley Committee (1954) Report of the Departmental Committee on Coastal Flooding. cmd 9165. HMSO

Location of Tide Gauges Around the U.K.

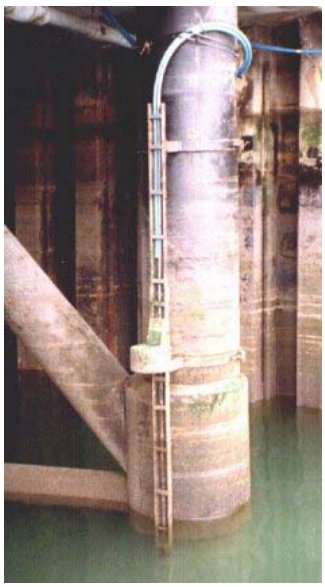
Instrument documentation

Bubbler Tide Gauge

The full tide bubbler system normally consists of two independent measuring systems. The pressure points are mounted approx 1m below Admiralty Chart Datum ACD so that negative surges may be recorded. The pressure points which you can see mounted underwater in the photograph are similar in appearance to an inverted bucket with a copper nozzle mounted on the side. This nozzle is the actual measuring point. A low flow of dry air (normally 7ml/min) is fed down an air tube to the top of the pressure point. When the air pressure in the air line equals the pressure exerted by the column of water above it, then the excess air is released as bubbles through the copper nozzle. This means that the pressure in the air line is proportional to the weight of the water column.

Mid tide bubbler

The operation of the mid tide bubbler is similar to that of the full tide system, except that the measuring point is mounted at the mid tide height. That means that the pressure point is only immersed for half of the tidal cycle. The reason for this, is that when the measuring point is exposed as in the photograph opposite it can be accurately levelled into the geodetic network. Once this is accomplished the full tide pressure points can be fitted to match the tidal curve produced by the mid tide pressure point, thereby connecting them to the geodetic network.



Pressure Transducer

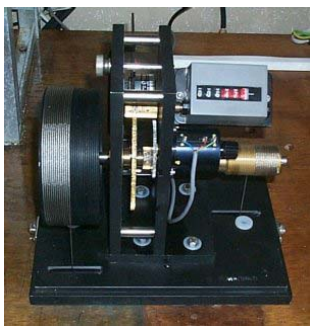
These are differential transducers contained in a watertight housing. The reference port is vented to atmosphere via the power supply and signal cable tube, while the measuring port of the transducer is connected to a copper outlet nozzle on the top of the transducer housing. The copper nozzle, transducer measuring port and connecting tube are filled with oil so the pressure is transmitted to the crystal element via the oil, thus keeping the transducer components free from the effects of the saltwater.

Munro float gauge

The Munro gauge measures sea level by means of a float in a stilling well. The float is about 45cm diameter - the large diameter reduces inevitable errors in buoyancy due to friction of the gearing and small changes in the length of float wire. This wire is coiled round a drum on the end of the gauge and another drum contains the counter balance wire. The drum is geared to a slotted tape attached to a pen carriage which traces the tide curve on the chart during the rise and fall of the tide. A precision potentiometer is attached to the gauge to provide an input to the data logger.

Wellhead float gauge

The Wellhead gauge measures the sea level by means of a float in a stilling well. The float is usually of a smaller diameter than that used on a Munro gauge (about 45cm diameter), and has a counterweight attached to a smaller diameter pulley than that of the float so it is not immersed in the sea when the float rises. The Wellhead unit does not produce a chart but does give a readout of the height. It is interfaced to the data logger via a precision potentiometer.



Data Processing

The data are collected on demand each week at Proudman Oceanographic Laboratory. The weekly files are then screened using our in-house visualisation package, Edteva. Suspect values are flagged and short gaps are interpolated where the accuracy is deemed not to be affected.

The weekly files are then concatenated into monthly files, with the residual added, and these are then edited so that all values fall on the quarter hour and gaps are filled in with null values and marked with an 'N' flag. The files are placed on the web for users to download. Statistics are produced monthly again using Edteva.

The last stage is where the monthly files are concatenated into yearly files and the metadata for the yearly files are then banked in a database.

Calculating Statistics in Edteva

There are essentially four types of summary information determined by Edteva: a history of when the tide gauge has been in operation (“history”), monthly extremes (“extremes”), monthly extreme surges (“surges”) and monthly and daily mean sea level (“MSL”).

Gaps greater than 4.1 hours in the primary channel are registered as gaps in the history.

Extremes are the maximum and minimum calculated over all sampled data during the month. This excludes any interpolated data but may include rapidly sampled data. Extreme surges (residuals) are calculated in the same way from tidal residuals. Tidal residuals are defined to be the measured water level minus the predicted tide. The predictions derive from the database of tidal constants maintained by POL’s Applications Group (as defined at the time of the calculation) for the ports of UK and elsewhere.

Mean Sea Level is calculated from a filter working on quarter-hourly values derived from one or more cubic splines applied to the raw data. The filter is a convolution of Vassie’s 03B filter which converts 15-minute data to hourly values and Doodson’s X0 filter. Splines are not applied across gaps as defined above. Shortish gaps can therefore lead to the loss of a day of output data (the half length of the filter is 91 and a day is 96 samples). Provided there are some daily (@12:00Z) values these are then averaged to provide the monthly value.

Global Positioning System and Tide Gauges

Global sea level has risen by 10 to 20cm during the 20th century. Much of the evidence for this rise has come from mean sea level (MSL) measurements obtained at tide gauges which measure relative MSL with respect to a local tide gauge bench mark. It is impossible however to distinguish between any true sea level variations and any changes in the height of the land at the tide gauges using these measurements alone. Around Britain sea levels have risen by different amounts during the last century from a 7 cm rise at Aberdeen to 21 cm at Sheerness on the east coast. This is because different parts of the UK are rising and subsiding at different rates due to the removal of the weight of the ice sheet at the end of the last ice age.

Knowledge of the vertical land movement at the tide gauge can be used to provide an estimate of absolute MSL changes. In recent years, modern geodetic techniques have developed to the stage where they can be used to measure vertical land movements. The two most suitable techniques for this work are measurements using the Global Positioning System (GPS) of satellites and measurements of absolute gravity.

POL, together with the IESSG, has developed a network of continuously operating GPS measuring stations at or near the tide gauges at Newlyn, Portsmouth, Sheerness, Lowestoft, Liverpool, North Shields, Lerwick and Aberdeen. The network also includes 12 other GPS stations within the UK.

The trends in the GPS time series so far appear to support the post-glacial rebound theory of uplift in mainland Scotland and subsidence in the South of England. These results are still preliminary; more reliable estimates of land movement will be obtained after an extended monitoring period. Long term monitoring of land movements should enable space- and time-variations in MSL to be measured and compared to global levels and also provide a better understanding of the mechanisms behind relative MSL changes.


Tide Gauge CGPS
CGPS
Lerwick
Aberdeen
North Shields
Liverpool
Lowestoft
Sheerness
Portsmouth
Newlyn
Brest

Aberdeen Tide Gauge

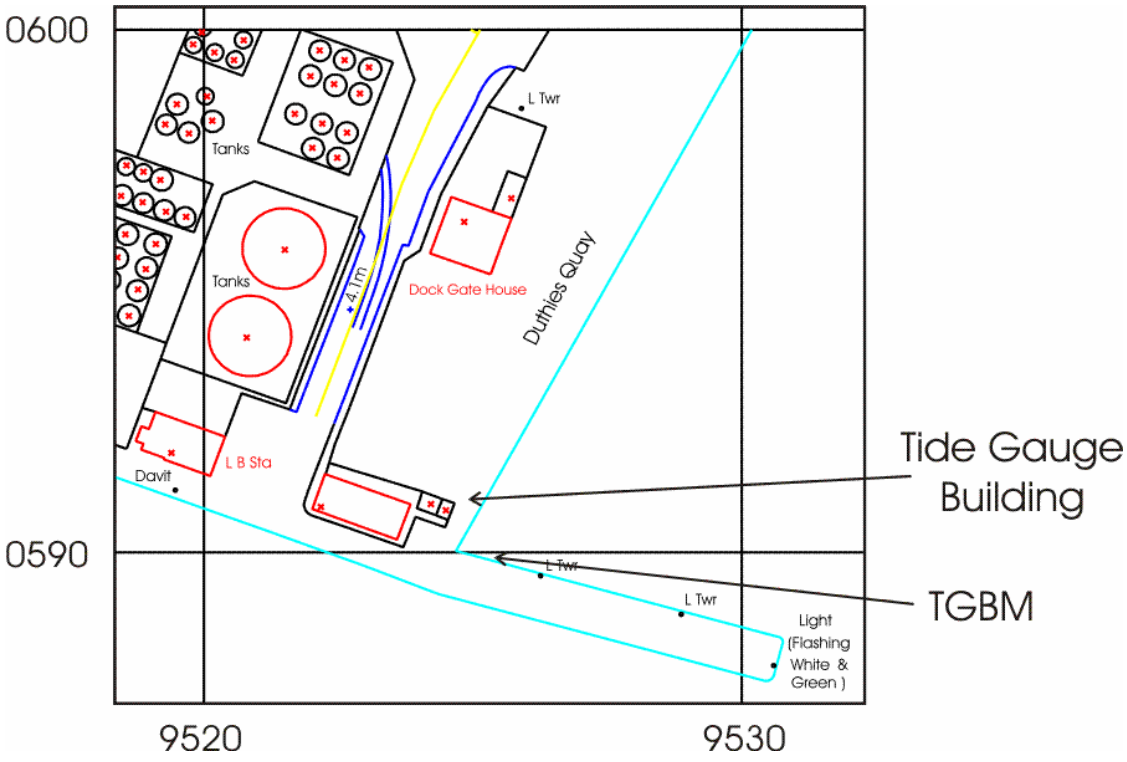
Latitude : 57° 08' 38.5" N Longitude : 02° 04' 49.1" W

Grid Reference : NJ 9524 0591

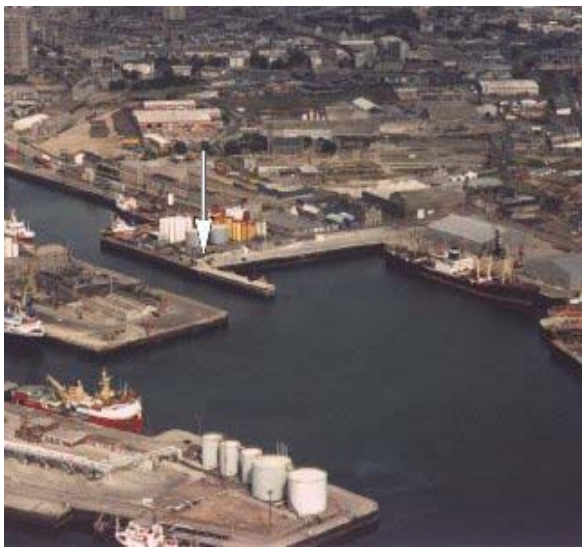
Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located on the South East corner of Waterloo Quay, Aberdeen Harbour.



Tide gauge location



Aerial view of site

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NJ 9525 0590	New bolt N side jetty Waterloo Quay.
Aux1	NJ 9572 0593	Building NW side York Place SE face E angle
Aux2	NJ 9586 0571	Observatory Pocra Quay N face NW angle.
Aux3	NJ 9524 0600	Building NE side Waterloo Quay SW face S angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.25m below Ordnance Datum Newlyn (ODN)
TGZ = 6.318m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 20/09/1998.

T.G.I. visits to site :	Day 036	Repair of pneumatic system.
	Day 147	General maintenance.
	Day 351	Communications fault.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
96	15 minutes	351-365	None

Residuals

Plots of the residuals for Aberdeen for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Aberdeen for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.012	28	20:00:00
February	0.916	02	03:15:00
March	0.630	06	14:00:00
April	0.610	26	21:30:00
May	0.420	21	16:15:00
June	0.619	18	01:15:00
July	0.286	01	11:15:00
August	0.340	15	23:00:00
September	0.253	06	02:30:00
October	0.514	22	20:30:00
November	0.361	06	12:15:00
December	0.382	02	07:00:00

Surge Minima	Value	Day	Time
January	-0.246	25	20:15:00
February	-0.370	21	04:00:00
March	-0.264	01	13:15:00
April	-0.205	05	17:15:00
May	-0.200	07	20:15:00
June	-0.091	28	20:45:00
July	-0.211	31	16:00:00
August	-0.188	01	00:15:00
September	-0.280	01	11:30:00
October	-0.249	12	05:30:00
November	-0.304	02	23:15:00
December	-0.404	09	05:15:00

Extreme Maxima	Value	Day	Time
January	4.864	29	01:15:00
February	5.064	02	04:15:00
March	4.661	30	14:15:00
April	4.812	28	14:00:00
May	4.496	26	13:15:00
June	4.215	13	02:30:00
July	4.335	26	02:15:00
August	4.590	12	03:30:00
September	4.688	10	03:00:00
October	4.706	08	02:00:00
November	4.897	06	14:00:00
December	4.472	05	01:15:00

Extreme Minima	Value	Day	Time
January	0.380	29	19:45:00
February	0.102	28	20:15:00
March	-0.134	01	21:00:00
April	0.289	27	19:30:00
May	0.592	26	19:15:00
June	0.695	26	08:15:00
July	0.424	14	10:00:00
August	0.309	10	08:15:00
September	-0.059	09	08:30:00
October	-0.011	07	07:30:00
November	0.194	05	07:00:00
December	0.483	06	20:45:00

Mean Sea Level	No Days	MSL
January	31	2.716
February	28	2.744
March	31	2.535
April	30	2.510
May	31	2.515
June	30	2.552
July	31	2.511
August	31	2.533
September	30	2.552
October	31	2.617
November	30	2.676
December	15	2.470
	sum days	avg
	349	2.578

Avonmouth Tide Gauge

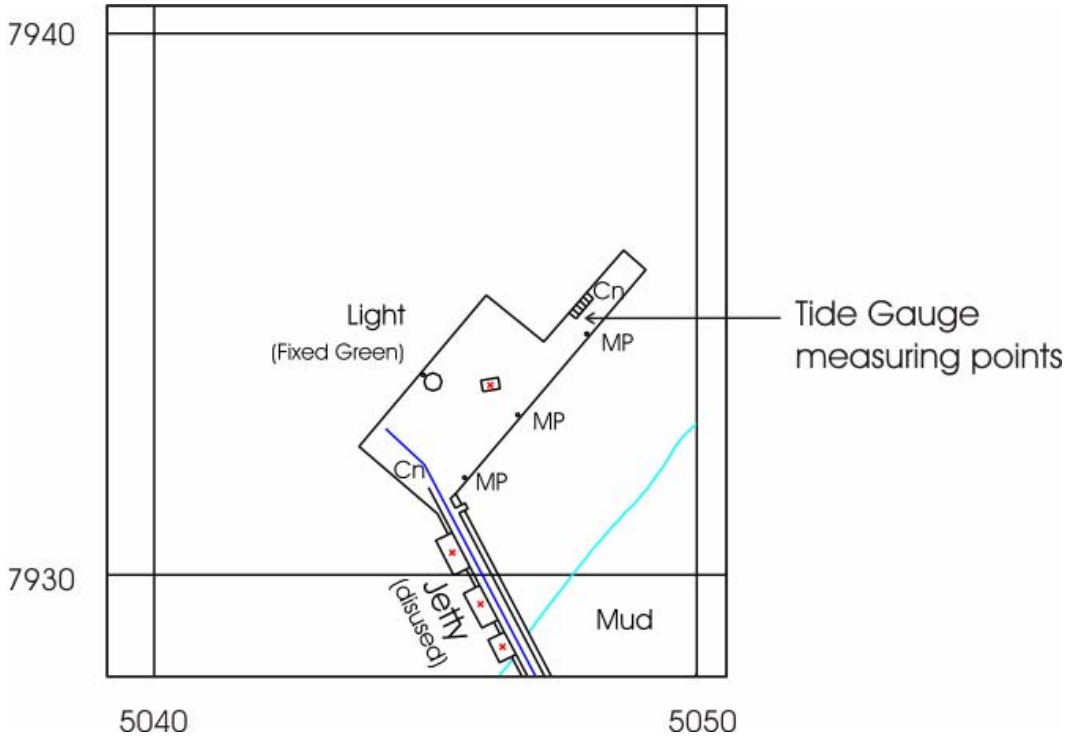
Latitude : 51° 30' 27.9" N Longitude : 02° 42' 45.9" W

Grid Reference : ST 5063 7900

Instrument type : Data acquisition system with dual underwater pressure transducers.

Site of Gauge:

The tide gauge building is located on land between the wartime jetty and the fuel storage depot, with the measuring points being located on the superstructure of the wartime jetty.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 5057 7881	OSBM bolt at base of bollard
Aux1	ST 5072 7859	Rivet adjacent to transit shed NW face W angle
Aux2	ST 5063 7898	Rivet base building NW side S angle
Ref M	ST 5047 7934	Ref mark on seaward end of jetty

TGZ = Admiralty Chart Datum (ACD)
TGZ = 6.50 m below Ordnance Datum Newlyn (ODN)
TGZ = 15.711 m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 06/10/1994.

T.G.I. visits to site :	Day 278	Installation of transducer amplifier board.
	Day 315	General maintenance.

Data quality

Up to September 2002, the secondary (backup) channel was used as the data were of better quality than the primary channel. From October 2002 the primary channel was used.

ASLVTD02 is the parameter code for the secondary (backup) channel and ASLVTD01 is the primary channel.

Parameter	CI (%)	Sample interval	Missing data	Suspect data
ASLVTD02	to September	15 minutes	None	None
ASLVTD01	October to December	15 minutes	None	274-276

Residuals

Plots of the residuals for Avonmouth for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Avonmouth for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
October	2.341	27	05:45:00
November	1.157	22	03:45:00
December	1.397	26	07:00:00

Surge Minima	Value	Day	Time
October	-0.813	13	16:45:00
November	-0.495	02	11:45:00
December	-0.958	10	17:30:00

Extreme Maxima	Value	Day	Time
October	14.393	07	20:00:00
November	14.320	06	08:00:00
December	13.725	04	06:45:00

Extreme Minima	Value	Day	Time
October	0.343	07	15:00:00
November	0.497	05	14:30:00
December	0.725	05	14:45:00

Mean Sea Level	No Days	MSL
October	27	7.039
November	30	7.102
December	31	6.936
	sum days	avg
	88	7.026

Bangor Tide Gauge

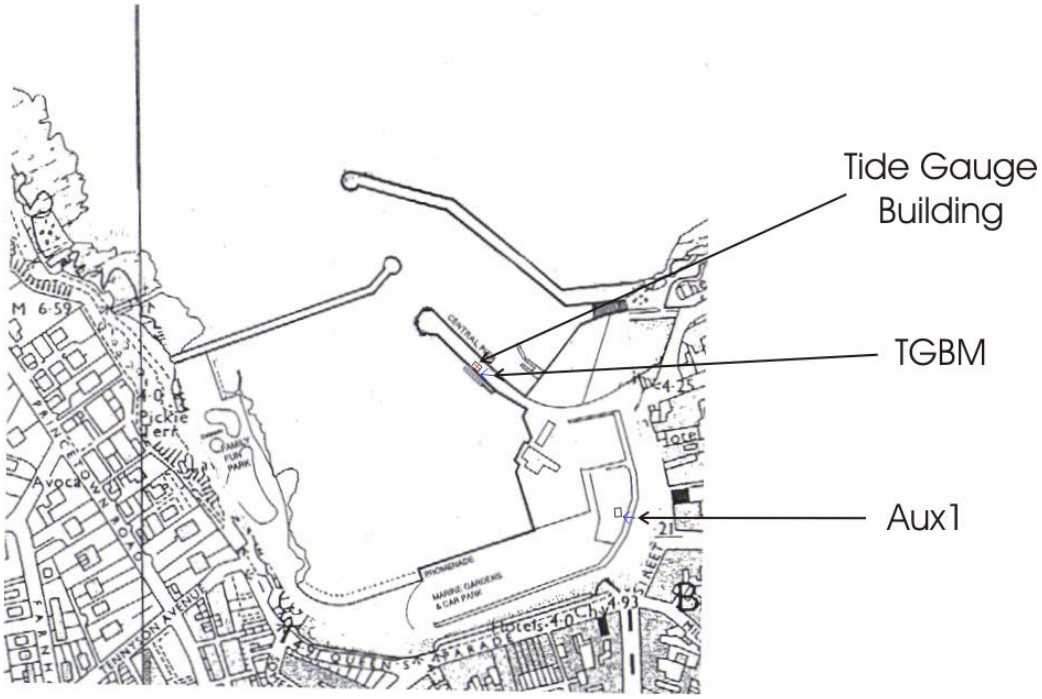
Latitude : 54° 39' 53.1" N Longitude : 05° 40' 10.1" W

Grid Reference : NW 6340 3620

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building and measuring points are located on Central Pier at Bangor Marina. The measuring points are on the seaward side of the open pier directly beneath the tide gauge building.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	5043 8212 (Sheet 115)	S S Pin Tide gauge building Central Pier
Aux1	5038 8200 (Sheet 115)	Cut mark Clock tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.01m below Ordnance Datum Belfast (ODB)
TGZ = 5.592m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 10/12/2001.

T.G.I. visits to site : Day 233 General maintenance.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	None

Residuals

Plots of the residuals for Bangor for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Bangor for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.991	28	13:45:00
February	1.043	01	11:30:00
March	0.885	10	17:00:00
April	0.423	26	06:30:00
May	0.637	24	16:00:00
June	0.479	17	10:00:00
July	0.332	08	08:00:00
August	0.333	17	23:45:00
September	0.240	05	10:45:00
October	0.634	27	07:30:00
November	0.617	03	04:30:00
December	0.644	01	17:30:00

Surge Minima	Value	Day	Time
January	-0.246	05	17:30:00
February	-0.551	21	00:30:00
March	-0.386	01	14:00:00
April	-0.174	09	18:00:00
May	-0.236	07	15:45:00
June	-0.280	28	07:45:00
July	-0.189	16	03:00:00
August	-0.216	31	20:15:00
September	-0.242	01	09:30:00
October	-0.375	27	18:15:00
November	-0.287	07	22:15:00
December	-0.400	09	08:15:00

Extreme Maxima	Value	Day	Time
January	4.218	28	10:30:00
February	4.618	01	13:30:00
March	3.758	31	13:00:00
April	3.957	28	11:30:00
May	3.864	24	08:45:00
June	3.667	17	03:15:00
July	3.525	28	01:15:00
August	3.734	13	02:00:00
September	3.899	10	00:45:00
October	3.888	09	00:15:00
November	4.049	05	23:30:00
December	4.079	01	20:30:00

Extreme Minima	Value	Day	Time
January	0.408	05	21:45:00
February	0.226	28	17:45:00
March	-0.128	01	18:30:00
April	0.186	25	15:30:00
May	0.478	27	05:15:00
June	0.305	28	07:15:00
July	0.282	14	07:30:00
August	0.168	12	07:15:00
September	0.204	09	06:00:00
October	0.171	06	04:15:00
November	0.391	04	03:45:00
December	0.268	03	03:30:00

Mean Sea Level	No Days	MSL
January	31	2.212
February	28	2.200
March	31	2.004
April	30	1.994
May	31	2.054
June	30	2.032
July	31	1.974
August	31	1.979
September	30	2.019
October	31	2.110
November	30	2.269
December	31	2.114
	sum days	avg
	365	2.080

Barmouth Tide Gauge

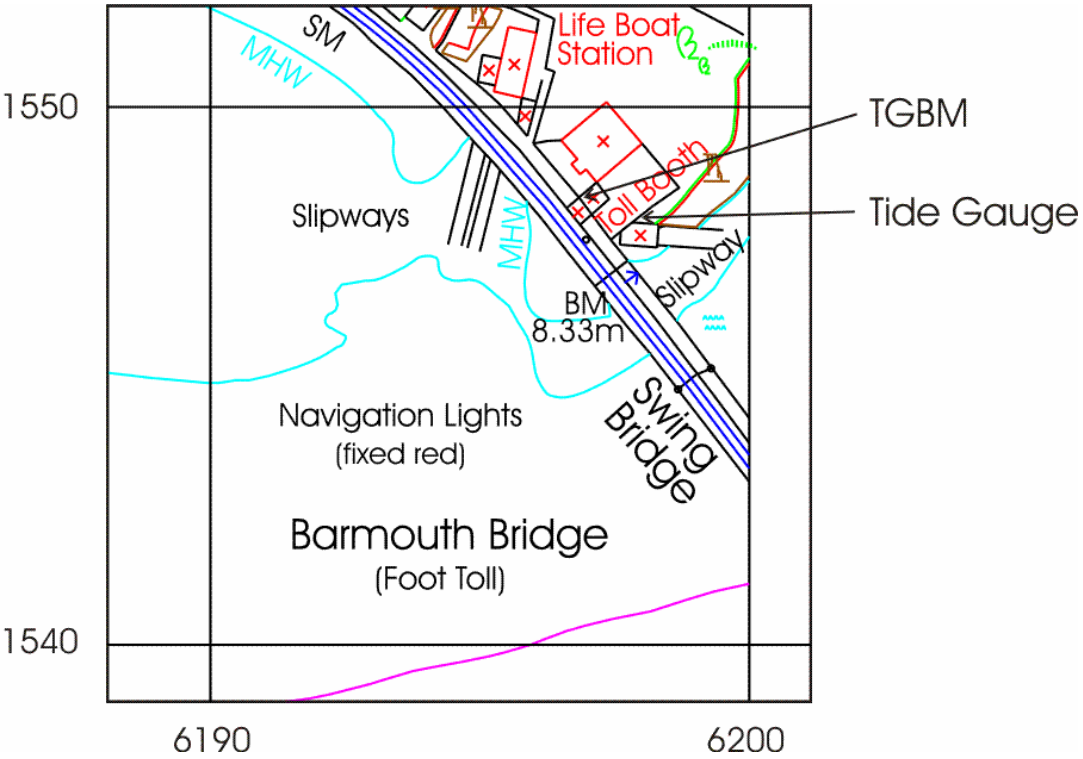
Latitude : 52° 43' 09.6" N Longitude : 04° 02' 42.1" W

Grid Reference : SH 6197 1548

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The Tide Gauge is located in the toll booth on the North end of Barmouth railway bridge which crosses river Mawddach. The measuring points are attached to the first leg of the railway bridge in the deep channel.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 6197 1548	NBM rivet concrete 2.9M NE wall junction
Aux 1	SH 6173 1558	Rivet step NE side of road NW entrance path
Aux 2	SH 6186 1556	Rivet wall SE side road 17.6M E steps
Aux 3	SH 6196 1550	Rivet step E side lifeboat station

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.44m below ODN
TGZ = 10.363m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 10/10/1991.

T.G.I. visits to site : Day 227 Compressor change & general maintenance.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	None

Residuals

Plots of the residuals for Barmouth for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Barmouth for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.148	28	10:00:00
February	2.199	26	04:00:00
March	1.231	09	11:15:00
April	1.032	29	00:00:00
May	0.934	24	10:45:00
June	0.687	10	03:45:00
July	0.355	08	02:45:00
August	0.375	30	16:30:00
September	0.405	10	05:15:00
October	1.946	27	06:45:00
November	0.781	14	11:30:00
December	0.881	01	21:00:00

Surge Minima	Value	Day	Time
January	-0.290	10	02:30:00
February	-0.866	20	23:45:00
March	-0.351	26	08:00:00
April	-0.212	24	13:45:00
May	-0.167	06	04:45:00
June	-0.269	28	07:45:00
July	-0.244	16	01:45:00
August	-0.243	25	17:00:00
September	-0.225	01	13:15:00
October	-0.319	27	23:00:00
November	-0.255	30	00:15:00
December	-0.530	10	09:30:00

Extreme Maxima	Value	Day	Time
January	5.631	31	10:00:00
February	6.151	01	10:45:00
March	5.635	31	10:00:00
April	5.746	28	08:45:00
May	5.424	24	18:45:00
June	4.964	10	07:45:00
July	4.961	12	21:45:00
August	5.342	11	22:15:00
September	5.734	09	22:00:00
October	5.770	08	21:30:00
November	5.762	05	20:30:00
December	5.490	01	17:45:00

Extreme Minima	Value	Day	Time
January	0.764	01	04:30:00
February	0.686	14	04:45:00
March	0.580	01	18:00:00
April	0.658	25	14:45:00
May	0.809	27	04:00:00
June	0.845	25	16:00:00
July	0.790	15	07:15:00
August	0.759	12	06:30:00
September	0.719	11	06:45:00
October	0.673	06	03:45:00
November	0.691	07	17:30:00
December	0.625	06	17:15:00

Mean Sea Level	No Days	MSL
January	31	2.851
February	28	2.895
March	31	2.675
April	30	2.673
May	31	2.756
June	30	2.694
July	31	2.637
August	31	2.646
September	30	2.690
October	31	2.802
November	30	2.937
December	31	2.762
	sum days	avg
	365	2.752

Bournemouth Tide Gauge

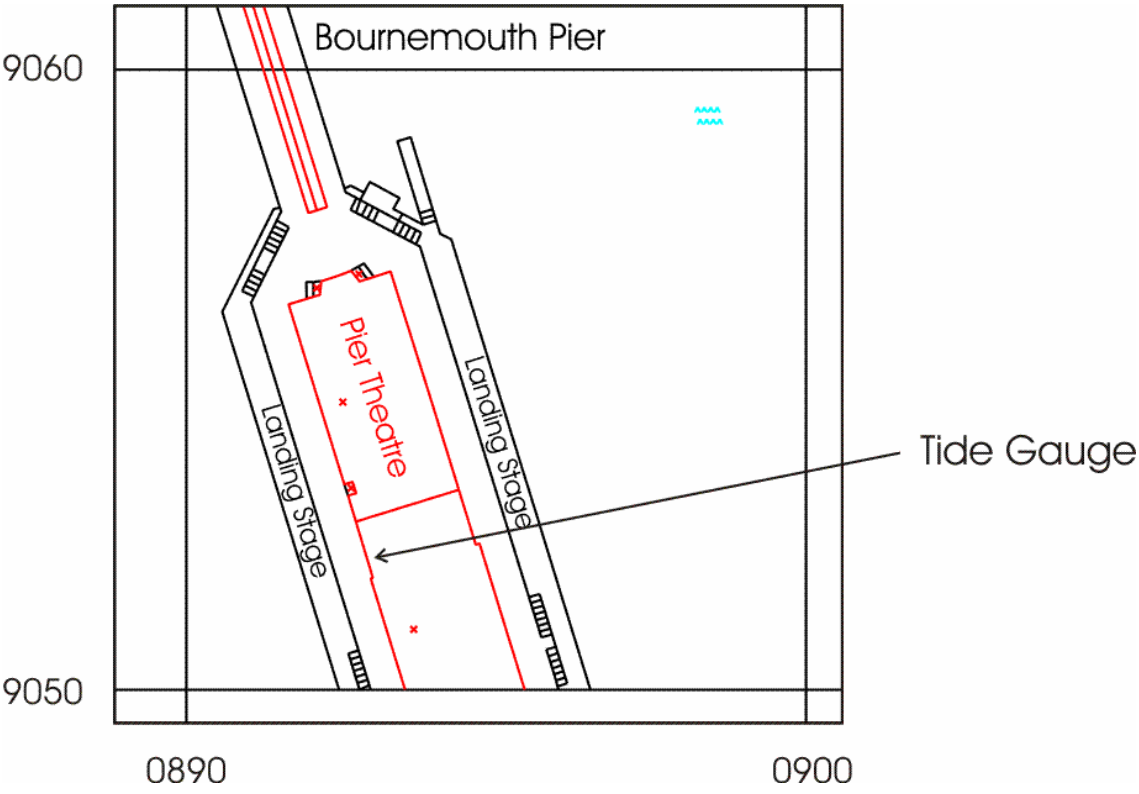
Latitude : 50° 42' 51.6" N Longitude : 01° 52' 29.5" W

Grid Reference : SZ 0893 9053

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge equipment is located in the pier electrical room at the west side of the South Pier with the measuring points mounted directly below on one of the pier legs.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
Aux1	SZ 0869 9066	Cut mark Wall
Aux2	SZ 0893 9083	Cut mark Pillar
REF A	SZ 0893 9052	Steelwork clamp
REF B	SZ 0893 9052	Mid-tide pressure point nozzle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.40m below ODN
TGZ = 5.96m below Aux1

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 19/06/1996.

T.G.I. visits to site : Day 296 To reinstate channel 3 (half tide).

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	296	296-298

Residuals

Plots of the residuals for Bournemouth for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Bournemouth for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.733	23	22:00:00
February	0.710	26	03:45:00
March	0.541	18	09:00:00
April	0.419	30	11:45:00
May	0.518	21	20:45:00
June	0.275	09	12:15:00
July	0.359	02	23:00:00
August	0.208	31	16:45:00
September	0.209	23	01:00:00
October	0.720	15	13:00:00
November	0.773	14	03:45:00
December	0.560	26	08:45:00

Surge Minima	Value	Day	Time
January	-0.193	08	16:30:00
February	-0.323	22	06:45:00
March	-0.325	13	23:30:00
April	-0.290	22	03:15:00
May	-0.227	06	05:00:00
June	-0.294	29	13:00:00
July	-0.179	16	03:30:00
August	-0.226	26	12:15:00
September	-0.243	02	02:00:00
October	-0.637	27	16:30:00
November	-0.227	07	17:30:00
December	-0.374	06	00:00:00

Extreme Maxima	Value	Day	Time
January	2.592	29	09:15:00
February	2.744	01	11:15:00
March	2.603	01	10:00:00
April	2.633	27	21:15:00
May	2.430	25	20:00:00
June	2.181	11	20:45:00
July	2.179	10	20:15:00
August	2.411	11	22:45:00
September	2.609	08	21:30:00
October	2.638	08	22:00:00
November	2.753	14	08:15:00
December	2.514	04	08:30:00

Extreme Minima	Value	Day	Time
January	0.351	01	17:00:00
February	0.250	28	16:30:00
March	-0.037	30	17:00:00
April	0.150	26	15:00:00
May	0.490	27	03:45:00
June	0.375	25	03:30:00
July	0.285	14	06:15:00
August	0.252	11	05:00:00
September	0.163	10	05:30:00
October	0.030	07	03:45:00
November	0.246	06	16:30:00
December	0.229	06	17:00:00

Mean Sea Level	No Days	MSL
January	31	1.639
February	28	1.658
March	31	1.534
April	30	1.535
May	31	1.600
June	30	1.550
July	31	1.552
August	31	1.578
September	30	1.606
October	28	1.687
November	30	1.783
December	31	1.676
	sum days	avg
	362	1.617

Cromer Tide Gauge

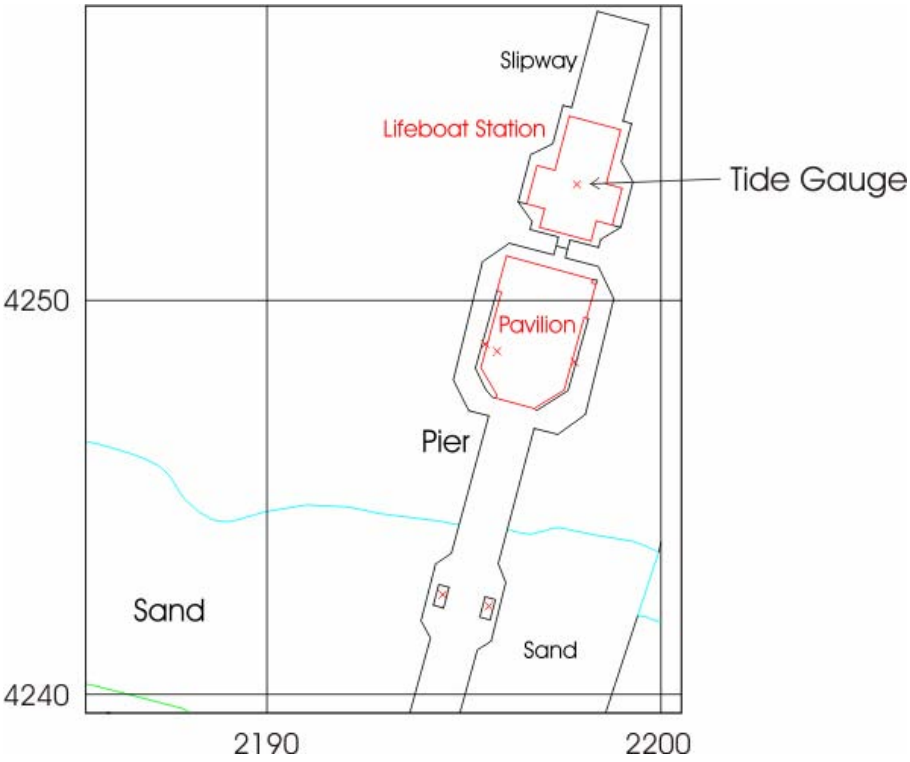
Latitude : 52° 56' 03.4" N Longitude : 01° 18' 05.9" E

Grid Reference : TG 2198 4253

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge equipment is located within Cromer lifeboat station, with the measuring points attached to a leg of the pier.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TG 2193 4233	S Steel bolt on top of wall opposite E side of pier
Aux1	TG 2198 4253	Rivet on steps of catwalk NE angle of LB station
Aux2	TG 2195 4233	S.Steel bolt bottom ramp S side at W corner

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Newlyn
TGZ = 10.117m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : T.G.I. checked levelling day 332 and it was perfect.

T.G.I. visits to site : Day 015 To fit mid tide sensor
Day 332 Site levelling & general maintenance

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	015-016	051-052,054-055,073-075,103,265-266,279,282-284,289,340-344,365

Residuals

Plots of the residuals for Cromer for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Cromer for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.870	29	03:00:00
February	1.206	20	21:00:00
March	0.893	06	20:15:00
April	1.077	27	03:30:00
May	0.450	21	21:15:00
June	0.741	18	08:30:00
July	0.413	21	13:15:00
August	0.736	31	08:00:00
September	0.660	26	05:15:00
October	1.514	27	17:30:00
November	0.796	06	16:45:00
December	0.665	02	13:45:00

Surge Minima	Value	Day	Time
January	-0.622	25	20:00:00
February	-1.046	21	21:30:00
March	-0.664	10	14:30:00
April	-0.309	21	11:30:00
May	-0.178	24	13:15:00
June	-0.100	29	15:30:00
July	-0.102	08	13:15:00
August	-0.131	13	06:30:00
September	-0.241	10	04:15:00
October	-0.403	27	07:30:00
November	-0.796	03	02:15:00
December	-0.650	23	18:45:00

Extreme Maxima	Value	Day	Time
January	5.608	29	06:15:00
February	5.590	28	19:15:00
March	5.480	02	20:45:00
April	5.550	27	06:30:00
May	5.097	26	18:15:00
June	5.176	28	08:30:00
July	5.129	26	07:30:00
August	5.463	12	08:45:00
September	5.443	09	07:45:00
October	5.495	07	06:30:00
November	5.636	07	07:45:00
December	5.321	05	06:30:00

Extreme Minima	Value	Day	Time
January	0.401	30	01:45:00
February	0.323	01	03:30:00
March	0.067	30	02:15:00
April	0.285	28	02:00:00
May	0.522	25	00:00:00
June	0.778	26	14:00:00
July	0.629	14	16:00:00
August	0.551	11	15:00:00
September	0.321	09	15:00:00
October	0.074	08	14:30:00
November	-0.022	03	11:30:00
December	0.365	04	13:00:00

Mean Sea Level	No Days	MSL
January	28	2.968
February	24	3.034
March	28	2.909
April	30	2.885
May	31	2.886
June	30	2.934
July	31	2.926
August	31	2.980
September	28	2.993
October	27	3.024
November	30	2.949
December	28	2.908
	sum days	avg
	346	2.950

Devonport Tide Gauge

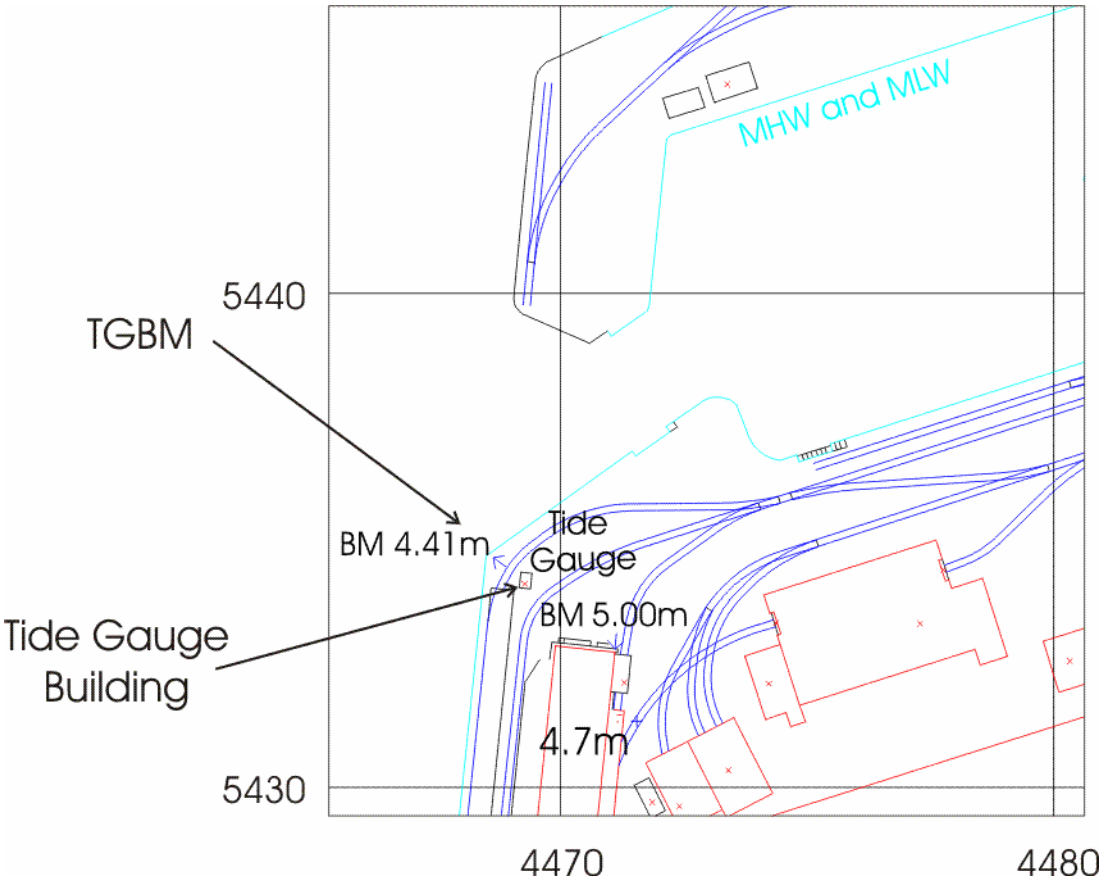
Latitude : 50° 22' 06.2" N Longitude : 04° 11' 06.9" W

Grid Reference : SX 4469 5434

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The gauge is situated on No. 1 Jetty in Devonport Royal Naval base.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SX 4468 5434	Bolt on jetty wall. 6.6m NW angle T G building
Aux1	SX 4471 5433	Building N face NE angle
Aux2	SX 4487 5425	Bldg NW face W angle
Aux3	SX 4501 5454	Fl Br 11818 bldg W face NW angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.22m below ODN
TGZ = 7.631m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 02/06/1997.

T.G.I. visits to site : Day 220 Data logger repaired.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
92	15 minutes	190,194-220,319-322	None

Residuals

Plots of the residuals for Devonport for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Devonport for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.695	23	18:15:00
February	0.559	03	03:30:00
March	0.523	18	07:00:00
April	0.284	30	05:30:00
May	0.498	21	19:00:00
June	0.235	07	23:15:00
July	0.212	02	20:45:00
August	0.153	09	01:30:00
September	0.138	30	17:30:00
October	0.477	15	10:30:00
November	0.612	14	00:30:00
December	0.546	26	01:45:00

Surge Minima	Value	Day	Time
January	-0.266	06	14:15:00
February	-0.352	15	07:45:00
March	-0.290	27	05:30:00
April	-0.298	21	01:00:00
May	-0.195	31	16:00:00
June	-0.291	29	12:30:00
July	-0.199	12	23:00:00
August	-0.239	31	12:15:00
September	-0.270	02	02:00:00
October	-0.505	27	18:30:00
November	-0.308	07	18:15:00
December	-0.361	05	22:30:00

Extreme Maxima	Value	Day	Time
January	5.884	31	07:30:00
February	6.072	01	08:30:00
March	6.055	01	07:15:00
April	5.938	28	06:30:00
May	5.685	26	05:30:00
June	5.400	12	18:30:00
July	5.445	12	19:15:00
August	5.769	11	19:45:00
September	6.042	08	18:45:00
October	6.080	08	19:15:00
November	5.924	05	18:00:00
December	5.765	04	05:30:00

Extreme Minima	Value	Day	Time
January	0.660	31	01:15:00
February	0.529	28	12:45:00
March	0.097	30	13:15:00
April	0.381	27	12:00:00
May	0.779	27	12:30:00
June	0.752	24	23:45:00
July	0.886	12	00:45:00
August	0.518	11	01:30:00
September	0.369	10	02:00:00
October	0.228	07	00:00:00
November	0.416	07	01:00:00
December	0.589	05	12:15:00

Mean Sea Level	No Days	MSL
January	31	3.452
February	28	3.429
March	31	3.331
April	30	3.320
May	31	3.387
June	30	3.319
July	9	3.343
August	23	3.323
September	30	3.389
October	31	3.484
November	24	3.578
December	31	3.501
	sum days	avg
	329	3.405

Dover Tide Gauge

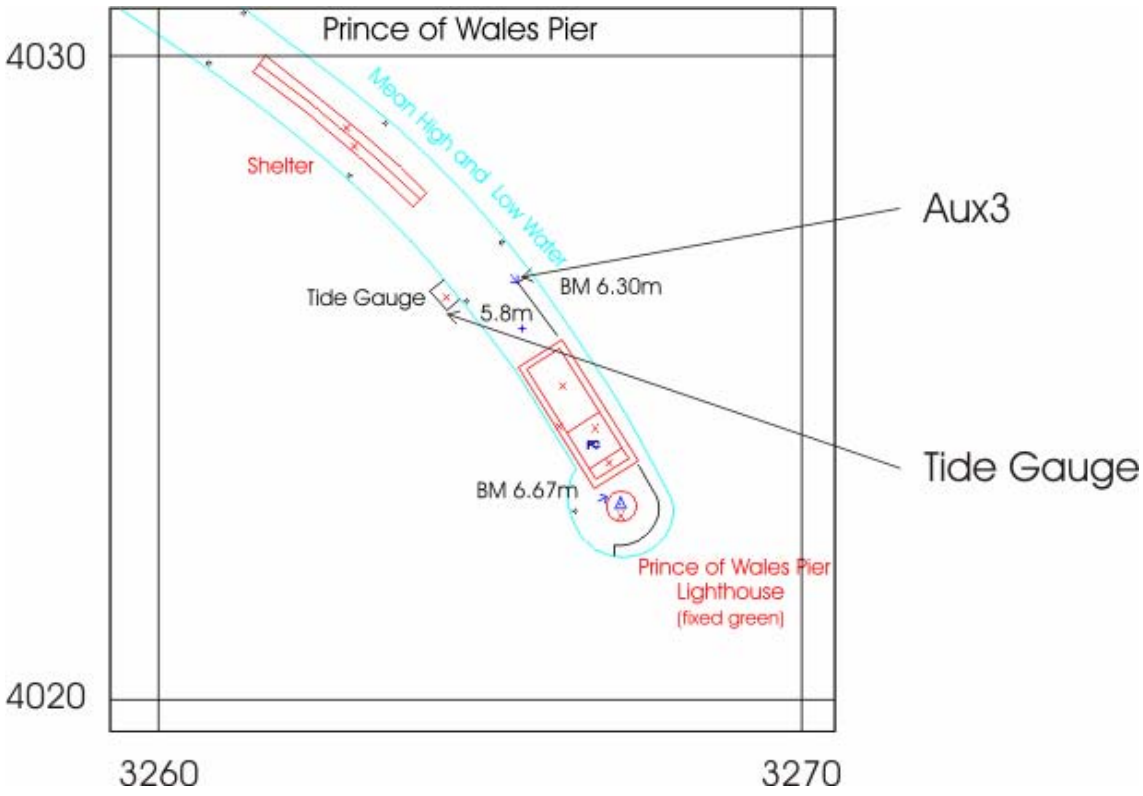
Latitude : 51° 06' 51.8" N Longitude : 01° 19' 21.1" E

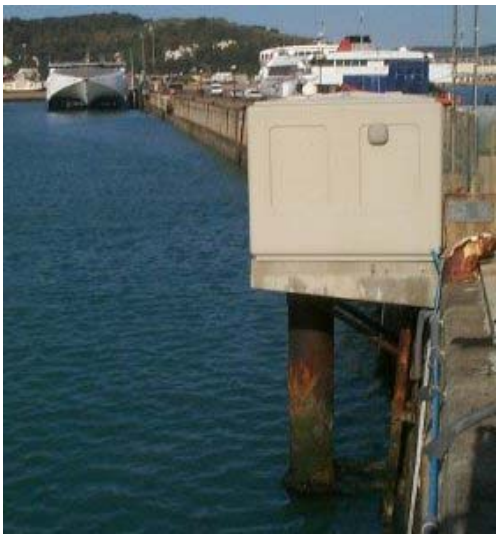
Grid Reference : TR 3264 4026

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located just before the lighthouse at the end of Prince of Wales Pier, Western Dock.





Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TR 3193 4074	Fl Br G4868 building. East side of works entrance
Aux 1	TR 3195 4095	No 29 Waterloo Crescent SW face S angle
Aux 2	TR 3228 4053	Rivet pier wall NE side of pier F junction
Aux 3	TR 3265 4026	Rivet steps NE side P of W pier 1.0M SE W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.67m below Ordnance Datum Newlyn (ODN)
TGZ = 10.491m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 21/05/1997.

T.G.I. visits to site : Day 63 General maintenance.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	None

Residuals

Plots of the residuals for Dover for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Dover for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.881	24	16:45:00
February	1.270	22	15:45:00
March	0.531	07	02:30:00
April	0.563	27	07:45:00
May	0.480	21	23:00:00
June	0.375	05	17:15:00
July	0.414	03	15:15:00
August	0.400	31	12:30:00
September	0.409	22	23:00:00
October	1.226	27	23:00:00
November	0.650	14	05:15:00
December	0.524	30	18:15:00

Surge Minima	Value	Day	Time
January	-0.443	28	10:15:00
February	-0.744	22	04:30:00
March	-0.645	14	09:15:00
April	-0.551	07	17:15:00
May	-0.241	24	21:30:00
June	-0.275	02	00:00:00
July	-0.237	19	15:30:00
August	-0.266	31	02:45:00
September	-0.363	01	21:00:00
October	-0.980	27	13:15:00
November	-0.698	03	09:30:00
December	-0.536	24	02:15:00

Extreme Maxima	Value	Day	Time
January	7.210	29	11:15:00
February	7.225	28	23:45:00
March	7.244	01	00:00:00
April	7.245	27	11:00:00
May	6.794	26	22:45:00
June	6.683	28	13:15:00
July	6.647	13	13:00:00
August	7.057	12	13:30:00
September	7.187	09	12:15:00
October	7.175	06	10:30:00
November	7.316	07	00:00:00
December	7.001	05	11:15:00

Extreme Minima	Value	Day	Time
January	0.615	30	07:00:00
February	0.548	01	08:45:00
March	0.194	30	07:30:00
April	0.453	28	07:00:00
May	0.731	28	07:15:00
June	0.866	26	19:15:00
July	0.838	14	21:15:00
August	0.670	11	20:15:00
September	0.368	09	20:00:00
October	0.301	08	19:45:00
November	0.368	05	18:30:00
December	0.627	04	18:00:00

Mean Sea Level	No Days	MSL
January	31	3.765
February	28	3.847
March	31	3.680
April	30	3.685
May	31	3.710
June	30	3.717
July	31	3.718
August	31	3.755
September	30	3.772
October	31	3.838
November	30	3.838
December	31	3.748
	sum days	avg
	365	3.756

Felixstowe Tide Gauge

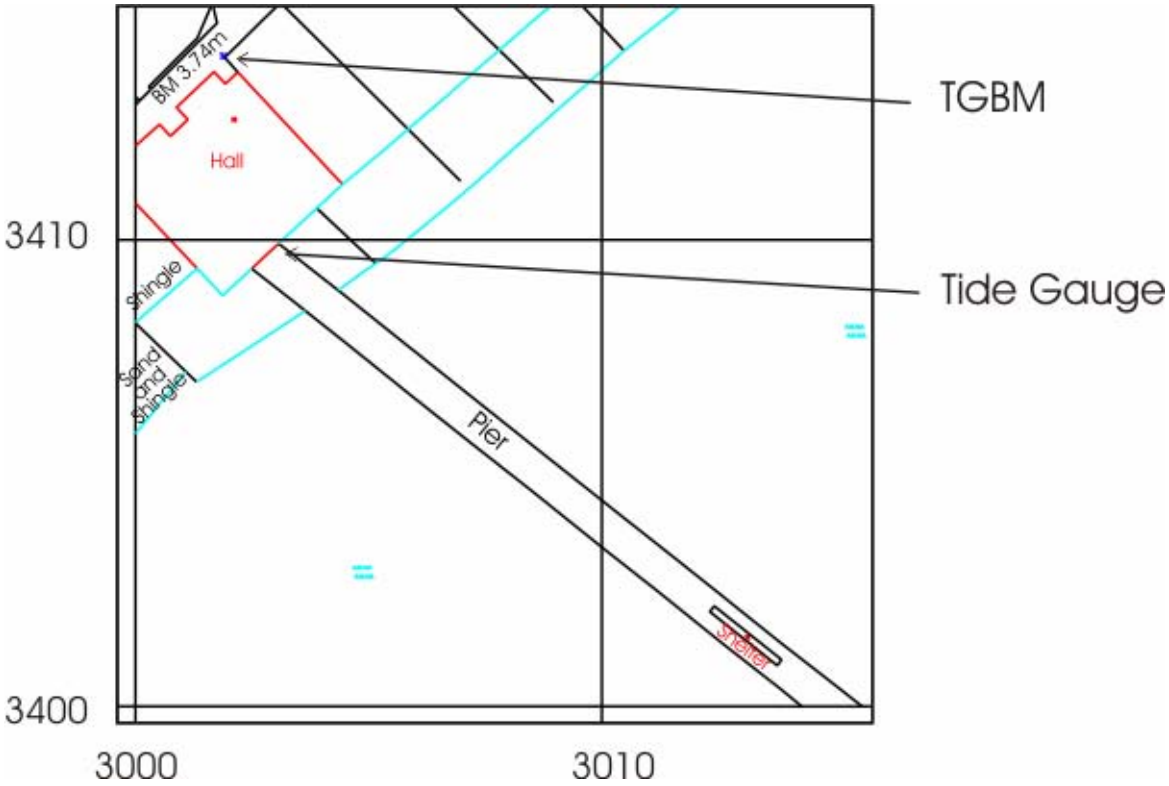
Latitude : 51° 57' 27.7" N Longitude : 01° 20' 47.6" E

Grid Reference : TM 3003 3409

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The Tide Gauge and measuring points are located on Felixstowe pier, the equipment being located on the landward end and the measuring points located in deep water at the seaward end.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TM 3001 3414	Bolt on the SE side of prom NE face of arcade
Aux1	TM 2956 3393	Flush Bracket 2071 on No. 25 Langer Road W angle NW face.
Aux3	TM 3003 3409	Rivet outside TG building

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.95m below ODN
TGZ = 5.69m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 30/08/1996.

T.G.I. visits to site : There were no visits to site in 2002.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	216,219,227,229,231,312-314,322-324,328-329

Residuals

Plots of the residuals for Felixstowe for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Felixstowe for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.292	29	06:30:00
February	1.425	22	16:30:00
March	0.653	09	06:30:00
April	0.773	27	06:45:00
May	0.388	22	00:00:00
June	0.498	18	12:15:00
July	0.292	24	09:30:00
August	0.589	31	11:30:00
September	0.515	22	19:30:00
October	1.432	27	21:15:00
November	0.527	06	22:45:00
December	0.576	29	18:45:00

Surge Minima	Value	Day	Time
January	-0.792	25	22:15:00
February	-1.123	22	00:15:00
March	-0.835	10	17:15:00
April	-0.389	30	15:00:00
May	-0.324	24	18:30:00
June	-0.289	30	22:45:00
July	-0.283	01	05:00:00
August	-0.317	30	23:45:00
September	-0.339	10	02:45:00
October	-0.904	27	10:45:00
November	-0.981	03	06:15:00
December	-0.705	23	22:45:00

Extreme Maxima	Value	Day	Time
January	4.358	29	11:45:00
February	4.407	28	12:00:00
March	4.276	01	13:00:00
April	4.373	27	11:30:00
May	4.011	26	11:00:00
June	3.963	28	14:00:00
July	3.897	23	23:00:00
August	4.148	12	01:45:00
September	4.174	09	13:00:00
October	4.307	05	23:00:00
November	4.389	07	00:30:00
December	4.083	04	23:30:00

Extreme Minima	Value	Day	Time
January	0.224	30	06:00:00
February	0.139	01	07:45:00
March	-0.130	02	07:30:00
April	0.078	28	06:00:00
May	0.176	25	04:00:00
June	0.332	29	20:30:00
July	0.289	14	20:30:00
August	0.246	11	19:30:00
September	0.107	09	19:15:00
October	0.057	08	18:45:00
November	-0.097	03	15:45:00
December	0.128	24	08:00:00

Mean Sea Level	No Days	MSL
January	31	2.108
February	28	2.169
March	31	2.033
April	30	2.022
May	31	2.023
June	30	2.064
July	31	2.066
August	29	2.134
September	30	2.160
October	31	2.160
November	22	2.076
December	31	2.058
	sum days	avg
	355	2.089

Fishguard Tide Gauge

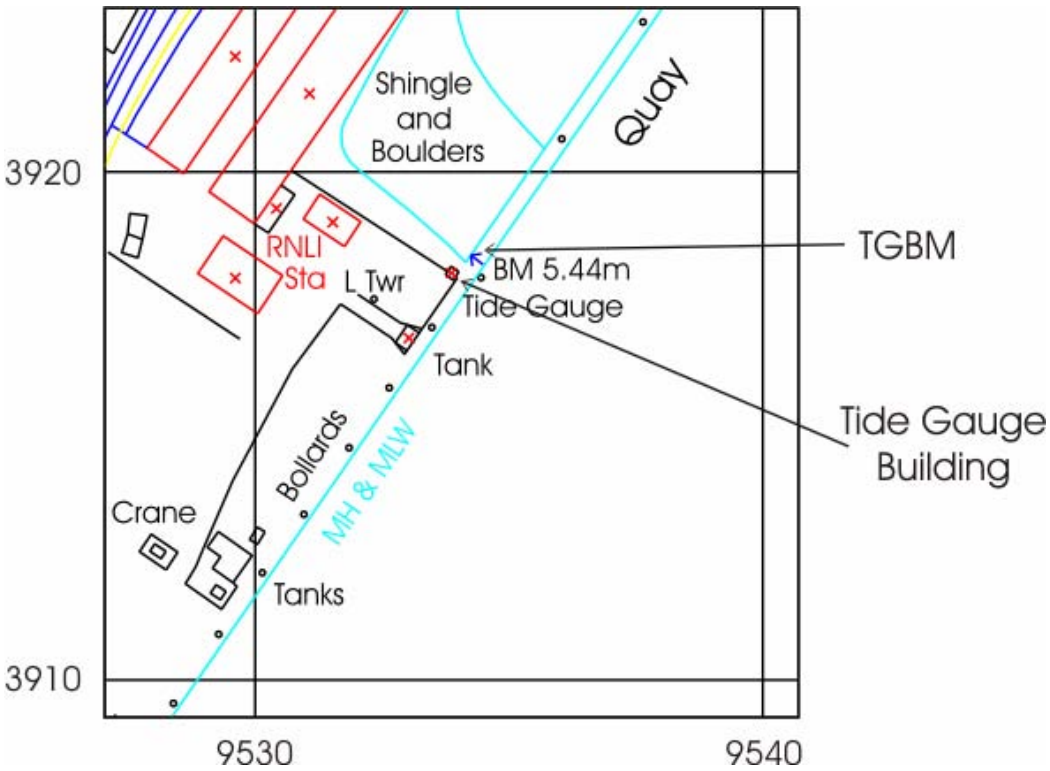
Latitude : 52° 00' 47.6" N Longitude : 04° 59' 01.5" W

Grid Reference : SM 9534 3918

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The Tide Gauge building is located on Fishguard Quay adjacent to the RNLI station, and the measuring points are located approx 10m from the end of the quay.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SM 9534 3918	OSBM bolt on quay 3.6M NE end of railings (1987)
Aux1	SM 9513 3874	OS bolt con base railings 6.4M NW angle TG hut
Aux2	SM 9489 3849	Rivet step top of Goodwick Quay
Aux3	SM 9455 3820	Fl Br 11518 blding SW side railway bridge SE Face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.44m below ODN
TGZ = 7.88m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 16/01/1997.

T.G.I. visits to site :	Day 070	Data logger off, faulty battery charger.
	Day 179	General maintenance.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
91	15 minutes	036-070	070-091

Residuals

Plots of the residuals for Fishguard for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Fishguard for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.831	23	12:45:00
February	1.057	01	14:45:00
March			
April	0.492	30	05:15:00
May	0.689	22	09:15:00
June	0.400	10	01:45:00
July	0.316	08	01:15:00
August	0.290	17	20:30:00
September	0.275	06	11:00:00
October	0.884	27	04:30:00
November	0.745	21	02:30:00
December	0.645	27	06:00:00

Surge Minima	Value	Day	Time
January	-0.071	10	02:00:00
February	0.258	01	00:45:00
March			
April	-0.143	26	16:45:00
May	-0.067	06	12:30:00
June	-0.143	28	13:45:00
July	-0.073	15	00:45:00
August	-0.117	31	11:45:00
September	-0.122	01	13:00:00
October	-0.375	27	22:45:00
November	-0.213	07	18:00:00
December	-0.229	06	00:00:00

Extreme Maxima	Value	Day	Time
January	5.418	31	09:00:00
February	5.698	01	09:30:00
March			
April	5.416	28	07:45:00
May	5.043	26	06:45:00
June	4.727	12	20:15:00
July	4.802	12	20:45:00
August	5.147	11	21:15:00
September	5.509	08	20:15:00
October	5.559	08	20:30:00
November	5.447	05	19:30:00
December	5.159	04	06:45:00

Extreme Minima	Value	Day	Time
January	0.813	30	15:00:00
February	0.964	01	03:45:00
March			
April	0.460	26	13:30:00
May	0.822	27	01:45:00
June	0.871	25	01:30:00
July	0.853	14	04:15:00
August	0.626	12	04:15:00
September	0.540	09	03:00:00
October	0.356	07	02:00:00
November	0.542	07	02:30:00
December	0.631	05	14:15:00

Mean Sea Level	No Days	MSL
January	31	2.936
February	3	3.189
March		
April	28	2.704
May	31	2.791
June	30	2.741
July	31	2.722
August	31	2.740
September	30	2.775
October	31	2.851
November	30	2.984
December	31	2.869
	sum days	avg
	307	2.846

Heysham Tide Gauge

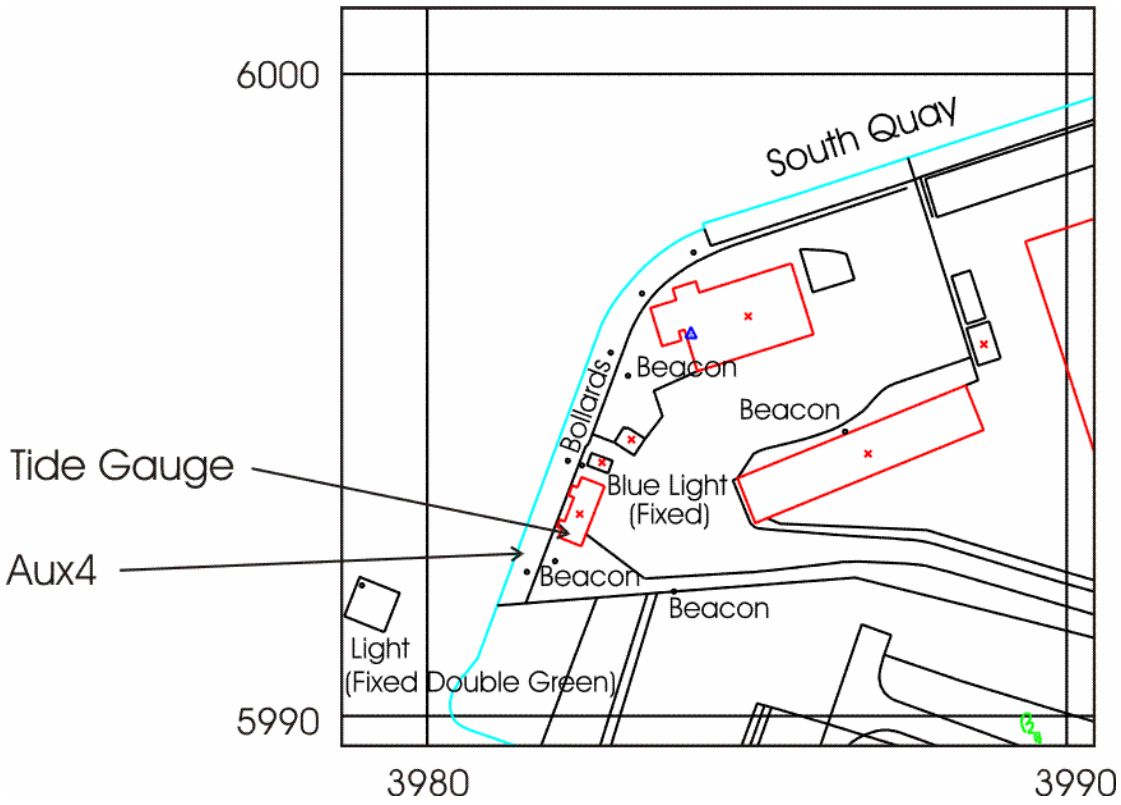
Latitude : 54° 01' 54.6" N Longitude : 02° 55' 12.9" W

Grid Reference : SD 3982 5993

Instrument type : Data acquisition system with two full tide bubbler gauges.

Site of Gauge:

The tide gauge is located in the tide gauge building, at the south entrance to Heysham Port.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SD 4030 6012	OSBM bolt on south quay 40.8m SW from SE angle of dock.
Aux1	SD 4141 6005	Bridge parapet, E side of road.
Aux2	SD 4026 6033	Pivot pin harbour wall 6.1M SW N angle of harbour.
Aux3	SD 4026 6033	Rivet harbour wall 5.7M SW of N angle of Harbour.
Aux4	SD 3982 5992	Brass bolt quay edge.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.90m below Ordnance Datum Newlyn (ODN)
TGZ = 12.098m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 02/08/1997.

T.G.I. visits to site :	Day 079	Modem replaced.
	Day 150	Equipment vandalised.
	Day 162	System reinstated.
	Day 235	Battery charger replaced & general maintenance.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
91	15 minutes	057-079, 150-162	None

Residuals

Plots of the residuals for Heysham for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Heysham for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.162	28	14:30:00
February	1.239	01	13:30:00
March	0.257	20	06:00:00
April	0.783	29	07:45:00
May	0.929	24	16:15:00
June	0.508	30	20:45:00
July	0.479	08	07:15:00
August	0.575	30	19:45:00
September	0.449	07	04:30:00
October	1.540	27	10:00:00
November	0.743	27	12:45:00
December	1.127	02	02:00:00

Surge Minima	Value	Day	Time
January	-0.315	10	04:00:00
February	-0.955	21	02:30:00
March	-0.327	26	06:45:00
April	-0.271	10	02:45:00
May	-0.242	06	15:00:00
June	-0.280	28	05:45:00
July	-0.239	15	19:15:00
August	-0.262	25	20:00:00
September	-0.281	27	19:15:00
October	-0.598	15	18:00:00
November	-0.244	07	22:00:00
December	-0.667	10	14:45:00

Extreme Maxima	Value	Day	Time
January	10.293	30	12:00:00
February	11.353	01	13:45:00
March	10.518	30	12:15:00
April	10.664	28	12:00:00
May	10.057	24	21:45:00
June	9.515	13	00:15:00
July	9.485	13	00:45:00
August	10.057	12	01:15:00
September	10.731	10	01:00:00
October	10.635	07	23:45:00
November	10.626	05	23:30:00
December	10.053	04	10:45:00

Extreme Minima	Value	Day	Time
January	0.915	30	19:15:00
February	1.028	13	19:00:00
March	0.118	29	18:30:00
April	0.583	27	18:00:00
May	0.967	26	17:45:00
June	1.272	25	05:45:00
July	1.087	14	08:30:00
August	0.691	12	08:15:00
September	0.424	09	07:15:00
October	0.315	07	06:15:00
November	0.643	05	05:30:00
December	0.786	05	06:00:00

Mean Sea Level	No Days	MSL
January	31	5.352
February	24	5.391
March	11	5.027
April	30	5.129
May	28	5.206
June	18	5.161
July	31	5.124
August	31	5.139
September	30	5.168
October	31	5.255
November	30	5.396
December	31	5.190
	sum days	avg
	326	5.212

Hinkley Point Tide Gauge

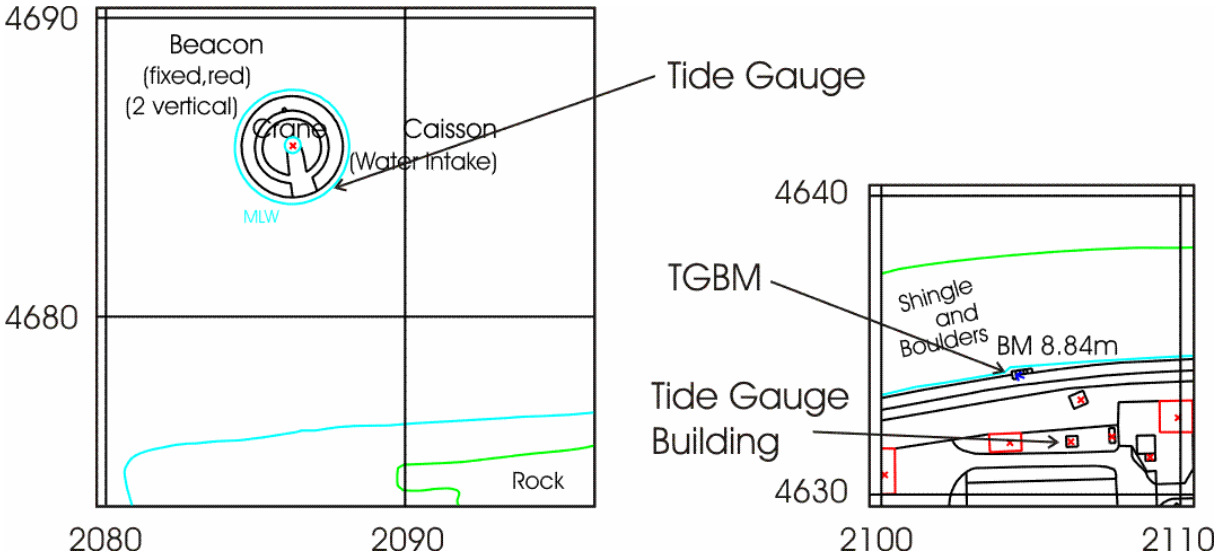
Latitude : 51° 12' 54.9" N Longitude : 03° 08' 04.1" W

Grid Reference : ST 2086 4684

Instrument type : Dataring system with dual underwater pressure transducers.

Site of Gauge:

The transducers are located in underwater vented chambers, suspended from a steel pole connected to the structure of the power station cooling water intake tower, some 400m offshore.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 2104 4634	Bolt on wall 0.962m NE of SE corner of steps.
Aux1	ST 2078 4626	Rivet on sea wall 41.28m SW of corner of outfall.
Aux2	ST 2094 4631	Bolt on sea wall 31.245m SW of end of railings.
Aux3	ST 2123 4634	Bolt sea defence wall.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.80m below Ordnance Datum Newlyn (ODN)
TGZ = 14.639m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled in 1991.

T.G.I. visits to site : There were no visits to site in 2002.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	None

Residuals

Plots of the residuals for Hinkley Point for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Hinkley Point for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.899	23	06:44:59
February	1.677	26	03:59:59
March	1.019	09	09:14:59
April	0.993	29	03:14:59
May	0.639	13	16:29:59
June	0.579	10	00:59:59
July	0.385	09	12:44:59
August	0.310	08	13:29:59
September	0.363	26	03:59:59
October	1.523	27	06:14:59
November	0.764	21	01:59:59
December	0.870	24	04:15:00

Surge Minima	Value	Day	Time
January	-0.251	09	00:59:59
February	-0.617	21	00:29:59
March	-0.547	24	02:59:59
April	-0.428	21	01:14:59
May	-0.368	31	15:29:59
June	-0.449	29	15:29:59
July	-0.350	15	23:59:59
August	-0.409	25	14:14:59
September	-0.461	01	13:29:59
October	-0.558	13	14:14:59
November	-0.327	04	02:29:59
December	-0.613	09	02:30:00

Extreme Maxima	Value	Day	Time
January	12.421	31	08:29:59
February	12.928	01	09:14:59
March	12.870	01	08:14:59
April	12.860	28	19:44:59
May	12.150	26	18:44:59
June	11.446	25	19:14:59
July	11.626	12	20:14:59
August	12.233	11	20:44:59
September	12.876	09	20:29:59
October	12.912	07	19:29:59
November	12.832	05	18:59:59
December	12.329	04	06:15:00

Extreme Minima	Value	Day	Time
January	0.690	30	14:14:59
February	0.463	28	13:44:59
March	-0.223	30	01:59:59
April	0.243	27	13:14:59
May	0.732	27	00:59:59
June	1.059	26	01:29:59
July	0.959	13	14:59:59
August	0.674	11	14:44:59
September	0.240	09	02:14:59
October	0.050	08	01:59:59
November	0.273	05	12:59:59
December	0.626	05	13:30:00

Mean Sea Level	No Days	MSL
January	31	6.320
February	28	6.370
March	31	6.179
April	30	6.194
May	31	6.259
June	30	6.198
July	31	6.184
August	31	6.185
September	30	6.222
October	31	6.332
November	30	6.440
December	31	6.297
	sum days	avg
	365	6.265

Holyhead Tide Gauge

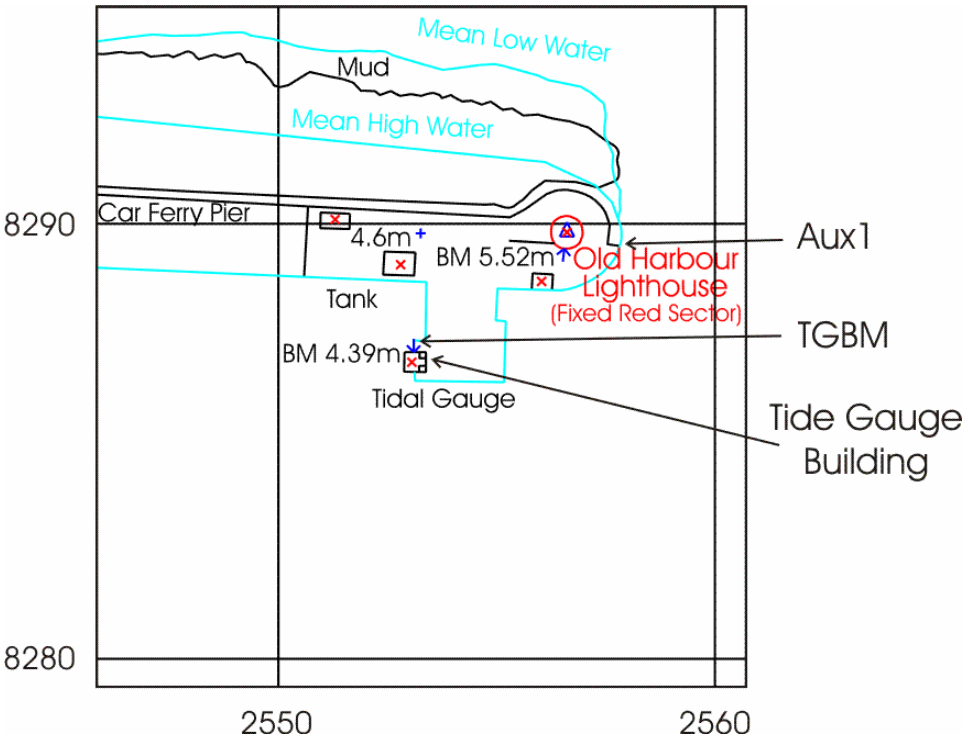
Latitude : 53° 18' 50.2" N Longitude : 04° 37' 14.1" W

Grid Reference : SH 2553 8287

Instrument type : Data acquisition system with a full tide and a mid-tide bubbler gauge and a back-up Munro float gauge installed. Wind speed and wind direction are also recorded.

Site of Gauge:

The tide gauge building and measuring points are situated on the south side of car ferry pier, close to the old harbour lighthouse.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 2553 8287	Bolt on concrete foundation, N side of T G building.
Aux1	SH 2556 8289	Cut mark lighthouse.
Aux3	SH 2506 8292	Bolt Salt Island bridge.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.05m below Ordnance Datum Newlyn (ODN)
TGZ = 7.436m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 20/05/1996.

T.G.I. visits to site :	Day 304	New data logger fitted.
	Day 311	Wind speed and direction sensors.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
96	15 minutes	295-311	None

Residuals

Plots of the residuals for Holyhead for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Holyhead for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.703	23	13:00:00
February	1.067	26	04:00:00
March	0.780	10	15:00:00
April	0.437	29	01:30:00
May	0.607	21	19:45:00
June	0.346	09	21:00:00
July	0.259	08	05:15:00
August	0.212	17	22:45:00
September	0.194	07	04:15:00
October	0.353	21	18:00:00
November	0.593	27	11:15:00
December	0.501	27	05:00:00

Surge Minima	Value	Day	Time
January	-0.166	10	02:15:00
February	-0.797	21	00:00:00
March	-0.280	01	14:30:00
April	-0.162	25	10:15:00
May	-0.206	06	13:15:00
June	-0.308	28	08:00:00
July	-0.189	15	17:45:00
August	-0.234	31	08:00:00
September	-0.202	01	09:00:00
October	-0.285	15	18:45:00
November	-0.335	07	19:00:00
December	-0.401	10	10:45:00

Extreme Maxima	Value	Day	Time
January	6.198	31	12:15:00
February	6.856	01	12:45:00
March	6.116	31	12:00:00
April	6.263	28	11:15:00
May	5.864	24	08:15:00
June	5.576	12	23:15:00
July	5.589	12	23:45:00
August	5.892	10	23:30:00
September	6.252	10	00:00:00
October	6.276	08	23:30:00
November	5.826	08	12:30:00
December	5.967	01	19:45:00

Extreme Minima	Value	Day	Time
January	0.516	30	17:30:00
February	0.218	28	17:15:00
March	-0.150	01	18:00:00
April	0.162	26	15:30:00
May	0.569	26	16:00:00
June	0.668	25	04:15:00
July	0.573	14	07:00:00
August	0.278	12	06:45:00
September	0.171	09	05:30:00
October	0.062	07	04:15:00
November	0.474	07	18:15:00
December	0.378	05	16:45:00

Mean Sea Level	No Days	MSL
January	31	3.429
February	28	3.399
March	31	3.219
April	30	3.215
May	31	3.287
June	30	3.242
July	31	3.199
August	31	3.201
September	30	3.246
October	20	3.281
November	22	3.524
December	31	3.310
	sum days	avg
	346	3.296

Ilfracombe Tide Gauge

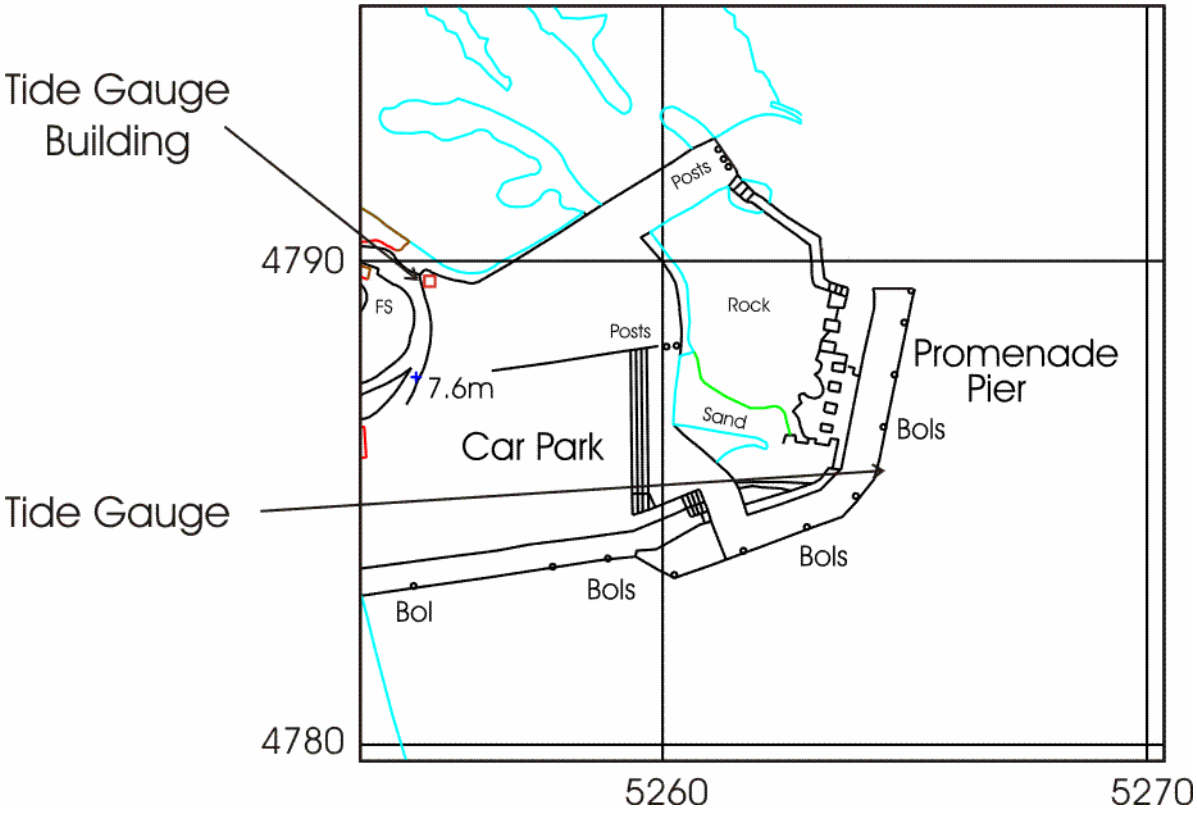
Latitude : 51° 12' 40.1" N Longitude : 04° 06' 44.6" W

Grid Reference : SS 5255 4789

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building and measuring points are located on the seaward side of Ilfracombe pier at the harbour entrance.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SS 5263 4791	OSBM Bolt on concrete pier, S.angle of T G hut.
Aux1	SS 5245 4782	Pier Hotel, The Quay
Aux2	SS 5251 4789	St Nicholas chapel N face 6.1M from NW angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.80m below Ordnance Datum Newlyn (ODN)
TGZ = 12.379m below TGBM
TGZ = 10.76m below Aux1
TGZ = 32.541m below Aux2

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was levelled again in 2002.

T.G.I. visits to site : Day 252 A new gauge was fitted, with three channels.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
85	15 minutes	036-050,130-170,252	001-036,050-130,170-252,282,286,288,293,299,307-308,310,311,335-336,343-345,353

Residuals

Plots of the residuals for Ilfracombe for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Ilfracombe for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
September	0.248	10	01:30:00
October	1.108	27	05:00:00
November	0.697	21	02:00:00
December	0.641	24	03:00:00

Surge Minima	Value	Day	Time
September	-0.212	27	11:45:00
October	-0.367	27	22:00:00
November	-0.215	07	23:15:00
December	-0.481	10	06:15:00

Extreme Maxima	Value	Day	Time
September	10.188	09	19:45:00
October	10.153	08	19:15:00
November	10.075	05	18:00:00
December	9.689	04	05:30:00

Extreme Minima	Value	Day	Time
September	0.515	10	01:45:00
October	0.136	07	12:15:00
November	0.371	05	12:00:00
December	0.626	05	12:15:00

Mean Sea Level	No Days	MSL
September	20	4.981
October	24	5.054
November	24	5.263
December	26	5.097
	sum days	avg
	94	5.099

Immingham Tide Gauge

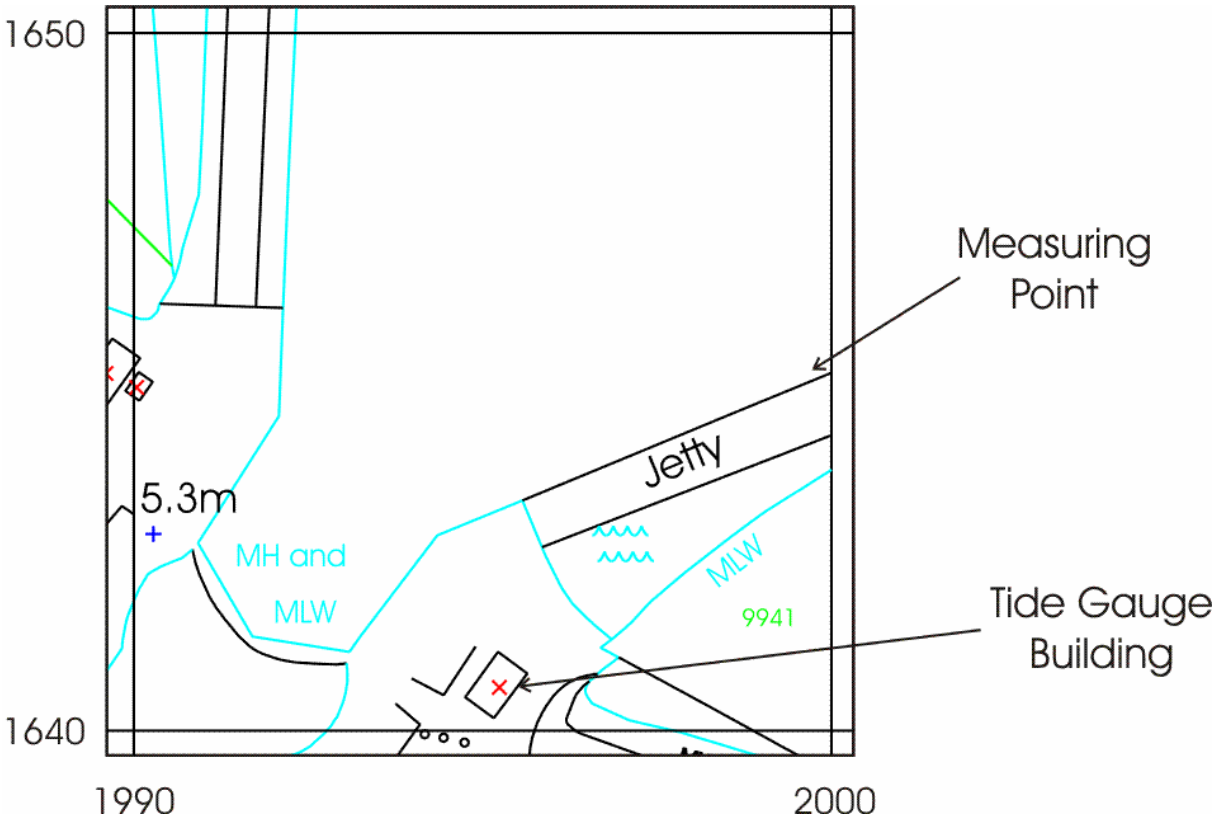
Latitude : 53° 37' 49.5" N Longitude : 00° 11' 14.2" W

Grid Reference : TA 1995 1640

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The gauge is situated at the east entrance to Immingham Docks.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TA 1989 1630	Docks office, north angle, north east face
Aux1	TA 2005 1631	Customs house, east angle, north east face
Aux2	TA 1994 1640	Bolt on concrete base of tide gauge building
Aux3	TA 2000 1648	Stud in camera tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.90m below ODN
TGZ = 9.131m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 24/04/1997.

T.G.I. visits to site : Day 80 Compressor change and maintenance.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	263-264,302-303

Residuals

Plots of the residuals for Immingham for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Immingham for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.789	29	01:00:00
February	0.721	20	17:15:00
March	0.594	06	19:00:00
April	0.661	27	02:45:00
May	0.362	21	21:30:00
June	0.594	18	06:30:00
July	0.245	09	12:45:00
August	0.362	16	06:45:00
September	0.327	22	12:30:00
October	0.918	27	16:45:00
November	0.455	14	07:00:00
December	0.354	25	06:30:00

Surge Minima	Value	Day	Time
January	-0.865	26	00:00:00
February	-1.282	21	20:45:00
March	-0.800	10	17:00:00
April	-0.492	21	11:45:00
May	-0.422	24	14:45:00
June	-0.387	29	03:00:00
July	-0.376	15	11:00:00
August	-0.397	31	01:30:00
September	-0.458	01	15:30:00
October	-0.473	11	23:15:00
November	-1.038	03	03:45:00
December	-0.736	23	19:45:00

Extreme Maxima	Value	Day	Time
January	7.585	29	05:45:00
February	7.707	28	18:45:00
March	7.604	02	20:00:00
April	7.575	27	05:45:00
May	7.290	26	17:45:00
June	6.993	28	08:00:00
July	7.113	26	07:00:00
August	7.529	12	08:15:00
September	7.543	09	07:00:00
October	7.639	09	07:30:00
November	7.739	06	18:45:00
December	7.370	05	06:00:00

Extreme Minima	Value	Day	Time
January	0.542	30	00:45:00
February	0.464	01	02:30:00
March	0.058	02	02:30:00
April	0.414	28	00:45:00
May	0.702	24	23:00:00
June	0.892	26	13:15:00
July	0.797	14	15:15:00
August	0.577	11	14:15:00
September	0.307	09	14:00:00
October	0.152	08	13:45:00
November	0.196	03	10:45:00
December	0.457	04	12:00:00

Mean Sea Level	No Days	MSL
January	31	4.153
February	28	4.172
March	31	4.057
April	30	4.059
May	31	4.058
June	30	4.080
July	31	4.071
August	31	4.115
September	27	4.140
October	28	4.191
November	30	4.131
December	31	4.106
	sum days	avg
	359	4.111

Port Erin (Isle of Man) Tide Gauge

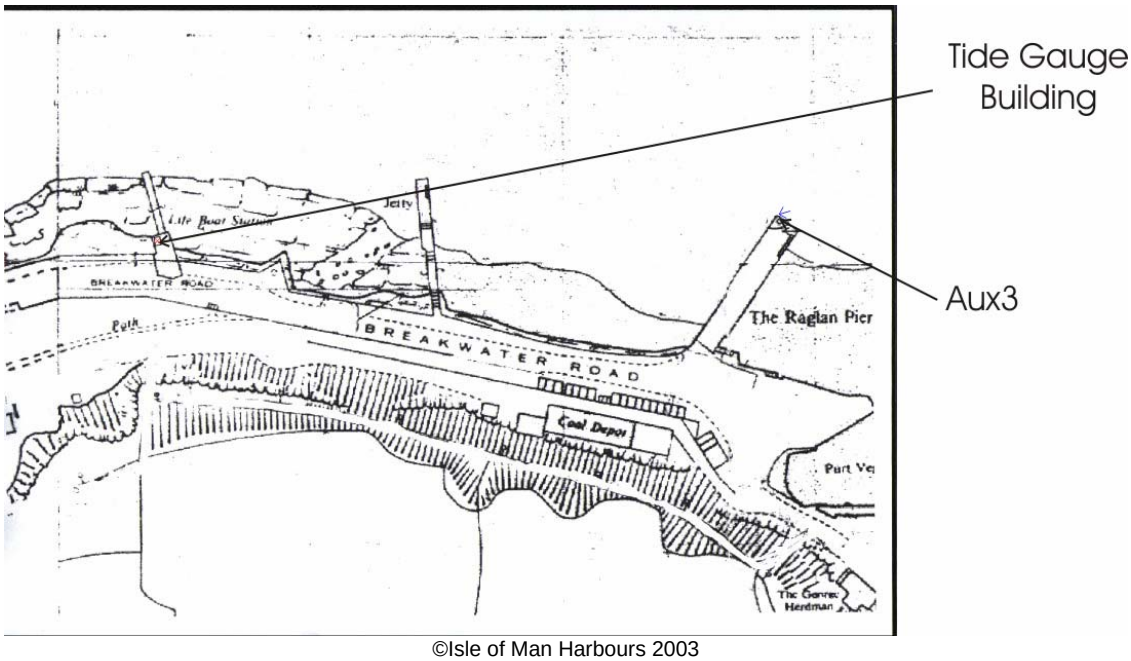
Latitude : 54° 05' 06.8" N Longitude : 04° 46' 05.0" W

Grid Reference : SC 1904 6902

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge equipment is situated in Port Erin lifeboat station and the measuring points are mounted close to the end of the lifeboat slipway. The equipment is housed in a heated Glasdon cabinet within the lifeboat station with the full tide and mid tide measuring point being mounted on steelwork attached to a concrete leg of the slipway.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SC 1904 6901	Bolt SE corner of the RNLI boathouse
Aux 2		Bolt on seawall NW of Marine labs
Aux 3	SC 1928 6903	Bolt base of light tower Raglan pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Local (ODL)
TGZ = 9.288m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 3/03/1998.

T.G.I. visits to site : Day 030 Gauge checked and general maintenance completed.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	001-030

Residuals

Plots of the residuals for Port Erin for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Port Erin for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.595	31	18:30:00
February	0.869	01	13:15:00
March	0.800	10	16:15:00
April	0.391	30	10:00:00
May	0.526	22	06:30:00
June	0.313	09	20:45:00
July	0.246	08	07:30:00
August	0.223	17	23:15:00
September	0.138	07	02:45:00
October	0.760	27	07:45:00
November	0.581	27	13:15:00
December	0.485	01	18:30:00

Surge Minima	Value	Day	Time
January	-0.255	01	01:45:00
February	-0.839	21	02:00:00
March	-0.358	01	15:30:00
April	-0.196	12	18:15:00
May	-0.219	07	02:45:00
June	-0.347	28	09:00:00
July	-0.254	15	20:00:00
August	-0.304	25	19:00:00
September	-0.269	01	09:45:00
October	-0.372	27	19:15:00
November	-0.332	07	22:45:00
December	-0.417	06	09:15:00

Extreme Maxima	Value	Day	Time
January	5.873	31	13:00:00
February	6.520	01	13:45:00
March	5.672	31	13:00:00
April	5.849	28	12:00:00
May	5.533	24	09:15:00
June	5.208	13	00:15:00
July	5.191	13	00:45:00
August	5.454	11	00:30:00
September	5.827	10	01:00:00
October	5.818	09	00:30:00
November	5.912	05	23:30:00
December	5.652	01	20:45:00

Extreme Minima	Value	Day	Time
January	0.249	30	0.7604167
February	-0.102	28	18:15:00
March	-0.450	01	19:00:00
April	-0.070	26	16:45:00
May	0.253	26	17:00:00
June	0.280	27	06:45:00
July	0.192	14	07:45:00
August	-0.061	12	07:30:00
September	-0.129	09	06:30:00
October	-0.210	07	05:15:00
November	0.075	05	05:00:00
December	0.061	05	17:45:00

Mean Sea Level	No Days	MSL
January		
February	28	2.989
March	31	2.799
April	30	2.791
May	31	2.860
June	30	2.819
July	31	2.767
August	31	2.770
September	30	2.810
October	31	2.912
November	30	3.067
December	31	2.903
	sum days	avg
	334	2.862

Port Ellen (Isle of Islay) Tide Gauge

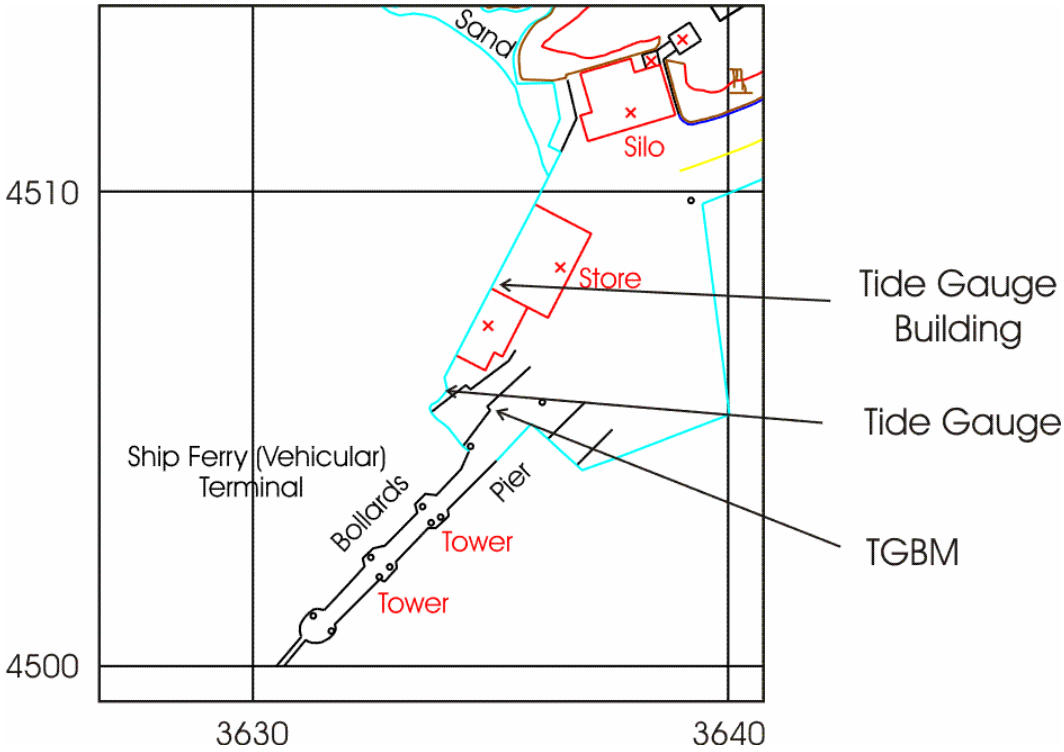
Latitude : 55° 37' 39.3" N Longitude : 06° 11' 23.7" W

Grid Reference : NR 3636 4508

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located within the Caledonian MacBrayne storeroom next to Port Ellen ferry terminal. The measuring points are located on the opposite side of the pier to the ferry docking area.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NR 3635 4507	Bolt SE side Booking Office
Aux1	NR 3642 4515	Rivet angle wall NW side entrance to pier
Aux2	NR 3651 4526	Police Station SE side of road SW face W angle
Aux3	NR 3635 4521	Sea Farm C gable NW face W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 0.19m below Ordnance Datum Newlyn (ODN)
TGZ = 2.839m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 26/04/1994.

T.G.I. visits to site :	Day 022	General maintenance.
	Day 085	New data logger installed.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	001-003	None

Residuals

Plots of the residuals for Port Ellen for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Port Ellen for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.066	28	13:15:00
February	1.131	01	17:45:00
March	1.054	10	17:29:59
April	0.428	28	08:59:59
May	0.698	24	15:44:59
June	0.640	17	09:14:59
July	0.383	08	06:14:59
August	0.410	17	16:59:59
September	0.279	06	19:44:59
October	0.562	25	11:45:00
November	0.730	27	15:44:59
December	0.766	01	16:59:59

Surge Minima	Value	Day	Time
January	-0.195	24	19:30:00
February	-0.587	21	01:14:59
March	-0.316	01	17:59:59
April	-0.134	12	20:14:59
May	-0.150	07	14:44:59
June	-0.240	27	21:44:59
July	-0.158	15	23:44:59
August	-0.199	25	17:29:59
September	-0.151	02	20:59:59
October	-0.313	27	18:45:00
November	-0.265	07	21:15:00
December	-0.406	02	18:29:59

Extreme Maxima	Value	Day	Time
January	1.580	28	13:45:00
February	1.677	01	17:15:00
March	1.354	10	16:14:59
April	1.207	26	04:29:59
May	1.117	21	22:29:59
June	1.093	17	05:29:59
July	0.868	27	19:14:59
August	0.940	11	18:59:59
September	1.053	06	16:59:59
October	1.281	25	16:00:00
November	1.469	27	15:44:59
December	1.520	01	15:29:59

Extreme Minima	Value	Day	Time
January	-0.006	06	0.0625
February	-0.458	21	00:59:59
March	-0.389	02	00:29:59
April	-0.287	26	22:44:59
May	-0.057	31	11:29:59
June	-0.221	28	10:29:59
July	-0.207	15	14:29:59
August	-0.247	12	13:14:59
September	-0.235	08	11:44:59
October	-0.248	06	10:30:00
November	-0.100	04	10:00:00
December	-0.138	09	23:44:59

Mean Sea Level	No Days	MSL
January	28	0.666
February	28	0.623
March	31	0.440
April	30	0.423
May	31	0.484
June	30	0.461
July	31	0.388
August	31	0.394
September	30	0.435
October	31	0.528
November	30	0.712
December	31	0.540
	sum days	avg
	362	0.508

St. Helier (Jersey) Tide Gauge

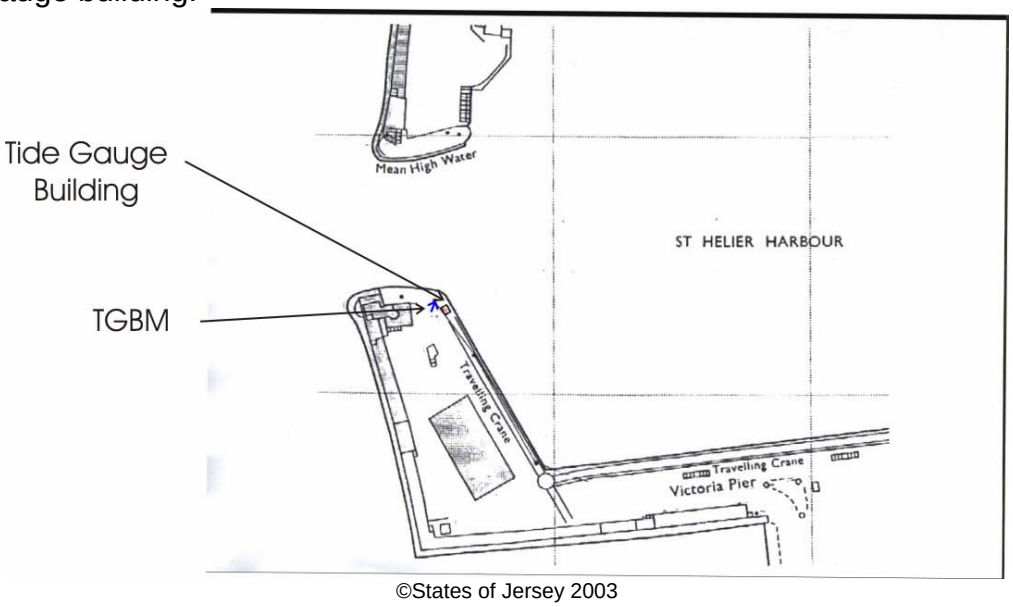
Latitude : 49° 11' 00" N Longitude : 02° 07' 00 " W

Grid Reference : 13/11 6466 4763

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge is located on Victoria Pier, St. Helier, adjacent to the Port Control building. The measuring points are located on the inside wall of the pier 2m from the Tide Gauge building.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	6465 4764 Plan 13/11	Pin bollard Victoria Pier
Aux1	6516 4764 Plan 13/11	Cut mark wall N side of road Mount Bingham
Aux2	6509 4780 Plan 13/11	"J" stone E face wall car park South Hill
Aux3	6507 4779 Plan 13/11	Cut mark S face wall car park South Hill
Aux4	6506 4784 Plan 13/11	Cut mark E face wall E side Commercial Rd

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.88m below Ordnance Datum Local (ODL)
TGZ = 13.658m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 24/04/1997.

T.G.I. visits to site : Day 289 Digital readout installed and general maintenance completed

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
98	15 minutes	290-297	None

Residuals

Plots of the residuals for St. Helier for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for St. Helier for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.903	23	21:15:00
February	0.894	26	03:00:00
March	0.528	18	10:45:00
April	0.444	29	03:45:00
May	0.468	21	18:30:00
June	0.369	07	01:30:00
July	0.378	03	08:30:00
August	0.323	09	15:15:00
September	0.261	22	17:00:00
October	0.957	27	05:30:00
November	1.013	14	02:00:00
December	0.630	26	07:00:00

Surge Minima	Value	Day	Time
January	-0.256	08	11:45:00
February	-0.499	21	11:45:00
March	-0.395	23	12:45:00
April	-0.402	21	00:15:00
May	-0.245	31	15:15:00
June	-0.299	28	14:15:00
July	-0.286	13	22:30:00
August	-0.328	31	23:30:00
September	-0.323	01	12:30:00
October	-0.532	28	09:30:00
November	-0.272	07	17:45:00
December	-0.350	06	02:45:00

Extreme Maxima	Value	Day	Time
January	11.504	31	08:15:00
February	11.742	01	08:45:00
March	11.996	01	07:45:00
April	11.889	28	19:30:00
May	11.243	26	18:30:00
June	10.520	25	18:45:00
July	10.737	12	20:00:00
August	11.462	11	20:30:00
September	12.047	09	20:15:00
October	12.064	08	19:45:00
November	11.861	06	07:00:00
December	11.367	04	06:00:00

Extreme Minima	Value	Day	Time
January	0.995	31	15:00:00
February	0.670	28	14:00:00
March	0.127	30	14:30:00
April	0.582	27	13:15:00
May	1.182	27	01:15:00
June	1.410	26	01:30:00
July	1.388	14	03:30:00
August	0.970	11	02:30:00
September	0.558	09	02:15:00
October	0.373	08	02:00:00
November	0.693	05	13:00:00
December	0.989	05	13:30:00

Mean Sea Level	No Days	MSL
January	31	6.086
February	28	6.065
March	31	5.910
April	30	5.919
May	31	5.990
June	30	5.934
July	31	5.982
August	31	6.004
September	30	6.022
October	22	6.113
November	30	6.242
December	31	6.144
	sum days	avg
	356	6.034

Kinlochbervie Tide Gauge

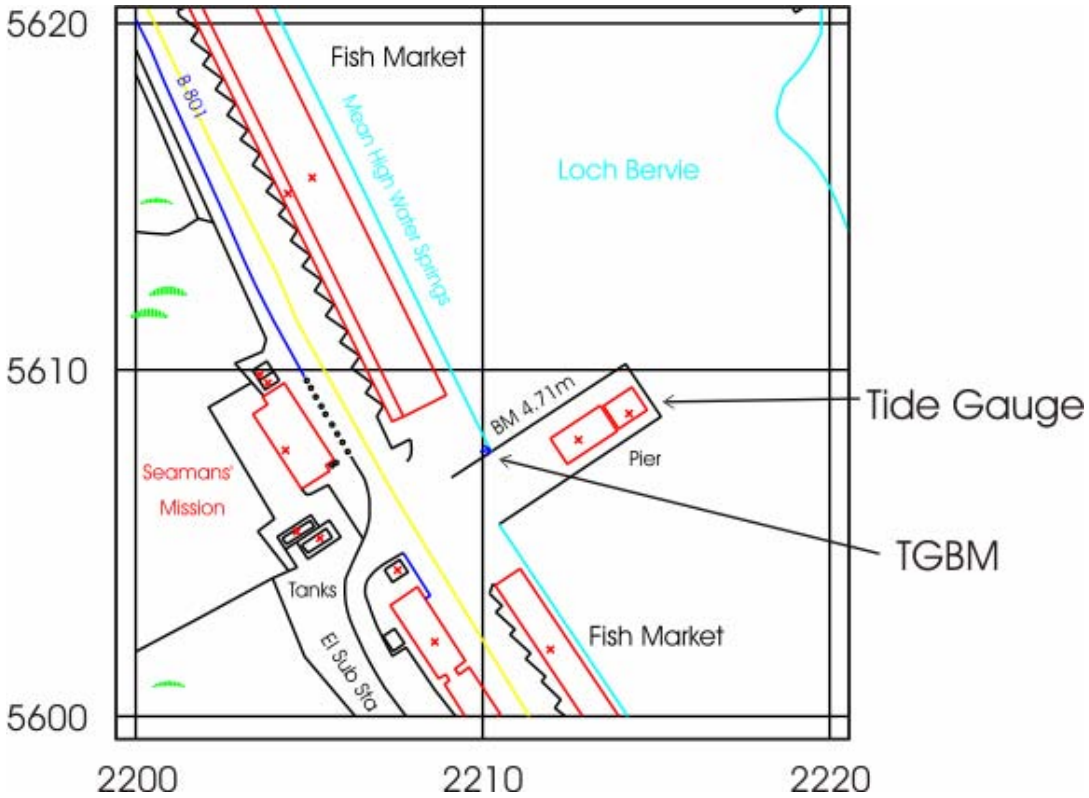
Latitude : 58° 27' 24.1" N Longitude : 05° 03' 01.3" W

Grid Reference : NC 2213 5609

Instrument type : Dataring system with two full tide bubbler gauges installed.

Site of Gauge:

Inside the Ice Plant, on the pier.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NC 2206 5613	Bolt S side harbour 19.5M SE angle of building
Aux1	NC 2210 5612	Rivet iceplant 7.45M from S angle of building
Aux2	NC 2210 5614	Rivet inside iceplant 3.5M E door
Aux3	NC 2203 5626	Rivet 12.3M SE N angle of building
Aux4	NC 2213 5621	Rivet 2.5M NW inside corner NE steps

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.50m below Ordnance Datum Newlyn (ODN)
TGZ = 7.213m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 11/02/1997.

T.G.I. visits to site : Day 233 Site survey for new installation.

Data quality

The gauge was offline in 2002 due to site refurbishment.

Residuals

None produced.

Statistics

None produced.

Leith Tide Gauge

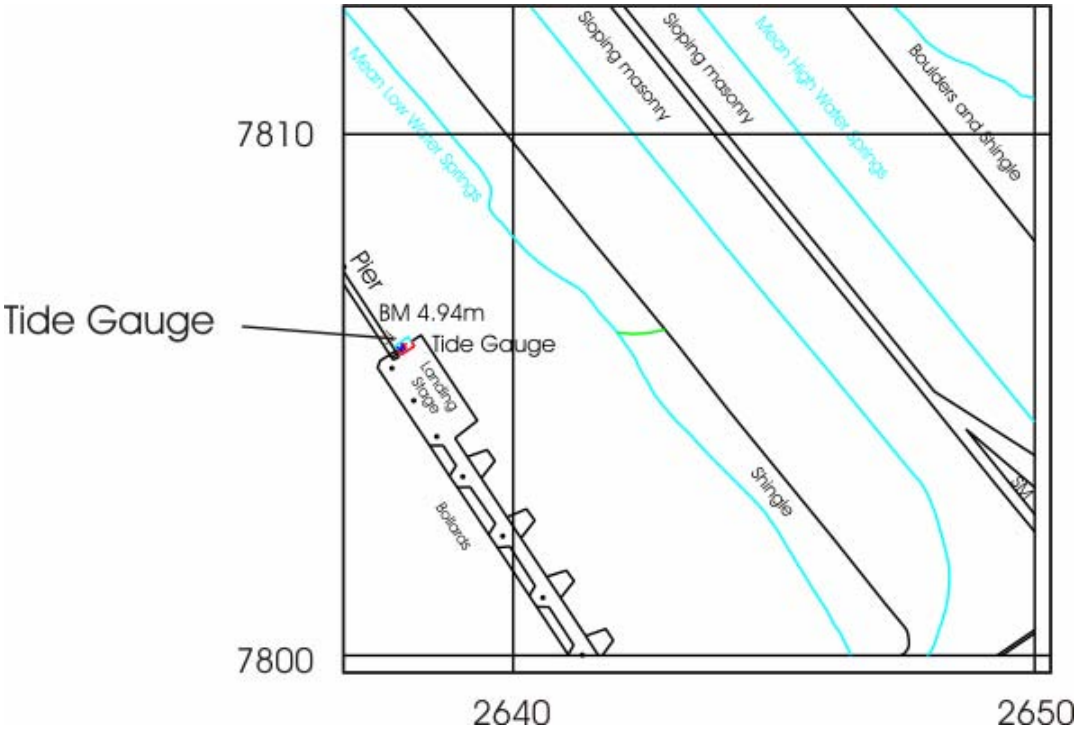
Latitude : 55° 59' 23.4"N Longitude : 03° 10' 54.1"E

Grid Reference : NT 2638 7806

Instrument type : Data acquisition system with a full tide bubbler gauge and a potentiometer connected to a Munro float gauge installed.

Site of Gauge:

The tide gauge building and measuring points are located on the landing stage at Leith docks.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NT 2643 7797	OSBM Bolt SE end of TG pier 0.9m N angle of pier.
Aux1	NT 2648 7797	Rivet on top step SW side of road 1.6m S angle of building.
Aux2	NT 2653 7789	Rivet top step SW side of road 11.9M W angle of building

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.90m below Ordnance Datum Newlyn (ODN)
TGZ = 7.84mm below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 8/2/2002.

T.G.I. visits to site :	Day 039	New data logger installed
	Day 226	General maintenance.
	Day 234	Float gauge recalibrated and new battery charger fitted.

Data quality

Up to February 2002, channel 2 was used as the primary channel and channel 1 was the secondary (backup) channel. In February 2002, after a visit was made by engineers to the site, channel 1 became the primary channel and channel 2 became the secondary (backup) channel.

Parameter	CI	Sample interval	Missing data	Suspect data
ASLVBG02	January	15 minutes	022-031	None
ASLVBG01	February to December	15 minutes	032-039, 099-121, 158-181, 190	145-147, 182-206

Residuals

Plots of the residuals for Leith for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Leith for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.521	21	01:45:00
February	0.738	22	18:45:00
March	0.699	06	15:45:00
April	0.226	01	13:30:00
May	0.497	21	16:15:00
June	0.626	18	03:45:00
July	0.284	01	13:00:00
August	0.344	16	04:15:00
September	0.236	26	01:00:00
October	0.544	26	00:30:00
November	0.599	14	14:30:00
December	0.424	27	06:45:00

Surge Minima	Value	Day	Time
January	-0.249	08	21:14:59
February	-0.493	21	14:45:00
March	-0.402	10	16:00:00
April	-0.209	05	17:15:00
May	-0.294	07	21:45:00
June	-0.282	29	10:30:00
July	-0.280	31	14:45:00
August	-0.246	25	23:15:00
September	-0.373	01	10:45:00
October	-0.384	29	03:00:00
November	-0.718	03	04:30:00
December	-0.453	03	17:00:00

Extreme Maxima	Value	Day	Time
January	5.632	01	15:59:59
February	6.210	28	03:00:00
March	6.010	30	15:45:00
April	5.754	01	17:15:00
May	5.721	27	15:00:00
June	5.419	25	15:00:00
July	5.474	26	03:45:00
August	5.895	12	04:45:00
September	6.001	09	16:15:00
October	6.023	08	03:15:00
November	6.125	06	15:15:00
December	5.739	04	14:15:00

Extreme Minima	Value	Day	Time
January	0.620	02	22:44:59
February	0.135	28	21:45:00
March	-0.183	01	22:15:00
April	0.639	01	10:45:00
May	0.612	24	19:00:00
June	0.672	26	09:30:00
July	0.475	14	11:30:00
August	0.301	11	10:30:00
September	-0.082	09	10:00:00
October	-0.146	07	08:45:00
November	0.076	05	08:30:00
December	0.467	04	08:00:00

Mean Sea Level	No Days	MSL
January	20	3.243
February	19	3.248
March	31	3.125
April	7	3.117
May	25	3.117
June	30	3.157
July	28	3.102
August	31	3.142
September	30	3.138
October	31	3.209
November	30	3.244
December	31	3.153
	sum days	avg
	313	3.166

Lerwick Tide Gauge

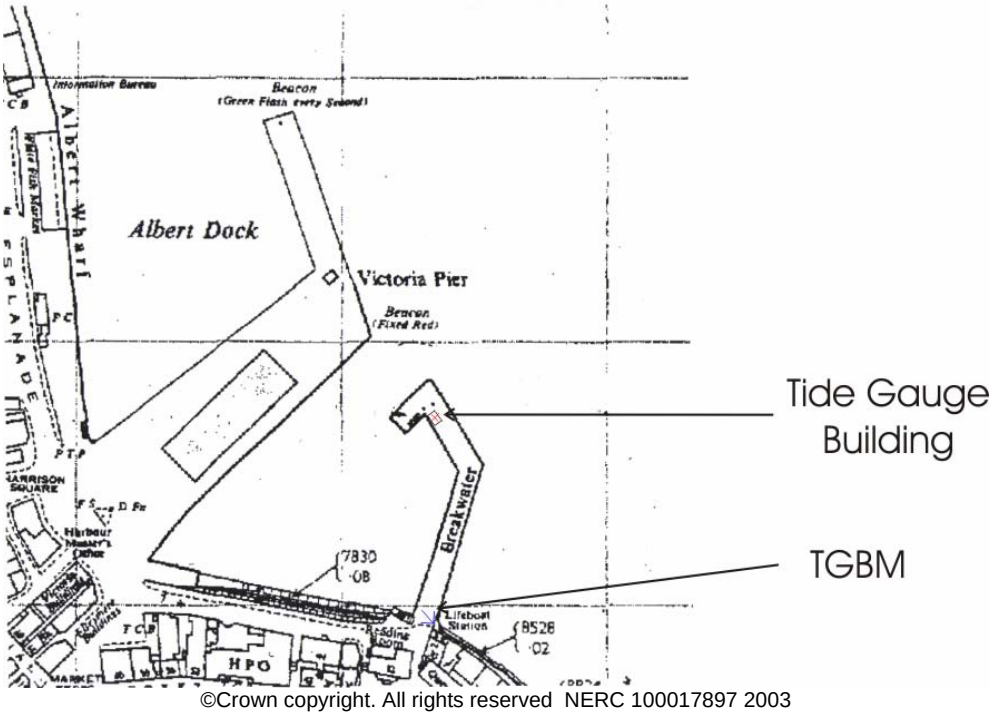
Latitude : 60° 09' 14.5" N Longitude : 01° 08' 25.1" W

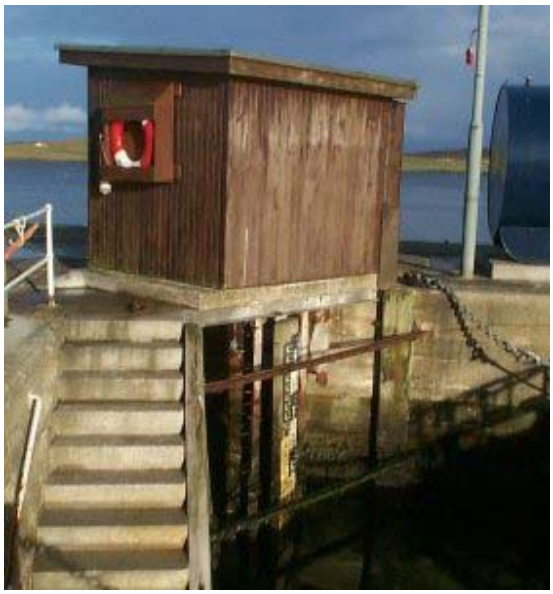
Grid Reference : HU 4783 4137

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge building and measuring points are located on the inner wall at breakwater entrance to the small boat harbour, south of Victoria Pier, Lerwick.





Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	HU 4783 4129	OSBM bolt on breakwater wall.
Aux1	HU 4784 4125	Queen's Hotel 7.5m SW face south angle.
Aux2	HU 4777 4110	Lerwick Parish Church North face NW angle.

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.22m below Ordnance Datum Local (ODL)
TGZ = 4.57m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 29/11/1995.

T.G.I. visits to site :	Day 021	New data logger fitted.
	Day 056	Building damaged by fire.
	Day 058	Survey of fire damage, all instrumentation destroyed.

Data quality

In 2002 the back-up channel (represented by the parameter code ASLVBG01) was used in place of the primary channel (ASLVBG02) as the data from the primary channel were of poor quality.

The tide gauge was destroyed by fire in February 2002 and is due to be reinstalled in 2003.

CI (%)	Sample interval	Missing data	Suspect data
14	15 minutes	050-365	008-013, 023, 046-050

Residuals

No individual plots for Lerwick, but the East Coast January plot in the Residuals Plots appendix has the Lerwick residual included.

Statistics

Statistics not produced as primary channel was completely flagged. Statistics are not produced from the back-up channel.

Liverpool Tide Gauge

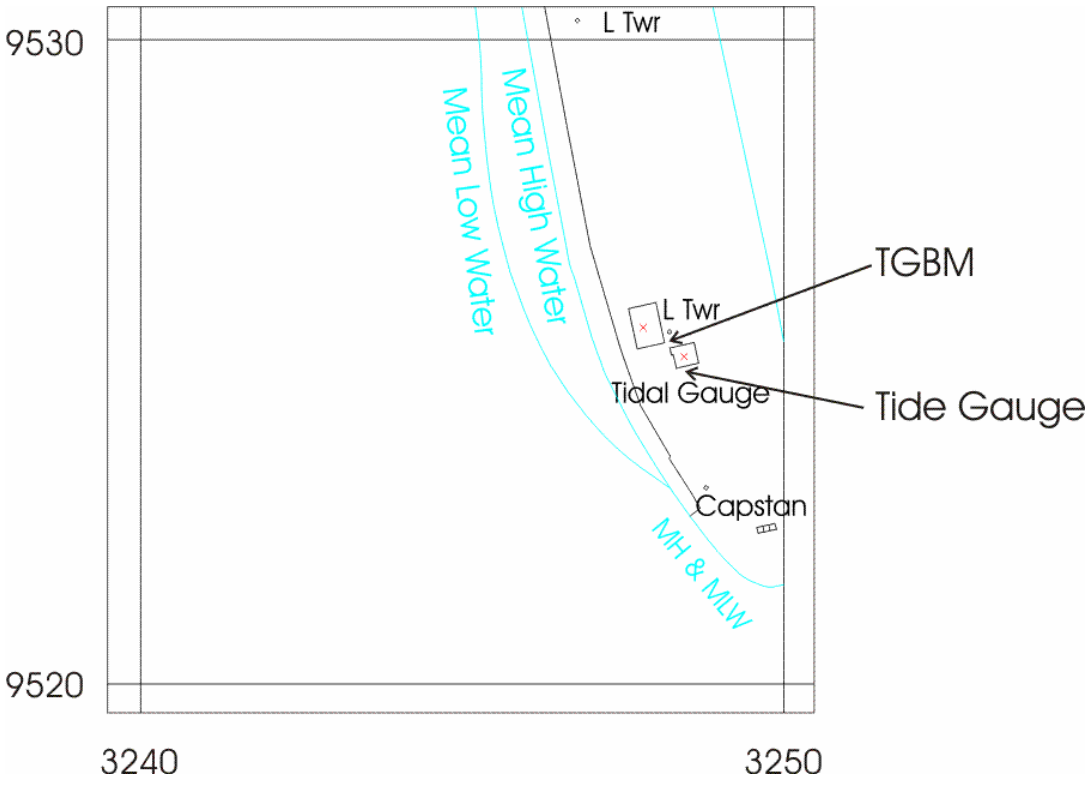
Latitude : 53° 26' 58.9" N Longitude : 03° 01' 05.3" W

Grid Reference : SJ 3248 9525

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed. Wind speed and wind direction also recorded.

Site of Gauge:

The Tide Gauge is located within the Old Lock Keepers Office at the entrance to Gladstone Dock, the measuring points being located on the seaward side of Gladstone Dock. The wind speed and direction instruments are mounted at the top of the light tower located next to the Tide Gauge building.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SJ 3249 9525	NBM rivet NE face E angle base of building
Aux1	SJ 3250 9523	Rivet E side of quay above hinge SW dock gate
Aux2	SJ 3244 9538	Building wall E face SE angle
Aux3	SJ 3294 9558	Rivet concrete adjacent to building No 335

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.93m below Ordnance Datum Newlyn (ODN)
TGZ = 14.475m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information :

The tide gauge at Liverpool (Gladstone dock) was relevelled in 2002. It was found that from 03/12/01 11:15 GMT to 09/01/02 20:30 GMT the data were 33 mm high and from 09/01/02 21:45 GMT to 25/04/02 21:15 GMT the data were 148 mm high. All affected files have been corrected to chart datum.

T.G.I. visits to site :	Day 009	Installation of mid-tide sensor and geodetic levelling
	Day 056	Connection of met instruments.
	Day 113	Geodetic levelling and new flow meters fitted.
	Day 196	Compressor replaced and general maintenance.
	Day 353	Software upgrade and geodetic levelling.
	Day 355	Faulty power supply replaced.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
90	15 minutes	050-056, 099-101, 105, 113-115, 142-151, 253-256, 351-365	None

Residuals

Plots of the residuals for Liverpool for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Liverpool for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.294	28	17:00:00
February	2.099	26	06:00:00
March	1.187	09	12:45:00
April	0.836	29	09:00:00
May	0.524	13	19:30:00
June	0.524	10	05:45:00
July	0.384	08	07:00:00
August	0.499	30	21:00:00
September	0.266	09	21:45:00
October	2.264	27	10:00:00
November	0.522	21	20:45:00
December	0.856	02	02:30:00

Surge Minima	Value	Day	Time
January	-0.338	09	20:44:53
February	-0.529	13	20:00:00
March	-0.391	01	15:45:00
April	-0.272	26	18:45:00
May	-0.328	06	15:30:00
June	-0.382	02	09:45:00
July	-0.337	16	05:15:00
August	-0.426	25	18:45:00
September	-0.386	27	19:30:00
October	-0.590	15	17:15:00
November	-0.354	30	02:45:00
December	-0.730	10	11:45:00

Extreme Maxima	Value	Day	Time
January	10.055	30	12:00:00
February	10.834	01	13:30:00
March	10.214	30	12:00:00
April	10.162	28	11:30:00
May	9.289	01	01:15:00
June	9.083	13	00:15:00
July	9.111	13	00:30:00
August	9.676	12	01:00:00
September	10.214	10	00:45:00
October	10.121	07	23:30:00
November	10.113	05	23:15:00
December	9.688	04	10:45:00

Extreme Minima	Value	Day	Time
January	0.879	30	19:15:00
February	0.484	28	19:00:00
March	-0.003	01	19:45:00
April	0.330	27	18:15:00
May	1.322	12	17:45:00
June	1.113	25	05:45:00
July	0.925	14	08:30:00
August	0.562	12	08:30:00
September	0.193	09	07:15:00
October	0.093	07	06:15:00
November	0.398	05	05:45:00
December	0.672	05	06:15:00

Mean Sea Level	No Days	MSL
January	31	5.434
February	19	5.524
March	31	5.255
April	17	5.225
May	20	5.101
June	29	5.147
July	31	5.097
August	31	5.095
September	25	5.129
October	31	5.230
November	30	5.337
December	15	5.055
	sum days	avg
	310	5.219

Llandudno Tide Gauge

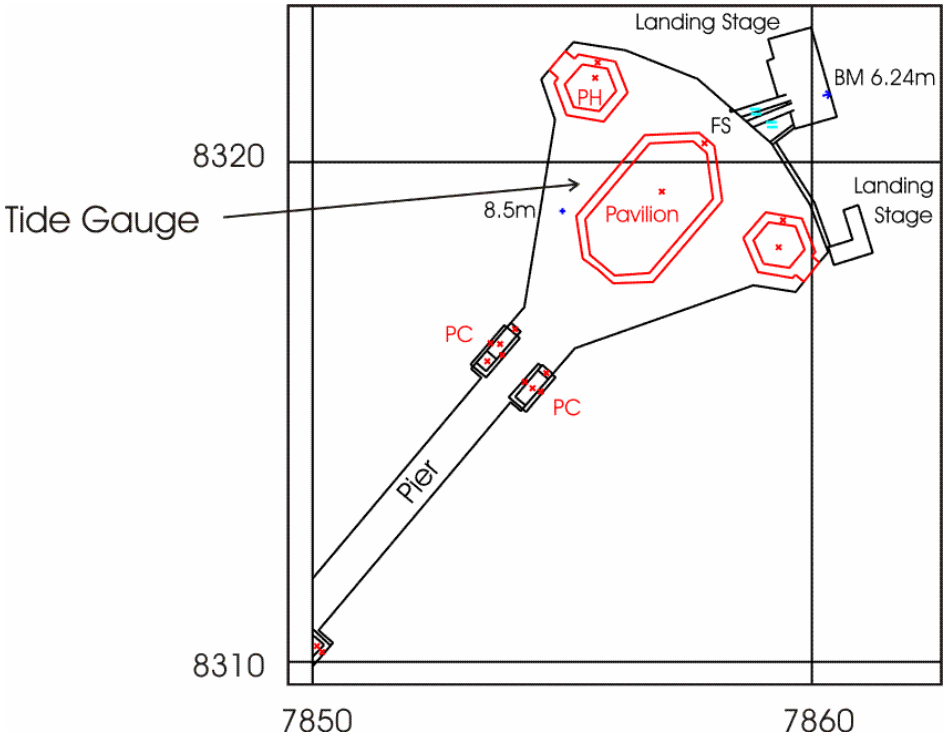
Latitude : 53° 19' 54.0" N Longitude : 03° 49' 30.8" W

Grid Reference : SH 7855 8319

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge equipment and measuring points are located on the sub-platform under the pavilion at the seaward end of Llandudno pier.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SH 7834 8292	Rivet stone butt gate entrance
Aux1	SH 7827 8255	OSBM bolt concrete step SE side of slipway
Aux2	SH 7840 8243	OSBM bolt bottom concrete step
Aux3	SH 7864 8229	OSBM bolt concrete ramp 6.5M NW C slipway

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.85m below Ordnance Datum Newlyn (ODN)
TGZ = 12.558m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled in 1992.

T.G.I. visits to site : Day 226 Battery operated compressor fitted.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

From January to July there were problems with the power supply causing most of the data to be suspect. The gap in the data from 330-334 was due to the phone line being cut during a refurbishment of the pier.

CI (%)	Sample interval	Missing data	Suspect data
97	15 minutes	152, 155, 157-160, 162-172, 174-181, 330-334	001-025, 057-058, 068-088, 094-104, 137-150, 182-188, 190-195, 198, 200-202, 204-207, 209, 211-212, 214-216, 218-223, 225-226, 335-365

Residuals

Plots of the residuals for Llandudno for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Llandudno for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.706	31	17:45:00
February	0.957	26	07:00:00
March	0.733	09	11:45:00
April	0.429	30	09:00:00
May	0.530	22	13:00:00
June	0.309	09	19:45:00
July	0.252	08	06:00:00
August	0.221	17	23:15:00
September	0.139	07	02:45:00
October	1.067	27	08:45:00
November	0.485	21	21:30:00
December			

Surge Minima	Value	Day	Time
January	-0.191	29	05:00:00
February	-0.964	21	00:45:00
March	-0.467	01	15:00:00
April	-0.281	26	18:45:00
May	-0.314	06	14:00:00
June	-0.546	28	05:15:00
July	-0.277	14	03:15:00
August	-0.333	31	08:30:00
September	-0.308	01	09:15:00
October	-0.610	15	18:00:00
November	-0.434	07	20:30:00
December			

Extreme Maxima	Value	Day	Time
January	8.203	30	11:30:00
February	8.900	01	13:15:00
March	8.306	30	11:45:00
April	8.395	28	11:15:00
May	7.806	25	22:00:00
June	7.440	12	23:45:00
July	7.490	13	00:15:00
August	7.919	12	00:45:00
September	8.337	10	00:15:00
October	8.407	07	23:15:00
November	8.411	05	23:00:00
December			

Extreme Minima	Value	Day	Time
January	0.209	30	18:30:00
February	-0.159	28	18:00:00
March	-0.586	01	18:45:00
April	-0.181	26	16:45:00
May	0.264	26	17:00:00
June	0.530	25	17:30:00
July	0.469	15	08:30:00
August	-0.187	12	07:15:00
September	-0.224	09	06:30:00
October	-0.320	07	05:15:00
November	-0.065	05	05:00:00
December			

Mean Sea Level	No Days	MSL
January	6	4.332
February	26	4.137
March	9	3.964
April	18	4.013
May	16	3.963
June	1	3.978
July	2	3.882
August	18	3.950
September	30	3.995
October	31	4.07
November	24	4.208
December		
	sum days	avg
	181	4.045

Lowestoft Tide Gauge

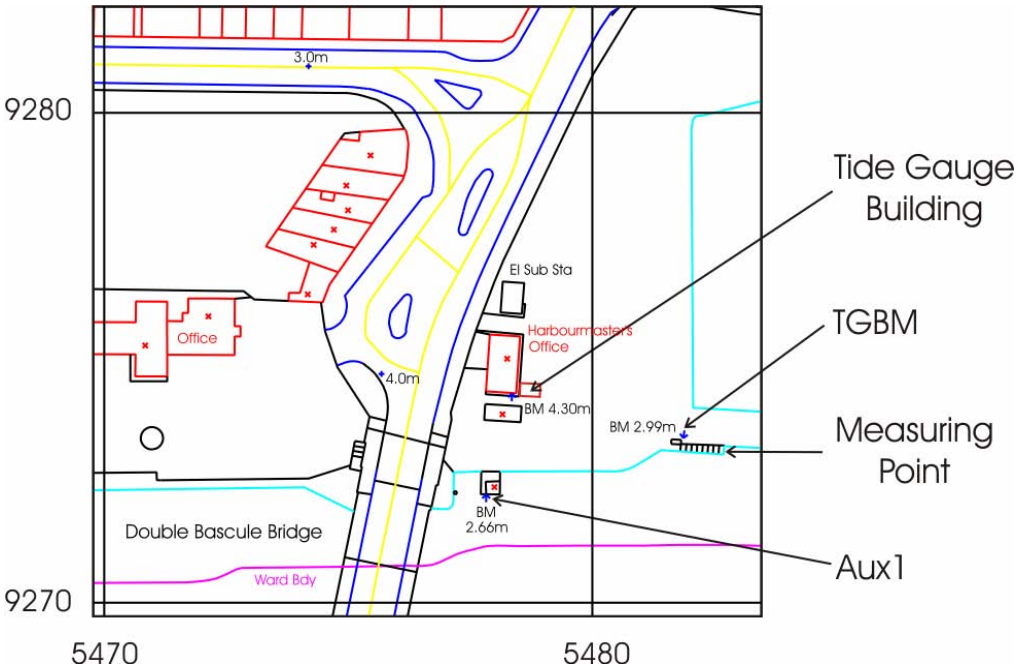
Latitude : 52° 28' 23.1" N Longitude : 01° 45' 00.9" E

Grid Reference : TM 5479 9274

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The disused tide gauge building (seen in the centre of the photograph) is mounted above the two stilling wells in front of the Harbour Master's office. The present tide gauge building is situated to the right of the Harbour Master's Office with the measuring points located on the quay wall approx 20m to the right of the old tide gauge building.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TM 5482 9273	Bolt on quay wall S side of pier.
Aux1	TM 5477 9272	Bolt on concrete jetty at SW corner of TG building
Aux2	TM 5478 9274	CM Harbour Masters Office SE angle S face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.50m below Ordnance Datum Newlyn (ODN)
TGZ = 4.483m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 13/11/1996.

T.G.I. visits to site :	Day 015	Software upgrade and general maintenance.
	Day 071	Repair of Ott chart recorder
	Day 217	Repair of Ott Chart recorder
	Day 283	Ott electronic driver board replaced

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	015,281-283	None

Residuals

Plots of the residuals for Lowestoft for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Lowestoft for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.313	29	04:45:00
February	1.118	22	15:45:00
March	0.705	06	23:15:00
April	0.846	27	05:15:00
May	0.407	21	21:45:00
June	0.572	18	09:00:00
July	0.307	24	03:15:00
August	0.550	31	09:15:00
September	0.486	22	13:00:00
October	1.445	27	19:45:00
November	0.523	07	01:45:00
December	0.450	29	18:30:00

Surge Minima	Value	Day	Time
January	-0.772	25	22:30:00
February	-1.017	21	22:30:00
March	-0.686	10	19:30:00
April	-0.328	21	12:45:00
May	-0.236	24	18:00:00
June	-0.162	03	03:00:00
July	-0.253	08	11:45:00
August	-0.233	30	23:30:00
September	-0.299	01	19:15:00
October	-0.547	27	09:00:00
November	-0.919	03	06:30:00
December	-0.682	23	23:30:00

Extreme Maxima	Value	Day	Time
January	3.162	29	09:15:00
February	3.082	22	16:15:00
March	2.851	02	23:45:00
April	2.981	27	09:30:00
May	2.627	26	21:30:00
June	2.875	28	11:30:00
July	2.741	26	10:45:00
August	2.916	12	11:45:00
September	2.910	22	10:00:00
October	3.112	27	23:30:00
November	3.052	06	22:30:00
December	2.789	05	09:15:00

Extreme Minima	Value	Day	Time
January	0.258	30	04:15:00
February	0.209	01	05:45:00
March	0.017	30	04:45:00
April	0.178	28	04:15:00
May	0.260	25	02:15:00
June	0.420	29	18:45:00
July	0.334	14	18:45:00
August	0.368	11	17:45:00
September	0.160	08	16:30:00
October	0.162	07	16:15:00
November	-0.089	03	14:00:00
December	0.065	24	06:15:00

Mean Sea Level	No Days	MSL
January	28	1.668
February	28	1.754
March	31	1.597
April	30	1.587
May	31	1.583
June	30	1.639
July	31	1.635
August	31	1.685
September	30	1.705
October	26	1.768
November	30	1.660
December	31	1.598
	sum days	avg
	357	1.657

Milford Haven Tide Gauge

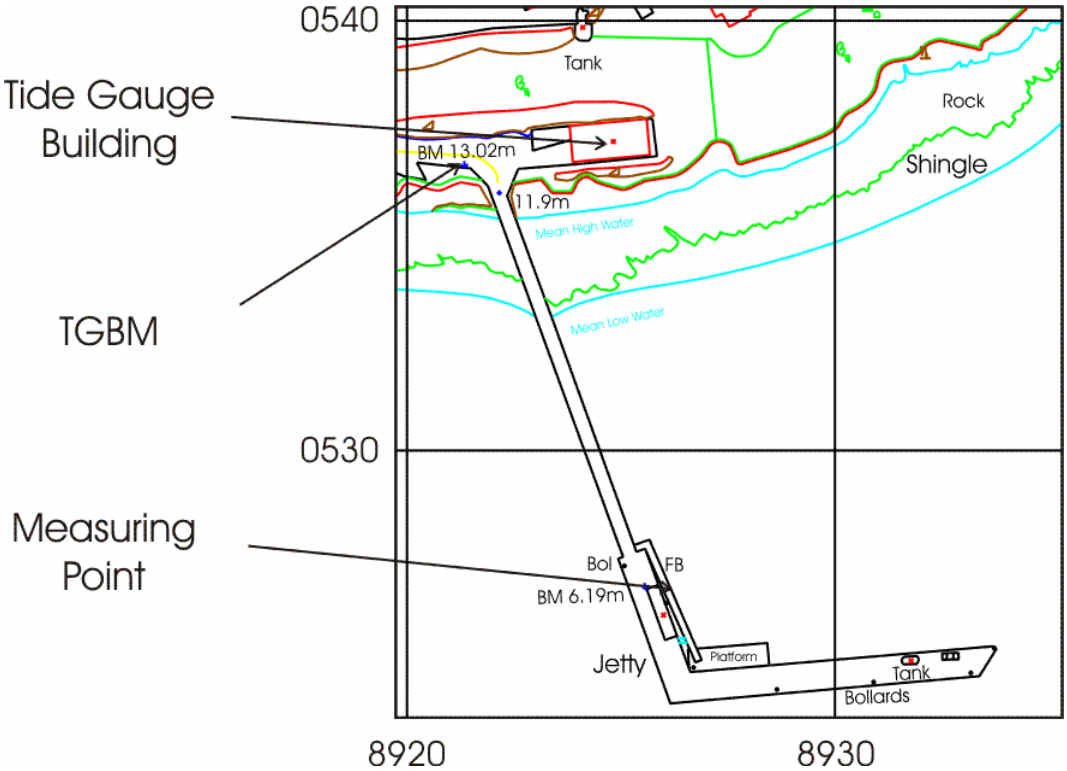
Latitude : 51° 42' 26.6" N Longitude : 05° 03' 06.7" W

Grid Reference : SM 8924 0537

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

Milford Haven Port Authority jetty.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SM 8921 0536	OSBM Bolt on wall W side of entrance to jetty
Aux1	SM 8918 0541	Fl Br G4977 office buildings. SW face NW angle.
Aux2	SM 9001 0601	OSBM bolt wall Victoria Road

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.71m below Ordnance Datum Newlyn (ODN)
TGZ = 16.734m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 16/01/1997.

T.G.I. visits to site :	Day 071	Pneumatic system repaired.
	Day 177	Power supply fault repaired.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	None

Residuals

Plots of the residuals for Milford Haven for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Milford Haven for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.797	23	13:45:00
February	1.120	26	02:15:00
March	0.637	09	08:00:00
April	0.520	30	04:45:00
May	0.706	22	08:30:00
June	0.387	10	01:15:00
July	0.305	08	01:30:00
August	0.237	08	12:30:00
September	0.226	06	11:15:00
October	1.100	27	04:00:00
November	0.761	21	01:45:00
December	0.662	27	05:15:00

Surge Minima	Value	Day	Time
January	-0.094	24	14:15:00
February	-0.605	20	23:00:00
March	-0.215	26	04:30:00
April	-0.157	22	13:00:00
May	-0.102	11	09:30:00
June	-0.201	28	02:00:00
July	-0.148	14	23:00:00
August	-0.211	31	12:00:00
September	-0.221	01	13:30:00
October	-0.365	27	22:00:00
November	-0.265	07	15:15:00
December	-0.252	05	22:30:00

Extreme Maxima	Value	Day	Time
January	7.563	31	08:00:00
February	8.022	01	08:30:00
March	7.770	01	07:30:00
April	7.779	27	18:30:00
May	7.299	25	17:15:00
June	6.806	12	19:15:00
July	6.908	12	19:30:00
August	7.316	11	20:15:00
September	7.766	08	19:15:00
October	7.868	08	19:30:00
November	7.771	05	18:30:00
December	7.414	04	05:30:00

Extreme Minima	Value	Day	Time
January	0.673	30	13:30:00
February	0.368	28	13:15:00
March	-0.003	29	13:00:00
April	0.277	27	12:30:00
May	0.703	27	00:30:00
June	0.827	25	00:15:00
July	0.811	14	02:45:00
August	0.480	12	02:45:00
September	0.286	09	01:30:00
October	0.147	07	00:30:00
November	0.361	07	01:30:00
December	0.551	05	12:45:00

Mean Sea Level	No Days	MSL
January	31	3.985
February	28	3.955
March	31	3.827
April	30	3.830
May	31	3.908
June	30	3.840
July	31	3.810
August	31	3.813
September	30	3.863
October	31	3.973
November	30	4.127
December	31	4.010
	sum days	avg
	365	3.912

Millport Tide Gauge

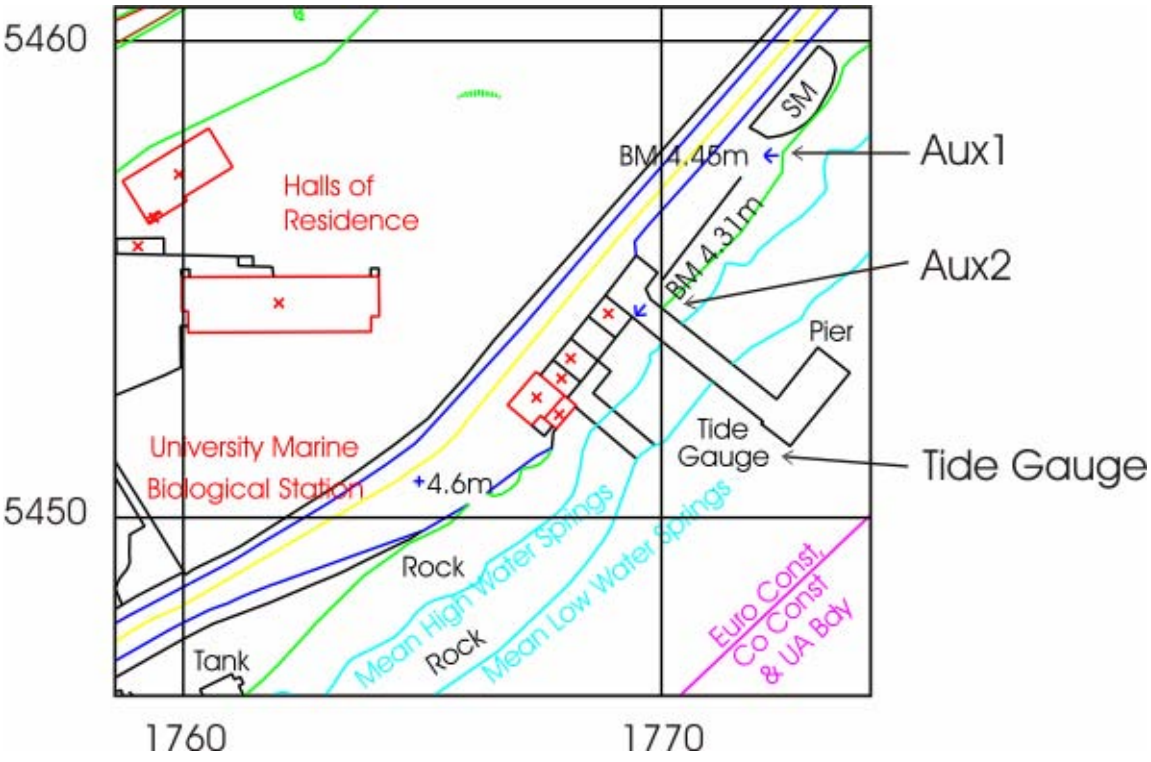
Latitude : 55° 44' 59.3" N Longitude : 04° 54' 22.8" W

Grid Reference : NS 1769 5454

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The pier, at the University Marine Biological Station.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NS 1757 5449	Fl Br G4602 Marine station
Aux1	NS 1772 5457	OSBM bolt rock SE side Rd 5M NE end wall
Aux2	NS 1769 5454	Rivet pier 0.8M prod SE face of TG building
Aux3	NS 1718 5451	No 45 Marine Parade NW angle N face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.62m below Ordnance Datum Newlyn (ODN)
TGZ = 7.825m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 14/03/1996.

T.G.I. visits to site : Day 084 General maintenance.
Day 177 Electricity supply repaired.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
94	15 minutes	169-177, 183-196	084-099,102-103,105-108, 110-111,119,121,127-129

Residuals

Plots of the residuals for Millport for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Millport for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.042	28	12:30:00
February	1.172	01	11:00:00
March	1.102	10	16:15:00
April	0.485	26	06:15:00
May	0.823	24	15:00:00
June	0.574	17	08:15:00
July	0.337	01	01:15:00
August	0.339	17	15:45:00
September	0.252	06	23:45:00
October	0.684	27	08:30:00
November	0.780	27	15:30:00
December	0.848	01	17:30:00

Surge Minima	Value	Day	Time
January	-0.354	09	22:00:00
February	-0.844	20	23:30:00
March	-0.364	01	14:00:00
April	-0.200	12	20:30:00
May	-0.236	06	14:00:00
June	-0.299	28	07:45:00
July	-0.216	31	22:30:00
August	-0.278	25	18:45:00
September	-0.217	13	14:15:00
October	-0.418	27	18:00:00
November	-0.297	07	23:00:00
December	-0.469	02	19:30:00

Extreme Maxima	Value	Day	Time
January	4.417	28	11:45:00
February	4.628	01	15:00:00
March	3.827	04	15:45:00
April	3.870	28	13:00:00
May	3.757	24	10:15:00
June	3.804	17	04:15:00
July	3.511	28	02:30:00
August	3.738	13	03:00:00
September	3.860	10	02:15:00
October	3.917	25	14:15:00
November	4.059	06	00:30:00
December	4.004	24	15:00:00

Extreme Minima	Value	Day	Time
January	0.344	05	22:30:00
February	0.027	13	18:45:00
March	-0.275	01	19:15:00
April	0.145	26	17:15:00
May	0.248	27	06:00:00
June	0.096	28	08:00:00
July	0.214	16	10:00:00
August	0.006	12	08:00:00
September	-0.004	08	06:15:00
October	0.033	06	05:00:00
November	0.242	07	19:15:00
December	0.057	05	18:15:00

Mean Sea Level	No Days	MSL
January	31	2.206
February	28	2.187
March	24	2.022
April	12	2.006
May	31	2.018
June	19	2.012
July	15	1.893
August	31	1.914
September	30	1.955
October	31	2.048
November	30	2.241
December	31	2.054
	sum days	avg
	313	2.046

Moray Firth Tide Gauge

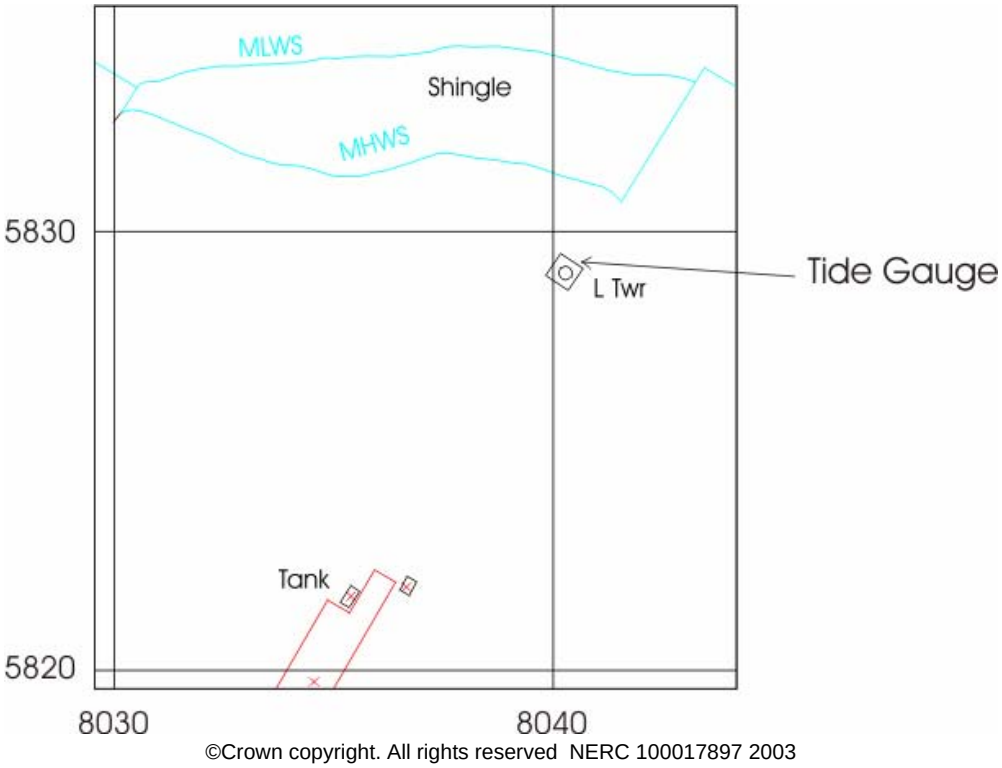
Latitude : 57° 35.55.3' N Longitude : 04° 00.10.1' W

Grid Reference : NH 8040 5829

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

On the south side of the entrance to Whiteness Bay, McDermott Base, Ardesier.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	N/A	Concrete corner of compound (JC 1)
Aux 1	N/A	Sheet piling quay edge (SP5)
Aux 2	N/A	Top of steelwork above pressure point
Aux 3	N/A	Bolt corner of light tower

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.10m below Ordnance Datum Newlyn (ODN)
TGZ = 6.619m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 21/09/1998.

T.G.I. visits to site :		
	Day 037	New data logger installed
	Day 148	Logger faulty returned to POL
	Day 150	Repaired logger refitted
	Day 240	General maintenance

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
91	15 minutes	001-003, 022-037, 134-150, 158-161, 197, 232-233, 309	199-234

Residuals

Plots of the residuals for Moray Firth for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Moray Firth for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.632	21	15:14:59
February	0.665	04	15:29:59
March	0.663	11	06:30:00
April	0.517	26	19:30:00
May	0.394	14	12:00:00
June	0.717	17	23:30:00
July	0.399	01	10:45:00
August	0.244	29	22:30:00
September	0.258	06	03:15:00
October	0.458	25	13:45:00
November	0.395	14	15:15:00
December	0.504	02	06:30:00

Surge Minima	Value	Day	Time
January	-0.189	09	03:29:59
February	-0.331	13	20:15:00
March	-0.403	01	20:45:00
April	-0.201	09	03:00:00
May	-0.262	06	04:15:00
June	-0.083	28	19:45:00
July	-0.145	16	03:45:00
August	-0.193	25	16:00:00
September	-0.287	01	13:45:00
October	-0.367	29	00:00:00
November	-0.356	03	00:00:00
December	-0.413	09	03:00:00

Extreme Maxima	Value	Day	Time
January	4.664	13	11:59:59
February	4.874	28	00:30:00
March	4.846	31	14:00:00
April	4.954	28	12:45:00
May	4.485	01	02:30:00
June	4.330	13	01:15:00
July	4.329	13	01:45:00
August	4.251	24	00:45:00
September	4.827	10	02:00:00
October	4.880	08	00:45:00
November	5.045	06	12:45:00
December	4.641	04	11:45:00

Extreme Minima	Value	Day	Time
January	0.852	03	21:14:59
February	0.103	28	19:15:00
March	-0.185	01	20:15:00
April	0.319	27	18:30:00
May	0.923	11	17:30:00
June	0.858	27	07:30:00
July	0.579	13	08:15:00
August	0.710	25	07:00:00
September	-0.033	09	07:30:00
October	0.013	07	06:15:00
November	0.566	04	05:15:00
December	0.580	06	19:45:00

Mean Sea Level	No Days	MSL
January	16	2.701
February	21	2.674
March	31	2.549
April	30	2.528
May	13	2.433
June	25	2.587
July	16	2.540
August	9	2.502
September	30	2.541
October	30	2.609
November	28	2.722
December	31	2.591
	sum days	avg
	280	2.581

Mumbles (West Glamorgan) Tide Gauge

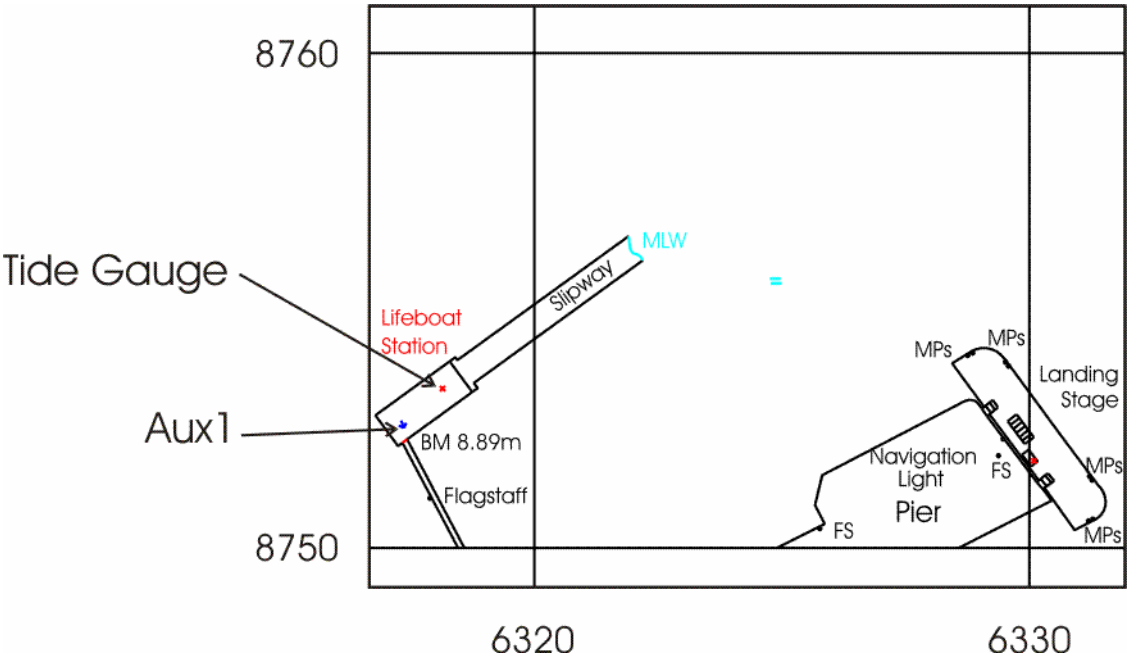
Latitude : 51° 34.12.0" N Longitude : 03° 58.31.6" W

Grid Reference : SS 6319 8753

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located at Mumbles lifeboat station and the measuring points mounted close to the end of the lifeboat slipway.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SS 6298 8743	OSBM bolt living rock S side of road
Aux1	SS 6317 8752	OSBM bolt lifeboat station Mumbles Pier
Aux2	SS 6284 8750	OSBM bolt concrete base bollard Lifeboat Cottages
Aux3	SS 6258 8760	Rivet SE side concrete chamber

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.00m below Ordnance Datum Newlyn (ODN)
TGZ = 13.821m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 21/08/1997.

T.G.I. visits to site :	Day 014	General maintenance.
	Day 178	Compressor replaced.
	Day 240	Blown fuse on distribution board replaced. Compressor replaced.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	178	014, 228-240

Residuals

Plots of the residuals for Mumbles for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Mumbles for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.860	26	08:15:00
February	1.441	26	03:00:00
March	0.778	09	08:15:00
April	0.590	29	00:15:00
May	0.574	22	09:15:00
June	0.384	10	00:30:00
July	0.266	08	01:30:00
August	0.246	03	10:00:00
September	0.141	08	11:30:00
October	1.125	27	05:15:00
November	0.660	21	01:30:00
December	0.553	27	05:45:00

Surge Minima	Value	Day	Time
January	-0.283	19	18:30:00
February	-0.648	20	23:15:00
March	-0.377	26	21:00:00
April	-0.361	08	09:45:00
May	-0.364	31	14:15:00
June	-0.489	28	13:15:00
July	-0.344	13	23:30:00
August	-0.445	31	14:00:00
September	-0.495	01	14:30:00
October	-0.507	13	15:00:00
November	-0.382	07	16:00:00
December	-0.562	09	01:15:00

Extreme Maxima	Value	Day	Time
January	10.05	31	08:00:00
February	10.495	01	08:45:00
March	10.346	01	07:45:00
April	10.349	27	18:45:00
May	9.792	25	17:30:00
June	9.195	12	19:15:00
July	9.341	12	19:45:00
August	9.818	11	20:15:00
September	10.360	09	20:00:00
October	10.395	08	19:30:00
November	10.333	05	18:30:00
December	9.950	04	05:45:00

Extreme Minima	Value	Day	Time
January	0.886	31	01:45:00
February	0.596	28	13:15:00
March	0.136	30	01:00:00
April	0.478	27	12:15:00
May	0.946	27	00:15:00
June	1.159	25	00:00:00
July	1.142	13	14:15:00
August	0.790	12	02:30:00
September	0.468	09	01:30:00
October	0.277	07	12:45:00
November	0.535	05	12:15:00
December	0.777	05	12:30:00

Mean Sea Level	No Days	MSL
January	31	5.318
February	28	5.321
March	31	5.172
April	30	5.174
May	31	5.253
June	30	5.182
July	31	5.148
August	18	5.167
September	30	5.193
October	31	5.298
November	30	5.439
December	31	5.295
	sum days	avg
	352	5.247

Newlyn Tide Gauge

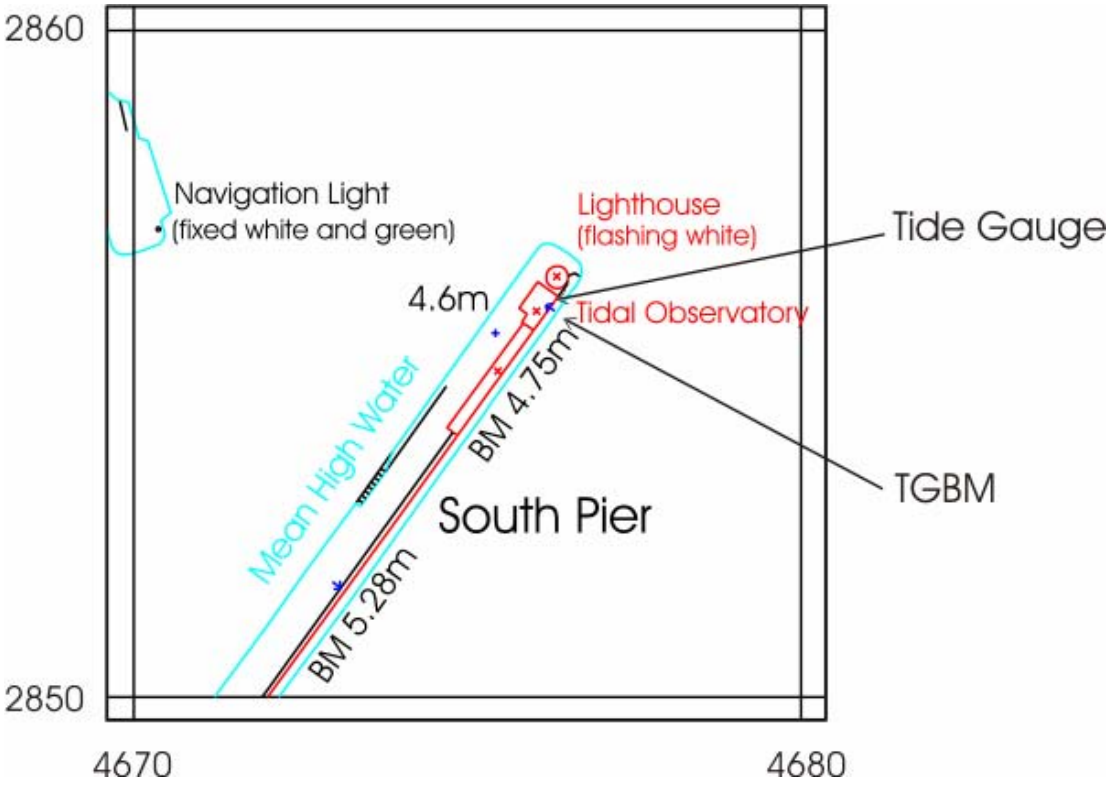
Latitude : 50° 06' 10.8" N Longitude : 05° 32' 34.2" W

Grid Reference : SW 4676 2856

Instrument type : Data acquisition system with a full tide, a mid-tide bubbler gauge and a potentiometer attached to a Munro float gauge installed.

Site of Gauge:

The Tidal Observatory is located at the end of South Pier, Newlyn, next to the lighthouse, and the measuring points are located on the seaward side of the pier behind the lighthouse.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SW 4677 2856	Brass bolt in the floor of the recorder hut.
Aux1	SW 4673 2851	Flush Bracket 1565 on wall S pier NW face 17.8m SW.
Aux2	SW 4659 2841	F Bracket 1520 wall SE side of S Pier Rd NW face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.05m below Ordnance Datum Newlyn (ODN)
TGZ = 7.801m below TGBM

Ordnance Datum Newlyn (ODN) is based on mean sea level at Newlyn between 1915 and 1921 (inclusive).

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 08/07/1997.

T.G.I. visits to site :	Day 113	Float gauge recalibrated.
	Day 317	Mid-tide channel connected.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
90	15 minutes	066-100, 114-115, 317	None

Residuals

Plots of the residuals for Newlyn for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Newlyn for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.657	23	11:15:00
February	0.499	02	00:15:00
March	0.239	01	04:15:00
April	0.252	30	14:45:00
May	0.610	22	04:45:00
June	0.311	07	12:15:00
July	0.289	02	20:00:00
August	0.240	02	21:45:00
September	0.237	08	09:00:00
October	0.602	20	14:15:00
November	0.628	13	20:45:00
December	0.529	26	18:30:00

Surge Minima	Value	Day	Time
January	-0.172	06	21:00:00
February	-0.406	20	21:15:00
March	-0.203	02	09:30:00
April	-0.240	22	12:45:00
May	-0.095	03	03:15:00
June	-0.167	24	13:00:00
July	-0.124	15	10:00:00
August	-0.113	31	12:45:00
September	-0.110	01	01:15:00
October	-0.385	27	19:00:00
November	-0.195	07	21:15:00
December	-0.240	06	01:00:00

Extreme Maxima	Value	Day	Time
January	5.886	31	06:15:00
February	6.027	01	06:45:00
March	6.147	01	06:00:00
April	5.955	28	05:15:00
May	5.745	26	04:15:00
June	5.428	11	17:00:00
July	5.514	12	18:15:00
August	5.837	11	18:30:00
September	6.182	08	17:30:00
October	6.256	08	18:00:00
November	6.109	05	17:00:00
December	5.804	04	04:15:00

Extreme Minima	Value	Day	Time
January	0.638	31	00:30:00
February	0.428	28	12:00:00
March	0.242	02	13:30:00
April	0.381	27	11:30:00
May	0.800	26	23:15:00
June	0.820	24	23:00:00
July	0.798	14	01:45:00
August	0.610	12	01:30:00
September	0.539	10	01:00:00
October	0.395	06	23:15:00
November	0.495	07	00:30:00
December	0.586	05	11:45:00

Mean Sea Level	No Days	MSL
January	31	3.252
February	28	3.197
March	5	3.114
April	16	3.118
May	31	3.270
June	30	3.209
July	31	3.200
August	31	3.229
September	30	3.299
October	31	3.384
November	28	3.445
December	31	3.355
	sum days	avg
	323	3.256

Newhaven (Sussex) Tide Gauge

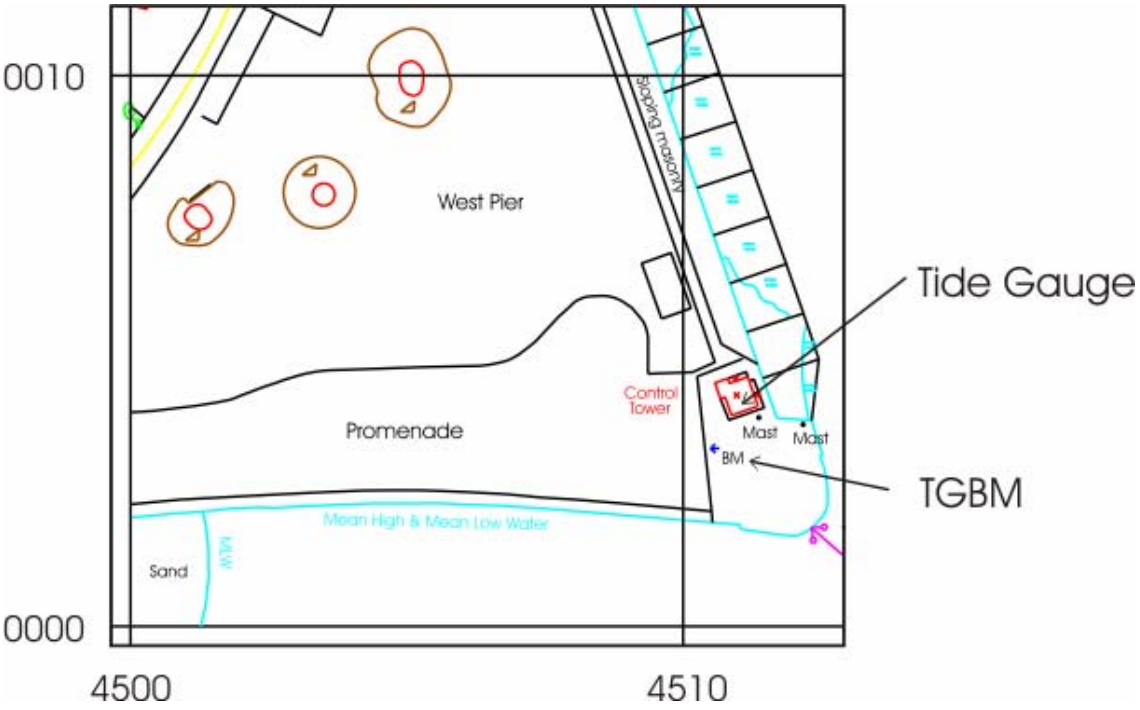
Latitude : 50° 46' 54.4" N Longitude : 00° 03' 25.3" E

Grid Reference : TQ 4511 0004

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The Tide Gauge is located within the Port Control building on West Pier, Newhaven, and the measuring points are located on the pier wall, southwest of the Port Control building. The anemometer and wind vane are located on the signals mast.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TQ 4510 0003	Bolt concrete 7.4M SW of SW angle of tower
Aux1	TQ 4495 0001	OSBM bolt concrete sea wall 154.3M SW of tower
Aux2	TQ 4503 0008	Steel ball Gun mount

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.52m below Ordnance Datum Newlyn (ODN)
TGZ = 8.783m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 17/11/1998.

T.G.I. visits to site :	Day 067	Survey of new Port Control Office.
	Day 189	General maintenance.
	Day 219	Damaged met instruments replaced.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	009

Residuals

Plots of the residuals for Newhaven for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Newhaven for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.744	27	05:45:00
February	0.786	22	17:00:00
March	0.614	18	12:15:00
April	0.463	29	09:45:00
May	0.428	22	00:30:00
June	0.348	07	06:45:00
July	0.310	03	00:45:00
August	0.265	31	14:00:00
September	0.298	22	23:00:00
October	0.792	25	23:15:00
November	0.971	14	06:30:00
December	0.526	26	13:15:00

Surge Minima	Value	Day	Time
January	-0.311	08	04:00:00
February	-0.415	21	15:30:00
March	-0.461	14	09:45:00
April	-0.454	07	17:30:00
May	-0.188	15	16:30:00
June	-0.256	29	08:30:00
July	-0.224	14	03:30:00
August	-0.213	31	04:45:00
September	-0.268	01	18:30:00
October	-0.406	27	14:00:00
November	-0.356	03	09:15:00
December	-0.394	09	07:15:00

Extreme Maxima	Value	Day	Time
January	7.185	29	11:15:00
February	7.193	27	23:45:00
March	7.274	01	00:15:00
April	7.254	29	00:30:00
May	6.931	25	22:15:00
June	6.463	23	22:00:00
July	6.569	13	13:15:00
August	6.971	11	13:00:00
September	7.275	09	12:45:00
October	7.181	08	12:15:00
November	7.227	07	00:15:00
December	6.971	05	11:30:00

Extreme Minima	Value	Day	Time
January	0.550	30	18:45:00
February	0.476	28	18:30:00
March	0.143	30	18:45:00
April	0.451	26	17:00:00
May	0.628	27	05:45:00
June	0.707	25	05:30:00
July	0.681	14	08:00:00
August	0.578	13	08:30:00
September	0.349	10	07:30:00
October	0.309	07	05:30:00
November	0.393	06	18:15:00
December	0.526	05	18:00:00

Mean Sea Level	No Days	MSL
January	28	3.702
February	28	3.739
March	31	3.576
April	30	3.575
May	31	3.626
June	30	3.601
July	31	3.605
August	31	3.630
September	30	3.645
October	31	3.747
November	30	3.803
December	31	3.687
	sum days	avg
	362	3.661

Newport (Wales) Tide Gauge

Latitude : 51° 33' 00.0" N Longitude : 02° 59' 14.8" W

Grid Reference : ST 3163 8392

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

Western entrance to Newport Docks.

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ST 3163 8392	Brass bolt adjacent to TG building
Aux1	ST 3160 8414	Pin in quay west side of South Lock
Aux2	ST 3160 8426	Pin in quay east side of South Lock
Aux3	ST 3147 8427	Pin in quay south west corner of South Dock

TGZ = Admiralty Chart Datum (ACD)
TGZ = 5.81m below Ordnance Datum Newlyn (ODN)
TGZ = 14.525m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled in 1997.

T.G.I. visits to site :	Day 178	General maintenance.
	Day 239	Compressor replaced.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	None

Residuals

Plots of the residuals for Newport for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Newport for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.074	27	13:00:00
February	1.858	26	04:30:00
March	1.509	09	10:15:00
April	1.321	29	04:30:00
May	0.964	13	15:30:00
June	0.976	10	01:45:00
July	0.635	08	12:45:00
August	0.619	30	18:15:00
September	0.831	09	14:45:00
October	2.007	27	05:15:00
November	1.249	22	03:30:00
December	1.347	26	06:30:00

Surge Minima	Value	Day	Time
January	-0.682	09	01:30:00
February	-1.027	21	00:15:00
March	-0.823	13	14:15:00
April	-0.643	12	14:15:00
May	-0.620	06	07:45:00
June	-0.769	28	16:00:00
July	-0.595	27	15:45:00
August	-0.734	25	15:30:00
September	-0.692	11	17:15:00
October	-0.863	09	16:30:00
November	-0.673	07	16:00:00
December	-0.904	10	17:30:00

Extreme Maxima	Value	Day	Time
January	12.645	31	09:00:00
February	13.216	01	09:30:00
March	13.116	30	08:15:00
April	13.157	28	20:15:00
May	12.439	26	19:00:00
June	11.636	25	19:30:00
July	11.799	12	20:30:00
August	12.443	10	20:30:00
September	13.126	09	20:45:00
October	13.174	07	19:45:00
November	13.102	06	07:45:00
December	12.519	04	06:45:00

Extreme Minima	Value	Day	Time
January	0.505	01	03:00:00
February	0.478	15	03:45:00
March	0.083	29	15:15:00
April	0.175	01	04:45:00
May	0.472	28	03:00:00
June	0.504	25	02:00:00
July	0.472	13	03:45:00
August	0.327	10	15:30:00
September	0.253	10	16:45:00
October	0.166	07	15:15:00
November	0.424	07	15:45:00
December	0.398	06	15:30:00

Mean Sea Level	No Days	MSL
January	31	6.125
February	28	6.195
March	31	5.997
April	30	5.997
May	31	6.072
June	30	6.002
July	31	5.993
August	31	5.997
September	30	6.030
October	31	6.136
November	30	6.255
December	31	6.069
	sum days	avg
	365	6.072

North Shields (Tyne and Wear) Tide Gauge

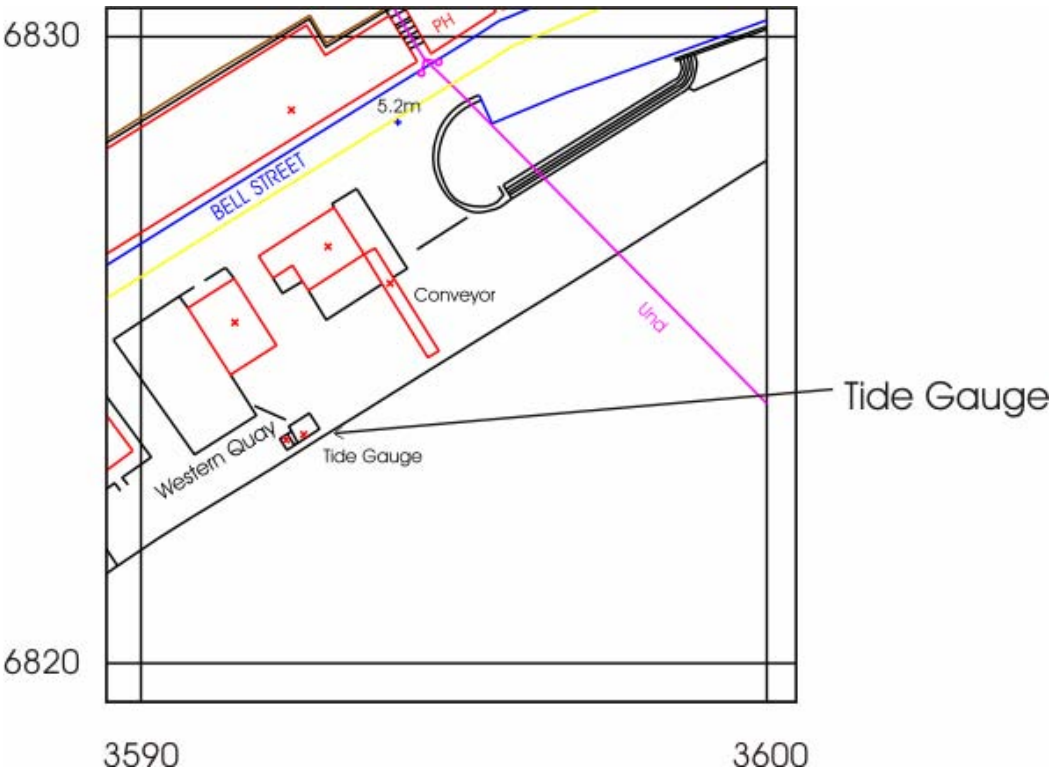
Latitude : 55° 00' 26.8" N Longitude : 01°26' 23.2" W

Grid Reference : NZ 3593 6824

Instrument type : Data acquisition system with potentiometers attached to the Munro float gauge and the Wellhead float gauge installed.

Site of Gauge:

The tide gauge is located on the north side of River Tyne.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NZ 3592 6823	Bolt adjacent to tide gauge building
Aux1	NZ 3626 6842	PA Bolt low lighthouse W face SW angle
Aux2	NZ 3630 6895	PA Bolt butt N side railway

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.60m below Ordnance Datum Newlyn (ODN)
TGZ = 6.754m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 21/10/1993.

T.G.I. visits to site : Day 212 BT line repaired

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
92	15 minutes	183-212	None

Residuals

Plots of the residuals for North Shields for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for North Shields for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.351	28	22:45:00
February	0.918	02	02:45:00
March	0.699	06	16:45:00
April	0.712	27	00:15:00
May	0.426	21	19:00:00
June	0.610	18	04:00:00
July	0.274	01	15:15:00
August	0.369	16	02:30:00
September	0.253	26	03:00:00
October	0.584	26	01:45:00
November	0.485	14	11:00:00
December	0.413	27	07:45:00

Surge Minima	Value	Day	Time
January	-0.405	25	20:30:00
February	-0.586	21	17:30:00
March	-0.360	10	16:00:00
April	-0.208	21	11:00:00
May	-0.185	07	22:45:00
June	-0.160	29	13:15:00
July	-0.125	31	22:45:00
August	-0.145	13	03:00:00
September	-0.290	01	13:00:00
October	-0.305	11	16:30:00
November	-0.581	03	02:30:00
December	-0.446	23	21:15:00

Extreme Maxima	Value	Day	Time
January	5.793	29	03:15:00
February	5.714	02	18:45:00
March	5.518	30	16:30:00
April	5.605	27	03:15:00
May	5.382	26	15:15:00
June	4.976	25	15:45:00
July	4.569	01	07:30:00
August	5.468	12	05:30:00
September	5.488	09	04:30:00
October	5.519	08	04:00:00
November	5.727	06	16:15:00
December	5.308	05	03:30:00

Extreme Minima	Value	Day	Time
January	0.237	31	23:45:00
February	0.226	28	22:45:00
March	-0.106	29	22:30:00
April	0.232	27	22:00:00
May	0.514	24	20:00:00
June	0.639	26	10:30:00
July	1.561	01	13:45:00
August	0.322	11	11:30:00
September	-0.043	09	11:00:00
October	-0.078	08	10:45:00
November	0.131	03	08:00:00
December	0.402	04	09:15:00

Mean Sea Level	No Days	MSL
January	31	3.064
February	28	3.141
March	31	2.937
April	30	2.906
May	31	2.915
June	30	2.954
July		
August	30	2.964
September	30	2.968
October	31	3.033
November	30	3.047
December	31	2.968
	sum days	avg
	333	2.991

Portpatrick (Scotland) Tide Gauge

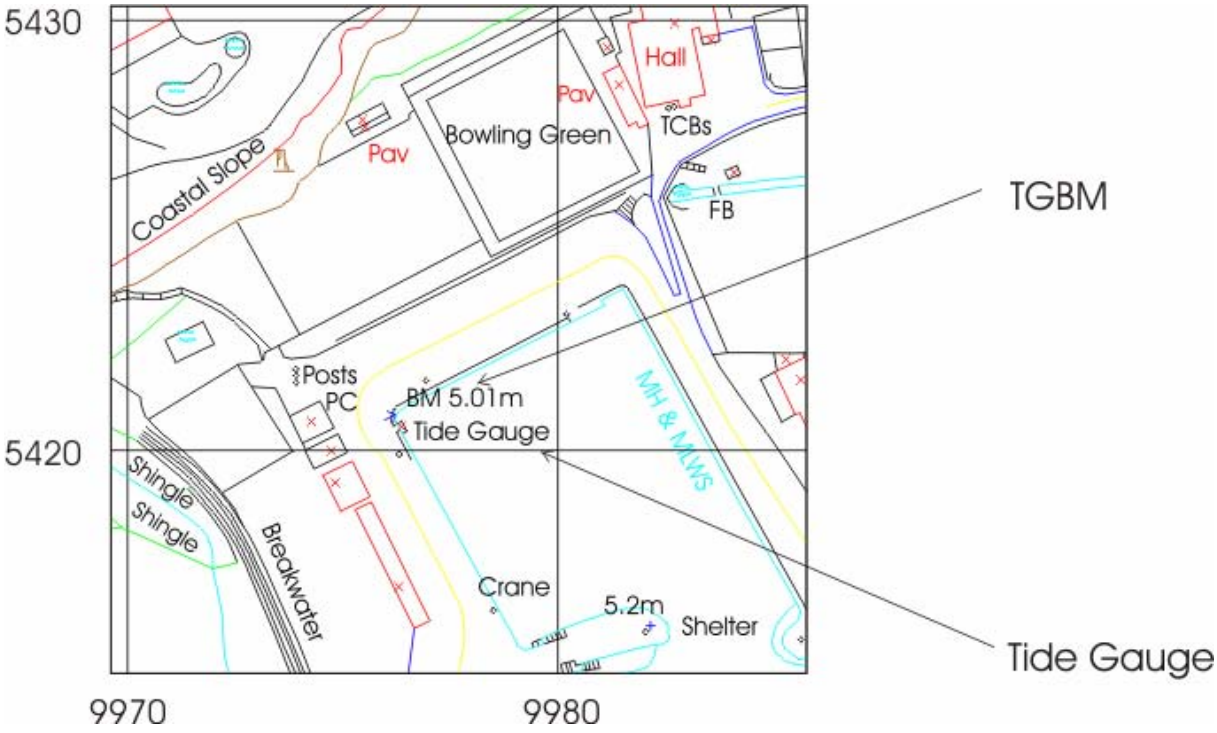
Latitude : 54° 50' 33.2" N Longitude : 05° 07' 12.1" W

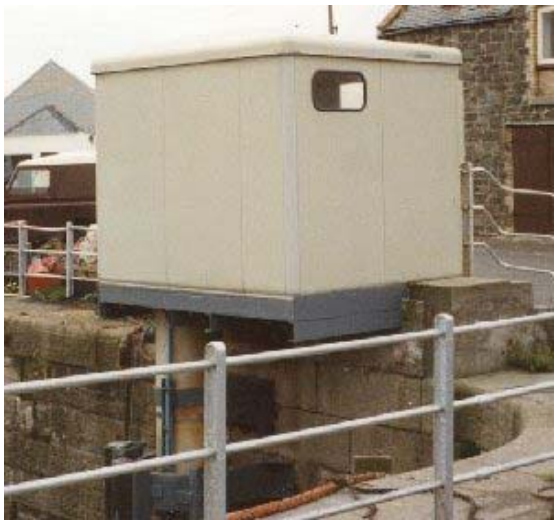
Grid Reference : NW 9976 5421

Instrument type : Data acquisition system with a full tide bubbler gauge and a potentiometer attached to a Munro float gauge installed.

Site of Gauge:

The tide gauge building is mounted over the stilling well in the corner of Portpatrick harbour. The pneumatic measuring points are located directly beneath the building.





Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NW 9976 5421	Bolt Harbour wall 13.84M NE angle of building
Aux1	NW 9977 5411	Rivet E side of Jetty wall 16.6M SE angle Lifeboat HQ
Aux2	NW 9995 5412	Rivet S angle No 53 Main St
Aux3	NX 0006 5423	Church hall SE side of Rd W angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.80m below Ordnance Datum Newlyn (ODN)
TGZ = 6.827m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 05/10/1993.

T.G.I. visits to site :	Day 083	New data logger installed
	Day 176	Compressor replaced
	Day 231	Faulty compressor replaced

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	039	083-086

Residuals

Plots of the residuals for Portpatrick for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Portpatrick for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.954	28	14:29:59
February	1.079	01	11:29:59
March	0.975	10	16:59:59
April	0.454	30	10:00:00
May	0.712	24	15:00:00
June	0.502	17	06:30:00
July	0.349	08	07:00:00
August	0.321	17	23:30:00
September	0.231	07	02:00:00
October	0.727	27	07:45:00
November	0.697	27	14:15:00
December	0.694	01	16:45:00

Surge Minima	Value	Day	Time
January	-0.243	05	21:15:00
February	-0.717	21	01:29:59
March	-0.274	01	15:44:59
April	-0.130	12	19:15:00
May	-0.158	06	13:45:00
June	-0.270	28	09:00:00
July	-0.167	14	18:15:00
August	-0.242	25	18:30:00
September	-0.207	01	09:30:00
October	-0.335	27	18:15:00
November	-0.303	07	22:15:00
December	-0.382	10	12:30:00

Extreme Maxima	Value	Day	Time
January	4.682	28	10:59:59
February	5.169	01	13:59:59
March	4.257	31	13:15:00
April	4.425	28	12:15:00
May	4.284	24	09:30:00
June	4.085	17	03:45:00
July	3.914	13	01:15:00
August	4.159	13	02:30:00
September	4.405	10	01:15:00
October	4.401	09	00:45:00
November	4.532	05	23:45:00
December	4.490	01	21:00:00

Extreme Minima	Value	Day	Time
January	0.411	05	22:15:00
February	0.083	28	18:29:59
March	-0.258	01	19:14:59
April	0.117	26	17:00:00
May	0.349	27	05:45:00
June	0.199	28	07:45:00
July	0.220	14	08:15:00
August	0.046	12	07:45:00
September	0.065	09	06:45:00
October	0.029	07	05:30:00
November	0.215	07	19:15:00
December	0.122	06	19:00:00

Mean Sea Level	No Days	MSL
January	31	2.374
February	28	2.354
March	27	2.176
April	30	2.138
May	31	2.209
June	30	2.175
July	31	2.101
August	31	2.103
September	30	2.144
October	31	2.242
November	30	2.414
December	31	2.239
	sum days	avg
	361	2.222

Portrush (Northern Ireland) Tide Gauge

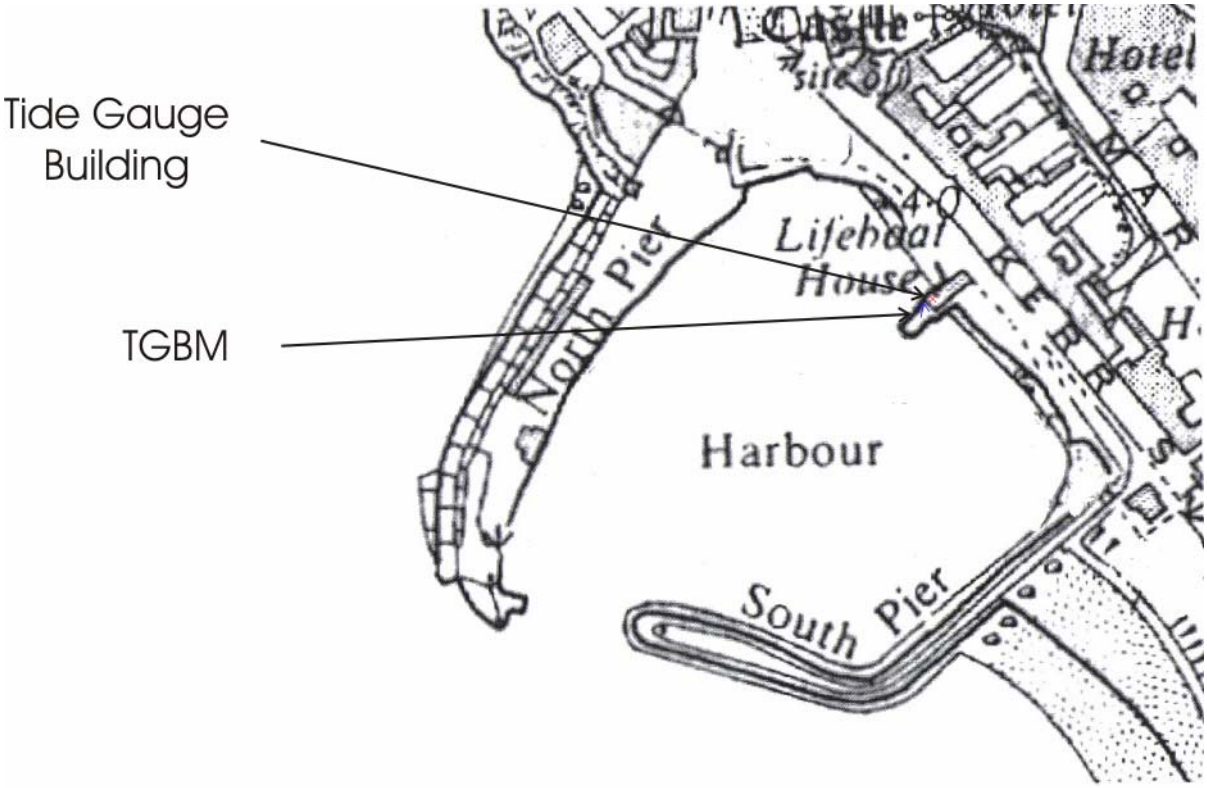
Latitude : 55° 12' 24.4" N Longitude : 06° 39' 24.6" W

Grid Reference : NW 0416 9952

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The gauge is located in the RNLI boathouse.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	Sheet 6 C 8556 4079	Pin RNLI slipway
Aux1	Sheet 6 C 8567 4070	Cut mark wall Kerr St
Aux2	Sheet 6 C 8580 4055	Cut mark wall Kerr St

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.24m below Ordnance Datum Belfast (ODB)
TGZ = 2.844m below TGBM
Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 22/05/1996.

T.G.I. visits to site : Day 085 Pneumatic system repaired
Day 232 Crushed tube replaced on pneumatic system

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	198-232

Residuals

Plots of the residuals for Portrush for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Portrush for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.001	28	13:30:00
February	0.935	01	17:00:00
March	0.859	10	17:30:00
April	0.439	26	04:15:00
May	0.637	24	16:30:00
June	0.624	17	11:00:00
July	0.312	08	09:00:00
August	0.170	30	15:15:00
September	0.187	06	20:45:00
October	0.458	25	12:00:00
November	0.677	03	04:30:00
December	0.721	01	16:45:00

Surge Minima	Value	Day	Time
January	-0.302	01	04:00:00
February	-0.500	20	23:30:00
March	-0.422	01	12:30:00
April	-0.172	09	16:00:00
May	-0.217	07	14:30:00
June	-0.252	28	10:15:00
July	-0.162	16	00:15:00
August	-0.261	25	17:00:00
September	-0.221	01	08:45:00
October	-0.325	28	03:00:00
November	-0.232	07	21:15:00
December	-0.409	08	08:15:00

Extreme Maxima	Value	Day	Time
January	2.897	28	05:45:00
February	3.032	01	09:15:00
March	2.515	10	17:30:00
April	2.666	26	05:45:00
May	2.478	24	17:15:00
June	2.236	12	19:30:00
July	2.108	12	20:00:00
August	2.147	23	19:00:00
September	2.484	06	18:15:00
October	2.550	07	18:45:00
November	2.727	03	05:00:00
December	2.905	01	16:45:00

Extreme Minima	Value	Day	Time
January	0.294	01	01:00:00
February	0.147	28	13:30:00
March	-0.091	01	14:15:00
April	0.171	26	23:45:00
May	0.385	27	00:15:00
June	0.316	27	14:00:00
July	0.271	13	14:15:00
August	0.240	25	13:45:00
September	0.060	08	13:00:00
October	0.074	07	12:15:00
November	0.260	05	12:00:00
December	0.275	06	01:15:00

Mean Sea Level	No Days	MSL
January	31	1.460
February	28	1.458
March	31	1.261
April	30	1.243
May	31	1.288
June	30	1.287
July	14	1.229
August	11	1.176
September	30	1.251
October	31	1.334
November	30	1.494
December	31	1.347
	sum days	avg
	328	1.319

Portsmouth (Hampshire) Tide Gauge

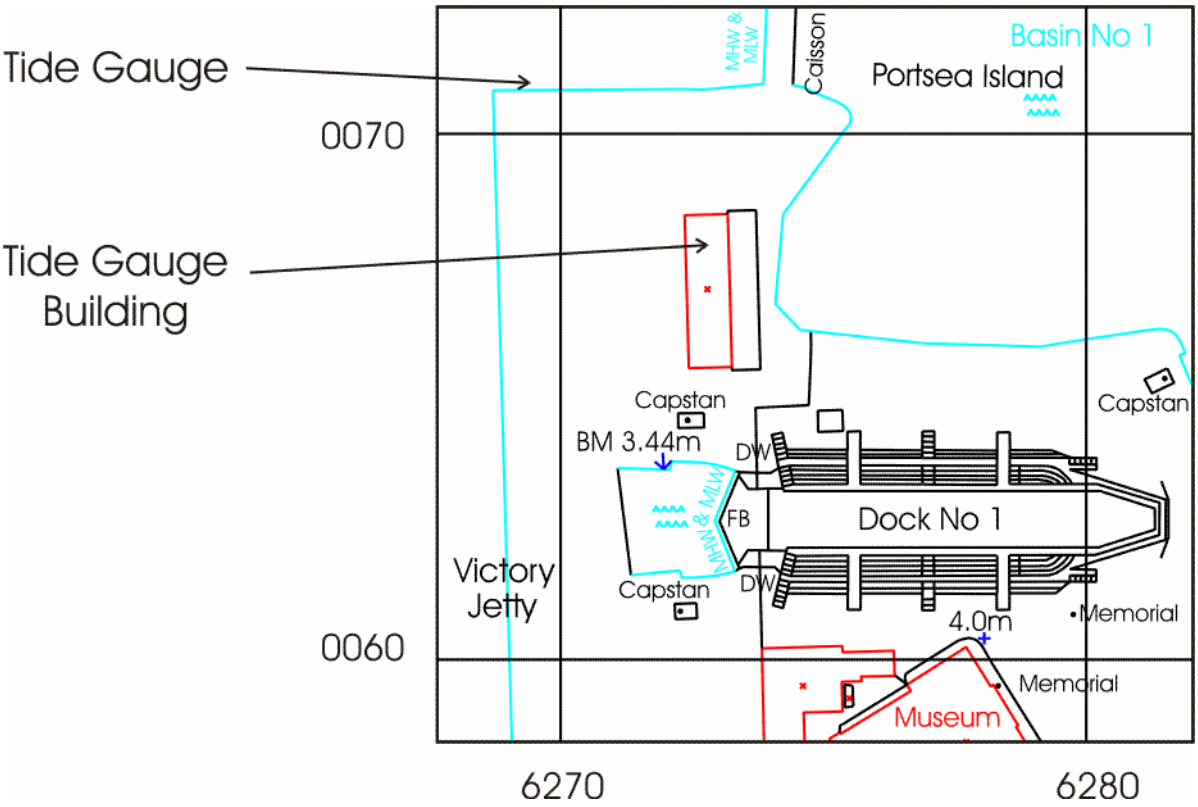
Latitude : 50° 48' 07.9" N Longitude : 01° 06' 40.2" W

Grid Reference : SU 6269 0067

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

Victory Jetty.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SU 6269 0053	Bolt in concrete jetty TG building S angle
Aux1	SU 6330 9996	GP N side entrance to HMS Vernon
Aux2	SU 6274 0039	Building SW face 0.6M S angle
Aux3	SU 6283 0050	Building SW side of Main Rd NE face N angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.73m below Ordnance Datum Newlyn (ODN)
TGZ = 6.007m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 18/11/1998.

T.G.I. visits to site : There were no visits to site in 2002.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	209,287,289,300-301,306

Residuals

Plots of the residuals for Portsmouth for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Portsmouth for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.893	26	13:45:00
February	0.775	04	14:45:01
March	0.652	18	10:15:00
April	0.467	30	12:15:01
May	0.613	22	01:30:00
June	0.357	07	08:00:00
July	0.385	03	00:00:00
August	0.248	09	17:30:00
September	0.297	09	15:00:00
October	0.801	15	13:15:02
November	0.876	14	04:00:00
December	0.665	26	09:45:00

Surge Minima	Value	Day	Time
January	-0.201	04	03:45:00
February	-0.451	22	06:15:00
March	-0.290	14	11:30:00
April	-0.260	07	18:15:00
May	-0.132	14	15:15:00
June	-0.191	29	06:30:00
July	-0.189	14	06:15:00
August	-0.220	31	06:45:00
September	-0.197	30	06:45:00
October	-0.575	27	16:00:02
November	-0.283	03	10:45:00
December	-0.292	09	05:45:00

Extreme Maxima	Value	Day	Time
January	5.318	29	11:30:00
February	5.276	27	23:30:00
March	5.228	01	00:30:00
April	5.235	27	23:45:01
May	5.074	25	22:30:00
June	4.635	11	23:45:01
July	4.634	26	12:45:00
August	4.939	11	13:15:00
September	5.106	09	12:45:00
October	5.068	08	12:30:00
November	5.172	04	10:30:00
December	5.045	04	10:45:00

Extreme Minima	Value	Day	Time
January	0.671	30	17:45:00
February	0.580	28	17:45:00
March	0.160	30	18:00:00
April	0.389	26	16:00:01
May	0.744	27	04:45:00
June	0.685	25	04:30:00
July	0.645	14	07:15:00
August	0.543	11	06:15:00
September	0.393	09	06:00:00
October	0.280	07	04:45:00
November	0.434	06	17:30:00
December	0.496	05	17:15:00

Mean Sea Level	No Days	MSL
January	31	2.971
February	28	2.993
March	31	2.853
April	30	2.845
May	31	2.908
June	30	2.864
July	29	2.868
August	31	2.893
September	30	2.917
October	27	3.005
November	28	3.095
December	31	2.973
	sum days	avg
	357	2.932

Sheerness (Kent) Tide Gauge

Latitude : 51° 26' 44.3" N Longitude : 00° 44' 36.4" E

Grid Reference : TQ 9074 7542

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge is located on the jetty at Garrison Point, Sheerness Docks.

Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	TQ 9080 7549	Flush bracket 11859, Garrison Fort, S angle, SW building.
Aux1	TQ 9133 7532	Flush bracket G.4790, on house, NW angle, N face
Aux2	TQ 9115 7533	Wall on SW side of road, NE angle.
Aux3	TQ 9147 7516	Bolt Ch. Dis, SW side of road, E face, NE angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.90m below Ordnance Datum Newlyn (ODN)
TGZ = 7.532m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 16/02/2002.

T.G.I. visits to site :	Day 046	Measuring systems replaced
	Day 129	Data logger removed radio interference
	Day 164	Shielded data logger installed
	Day 245	Faulty pressure transducer replaced

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
83	15 minutes	043-048, 128-165, 190-201, 232-235, 240-245, 322	001-043

Residuals

Plots of the residuals for Sheerness for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Sheerness for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
February	1.547	22	17:15:00
March	0.789	09	07:15:00
April	0.790	27	08:30:00
May	0.483	05	14:30:00
June	0.633	18	13:45:00
July	0.365	03	17:45:00
August	0.425	16	14:15:00
September	0.635	22	21:15:00
October	1.701	27	23:00:00
November	0.683	09	02:15:00
December	0.678	30	21:15:00

Surge Minima	Value	Day	Time
February	-1.280	22	02:15:00
March	-1.096	10	19:00:00
April	-0.529	30	17:00:00
May	-0.181	01	00:00:00
June	-0.422	30	23:30:00
July	-0.396	01	00:00:00
August	-0.226	18	04:45:00
September	-0.581	09	22:00:00
October	-1.818	27	12:00:00
November	-1.171	03	07:00:00
December	-0.770	01	17:45:00

Extreme Maxima	Value	Day	Time
February	6.542	28	13:15:00
March	6.505	01	14:15:00
April	6.350	27	12:30:00
May	5.930	01	03:00:00
June	5.828	27	02:00:00
July	5.792	24	00:15:00
August	6.196	12	02:45:00
September	6.229	09	14:00:00
October	6.191	08	01:15:00
November	6.437	07	01:30:00
December	6.119	05	00:30:00

Extreme Minima	Value	Day	Time
February	0.295	26	06:15:00
March	0.060	30	08:00:00
April	0.029	29	08:30:00
May	0.637	01	09:30:00
June	0.586	26	20:00:00
July	0.556	25	19:45:00
August	0.338	11	21:00:00
September	-0.063	09	21:00:00
October	0.202	27	10:30:00
November	0.058	03	17:30:00
December	0.252	04	18:45:00

Mean Sea Level	No Days	MSL
February	10	3.096
March	31	3.028
April	30	3.028
May	6	3.089
June	15	3.048
July	17	3.024
August	20	3.088
September	27	3.142
October	31	3.114
November	28	3.069
December	31	3.051
	sum days	avg
	246	3.071

St. Mary's (Isles of Scilly) Tide Gauge

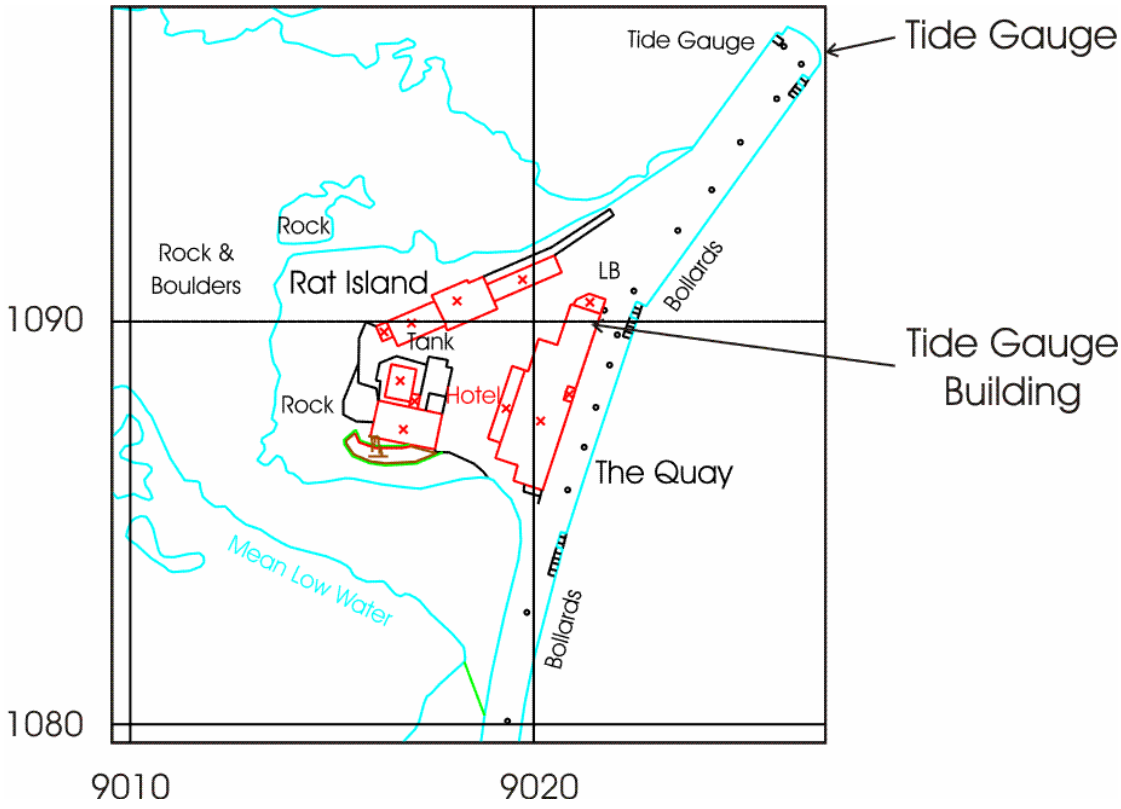
Latitude : 49° 55' 04.2" N Longitude : 06° 19' 02.1" W

Grid Reference : SV 9021 1090

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge is located on The Quay, Hugh Town, inside the ferry terminal store room. The measuring points are located on the nose of the quay.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	N/A	Bolt by VTS
Aux1	N/A	Bolt by VTS 2
Aux2	N/A	Bolt by top of steps
Aux3	N/A	Bolt by top of steps
Aux4	SV 9028 1097	Point above pressure points
Aux5	SV 9014 1071	Cut Mark east angle Mermaid Inn
Aux6	SV 9007 1065	Cut Mark Guard House top of Garrison Hill
VTS	SV 9023 1091	Tide staff 7.210 metre mark
VTS2	N/A	Tide staff 7.245 metre mark

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.91m below Ordnance Datum Local (ODL)
TGZ = 7.425m below TGBM
TGZ = 7.399m below Aux 1
TGZ = 6.776m below Aux 2

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 09/07/1997.

T.G.I. visits to site :	Day	115	New data logger installed
	Day	316	Faulty modem replaced and new battery charger fitted

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
94	15 minutes	015,064,093,115,129,169-176,302-316,351	010-015, 032-036, 058-064, 089-093, 125-129, 129-131, 141-142,196-202,247-248

Residuals

Plots of the residuals for St. Mary's for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for St. Mary's for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.612	23	10:44:59
February	0.707	05	07:15:00
March	0.536	18	05:44:59
April	0.265	05	21:15:00
May	0.354	22	09:45:00
June	0.213	07	13:00:00
July	0.181	02	20:15:00
August	0.139	17	22:30:00
September	0.169	09	05:15:00
October	0.473	25	15:15:00
November	0.498	20	23:30:00
December	0.511	26	20:30:00

Surge Minima	Value	Day	Time
January	-0.207	06	07:44:59
February	-0.281	15	04:59:59
March	-0.169	26	01:44:59
April	-0.159	22	12:45:00
May	-0.176	31	13:30:00
June	-0.277	28	11:30:00
July	-0.230	13	20:45:00
August	-0.174	31	10:45:00
September	-0.195	01	13:15:00
October	-0.295	27	20:30:01
November	-0.160	30	07:45:00
December	-0.291	06	00:15:00

Extreme Maxima	Value	Day	Time
January	6.097	31	06:30:00
February	6.250	01	07:00:00
March	6.175	30	05:29:59
April	6.130	28	05:15:00
May	5.751	27	17:15:00
June	5.408	12	17:30:00
July	5.500	12	18:15:00
August	5.824	11	18:45:00
September	6.230	08	17:30:00
October	6.326	08	18:00:00
November	5.799	21	05:00:00
December	5.954	04	04:00:00

Extreme Minima	Value	Day	Time
January	0.573	30	12:15:00
February	0.723	01	01:15:00
March	0.107	29	11:29:59
April	0.304	27	11:15:00
May	0.596	26	23:00:00
June	0.681	25	23:30:00
July	0.655	14	01:30:00
August	0.435	12	01:15:00
September	0.380	09	00:00:00
October	0.222	06	23:00:00
November	1.302	19	22:30:00
December	0.515	05	11:15:00

Mean Sea Level	No Days	MSL
January	23	3.276
February	20	3.192
March	23	3.203
April	24	3.182
May	20	3.164
June	22	3.113
July	22	3.098
August	31	3.107
September	26	3.193
October	27	3.285
November	17	3.480
December	31	3.327
	sum days	avg
	286	3.218

Stornoway (Hebrides) Tide Gauge

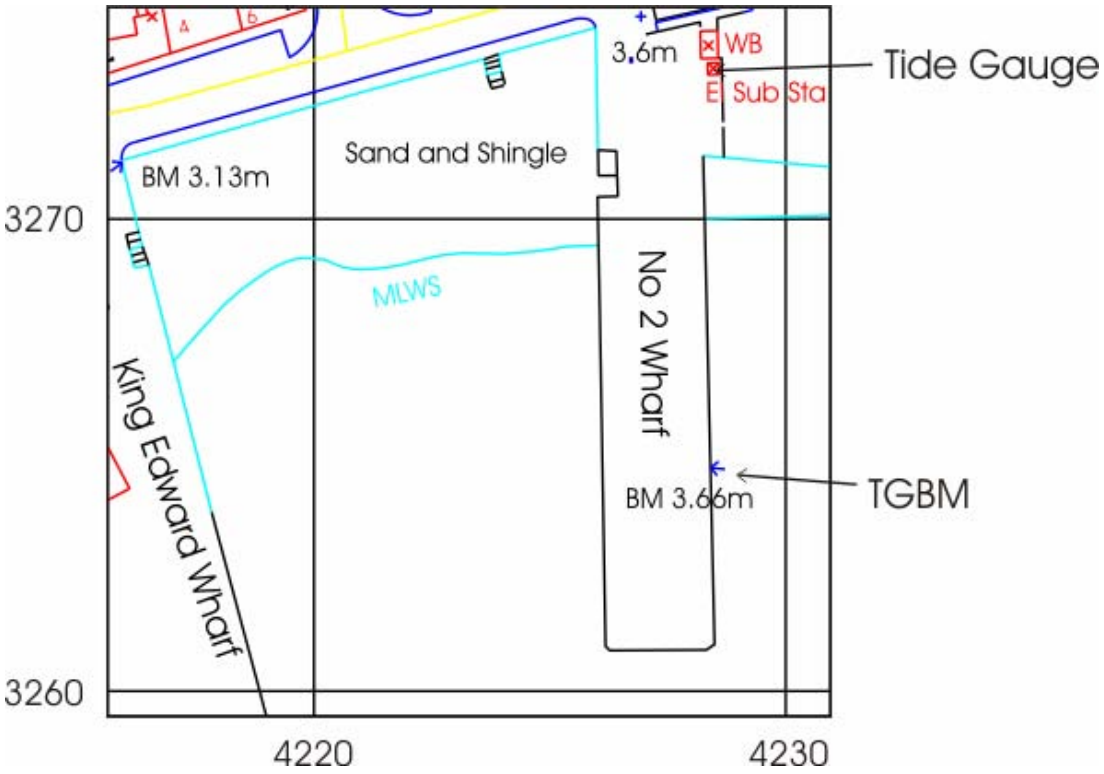
Latitude : 58° 12' 27.8" N Longitude : 06° 23' 20.3" W

Grid Reference : NB 4228 3273

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

East side of No. 2 wharf.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NB 4228 3264	OSBM bolt E side of No 2 wharf
Aux1	NB 4215 3271	OSBM bolt STS NE angle King Edwards Wharf
Aux2	NB 4212 3275	Amity House E side of Espl Rd N face NW angle
Aux3	NB 4223 3280	BK S side Worth Beach NW angle N face

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.71m below Ordnance Datum Local (ODL)
TGZ = 6.368m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 17/09/1997.

T.G.I. visits to site : Day 232 Faulty battery charger replaced.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	None

Residuals

Plots of the residuals for Stornoway for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Stornoway for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.930	28	0.3854398
February	0.891	01	21:45:00
March	0.750	11	02:45:00
April	0.411	26	08:30:00
May	0.590	22	14:45:00
June	0.647	17	20:45:00
July	0.288	08	19:15:00
August	0.386	15	12:00:00
September	0.240	06	13:15:00
October	0.355	25	04:15:00
November	0.629	03	13:00:00
December	0.448	24	06:00:00

Surge Minima	Value	Day	Time
January	-0.331	08	15:30:02
February	-0.415	20	13:15:00
March	-0.371	01	10:00:00
April	-0.139	12	21:00:00
May	-0.171	06	02:45:00
June	-0.202	27	13:30:00
July	-0.246	31	13:30:00
August	-0.216	25	12:45:00
September	-0.186	08	11:45:00
October	-0.199	28	15:00:00
November	-0.259	16	08:15:00
December	-0.365	05	23:30:00

Extreme Maxima	Value	Day	Time
January	5.520	28	06:30:02
February	5.744	01	09:15:00
March	5.356	30	07:30:00
April	5.382	28	07:30:00
May	5.082	25	18:00:00
June	4.755	12	19:45:00
July	4.858	25	19:45:00
August	5.120	11	20:45:00
September	5.319	09	20:15:00
October	5.482	07	19:15:00
November	5.477	03	17:45:00
December	5.191	04	06:30:00

Extreme Minima	Value	Day	Time
January	0.640	01	14:30:02
February	0.085	28	14:00:00
March	-0.199	01	14:45:00
April	0.187	27	13:15:00
May	0.562	26	12:45:00
June	0.833	28	03:00:00
July	0.661	13	03:00:00
August	0.373	12	03:15:00
September	0.063	09	02:15:00
October	-0.003	07	01:15:00
November	0.354	05	00:45:00
December	0.525	05	01:15:00

Mean Sea Level	No Days	MSL
January	31	3.117
February	28	3.070
March	31	2.885
April	30	2.87
May	31	2.878
June	30	2.901
July	31	2.831
August	31	2.857
September	30	2.884
October	31	2.947
November	30	3.114
December	31	2.958
	sum days	avg
	365	2.943

Tobermory (Mull) Tide Gauge

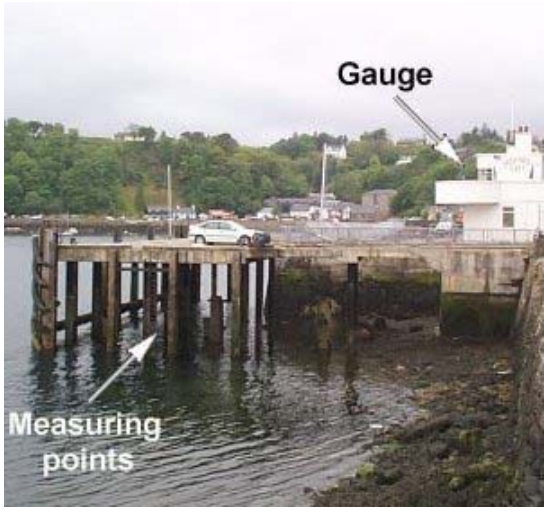
Latitude : 56° 37' 23.2" N Longitude : 06° 03' 51.2" W

Grid Reference : NM 5079 5531

Instrument type : Dataring system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The Tide Gauge equipment is located in the Caledonian MacBrayne ferry terminal on Mishnish Pier, Tobermory, and the pressure points are located on one of the pier legs as shown opposite.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NM 5069 5530	F bracket G5186 on SW angle of Royal bldg
Aux2	NM 5077 5529	NBM rivet in sea wall of Mishnish Pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.39m below Ordnance Datum Newlyn (ODN)
TGZ = Chart Datum = 6.856m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 24/03/1993.

T.G.I. visits to site : There were no visits to site in 2002.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
95	15 minutes	013, 022-026, 043-044, 093-095, 288-289, 295-302, 323, 337-341	None

Residuals

Plots of the residuals for Tobermory for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Tobermory for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.148	28	0.34375
February	1.003	01	19:00:00
March	1.123	10	17:44:59
April	0.452	28	08:44:59
May	0.650	22	15:44:59
June	0.673	17	10:44:59
July	0.390	08	11:29:59
August	0.404	17	21:44:59
September	0.300	06	19:44:59
October	0.314	02	18:44:59
November	0.744	03	05:29:59
December	0.693	01	17:45:00

Surge Minima	Value	Day	Time
January	-0.318	08	22:14:59
February	-0.615	20	22:59:59
March	-0.418	01	09:44:59
April	-0.147	09	18:14:59
May	-0.158	08	05:29:59
June	-0.241	27	13:59:59
July	-0.179	20	20:44:59
August	-0.234	25	13:14:59
September	-0.196	02	20:59:59
October	-0.214	06	01:14:59
November	-0.225	16	07:14:59
December	-0.358	08	09:15:00

Extreme Maxima	Value	Day	Time
January	5.372	28	05:30:00
February	5.440	01	20:30:00
March	5.050	31	07:14:59
April	5.165	28	06:29:59
May	4.869	24	16:29:59
June	4.563	12	18:44:59
July	4.511	25	18:44:59
August	4.826	11	19:29:59
September	5.044	09	19:29:59
October	5.205	08	18:59:59
November	5.213	03	04:29:59
December	5.013	01	15:30:00

Extreme Minima	Value	Day	Time
January	0.670	01	00:59:59
February	0.241	28	12:59:59
March	-0.016	01	13:44:59
April	0.299	26	23:44:59
May	0.629	27	00:14:59
June	0.738	27	13:44:59
July	0.655	13	13:59:59
August	0.456	12	14:29:59
September	0.208	08	12:44:59
October	0.204	07	12:14:59
November	0.408	05	11:59:59
December	0.656	02	22:45:00

Mean Sea Level	No Days	MSL
January	24	2.891
February	25	2.915
March	31	2.701
April	25	2.672
May	31	2.717
June	30	2.727
July	31	2.646
August	31	2.651
September	30	2.683
October	18	2.722
November	30	2.941
December	24	2.819
	sum days	avg
	330	2.757

Ullapool (Scotland) Tide Gauge

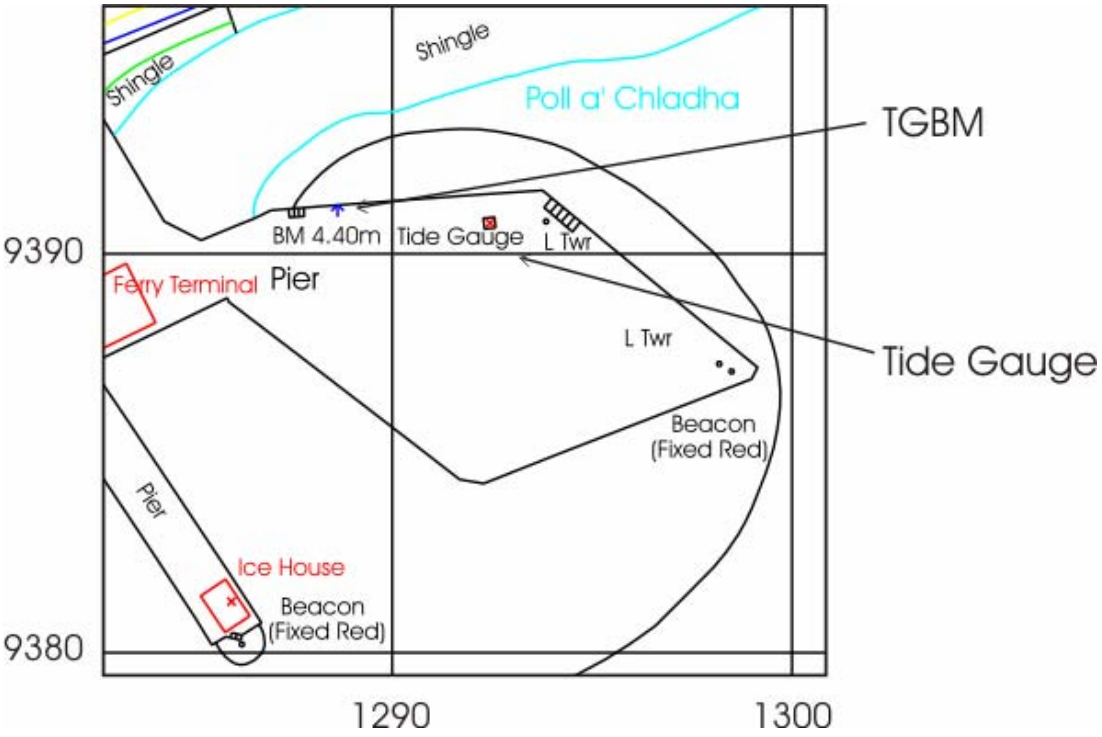
Latitude : 57° 53' 42.9" N Longitude : 05° 09' 29.0" W

Grid Reference : NH 1292 9391

Instrument type : Data acquisition system with a full tide, a mid-tide bubbler gauge and a potentiometer attached to a Munro float gauge installed. Wind speed and wind direction also recorded.

Site of Gauge:

The Pier, Ullapool Harbour.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NH 1288 9391	OSBM Pier NW Para 8.2M NE steps
Aux1	NH 1303 9425	PA bolt Church SW side of road NE face N angle
Aux2	NH 1288 9398	No 8 Shore Street SE face 0.3M S angle
Aux3	NH 1253 9376	Rivet Fnd No 21 West Shore Street S angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 2.75m below Ordnance Datum Newlyn (ODN)
TGZ = 7.155m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 18/09/1997.

T.G.I. visits to site : Day 232 General maintenance.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
100	15 minutes	None	None

Residuals

Plots of the residuals for Ullapool for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Ullapool for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.145	28	09:14:59
February	0.949	01	21:29:59
March	0.967	11	02:00:00
April	0.468	26	06:14:59
May	0.560	24	17:30:00
June	0.678	17	16:30:00
July	0.288	08	19:15:00
August	0.386	17	21:45:00
September	0.223	06	20:59:59
October	0.362	25	04:45:00
November	0.582	03	13:14:59
December	0.437	01	18:29:58

Surge Minima	Value	Day	Time
January	-0.407	24	23:59:59
February	-0.534	20	13:44:59
March	-0.426	01	11:00:00
April	-0.173	12	20:59:59
May	-0.219	06	03:14:59
June	-0.237	27	16:45:00
July	-0.272	31	13:14:59
August	-0.261	25	12:45:00
September	-0.283	08	03:29:59
October	-0.308	28	11:30:00
November	-0.318	16	08:29:59
December	-0.496	08	23:44:58

Extreme Maxima	Value	Day	Time
January	5.952	28	06:29:59
February	6.058	01	21:44:59
March	5.700	30	07:44:59
April	5.769	26	05:59:59
May	5.496	24	17:30:00
June	5.097	12	19:45:00
July	5.126	25	19:44:59
August	5.415	11	20:45:00
September	5.619	09	20:14:59
October	5.795	07	19:14:59
November	5.846	06	07:14:59
December	5.563	04	06:14:58

Extreme Minima	Value	Day	Time
January	0.653	31	14:59:59
February	0.035	28	14:15:00
March	-0.270	01	14:45:00
April	0.154	27	13:32:07
May	0.566	27	13:30:00
June	0.870	28	03:00:00
July	0.678	13	02:59:59
August	0.370	12	03:30:00
September	0.015	09	02:29:59
October	-0.019	07	01:29:59
November	0.338	05	00:44:59
December	0.478	02	23:44:58

Mean Sea Level	No Days	MSL
January	31	3.301
February	28	3.257
March	31	3.064
April	30	3.036
May	31	3.044
June	30	3.072
July	31	2.998
August	31	3.007
September	30	3.032
October	31	3.096
November	30	3.267
December	31	3.106
	sum days	avg
	365	3.107

Weymouth (Dorset) Tide Gauge

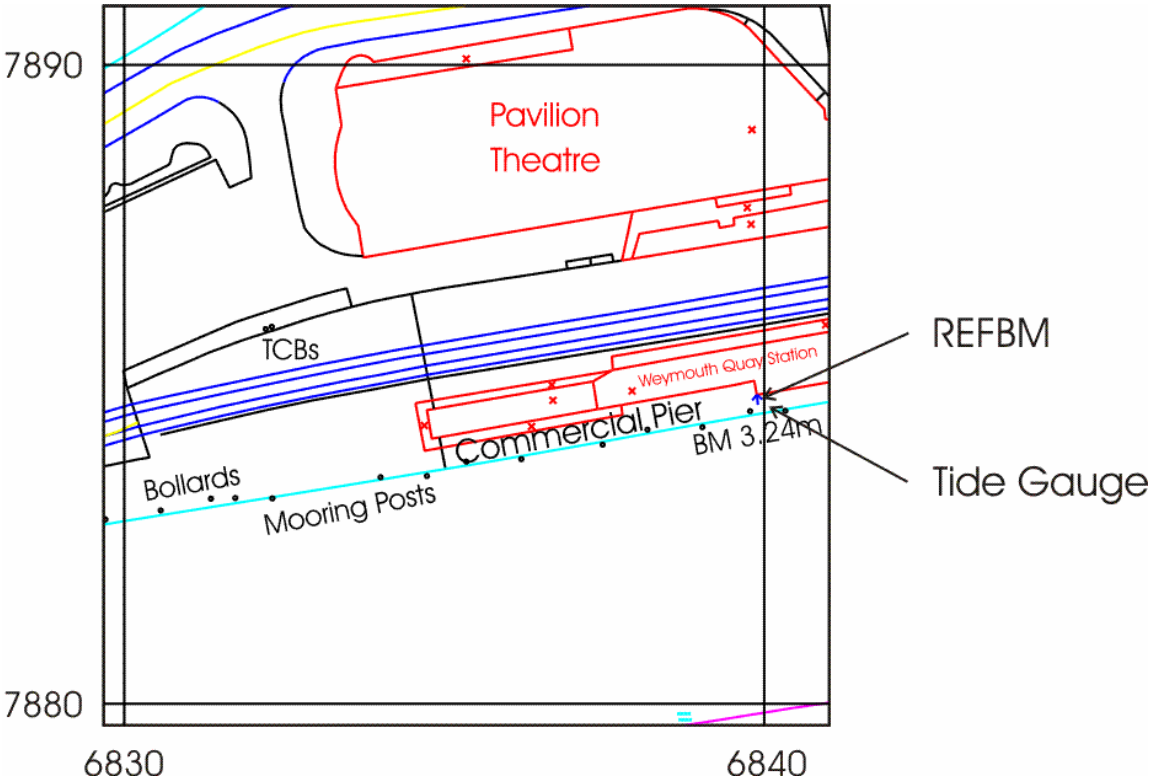
Latitude : 50° 36' 30.6" N Longitude : 02° 26' 52.6" W

Grid Reference : SY 6840 7885

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The Tide Gauge building is located on Commercial Pier adjacent to the ferry terminal, and measuring points are located on the pier wall directly in front of the Tide Gauge building.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	SY 6826 7882	Bolt corner of quay wall NW side N angle
Aux1	SY 6822 7886	Bolt sea wall 5.5M W steps
Aux2	SY 6813 7888	Right base NW pillar NE entrance Alexandra gardens
Aux3	SY 6810 7893	Bolt sea wall 10.1M NW shelter
Aux4	SY 6806 7908	Bolt N base STS aquarium E side of esplanade
REFBM	SY 6837 7884	Bolt concrete SW corner of building adjacent to Tide Gauge Hut

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.02m below Ordnance Datum Newlyn (ODN)
TGZ = 4.334m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled in 1991.

T.G.I. visits to site : There were no visits to site in 2002.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	295	None

Residuals

Plots of the residuals for Weymouth for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Weymouth for the whole year. Statistics for the Channel & SW approaches can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.648	23	21:30:00
February	0.595	04	14:15:00
March	0.539	18	10:15:00
April	0.385	30	11:45:00
May	0.555	21	21:15:00
June	0.314	09	12:45:00
July	0.310	02	22:00:00
August	0.240	11	14:15:00
September	0.217	23	01:00:00
October	0.737	15	12:45:00
November	0.811	14	04:00:00
December	0.513	27	05:30:00

Surge Minima	Value	Day	Time
January	-0.214	07	10:30:00
February	-0.324	15	01:15:00
March	-0.255	02	05:30:00
April	-0.250	21	01:15:00
May	-0.174	31	14:30:00
June	-0.246	29	14:15:00
July	-0.172	15	07:45:00
August	-0.165	31	05:30:00
September	-0.226	02	01:00:00
October	-0.551	27	16:30:00
November	-0.229	07	18:15:00
December	-0.395	06	00:30:00

Extreme Maxima	Value	Day	Time
January	2.568	31	08:45:00
February	2.706	01	09:30:00
March	2.685	01	08:15:00
April	2.588	27	19:15:00
May	2.404	26	06:00:00
June	2.221	11	19:00:00
July	2.212	12	20:15:00
August	2.480	11	20:45:00
September	2.702	09	20:45:00
October	2.707	08	20:15:00
November	2.636	06	07:30:00
December	2.456	04	06:45:00

Extreme Minima	Value	Day	Time
January	0.171	30	16:15:00
February	-0.034	28	15:45:00
March	-0.26	30	16:15:00
April	-0.042	26	14:15:00
May	0.270	25	14:00:00
June	0.198	25	02:45:00
July	0.103	14	05:30:00
August	0.023	11	04:30:00
September	-0.049	09	04:00:00
October	-0.158	07	03:00:00
November	0.044	06	15:30:00
December	0.032	06	00:15:00

Mean Sea Level	No Days	MSL
January	31	1.228
February	28	1.230
March	31	1.108
April	30	1.104
May	31	1.172
June	30	1.122
July	31	1.126
August	31	1.150
September	30	1.185
October	31	1.279
November	30	1.362
December	31	1.255
	sum days	avg
	365	1.193

Whitby (Yorkshire) Tide Gauge

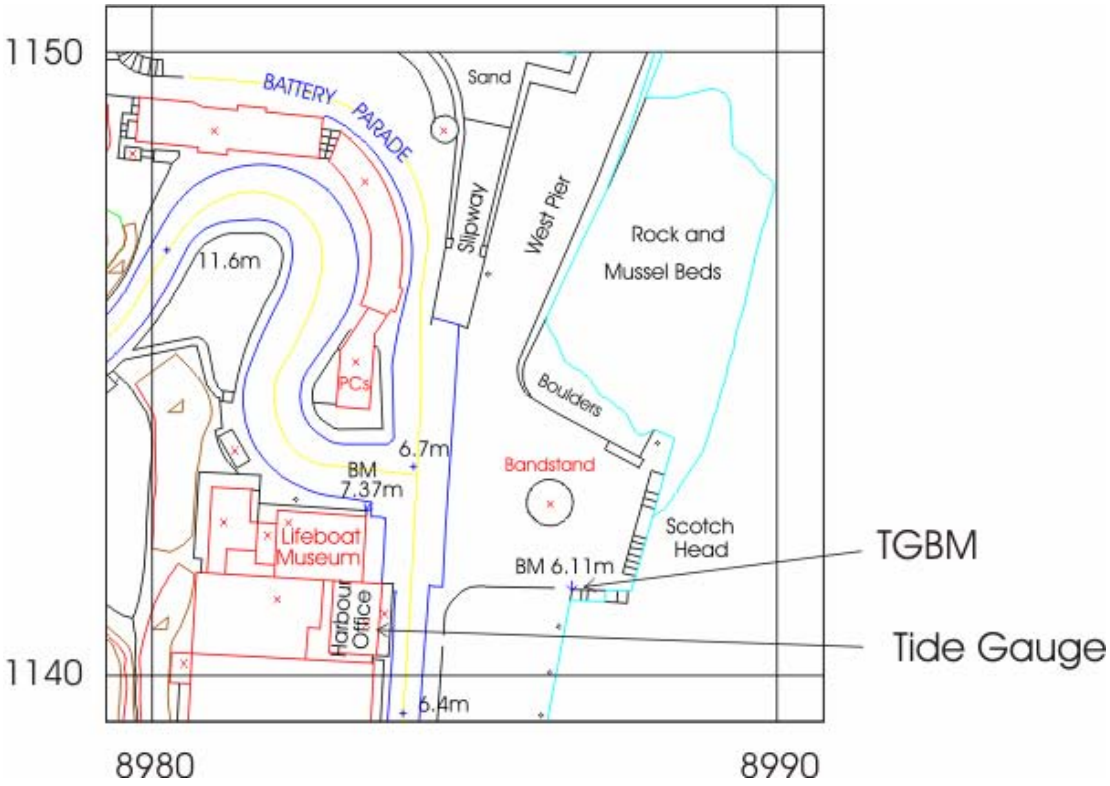
Latitude : 54° 29' 24.0" N Longitude : 00° 36' 52.6" W

Grid Reference : NZ 8986 1140

Instrument type : Data acquisition system with two full tide and a mid-tide bubbler gauge installed.

Site of Gauge:

The tide gauge is located in the Harbour Master's Office, Pier Road. The measuring points are positioned underneath the Quay adjacent to the Harbour Office.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	NZ 8986 1141	E side of Pier Rd
Aux1	NZ 8992 1105	Bolt butt of Whitby Bridge
Aux2	NZ 8985 1134	Rivet quayside SE side of Pier Rd
Aux3	NZ 8983 1142	Rivet wall angle S side of road angle of lifeboat museum

TGZ = Admiralty Chart Datum (ACD)
TGZ = 3.00m below Ordnance Datum Newlyn (ODN)
TGZ = 9.105m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 19/07/1994.

T.G.I. visits to site :	Day 081	New data logger installed
	Day 183	Compressor replaced
	Day 324	Pneumatic tube crushed by contractors

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	080	085-093, 099-107

Residuals

Plots of the residuals for Whitby for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Whitby for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	1.496	28	23:14:59
February	0.870	02	03:44:59
March	0.764	06	17:14:59
April	0.742	27	00:30:00
May	0.406	21	19:45:00
June	0.628	18	05:00:00
July	0.272	01	15:30:00
August	0.382	16	03:00:00
September	0.283	26	02:45:00
October	0.552	26	02:30:00
November	0.411	06	14:00:00
December	0.423	02	10:15:00

Surge Minima	Value	Day	Time
January	-0.402	25	20:59:59
February	-0.619	21	17:59:59
March	-0.404	10	15:14:59
April	-0.232	21	09:15:00
May	-0.175	07	23:15:00
June	-0.150	29	03:00:00
July	-0.159	31	22:30:00
August	-0.149	13	03:30:00
September	-0.294	01	15:15:00
October	-0.362	11	16:00:00
November	-0.646	03	03:45:00
December	-0.515	23	21:30:00

Extreme Maxima	Value	Day	Time
January	6.254	29	03:44:59
February	6.148	02	19:14:59
March	5.971	02	17:59:59
April	6.100	27	03:45:00
May	5.799	26	15:45:00
June	5.481	28	06:00:00
July	5.619	26	05:00:00
August	5.950	12	06:15:00
September	5.937	09	05:00:00
October	5.990	07	04:00:00
November	6.197	06	16:45:00
December	5.810	05	04:00:00

Extreme Minima	Value	Day	Time
January	0.474	31	23:59:59
February	0.447	01	00:14:59
March	0.163	01	23:59:59
April	0.442	27	22:30:00
May	0.785	24	20:30:00
June	0.917	26	10:45:00
July	0.732	14	12:45:00
August	0.601	11	12:00:00
September	0.220	09	11:30:00
October	0.105	08	11:15:00
November	0.325	05	10:00:00
December	0.588	04	09:30:00

Mean Sea Level	No Days	MSL
January	31	3.451
February	28	3.513
March	24	3.347
April	16	3.286
May	31	3.288
June	30	3.324
July	31	3.310
August	31	3.357
September	30	3.367
October	31	3.419
November	30	3.404
December	31	3.33
	sum days	avg
	344	3.366

Wick (Scotland) Tide Gauge

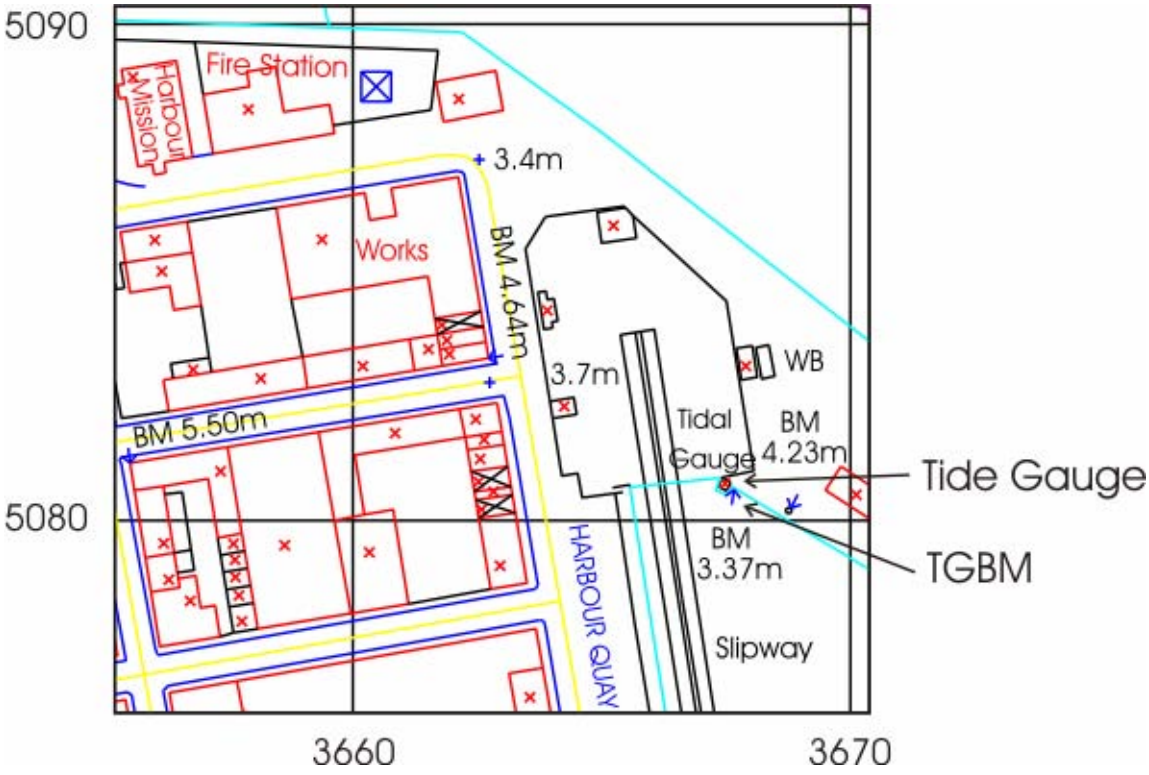
Latitude : 58° 26' 27.5" N Longitude : 03° 05' 11.3" W

Grid Reference : ND 3667 5081

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge building is mounted over an unused stilling well at the end of Wick Harbour next to the ship repair slipway. The measuring points are located directly beneath the building.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
TGBM	ND 3667 5081	New OSBM bolt quay E angle tide gauge building
Aux1	ND 3670 5084	Rivet base of wall 15.5M NE angle of building
Aux2	ND 3670 5083	NBM rivet base SE end of wall NE side of N pier
Aux3	ND 3705 5055	Wall base of steps SE side of pier

TGZ = Admiralty Chart Datum (ACD)
TGZ = 1.71m below Ordnance Datum (ODN)
TGZ = 5.084m below TGBM

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : The site was last levelled on 22/09/1998.

T.G.I. visits to site : There were no visits to site in 2002.

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	337-338	020-023, 025-027, 055, 059-062, 100-101, 103-106

Residuals

Plots of the residuals for Wick for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Wick for the whole year. Statistics for the whole East Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.739	28	16:30:00
February	0.826	02	02:15:00
March	0.698	11	07:00:00
April	0.500	26	20:30:00
May	0.481	21	11:45:00
June	0.710	17	23:00:00
July	0.274	01	11:30:00
August	0.349	15	23:15:00
September	0.267	06	02:00:00
October	0.408	25	13:00:00
November	0.495	21	18:45:00
December	0.475	02	05:30:00

Surge Minima	Value	Day	Time
January	-0.303	08	23:00:00
February	-0.445	20	23:15:00
March	-0.210	23	06:00:00
April	-0.147	05	17:15:00
May	-0.196	08	12:15:00
June	-0.131	28	18:00:00
July	-0.208	31	16:30:00
August	-0.189	01	08:45:00
September	-0.210	08	20:00:00
October	-0.205	28	23:00:00
November	-0.203	16	09:45:00
December	-0.410	09	08:45:00

Extreme Maxima	Value	Day	Time
January	4.144	28	11:00:00
February	4.277	02	02:15:00
March	3.846	31	13:00:00
April	3.986	28	12:00:00
May	3.755	25	10:00:00
June	3.490	13	00:30:00
July	3.574	26	00:15:00
August	3.748	12	01:30:00
September	3.826	10	01:00:00
October	3.915	08	00:00:00
November	4.084	06	11:45:00
December	3.726	02	09:15:00

Extreme Minima	Value	Day	Time
January	0.442	29	17:15:00
February	0.433	13	18:15:00
March	-0.086	29	17:45:00
April	0.257	27	17:30:00
May	0.534	28	06:00:00
June	0.600	28	07:00:00
July	0.405	14	07:30:00
August	0.225	10	06:00:00
September	0.009	09	06:30:00
October	0.030	07	05:15:00
November	0.278	05	05:00:00
December	0.399	06	18:30:00

Sea Level	No Days	MSL
January	21	2.205
February	23	2.279
March	27	2.067
April	22	2.042
May	31	2.029
June	30	2.068
July	31	2.008
August	31	2.024
September	30	2.050
October	31	2.113
November	30	2.234
December	27	2.083
	sum days	avg
	334	2.100

Workington (Cumbria) Tide Gauge

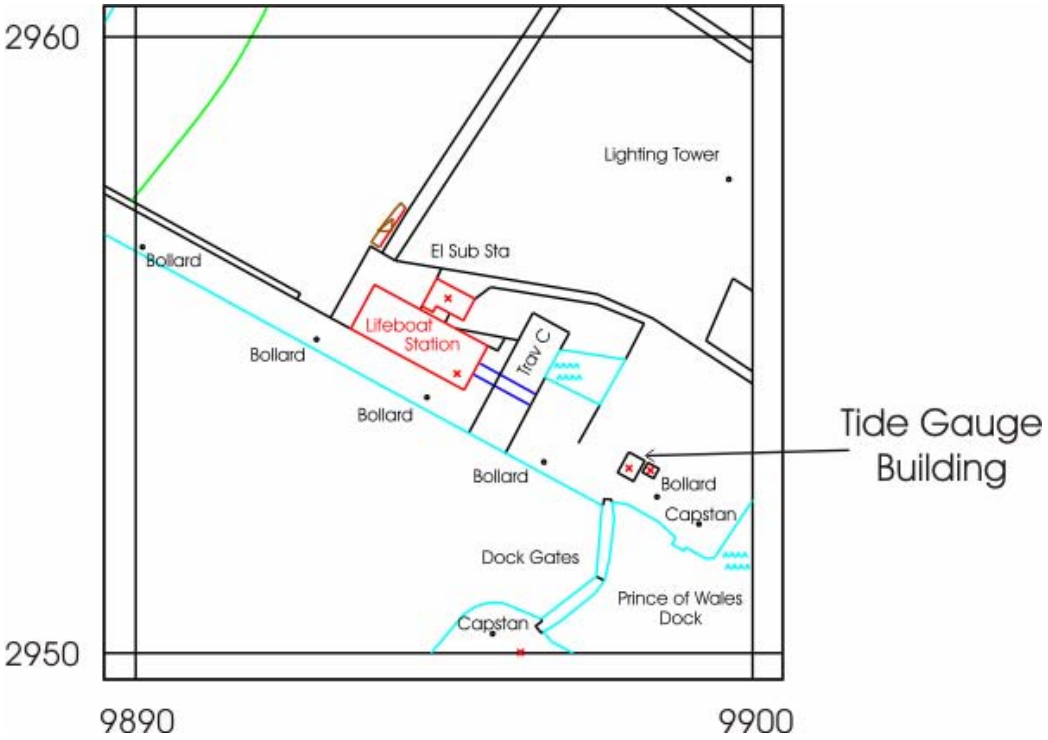
Latitude : 54° 39' 02.6" N Longitude : 03° 34' 01.8"W

Grid Reference : NX 9898 2953

Instrument type : Data acquisition system with two full tide bubbler gauges installed.

Site of Gauge:

The tide gauge is located in a concrete building next to the dock entrance, the measuring points being located behind fender piles on the north seaward side of the dock gates. The wind speed and direction instruments are mounted at the top of the mast located next to the tide gauge building.



Benchmarks and Benchmark relationships:

Benchmark	Grid Reference	Description
Aux1	NX 9917 2928	Building SW face 3.7M from S angle Workington Dock
Aux2	NX 9948 2967	NBM works building S side Rd N face NE angle

TGZ = Admiralty Chart Datum (ACD)
TGZ = 4.20m below Ordnance Datum Newlyn (ODN)
TGZ = 11.59m below Aux1

Datum information : All data are to Admiralty Chart Datum (ACD).

Levelling information : 24/09/02 16:00 G.M.T. – Workington tide gauge was relevelled in 2002 and it was found that the data were 18cm low from the installation in 1992 to 24/09/02 16:00.

T.G.I. visits to site :	Day 176	Compressor replaced
	Day 267	Geodetic levelling completed
	Day 304	Faulty compressor replaced

Data quality

Only the primary channel (parameter name ASLVBG02) has been screened and quality controlled, so the results presented here are from that channel only.

CI (%)	Sample interval	Missing data	Suspect data
99	15 minutes	267	299-304

Residuals

Plots of the residuals for Workington for the whole year or by each month with neighbouring stations can be seen in the Residuals Plots appendix.

Statistics

The tables below list the statistics for Workington for the whole year. Statistics for the whole West Coast can be found in the Statistics appendix.

Surge Maxima	Value	Day	Time
January	0.872	28	14:00:00
February	1.143	01	17:15:00
March	1.042	10	16:30:00
April	0.610	29	06:30:00
May	0.846	24	14:15:00
June	0.473	17	07:30:00
July	0.407	08	06:30:00
August	0.387	30	12:15:00
September	0.304	25	23:15:00
October	0.931	25	22:00:00
November	0.897	27	13:30:00
December	0.949	02	00:15:00

Surge Minima	Value	Day	Time
January	-0.518	05	21:30:00
February	-1.118	21	02:30:00
March	-0.520	01	15:15:00
April	-0.250	10	02:45:00
May	-0.268	06	16:15:00
June	-0.348	28	05:45:00
July	-0.298	16	06:00:00
August	-0.344	25	18:45:00
September	-0.329	01	09:15:00
October	-0.382	15	17:45:00
November	-0.181	07	21:45:00
December	-0.469	10	13:45:00

Extreme Maxima	Value	Day	Time
January	8.949	31	13:15:00
February	9.541	01	13:45:00
March	8.899	30	12:30:00
April	9.113	28	12:15:00
May	8.459	24	22:00:00
June	8.053	13	00:30:00
July	8.041	13	01:00:00
August	8.462	11	00:45:00
September	8.999	10	01:00:00
October	9.184	08	00:00:00
November	9.282	05	23:45:00
December	8.693	04	11:00:00

Extreme Minima	Value	Day	Time
January	0.556	30	19:00:00
February	0.116	28	18:45:00
March	-0.169	01	19:30:00
April	0.276	26	17:15:00
May	0.581	26	17:45:00
June	0.824	25	05:45:00
July	0.677	13	07:45:00
August	0.284	12	08:15:00
September	0.077	09	07:00:00
October	0.179	07	06:00:00
November	0.459	05	05:45:00
December	0.594	05	06:00:00

Mean Sea Level	No Days	MSL
January	31	4.565
February	28	4.572
March	31	4.333
April	30	4.317
May	31	4.397
June	30	4.372
July	31	4.300
August	31	4.298
September	27	4.366
October	24	4.564
November	30	4.779
December	31	4.571
	sum days	avg
	355	4.453

Statistics Appendix

Extreme Maxima

- West Coast
- East Coast
- Channel & SW approaches

Extreme Minima

- West Coast
- East Coast
- Channel & SW approaches

Mean Sea Level

- West Coast
- East Coast
- Channel & SW approaches

Table 1 - Extreme Maxima for sites on the West Coast

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
STORNOWAY	5.52	28	06:30:02	5.744	01	09:15:00	5.356	30	07:30:00	5.382	28	07:30:00	5.082	25	18:00:00	4.755	12	19:45:00
ULLAPOOL	5.952	28	06:29:59	6.058	01	21:44:59	5.7	30	07:44:59	5.769	26	05:59:59	5.496	24	17:30:00	5.097	12	19:45:00
TOBERMORY	5.372	28	05:30:00	5.44	01	20:30:00	5.05	31	07:14:59	5.165	28	06:29:59	4.869	24	16:29:59	4.563	12	18:44:59
MILLPORT	4.417	28	11:45:00	4.628	01	15:00:00	3.827	04	15:45:00	3.87	28	13:00:00	3.757	24	10:15:00	3.804	17	04:15:00
PORT ELLEN (ISLAY)	1.58	28	13:45:00	1.677	01	17:15:00	1.354	10	16:14:59	1.207	26	04:29:59	1.117	21	22:29:59	1.093	17	05:29:59
PORTRUSH	2.897	28	05:45:00	3.032	01	09:15:00	2.515	10	17:30:00	2.666	26	05:45:00	2.478	24	17:15:00	2.236	12	19:30:00
PORTPATRICK	4.682	28	10:59:59	5.169	01	13:59:59	4.257	31	13:15:00	4.425	28	12:15:00	4.284	24	09:30:00	4.085	17	03:45:00
BANGOR, NORTHERN IRELAND	4.218	28	10:30:00	4.618	01	13:30:00	3.758	31	13:00:00	3.957	28	11:30:00	3.864	24	08:45:00	3.667	17	03:15:00
WORKINGTON	8.949	31	13:15:00	9.541	01	13:45:00	8.899	30	12:30:00	9.113	28	12:15:00	8.459	24	22:00:00	8.053	13	00:30:00
HEYSHAM	10.293	30	12:00:00	11.353	01	13:45:00	10.518	30	12:15:00	10.664	28	12:00:00	10.057	24	21:45:00	9.515	13	00:15:00
PORT ERIN, ISLE OF MAN	5.873	31	13:00:00	6.52	01	13:45:00	5.672	31	13:00:00	5.849	28	12:00:00	5.533	24	09:15:00	5.208	13	00:15:00
LIVERPOOL (GLADSTONE DOCK)	10.055	30	12:00:00	10.834	01	13:30:00	10.214	30	12:00:00	10.162	28	11:30:00	9.289	01	01:15:00	9.083	13	00:15:00
LLANDUDNO	8.203	30	11:30:00	8.9	01	13:15:00	8.306	30	11:45:00	8.395	28	11:15:00	7.806	25	22:00:00	7.44	12	23:45:00
HOLYHEAD	6.198	31	12:15:00	6.856	01	12:45:00	6.116	31	12:00:00	6.263	28	11:15:00	5.864	24	08:15:00	5.576	12	23:15:00
BARMOUTH,WALES	5.631	31	10:00:00	6.151	01	10:45:00	5.635	31	10:00:00	5.746	28	08:45:00	5.424	24	18:45:00	4.964	10	07:45:00
FISHGUARD	5.418	31	09:00:00	5.698	01	09:30:00				5.416	28	07:45:00	5.043	26	06:45:00	4.727	12	20:15:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
STORNOWAY	4.858	25	19:45:00	5.12	11	20:45:00	5.319	09	20:15:00	5.482	07	19:15:00	5.477	03	17:45:00	5.191	04	06:30:00
ULLAPOOL	5.126	25	19:44:59	5.415	11	20:45:00	5.619	09	20:14:59	5.795	07	19:14:59	5.846	06	07:14:59	5.563	04	06:14:58
TOBERMORY	4.511	25	18:44:59	4.826	11	19:29:59	5.044	09	19:29:59	5.205	08	18:59:59	5.213	03	04:29:59	5.013	01	15:30:00
MILLPORT	3.511	28	02:30:00	3.738	13	03:00:00	3.86	10	02:15:00	3.917	25	14:15:00	4.059	06	00:30:00	4.004	24	15:00:00
PORT ELLEN (ISLAY)	0.868	27	19:14:59	0.94	11	18:59:59	1.053	06	16:59:59	1.281	25	16:00:00	1.469	27	15:44:59	1.52	01	15:29:59
PORTRUSH	2.108	12	20:00:00	2.147	23	19:00:00	2.484	06	18:15:00	2.55	07	18:45:00	2.727	03	05:00:00	2.905	01	16:45:00
PORTPATRICK	3.914	13	01:15:00	4.159	13	02:30:00	4.405	10	01:15:00	4.401	09	00:45:00	4.532	05	23:45:00	4.49	01	21:00:00
BANGOR, NORTHERN IRELAND	3.525	28	01:15:00	3.734	13	02:00:00	3.899	10	00:45:00	3.888	09	00:15:00	4.049	05	23:30:00	4.079	01	20:30:00
WORKINGTON	8.041	13	01:00:00	8.462	11	00:45:00	8.999	10	01:00:00	9.184	08	00:00:00	9.282	05	23:45:00	8.693	04	11:00:00
HEYSHAM	9.485	13	00:45:00	10.057	12	01:15:00	10.731	10	01:00:00	10.635	07	23:45:00	10.626	05	23:30:00	10.053	04	10:45:00
PORT ERIN, ISLE OF MAN	5.191	13	00:45:00	5.454	11	00:30:00	5.827	10	01:00:00	5.818	09	00:30:00	5.912	05	23:30:00	5.652	01	20:45:00
LIVERPOOL (GLADSTONE DOCK)	9.111	13	00:30:00	9.676	12	01:00:00	10.214	10	00:45:00	10.121	07	23:30:00	10.113	05	23:15:00	9.688	04	10:45:00
LLANDUDNO	7.49	13	00:15:00	7.919	12	00:45:00	8.337	10	00:15:00	8.407	07	23:15:00	8.411	05	23:00:00			
HOLYHEAD	5.589	12	23:45:00	5.892	10	23:30:00	6.252	10	00:00:00	6.276	08	23:30:00	5.826	08	12:30:00	5.967	01	19:45:00
BARMOUTH,WALES	4.961	12	21:45:00	5.342	11	22:15:00	5.734	09	22:00:00	5.77	08	21:30:00	5.762	05	20:30:00	5.49	01	17:45:00
FISHGUARD	4.802	12	20:45:00	5.147	11	21:15:00	5.509	08	20:15:00	5.559	08	20:30:00	5.447	05	19:30:00	5.159	04	06:45:00

Table 2 - Extreme Maxima for sites on the East Coast

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
LERWICK																		
WICK	4.144	28	11:00:00	4.277	02	02:15:00	3.846	31	13:00:00	3.986	28	12:00:00	3.755	25	10:00:00	3.49	13	00:30:00
MORAY FIRTH	4.664	13	11:59:59	4.874	28	00:30:00	4.846	31	14:00:00	4.954	28	12:45:00	4.485	01	02:30:00	4.33	13	01:15:00
ABERDEEN	4.864	29	01:15:00	5.064	02	04:15:00	4.661	30	14:15:00	4.812	28	14:00:00	4.496	26	13:15:00	4.215	13	02:30:00
LEITH	5.632	01	15:59:59	6.21	28	03:00:00	6.01	30	15:45:00	5.754	01	17:15:00	5.721	27	15:00:00	5.419	25	15:00:00
NORTH SHIELDS	5.793	29	03:15:00	5.714	02	18:45:00	5.518	30	16:30:00	5.605	27	03:15:00	5.382	26	15:15:00	4.976	25	15:45:00
WHITBY	6.254	29	03:44:59	6.148	02	19:14:59	5.971	02	17:59:59	6.1	27	03:45:00	5.799	26	15:45:00	5.481	28	06:00:00
IMMINGHAM	7.585	29	05:45:00	7.707	28	18:45:00	7.604	02	20:00:00	7.575	27	05:45:00	7.29	26	17:45:00	6.993	28	08:00:00
CROMER	5.608	29	06:15:00	5.59	28	19:15:00	5.48	02	20:45:00	5.55	27	06:30:00	5.097	26	18:15:00	5.176	28	08:30:00
LOWESTOFT	3.162	29	09:15:00	3.082	22	16:15:00	2.851	02	23:45:00	2.981	27	09:30:00	2.627	26	21:30:00	2.875	28	11:30:00
FELIXSTOWE	4.358	29	11:45:00	4.407	28	12:00:00	4.276	01	13:00:00	4.373	27	11:30:00	4.011	26	11:00:00	3.963	28	14:00:00
SHEERNESS				6.542	28	13:15:00	6.505	01	14:15:00	6.35	27	12:30:00	5.93	01	03:00:00	5.828	27	02:00:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
LERWICK																		
WICK	3.574	26	00:15:00	3.748	12	01:30:00	3.826	10	01:00:00	3.915	08	00:00:00	4.084	06	11:45:00	3.726	02	09:15:00
MORAY FIRTH	4.329	13	01:45:00	4.251	24	00:45:00	4.827	10	02:00:00	4.88	08	00:45:00	5.045	06	12:45:00	4.641	04	11:45:00
ABERDEEN	4.335	26	02:15:00	4.59	12	03:30:00	4.688	10	03:00:00	4.706	08	02:00:00	4.897	06	14:00:00	4.472	05	01:15:00
LEITH	5.474	26	03:45:00	5.895	12	04:45:00	6.001	09	16:15:00	6.023	08	03:15:00	6.125	06	15:15:00	5.739	04	14:15:00
NORTH SHIELDS	4.569	01	07:30:00	5.468	12	05:30:00	5.488	09	04:30:00	5.519	08	04:00:00	5.727	06	16:15:00	5.308	05	03:30:00
WHITBY	5.619	26	05:00:00	5.95	12	06:15:00	5.937	09	05:00:00	5.99	07	04:00:00	6.197	06	16:45:00	5.81	05	04:00:00
IMMINGHAM	7.113	26	07:00:00	7.529	12	08:15:00	7.543	09	07:00:00	7.639	09	07:30:00	7.739	06	18:45:00	7.37	05	06:00:00
CROMER	5.129	26	07:30:00	5.463	12	08:45:00	5.443	09	07:45:00	5.495	07	06:30:00	5.636	07	07:45:00	5.321	05	06:30:00
LOWESTOFT	2.741	26	10:45:00	2.916	12	11:45:00	2.91	22	10:00:00	3.112	27	23:30:00	3.052	06	22:30:00	2.789	05	09:15:00
FELIXSTOWE	3.897	23	23:00:00	4.148	12	01:45:00	4.174	09	13:00:00	4.307	05	23:00:00	4.389	07	00:30:00	4.083	04	23:30:00
SHEERNESS	5.792	24	00:15:00	6.196	12	02:45:00	6.229	09	14:00:00	6.191	08	01:15:00	6.437	07	01:30:00	6.119	05	00:30:00

Table 3 - Extreme Maxima for sites along the English Channel & SW approaches

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
DOVER	7.21	29	11:15:00	7.225	28	23:45:00	7.244	01	00:00:00	7.245	27	11:00:00	6.794	26	22:45:00	6.683	28	13:15:00
NEWHAVEN	7.185	29	11:15:00	7.193	27	23:45:00	7.274	01	00:15:00	7.254	29	00:30:00	6.931	25	22:15:00	6.463	23	22:00:00
PORTSMOUTH	5.318	29	11:30:00	5.276	27	23:30:00	5.228	01	00:30:00	5.235	27	23:45:01	5.074	25	22:30:00	4.635	11	23:45:01
BOURNEMOUTH	2.592	29	09:15:00	2.744	01	11:15:00	2.603	01	10:00:00	2.633	27	21:15:00	2.43	25	20:00:00	2.181	11	20:45:00
WEYMOUTH	2.568	31	08:45:00	2.706	01	09:30:00	2.685	01	08:15:00	2.588	27	19:15:00	2.404	26	06:00:00	2.221	11	19:00:00
ST.HELIER, JERSEY	11.504	31	08:15:00	11.742	01	08:45:00	11.996	01	07:45:00	11.889	28	19:30:00	11.243	26	18:30:00	10.52	25	18:45:00
DEVONPORT	5.884	31	07:30:00	6.072	01	08:30:00	6.055	01	07:15:00	5.938	28	06:30:00	5.685	26	05:30:00	5.4	12	18:30:00
NEWLYN	5.886	31	06:15:00	6.027	01	06:45:00	6.147	01	06:00:00	5.955	28	05:15:00	5.745	26	04:15:00	5.428	11	17:00:00
ST. MARYS, IS. OF SCILLY	6.097	31	06:30:00	6.25	01	07:00:00	6.175	30	05:29:59	6.13	28	05:15:00	5.751	27	17:15:00	5.408	12	17:30:00
AVONMOUTH																		
NEWPORT, (GWENT)	12.645	31	09:00:00	13.216	01	09:30:00	13.116	30	08:15:00	13.157	28	20:15:00	12.439	26	19:00:00	11.636	25	19:30:00
HINKLEY	12.421	31	08:29:59	12.928	01	09:14:59	12.87	01	08:14:59	12.86	28	19:44:59	12.15	26	18:44:59	11.446	25	19:14:59
ILFRACOMBE																		
MUMBLES, WALES	10.05	31	08:00:00	10.495	01	08:45:00	10.346	01	07:45:00	10.349	27	18:45:00	9.792	25	17:30:00	9.195	12	19:15:00
MILFORD HAVEN	7.563	31	08:00:00	8.022	01	08:30:00	7.77	01	07:30:00	7.779	27	18:30:00	7.299	25	17:15:00	6.806	12	19:15:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
DOVER	6.647	13	13:00:00	7.057	12	13:30:00	7.187	09	12:15:00	7.175	06	10:30:00	7.316	07	00:00:00	7.001	05	11:15:00
NEWHAVEN	6.569	13	13:15:00	6.971	11	13:00:00	7.275	09	12:45:00	7.181	08	12:15:00	7.227	07	00:15:00	6.971	05	11:30:00
PORTSMOUTH	4.634	26	12:45:00	4.939	11	13:15:00	5.106	09	12:45:00	5.068	08	12:30:00	5.172	04	10:30:00	5.045	04	10:45:00
BOURNEMOUTH	2.179	10	20:15:00	2.411	11	22:45:00	2.609	08	21:30:00	2.638	08	22:00:00	2.753	14	08:15:00	2.514	04	08:30:00
WEYMOUTH	2.212	12	20:15:00	2.48	11	20:45:00	2.702	09	20:45:00	2.707	08	20:15:00	2.636	06	07:30:00	2.456	04	06:45:00
ST.HELIER, JERSEY	10.737	12	20:00:00	11.462	11	20:30:00	12.047	09	20:15:00	12.064	08	19:45:00	11.861	06	07:00:00	11.367	04	06:00:00
DEVONPORT	5.445	12	19:15:00	5.769	11	19:45:00	6.042	08	18:45:00	6.08	08	19:15:00	5.924	05	18:00:00	5.765	04	05:30:00
NEWLYN	5.514	12	18:15:00	5.837	11	18:30:00	6.182	08	17:30:00	6.256	08	18:00:00	6.109	05	17:00:00	5.804	04	04:15:00
ST. MARYS, IS. OF SCILLY	5.5	12	18:15:00	5.824	11	18:45:00	6.23	08	17:30:00	6.326	08	18:00:00	5.799	21	05:00:00	5.954	04	04:00:00
AVONMOUTH										14.393	07	20:00:00	14.32	06	08:00:00	13.725	04	06:45:00
NEWPORT, (GWENT)	11.799	12	20:30:00	12.443	10	20:30:00	13.126	09	20:45:00	13.174	07	19:45:00	13.102	06	07:45:00	12.519	04	06:45:00
HINKLEY	11.626	12	20:14:59	12.233	11	20:44:59	12.876	09	20:29:59	12.912	07	19:29:59	12.832	05	18:59:59	12.329	04	06:15:00
ILFRACOMBE							10.188	09	19:45:00	10.153	08	19:15:00	10.075	05	18:00:00	9.689	04	05:30:00
MUMBLES, WALES	9.341	12	19:45:00	9.818	11	20:15:00	10.36	09	20:00:00	10.395	08	19:30:00	10.333	05	18:30:00	9.95	04	05:45:00
MILFORD HAVEN	6.908	12	19:30:00	7.316	11	20:15:00	7.766	08	19:15:00	7.868	08	19:30:00	7.771	05	18:30:00	7.414	04	05:30:00

Table 4 - Extreme Minima for sites on the West Coast

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
STORNOWAY	0.64	01	14:30:02	0.085	28	14:00:00	-0.199	01	14:45:00	0.187	27	13:15:00	0.562	26	12:45:00	0.833	28	03:00:00
ULLAPOOL	0.653	31	14:59:59	0.035	28	14:15:00	-0.27	01	14:45:00	0.154	27	13:32:07	0.566	27	13:30:00	0.87	28	03:00:00
TOBERMORY	0.67	01	00:59:59	0.241	28	12:59:59	-0.016	01	13:44:59	0.299	26	23:44:59	0.629	27	00:14:59	0.738	27	13:44:59
MILLPORT	0.344	05	22:30:00	0.027	13	18:45:00	-0.275	01	19:15:00	0.145	26	17:15:00	0.248	27	06:00:00	0.096	28	08:00:00
PORT ELLEN (ISLAY)	-0.006	06	01:30:00	-0.458	21	00:59:59	-0.389	02	00:29:59	-0.287	26	22:44:59	-0.057	31	11:29:59	-0.221	28	10:29:59
PORTRUSH	0.294	01	01:00:00	0.147	28	13:30:00	-0.091	01	14:15:00	0.171	26	23:45:00	0.385	27	00:15:00	0.316	27	14:00:00
PORTPATRICK	0.411	05	22:15:00	0.083	28	18:29:59	-0.258	01	19:14:59	0.117	26	17:00:00	0.349	27	05:45:00	0.199	28	07:45:00
BANGOR, NORTHERN IRELAND	0.408	05	21:45:00	0.226	28	17:45:00	-0.128	01	18:30:00	0.186	25	15:30:00	0.478	27	05:15:00	0.305	28	07:15:00
WORKINGTON	0.556	30	19:00:00	0.116	28	18:45:00	-0.169	01	19:30:00	0.276	26	17:15:00	0.581	26	17:45:00	0.824	25	05:45:00
HEYSHAM	0.915	30	19:15:00	1.028	13	19:00:00	0.118	29	18:30:00	0.583	27	18:00:00	0.967	26	17:45:00	1.272	25	05:45:00
PORT ERIN, ISLE OF MAN	0.249	30	18:15:00	-0.102	28	18:15:00	-0.45	01	19:00:00	-0.07	26	16:45:00	0.253	26	17:00:00	0.28	27	06:45:00
LIVERPOOL (GLADSTONE DOCK)	0.879	30	19:15:00	0.484	28	19:00:00	-0.003	01	19:45:00	0.33	27	18:15:00	1.322	12	17:45:00	1.113	25	05:45:00
LLANDUDNO	0.209	30	18:30:00	-0.159	28	18:00:00	-0.586	01	18:45:00	-0.181	26	16:45:00	0.264	26	17:00:00	0.53	25	17:30:00
HOLYHEAD	0.516	30	17:30:00	0.218	28	17:15:00	-0.15	01	18:00:00	0.162	26	15:30:00	0.569	26	16:00:00	0.668	25	04:15:00
BARMOUTH,WALES	0.764	01	04:30:00	0.686	14	04:45:00	0.58	01	18:00:00	0.658	25	14:45:00	0.809	27	04:00:00	0.845	25	16:00:00
FISHGUARD	0.813	30	15:00:00	0.964	01	03:45:00				0.46	26	13:30:00	0.822	27	01:45:00	0.871	25	01:30:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
STORNOWAY	0.661	13	03:00:00	0.373	12	03:15:00	0.063	09	02:15:00	-0.003	07	01:15:00	0.354	05	00:45:00	0.525	05	01:15:00
ULLAPOOL	0.678	13	02:59:59	0.37	12	03:30:00	0.015	09	02:29:59	-0.019	07	01:29:59	0.338	05	00:44:59	0.478	02	23:44:58
TOBERMORY	0.655	13	13:59:59	0.456	12	14:29:59	0.208	08	12:44:59	0.204	07	12:14:59	0.408	05	11:59:59	0.656	02	22:45:00
MILLPORT	0.214	16	10:00:00	0.006	12	08:00:00	-0.004	08	06:15:00	0.033	06	05:00:00	0.242	07	19:15:00	0.057	05	18:15:00
PORT ELLEN (ISLAY)	-0.207	15	14:29:59	-0.247	12	13:14:59	-0.235	08	11:44:59	-0.248	06	10:30:00	-0.1	04	10:00:00	-0.138	09	23:44:59
PORTRUSH	0.271	13	14:15:00	0.24	25	13:45:00	0.06	08	13:00:00	0.074	07	12:15:00	0.26	05	12:00:00	0.275	06	01:15:00
PORTPATRICK	0.22	14	08:15:00	0.046	12	07:45:00	0.065	09	06:45:00	0.029	07	05:30:00	0.215	07	19:15:00	0.122	06	19:00:00
BANGOR, NORTHERN IRELAND	0.282	14	07:30:00	0.168	12	07:15:00	0.204	09	06:00:00	0.171	06	04:15:00	0.391	04	03:45:00	0.268	03	03:30:00
WORKINGTON	0.677	13	07:45:00	0.284	12	08:15:00	0.077	09	07:00:00	0.179	07	06:00:00	0.459	05	05:45:00	0.594	05	06:00:00
HEYSHAM	1.087	14	08:30:00	0.691	12	08:15:00	0.424	09	07:15:00	0.315	07	06:15:00	0.643	05	05:30:00	0.786	05	06:00:00
PORT ERIN, ISLE OF MAN	0.192	14	07:45:00	-0.061	12	07:30:00	-0.129	09	06:30:00	-0.21	07	05:15:00	0.075	05	05:00:00	0.061	05	17:45:00
LIVERPOOL (GLADSTONE DOCK)	0.925	14	08:30:00	0.562	12	08:30:00	0.193	09	07:15:00	0.093	07	06:15:00	0.398	05	05:45:00	0.672	05	06:15:00
LLANDUDNO	0.469	15	08:30:00	-0.187	12	07:15:00	-0.224	09	06:30:00	-0.32	07	05:15:00	-0.065	05	05:00:00			
HOLYHEAD	0.573	14	07:00:00	0.278	12	06:45:00	0.171	09	05:30:00	0.062	07	04:15:00	0.474	07	18:15:00	0.378	05	16:45:00
BARMOUTH,WALES	0.79	15	07:15:00	0.759	12	06:30:00	0.719	11	06:45:00	0.673	06	03:45:00	0.691	07	17:30:00	0.625	06	17:15:00
FISHGUARD	0.853	14	04:15:00	0.626	12	04:15:00	0.54	09	03:00:00	0.356	07	02:00:00	0.542	07	02:30:00	0.631	05	14:15:00

Table 5 - Extreme Minima for sites on the East Coast

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
LERWICK																		
WICK	0.442	29	17:15:00	0.433	13	18:15:00	-0.086	29	17:45:00	0.257	27	17:30:00	0.534	28	06:00:00	0.6	28	07:00:00
MORAY FIRTH	0.852	03	21:14:59	0.103	28	19:15:00	-0.185	01	20:15:00	0.319	27	18:30:00	0.923	11	17:30:00	0.858	27	07:30:00
ABERDEEN	0.38	29	19:45:00	0.102	28	20:15:00	-0.134	01	21:00:00	0.289	27	19:30:00	0.592	26	19:15:00	0.695	26	08:15:00
LEITH	0.62	02	22:44:59	0.135	28	21:45:00	-0.183	01	22:15:00	0.639	01	10:45:00	0.612	24	19:00:00	0.672	26	09:30:00
NORTH SHIELDS	0.237	31	23:45:00	0.226	28	22:45:00	-0.106	29	22:30:00	0.232	27	22:00:00	0.514	24	20:00:00	0.639	26	10:30:00
WHITBY	0.474	31	23:59:59	0.447	01	00:14:59	0.163	01	23:59:59	0.442	27	22:30:00	0.785	24	20:30:00	0.917	26	10:45:00
IMMINGHAM	0.542	30	00:45:00	0.464	01	02:30:00	0.058	02	02:30:00	0.414	28	00:45:00	0.702	24	23:00:00	0.892	26	13:15:00
CROMER	0.401	30	01:45:00	0.323	01	03:30:00	0.067	30	02:15:00	0.285	28	02:00:00	0.522	25	00:00:00	0.778	26	14:00:00
LOWESTOFT	0.258	30	04:15:00	0.209	01	05:45:00	0.017	30	04:45:00	0.178	28	04:15:00	0.26	25	02:15:00	0.42	29	18:45:00
FELIXSTOWE	0.224	30	06:00:00	0.139	01	07:45:00	-0.13	02	07:30:00	0.078	28	06:00:00	0.176	25	04:00:00	0.332	29	20:30:00
SHEERNESS				0.295	26	06:15:00	0.06	30	08:00:00	0.029	29	08:30:00	0.637	01	09:30:00	0.586	26	20:00:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
LERWICK																		
WICK	0.405	14	07:30:00	0.225	10	06:00:00	0.009	09	06:30:00	0.03	07	05:15:00	0.278	05	05:00:00	0.399	06	18:30:00
MORAY FIRTH	0.579	13	08:15:00	0.71	25	07:00:00	-0.033	09	07:30:00	0.013	07	06:15:00	0.566	04	05:15:00	0.58	06	19:45:00
ABERDEEN	0.424	14	10:00:00	0.309	10	08:15:00	-0.059	09	08:30:00	-0.011	07	07:30:00	0.194	05	07:00:00	0.483	06	20:45:00
LEITH	0.475	14	11:30:00	0.301	11	10:30:00	-0.082	09	10:00:00	-0.146	07	08:45:00	0.076	05	08:30:00	0.467	04	08:00:00
NORTH SHIELDS	1.561	01	13:45:00	0.322	11	11:30:00	-0.043	09	11:00:00	-0.078	08	10:45:00	0.131	03	08:00:00	0.402	04	09:15:00
WHITBY	0.732	14	12:45:00	0.601	11	12:00:00	0.22	09	11:30:00	0.105	08	11:15:00	0.325	05	10:00:00	0.588	04	09:30:00
IMMINGHAM	0.797	14	15:15:00	0.577	11	14:15:00	0.307	09	14:00:00	0.152	08	13:45:00	0.196	03	10:45:00	0.457	04	12:00:00
CROMER	0.629	14	16:00:00	0.551	11	15:00:00	0.321	09	15:00:00	0.074	08	14:30:00	-0.022	03	11:30:00	0.365	04	13:00:00
LOWESTOFT	0.334	14	18:45:00	0.368	11	17:45:00	0.16	08	16:30:00	0.162	07	16:15:00	-0.089	03	14:00:00	0.065	24	06:15:00
FELIXSTOWE	0.289	14	20:30:00	0.246	11	19:30:00	0.107	09	19:15:00	0.057	08	18:45:00	-0.097	03	15:45:00	0.128	24	08:00:00
SHEERNESS	0.556	25	19:45:00	0.338	11	21:00:00	-0.063	09	21:00:00	0.202	27	10:30:00	0.058	03	17:30:00	0.252	04	18:45:00

Table 6 - Extreme Minima for sites along the English Channel & SW approaches

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
DOVER	0.615	30	07:00:00	0.548	01	08:45:00	0.194	30	07:30:00	0.453	28	07:00:00	0.731	28	07:15:00	0.866	26	19:15:00
NEWHAVEN	0.55	30	18:45:00	0.476	28	18:30:00	0.143	30	18:45:00	0.451	26	17:00:00	0.628	27	05:45:00	0.707	25	05:30:00
PORTSMOUTH	0.671	30	17:45:00	0.58	28	17:45:00	0.16	30	18:00:00	0.389	26	16:00:01	0.744	27	04:45:00	0.685	25	04:30:00
BOURNEMOUTH	0.351	01	17:00:00	0.25	28	16:30:00	-0.037	30	17:00:00	0.15	26	15:00:00	0.49	27	03:45:00	0.375	25	03:30:00
WEYMOUTH	0.171	30	16:15:00	-0.034	28	15:45:00	-0.26	30	16:15:00	-0.042	26	14:15:00	0.27	25	14:00:00	0.198	25	02:45:00
ST.HELIER, JERSEY	0.995	31	15:00:00	0.67	28	14:00:00	0.127	30	14:30:00	0.582	27	13:15:00	1.182	27	01:15:00	1.41	26	01:30:00
DEVONPORT	0.66	31	01:15:00	0.529	28	12:45:00	0.097	30	13:15:00	0.381	27	12:00:00	0.779	27	12:30:00	0.752	24	23:45:00
NEWLYN	0.638	31	00:30:00	0.428	28	12:00:00	0.242	02	13:30:00	0.381	27	11:30:00	0.8	26	23:15:00	0.82	24	23:00:00
ST. MARYS, IS. OF SCILLY	0.573	30	12:15:00	0.723	01	01:15:00	0.107	29	11:29:59	0.304	27	11:15:00	0.596	26	23:00:00	0.681	25	23:30:00
AVONMOUTH																		
NEWPORT, (GWENT)	0.505	01	03:00:00	0.478	15	03:45:00	0.083	29	15:15:00	0.175	01	04:45:00	0.472	28	03:00:00	0.504	25	02:00:00
HINKLEY	0.69	30	14:14:59	0.463	28	13:44:59	-0.223	30	01:59:59	0.243	27	13:14:59	0.732	27	00:59:59	1.059	26	01:29:59
ILFRACOMBE																		
MUMBLES, WALES	0.886	31	01:45:00	0.596	28	13:15:00	0.136	30	01:00:00	0.478	27	12:15:00	0.946	27	00:15:00	1.159	25	00:00:00
MILFORD HAVEN	0.673	30	13:30:00	0.368	28	13:15:00	-0.003	29	13:00:00	0.277	27	12:30:00	0.703	27	00:30:00	0.827	25	00:15:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
DOVER	0.838	14	21:15:00	0.67	11	20:15:00	0.368	09	20:00:00	0.301	08	19:45:00	0.368	05	18:30:00	0.627	04	18:00:00
NEWHAVEN	0.681	14	08:00:00	0.578	13	08:30:00	0.349	10	07:30:00	0.309	07	05:30:00	0.393	06	18:15:00	0.526	05	18:00:00
PORTSMOUTH	0.645	14	07:15:00	0.543	11	06:15:00	0.393	09	06:00:00	0.28	07	04:45:00	0.434	06	17:30:00	0.496	05	17:15:00
BOURNEMOUTH	0.285	14	06:15:00	0.252	11	05:00:00	0.163	10	05:30:00	0.03	07	03:45:00	0.246	06	16:30:00	0.229	06	17:00:00
WEYMOUTH	0.103	14	05:30:00	0.023	11	04:30:00	-0.049	09	04:00:00	-0.158	07	03:00:00	0.044	06	15:30:00	0.032	06	00:15:00
ST.HELIER, JERSEY	1.388	14	03:30:00	0.97	11	02:30:00	0.558	09	02:15:00	0.373	08	02:00:00	0.693	05	13:00:00	0.989	05	13:30:00
DEVONPORT	0.886	12	00:45:00	0.518	11	01:30:00	0.369	10	02:00:00	0.228	07	00:00:00	0.416	07	01:00:00	0.589	05	12:15:00
NEWLYN	0.798	14	01:45:00	0.61	12	01:30:00	0.539	10	01:00:00	0.395	06	23:15:00	0.495	07	00:30:00	0.586	05	11:45:00
ST. MARYS, IS. OF SCILLY	0.655	14	01:30:00	0.435	12	01:15:00	0.38	09	00:00:00	0.222	06	23:00:00	1.302	19	22:30:00	0.515	05	11:15:00
AVONMOUTH										0.343	07	15:00:00	0.497	05	14:30:00	0.725	05	14:45:00
NEWPORT, (GWENT)	0.472	13	03:45:00	0.327	10	15:30:00	0.253	10	16:45:00	0.166	07	15:15:00	0.424	07	15:45:00	0.398	06	15:30:00
HINKLEY	0.959	13	14:59:59	0.674	11	14:44:59	0.24	09	02:14:59	0.05	08	01:59:59	0.273	05	12:59:59	0.626	05	13:30:00
ILFRACOMBE							0.515	10	01:45:00	0.136	07	12:15:00	0.371	05	12:00:00	0.626	05	12:15:00
MUMBLES, WALES	1.142	13	14:15:00	0.79	12	02:30:00	0.468	09	01:30:00	0.277	07	12:45:00	0.535	05	12:15:00	0.777	05	12:30:00
MILFORD HAVEN	0.811	14	02:45:00	0.48	12	02:45:00	0.286	09	01:30:00	0.147	07	00:30:00	0.361	07	01:30:00	0.551	05	12:45:00

Table 7 - Surge Maxima for sites on the West Coast

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
STORNOWAY	0.93	28	09:15:02	0.891	01	21:45:00	0.75	11	02:45:00	0.411	26	08:30:00	0.59	22	14:45:00	0.647	17	20:45:00
ULLAPOOL	1.145	28	09:14:59	0.949	01	21:29:59	0.967	11	02:00:00	0.468	26	06:14:59	0.56	24	17:30:00	0.678	17	16:30:00
TOBERMORY	1.148	28	08:15:00	1.003	01	19:00:00	1.123	10	17:44:59	0.452	28	08:44:59	0.65	22	15:44:59	0.673	17	10:44:59
MILLPORT	1.042	28	12:30:00	1.172	01	11:00:00	1.102	10	16:15:00	0.485	26	06:15:00	0.823	24	15:00:00	0.574	17	08:15:00
PORT ELLEN (ISLAY)	1.066	28	13:15:00	1.131	01	17:45:00	1.054	10	17:29:59	0.428	28	08:59:59	0.698	24	15:44:59	0.64	17	09:14:59
PORTRUSH	1.001	28	13:30:00	0.935	01	17:00:00	0.859	10	17:30:00	0.439	26	04:15:00	0.637	24	16:30:00	0.624	17	11:00:00
PORTPATRICK	0.954	28	14:29:59	1.079	01	11:29:59	0.975	10	16:59:59	0.454	30	10:00:00	0.712	24	15:00:00	0.502	17	06:30:00
BANGOR, NORTHERN IRELAND	0.991	28	13:45:00	1.043	01	11:30:00	0.885	10	17:00:00	0.423	26	06:30:00	0.637	24	16:00:00	0.479	17	10:00:00
WORKINGTON	0.872	28	14:00:00	1.143	01	17:15:00	1.042	10	16:30:00	0.61	29	06:30:00	0.846	24	14:15:00	0.473	17	07:30:00
HEYSHAM	1.162	28	14:30:00	1.239	01	13:30:00	0.257	20	06:00:00	0.783	29	07:45:00	0.929	24	16:15:00	0.508	30	20:45:00
PORT ERIN, ISLE OF MAN	0.595	31	18:30:00	0.869	01	13:15:00	0.8	10	16:15:00	0.391	30	10:00:00	0.526	22	06:30:00	0.313	09	20:45:00
LIVERPOOL (GLADSTONE DOCK)	1.294	28	17:00:00	2.099	26	06:00:00	1.187	09	12:45:00	0.836	29	09:00:00	0.524	13	19:30:00	0.524	10	05:45:00
LLANDUDNO	0.706	31	17:45:00	0.957	26	07:00:00	0.733	09	11:45:00	0.429	30	09:00:00	0.53	22	13:00:00	0.309	09	19:45:00
HOLYHEAD	0.703	23	13:00:00	1.067	26	04:00:00	0.78	10	15:00:00	0.437	29	01:30:00	0.607	21	19:45:00	0.346	09	21:00:00
BARMOUTH,WALES	1.148	28	10:00:00	2.199	26	04:00:00	1.231	09	11:15:00	1.032	29	00:00:00	0.934	24	10:45:00	0.687	10	03:45:00
FISHGUARD	0.831	23	12:45:00	1.057	01	14:45:00				0.492	30	05:15:00	0.689	22	09:15:00	0.4	10	01:45:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
STORNOWAY	0.288	08	19:15:00	0.386	15	12:00:00	0.24	06	13:15:00	0.355	25	04:15:00	0.629	03	13:00:00	0.448	24	06:00:00
ULLAPOOL	0.288	08	19:15:00	0.386	17	21:45:00	0.223	06	20:59:59	0.362	25	04:45:00	0.582	03	13:14:59	0.437	01	18:29:58
TOBERMORY	0.39	08	11:29:59	0.404	17	21:44:59	0.3	06	19:44:59	0.314	02	18:44:59	0.744	03	05:29:59	0.693	01	17:45:00
MILLPORT	0.337	01	01:15:00	0.339	17	15:45:00	0.252	06	23:45:00	0.684	27	08:30:00	0.78	27	15:30:00	0.848	01	17:30:00
PORT ELLEN (ISLAY)	0.383	08	06:14:59	0.41	17	16:59:59	0.279	06	19:44:59	0.562	25	11:45:00	0.73	27	15:44:59	0.766	01	16:59:59
PORTRUSH	0.312	08	09:00:00	0.17	30	15:15:00	0.187	06	20:45:00	0.458	25	12:00:00	0.677	03	04:30:00	0.721	01	16:45:00
PORTPATRICK	0.349	08	07:00:00	0.321	17	23:30:00	0.231	07	02:00:00	0.727	27	07:45:00	0.697	27	14:15:00	0.694	01	16:45:00
BANGOR, NORTHERN IRELAND	0.332	08	08:00:00	0.333	17	23:45:00	0.24	05	10:45:00	0.634	27	07:30:00	0.617	03	04:30:00	0.644	01	17:30:00
WORKINGTON	0.407	08	06:30:00	0.387	30	12:15:00	0.304	25	23:15:00	0.931	25	22:00:00	0.897	27	13:30:00	0.949	02	00:15:00
HEYSHAM	0.479	08	07:15:00	0.575	30	19:45:00	0.449	07	04:30:00	1.54	27	10:00:00	0.743	27	12:45:00	1.127	02	02:00:00
PORT ERIN, ISLE OF MAN	0.246	08	07:30:00	0.223	17	23:15:00	0.138	07	02:45:00	0.76	27	07:45:00	0.581	27	13:15:00	0.485	01	18:30:00
LIVERPOOL (GLADSTONE DOCK)	0.384	08	07:00:00	0.499	30	21:00:00	0.266	09	21:45:00	2.264	27	10:00:00	0.522	21	20:45:00	0.856	02	02:30:00
LLANDUDNO	0.252	08	06:00:00	0.221	17	23:15:00	0.139	07	02:45:00	1.067	27	08:45:00	0.485	21	21:30:00			
HOLYHEAD	0.259	08	05:15:00	0.212	17	22:45:00	0.194	07	04:15:00	0.353	21	18:00:00	0.593	27	11:15:00	0.501	27	05:00:00
BARMOUTH,WALES	0.355	08	02:45:00	0.375	30	16:30:00	0.405	10	05:15:00	1.946	27	06:45:00	0.781	14	11:30:00	0.881	01	21:00:00
FISHGUARD	0.316	08	01:15:00	0.29	17	20:30:00	0.275	06	11:00:00	0.884	27	04:30:00	0.745	21	02:30:00	0.645	27	06:00:00

Table 8 - Surge Maxima for sites on the East Coast

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
LERWICK																		
WICK	0.739	28	16:30:00	0.826	02	02:15:00	0.698	11	07:00:00	0.5	26	20:30:00	0.481	21	11:45:00	0.71	17	23:00:00
MORAY FIRTH	0.632	21	15:14:59	0.665	04	15:29:59	0.663	11	06:30:00	0.517	26	19:30:00	0.394	14	12:00:00	0.717	17	23:30:00
ABERDEEN	1.012	28	20:00:00	0.916	02	03:15:00	0.63	06	14:00:00	0.61	26	21:30:00	0.42	21	16:15:00	0.619	18	01:15:00
LEITH	0.521	21	01:45:00	0.738	22	18:45:00	0.699	06	15:45:00	0.226	01	13:30:00	0.497	21	16:15:00	0.626	18	03:45:00
NORTH SHIELDS	1.351	28	22:45:00	0.918	02	02:45:00	0.699	06	16:45:00	0.712	27	00:15:00	0.426	21	19:00:00	0.61	18	04:00:00
WHITBY	1.496	28	23:14:59	0.87	02	03:44:59	0.764	06	17:14:59	0.742	27	00:30:00	0.406	21	19:45:00	0.628	18	05:00:00
IMMINGHAM	1.789	29	01:00:00	0.721	20	17:15:00	0.594	06	19:00:00	0.661	27	02:45:00	0.362	21	21:30:00	0.594	18	06:30:00
CROMER	1.87	29	03:00:00	1.206	20	21:00:00	0.893	06	20:15:00	1.077	27	03:30:00	0.45	21	21:15:00	0.741	18	08:30:00
LOWESTOFT	1.313	29	04:45:00	1.118	22	15:45:00	0.705	06	23:15:00	0.846	27	05:15:00	0.407	21	21:45:00	0.572	18	09:00:00
FELIXSTOWE	1.292	29	06:30:00	1.425	22	16:30:00	0.653	09	06:30:00	0.773	27	06:45:00	0.388	22	00:00:00	0.498	18	12:15:00
SHEERNESS				1.547	22	17:15:00	0.789	09	07:15:00	0.79	27	08:30:00	0.483	05	14:30:00	0.633	18	13:45:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
LERWICK																		
WICK	0.274	01	11:30:00	0.349	15	23:15:00	0.267	06	02:00:00	0.408	25	13:00:00	0.495	21	18:45:00	0.475	02	05:30:00
MORAY FIRTH	0.399	01	10:45:00	0.244	29	22:30:00	0.258	06	03:15:00	0.458	25	13:45:00	0.395	14	15:15:00	0.504	02	06:30:00
ABERDEEN	0.286	01	11:15:00	0.34	15	23:00:00	0.253	06	02:30:00	0.514	22	20:30:00	0.361	06	12:15:00	0.382	02	07:00:00
LEITH	0.284	01	13:00:00	0.344	16	04:15:00	0.236	26	01:00:00	0.544	26	00:30:00	0.599	14	14:30:00	0.424	27	06:45:00
NORTH SHIELDS	0.274	01	15:15:00	0.369	16	02:30:00	0.253	26	03:00:00	0.584	26	01:45:00	0.485	14	11:00:00	0.413	27	07:45:00
WHITBY	0.272	01	15:30:00	0.382	16	03:00:00	0.283	26	02:45:00	0.552	26	02:30:00	0.411	06	14:00:00	0.423	02	10:15:00
IMMINGHAM	0.245	09	12:45:00	0.362	16	06:45:00	0.327	22	12:30:00	0.918	27	16:45:00	0.455	14	07:00:00	0.354	25	06:30:00
CROMER	0.413	21	13:15:00	0.736	31	08:00:00	0.66	26	05:15:00	1.514	27	17:30:00	0.796	06	16:45:00	0.665	02	13:45:00
LOWESTOFT	0.307	24	03:15:00	0.55	31	09:15:00	0.486	22	13:00:00	1.445	27	19:45:00	0.523	07	01:45:00	0.45	29	18:30:00
FELIXSTOWE	0.292	24	09:30:00	0.589	31	11:30:00	0.515	22	19:30:00	1.432	27	21:15:00	0.527	06	22:45:00	0.576	29	18:45:00
SHEERNESS	0.365	03	17:45:00	0.425	16	14:15:00	0.635	22	21:15:00	1.701	27	23:00:00	0.683	09	02:15:00	0.678	30	21:15:00

Table 9 - Surge Maxima for sites along the English Channel & SW approaches

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
DOVER	0.881	24	16:45:00	1.27	22	15:45:00	0.531	07	02:30:00	0.563	27	07:45:00	0.48	21	23:00:00	0.375	05	17:15:00
NEWHAVEN	0.744	27	05:45:00	0.786	22	17:00:00	0.614	18	12:15:00	0.463	29	09:45:00	0.428	22	00:30:00	0.348	07	06:45:00
PORTSMOUTH	0.893	26	13:45:00	0.775	04	14:45:01	0.652	18	10:15:00	0.467	30	12:15:01	0.613	22	01:30:00	0.357	07	08:00:00
BOURNEMOUTH	0.733	23	22:00:00	0.71	26	03:45:00	0.541	18	09:00:00	0.419	30	11:45:00	0.518	21	20:45:00	0.275	09	12:15:00
WEYMOUTH	0.648	23	21:30:00	0.595	04	14:15:00	0.539	18	10:15:00	0.385	30	11:45:00	0.555	21	21:15:00	0.314	09	12:45:00
ST.HELIER, JERSEY	0.903	23	21:15:00	0.894	26	03:00:00	0.528	18	10:45:00	0.444	29	03:45:00	0.468	21	18:30:00	0.369	07	01:30:00
DEVONPORT	0.695	23	18:15:00	0.559	03	03:30:00	0.523	18	07:00:00	0.284	30	05:30:00	0.498	21	19:00:00	0.235	07	23:15:00
NEWLYN	0.657	23	11:15:00	0.499	02	00:15:00	0.239	01	04:15:00	0.252	30	14:45:00	0.61	22	04:45:00	0.311	07	12:15:00
ST. MARYS, IS. OF SCILLY	0.612	23	10:44:59	0.707	05	07:15:00	0.536	18	05:44:59	0.265	05	21:15:00	0.354	22	09:45:00	0.213	07	13:00:00
AVONMOUTH																		
NEWPORT, (GWENT)	1.074	27	13:00:00	1.858	26	04:30:00	1.509	09	10:15:00	1.321	29	04:30:00	0.964	13	15:30:00	0.976	10	01:45:00
HINKLEY	0.899	23	06:44:59	1.677	26	03:59:59	1.019	09	09:14:59	0.993	29	03:14:59	0.639	13	16:29:59	0.579	10	00:59:59
ILFRACOMBE																		
MUMBLES, WALES	0.86	26	08:15:00	1.441	26	03:00:00	0.778	09	08:15:00	0.59	29	00:15:00	0.574	22	09:15:00	0.384	10	00:30:00
MILFORD HAVEN	0.797	23	13:45:00	1.12	26	02:15:00	0.637	09	08:00:00	0.52	30	04:45:00	0.706	22	08:30:00	0.387	10	01:15:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
DOVER	0.414	03	15:15:00	0.4	31	12:30:00	0.409	22	23:00:00	1.226	27	23:00:00	0.65	14	05:15:00	0.524	30	18:15:00
NEWHAVEN	0.31	03	00:45:00	0.265	31	14:00:00	0.298	22	23:00:00	0.792	25	23:15:00	0.971	14	06:30:00	0.526	26	13:15:00
PORTSMOUTH	0.385	03	00:00:00	0.248	09	17:30:00	0.297	09	15:00:00	0.801	15	13:15:02	0.876	14	04:00:00	0.665	26	09:45:00
BOURNEMOUTH	0.359	02	23:00:00	0.208	31	16:45:00	0.209	23	01:00:00	0.72	15	13:00:00	0.773	14	03:45:00	0.56	26	08:45:00
WEYMOUTH	0.31	02	22:00:00	0.24	11	14:15:00	0.217	23	01:00:00	0.737	15	12:45:00	0.811	14	04:00:00	0.513	27	05:30:00
ST.HELIER, JERSEY	0.378	03	08:30:00	0.323	09	15:15:00	0.261	22	17:00:00	0.957	27	05:30:00	1.013	14	02:00:00	0.63	26	07:00:00
DEVONPORT	0.212	02	20:45:00	0.153	09	01:30:00	0.138	30	17:30:00	0.477	15	10:30:00	0.612	14	00:30:00	0.546	26	01:45:00
NEWLYN	0.289	02	20:00:00	0.24	02	21:45:00	0.237	08	09:00:00	0.602	20	14:15:00	0.628	13	20:45:00	0.529	26	18:30:00
ST. MARYS, IS. OF SCILLY	0.181	02	20:15:00	0.139	17	22:30:00	0.169	09	05:15:00	0.473	25	15:15:00	0.498	20	23:30:00	0.511	26	20:30:00
AVONMOUTH										2.341	27	05:45:00	1.157	22	03:45:00	1.397	26	07:00:00
NEWPORT, (GWENT)	0.635	08	12:45:00	0.619	30	18:15:00	0.831	09	14:45:00	2.007	27	05:15:00	1.249	22	03:30:00	1.347	26	06:30:00
HINKLEY	0.385	09	12:44:59	0.31	08	13:29:59	0.363	26	03:59:59	1.523	27	06:14:59	0.764	21	01:59:59	0.87	24	04:15:00
ILFRACOMBE							0.248	10	01:30:00	1.108	27	05:00:00	0.697	21	02:00:00	0.641	24	03:00:00
MUMBLES, WALES	0.266	08	01:30:00	0.246	03	10:00:00	0.141	08	11:30:00	1.125	27	05:15:00	0.66	21	01:30:00	0.553	27	05:45:00
MILFORD HAVEN	0.305	08	01:30:00	0.237	08	12:30:00	0.226	06	11:15:00	1.1	27	04:00:00	0.761	21	01:45:00	0.662	27	05:15:00

Table 10 - Surge Minima for sites on the West Coast

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
STORNOWAY	-0.331	08	15:30:02	-0.415	20	13:15:00	-0.371	01	10:00:00	-0.139	12	21:00:00	-0.171	06	02:45:00	-0.202	27	13:30:00
ULLAPOOL	-0.407	24	23:59:59	-0.534	20	13:44:59	-0.426	01	11:00:00	-0.173	12	20:59:59	-0.219	06	03:14:59	-0.237	27	16:45:00
TOBERMORY	-0.318	08	22:14:59	-0.615	20	22:59:59	-0.418	01	09:44:59	-0.147	09	18:14:59	-0.158	08	05:29:59	-0.241	27	13:59:59
MILLPORT	-0.354	09	22:00:00	-0.844	20	23:30:00	-0.364	01	14:00:00	-0.2	12	20:30:00	-0.236	06	14:00:00	-0.299	28	07:45:00
PORT ELLEN (ISLAY)	-0.195	24	19:30:00	-0.587	21	01:14:59	-0.316	01	17:59:59	-0.134	12	20:14:59	-0.15	07	14:44:59	-0.24	27	21:44:59
PORTRUSH	-0.302	01	04:00:00	-0.5	20	23:30:00	-0.422	01	12:30:00	-0.172	09	16:00:00	-0.217	07	14:30:00	-0.252	28	10:15:00
PORTPATRICK	-0.243	05	21:15:00	-0.717	21	01:29:59	-0.274	01	15:44:59	-0.13	12	19:15:00	-0.158	06	13:45:00	-0.27	28	09:00:00
BANGOR, NORTHERN IRELAND	-0.246	05	17:30:00	-0.551	21	00:30:00	-0.386	01	14:00:00	-0.174	09	18:00:00	-0.236	07	15:45:00	-0.28	28	07:45:00
WORKINGTON	-0.518	05	21:30:00	-1.118	21	02:30:00	-0.52	01	15:15:00	-0.25	10	02:45:00	-0.268	06	16:15:00	-0.348	28	05:45:00
HEYSHAM	-0.315	10	04:00:00	-0.955	21	02:30:00	-0.327	26	06:45:00	-0.271	10	02:45:00	-0.242	06	15:00:00	-0.28	28	05:45:00
PORT ERIN, ISLE OF MAN	-0.255	01	01:45:00	-0.839	21	02:00:00	-0.358	01	15:30:00	-0.196	12	18:15:00	-0.219	07	02:45:00	-0.347	28	09:00:00
LIVERPOOL (GLADSTONE DOCK)	-0.338	09	20:44:53	-0.529	13	20:00:00	-0.391	01	15:45:00	-0.272	26	18:45:00	-0.328	06	15:30:00	-0.382	02	09:45:00
LLANDUDNO	-0.191	29	05:00:00	-0.964	21	00:45:00	-0.467	01	15:00:00	-0.281	26	18:45:00	-0.314	06	14:00:00	-0.546	28	05:15:00
HOLYHEAD	-0.166	10	02:15:00	-0.797	21	00:00:00	-0.28	01	14:30:00	-0.162	25	10:15:00	-0.206	06	13:15:00	-0.308	28	08:00:00
BARMOUTH,WALES	-0.29	10	02:30:00	-0.866	20	23:45:00	-0.351	26	08:00:00	-0.212	24	13:45:00	-0.167	06	04:45:00	-0.269	28	07:45:00
FISHGUARD	-0.071	10	02:00:00	0.258	01	00:45:00				-0.143	26	16:45:00	-0.067	06	12:30:00	-0.143	28	13:45:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
STORNOWAY	-0.246	31	13:30:00	-0.216	25	12:45:00	-0.186	08	11:45:00	-0.199	28	15:00:00	-0.259	16	08:15:00	-0.365	05	23:30:00
ULLAPOOL	-0.272	31	13:14:59	-0.261	25	12:45:00	-0.283	08	03:29:59	-0.308	28	11:30:00	-0.318	16	08:29:59	-0.496	08	23:44:58
TOBERMORY	-0.179	20	20:44:59	-0.234	25	13:14:59	-0.196	02	20:59:59	-0.214	06	01:14:59	-0.225	16	07:14:59	-0.358	08	09:15:00
MILLPORT	-0.216	31	22:30:00	-0.278	25	18:45:00	-0.217	13	14:15:00	-0.418	27	18:00:00	-0.297	07	23:00:00	-0.469	02	19:30:00
PORT ELLEN (ISLAY)	-0.158	15	23:44:59	-0.199	25	17:29:59	-0.151	02	20:59:59	-0.313	27	18:45:00	-0.265	07	21:15:00	-0.406	02	18:29:59
PORTRUSH	-0.162	16	00:15:00	-0.261	25	17:00:00	-0.221	01	08:45:00	-0.325	28	03:00:00	-0.232	07	21:15:00	-0.409	08	08:15:00
PORTPATRICK	-0.167	14	18:15:00	-0.242	25	18:30:00	-0.207	01	09:30:00	-0.335	27	18:15:00	-0.303	07	22:15:00	-0.382	10	12:30:00
BANGOR, NORTHERN IRELAND	-0.189	16	03:00:00	-0.216	31	20:15:00	-0.242	01	09:30:00	-0.375	27	18:15:00	-0.287	07	22:15:00	-0.4	09	08:15:00
WORKINGTON	-0.298	16	06:00:00	-0.344	25	18:45:00	-0.329	01	09:15:00	-0.382	15	17:45:00	-0.181	07	21:45:00	-0.469	10	13:45:00
HEYSHAM	-0.239	15	19:15:00	-0.262	25	20:00:00	-0.281	27	19:15:00	-0.598	15	18:00:00	-0.244	07	22:00:00	-0.667	10	14:45:00
PORT ERIN, ISLE OF MAN	-0.254	15	20:00:00	-0.304	25	19:00:00	-0.269	01	09:45:00	-0.372	27	19:15:00	-0.332	07	22:45:00	-0.417	06	09:15:00
LIVERPOOL (GLADSTONE DOCK)	-0.337	16	05:15:00	-0.426	25	18:45:00	-0.386	27	19:30:00	-0.59	15	17:15:00	-0.354	30	02:45:00	-0.73	10	11:45:00
LLANDUDNO	-0.277	14	03:15:00	-0.333	31	08:30:00	-0.308	01	09:15:00	-0.61	15	18:00:00	-0.434	07	20:30:00			
HOLYHEAD	-0.189	15	17:45:00	-0.234	31	08:00:00	-0.202	01	09:00:00	-0.285	15	18:45:00	-0.335	07	19:00:00	-0.401	10	10:45:00
BARMOUTH,WALES	-0.244	16	01:45:00	-0.243	25	17:00:00	-0.225	01	13:15:00	-0.319	27	23:00:00	-0.255	30	00:15:00	-0.53	10	09:30:00
FISHGUARD	-0.073	15	00:45:00	-0.117	31	11:45:00	-0.122	01	13:00:00	-0.375	27	22:45:00	-0.213	07	18:00:00	-0.229	06	00:00:00

Table 11 - Surge Minima for sites on the East Coast

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
LERWICK																		
WICK	-0.303	08	23:00:00	-0.445	20	23:15:00	-0.21	23	06:00:00	-0.147	05	17:15:00	-0.196	08	12:15:00	-0.131	28	18:00:00
MORAY FIRTH, (SHEET PILE WALL)	-0.189	09	03:29:59	-0.331	13	20:15:00	-0.403	01	20:45:00	-0.201	09	03:00:00	-0.262	06	04:15:00	-0.083	28	19:45:00
ABERDEEN	-0.246	25	20:15:00	-0.37	21	04:00:00	-0.264	01	13:15:00	-0.205	05	17:15:00	-0.2	07	20:15:00	-0.091	28	20:45:00
LEITH	-0.249	08	21:14:59	-0.493	21	14:45:00	-0.402	10	16:00:00	-0.209	05	17:15:00	-0.294	07	21:45:00	-0.282	29	10:30:00
NORTH SHIELDS	-0.405	25	20:30:00	-0.586	21	17:30:00	-0.36	10	16:00:00	-0.208	21	11:00:00	-0.185	07	22:45:00	-0.16	29	13:15:00
WHITBY	-0.402	25	20:59:59	-0.619	21	17:59:59	-0.404	10	15:14:59	-0.232	21	09:15:00	-0.175	07	23:15:00	-0.15	29	03:00:00
IMMINGHAM	-0.865	26	00:00:00	-1.282	21	20:45:00	-0.8	10	17:00:00	-0.492	21	11:45:00	-0.422	24	14:45:00	-0.387	29	03:00:00
CROMER	-0.622	25	20:00:00	-1.046	21	21:30:00	-0.664	10	14:30:00	-0.309	21	11:30:00	-0.178	24	13:15:00	-0.1	29	15:30:00
LOWESTOFT	-0.772	25	22:30:00	-1.017	21	22:30:00	-0.686	10	19:30:00	-0.328	21	12:45:00	-0.236	24	18:00:00	-0.162	03	03:00:00
FELIXSTOWE	-0.792	25	22:15:00	-1.123	22	00:15:00	-0.835	10	17:15:00	-0.389	30	15:00:00	-0.324	24	18:30:00	-0.289	30	22:45:00
SHEERNESS				-1.28	22	02:15:00	-1.096	10	19:00:00	-0.529	30	17:00:00	-0.181	01	00:00:00	-0.422	30	23:30:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
LERWICK																		
WICK	-0.208	31	16:30:00	-0.189	01	08:45:00	-0.21	08	20:00:00	-0.205	28	23:00:00	-0.203	16	09:45:00	-0.41	09	08:45:00
MORAY FIRTH, (SHEET PILE WALL)	-0.145	16	03:45:00	-0.193	25	16:00:00	-0.287	01	13:45:00	-0.367	29	00:00:00	-0.356	03	00:00:00	-0.413	09	03:00:00
ABERDEEN	-0.211	31	16:00:00	-0.188	01	00:15:00	-0.28	01	11:30:00	-0.249	12	05:30:00	-0.304	02	23:15:00	-0.404	09	05:15:00
LEITH	-0.28	31	14:45:00	-0.246	25	23:15:00	-0.373	01	10:45:00	-0.384	29	03:00:00	-0.718	03	04:30:00	-0.453	03	17:00:00
NORTH SHIELDS	-0.125	31	22:45:00	-0.145	13	03:00:00	-0.29	01	13:00:00	-0.305	11	16:30:00	-0.581	03	02:30:00	-0.446	23	21:15:00
WHITBY	-0.159	31	22:30:00	-0.149	13	03:30:00	-0.294	01	15:15:00	-0.362	11	16:00:00	-0.646	03	03:45:00	-0.515	23	21:30:00
IMMINGHAM	-0.376	15	11:00:00	-0.397	31	01:30:00	-0.458	01	15:30:00	-0.473	11	23:15:00	-1.038	03	03:45:00	-0.736	23	19:45:00
CROMER	-0.102	08	13:15:00	-0.131	13	06:30:00	-0.241	10	04:15:00	-0.403	27	07:30:00	-0.796	03	02:15:00	-0.65	23	18:45:00
LOWESTOFT	-0.253	08	11:45:00	-0.233	30	23:30:00	-0.299	01	19:15:00	-0.547	27	09:00:00	-0.919	03	06:30:00	-0.682	23	23:30:00
FELIXSTOWE	-0.283	01	05:00:00	-0.317	30	23:45:00	-0.339	10	02:45:00	-0.904	27	10:45:00	-0.981	03	06:15:00	-0.705	23	22:45:00
SHEERNESS	-0.396	01	00:00:00	-0.226	18	04:45:00	-0.581	09	22:00:00	-1.818	27	12:00:00	-1.171	03	07:00:00	-0.77	01	17:45:00

Table 12 - Surge Minima for sites along the English Channel & SW approaches

	January			February			March			April			May			June		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
DOVER	-0.443	28	10:15:00	-0.744	22	04:30:00	-0.645	14	09:15:00	-0.551	07	17:15:00	-0.241	24	21:30:00	-0.275	02	00:00:00
NEWHAVEN	-0.311	08	04:00:00	-0.415	21	15:30:00	-0.461	14	09:45:00	-0.454	07	17:30:00	-0.188	15	16:30:00	-0.256	29	08:30:00
PORTSMOUTH	-0.201	04	03:45:00	-0.451	22	06:15:00	-0.29	14	11:30:00	-0.26	07	18:15:00	-0.132	14	15:15:00	-0.191	29	06:30:00
BOURNEMOUTH	-0.193	08	16:30:00	-0.323	22	06:45:00	-0.325	13	23:30:00	-0.29	22	03:15:00	-0.227	06	05:00:00	-0.294	29	13:00:00
WEYMOUTH	-0.214	07	10:30:00	-0.324	15	01:15:00	-0.255	02	05:30:00	-0.25	21	01:15:00	-0.174	31	14:30:00	-0.246	29	14:15:00
ST.HELIER, JERSEY	-0.256	08	11:45:00	-0.499	21	11:45:00	-0.395	23	12:45:00	-0.402	21	00:15:00	-0.245	31	15:15:00	-0.299	28	14:15:00
DEVONPORT	-0.266	06	14:15:00	-0.352	15	07:45:00	-0.29	27	05:30:00	-0.298	21	01:00:00	-0.195	31	16:00:00	-0.291	29	12:30:00
NEWLYN	-0.172	06	21:00:00	-0.406	20	21:15:00	-0.203	02	09:30:00	-0.24	22	12:45:00	-0.095	03	03:15:00	-0.167	24	13:00:00
ST. MARYS, IS. OF SCILLY	-0.207	06	07:44:59	-0.281	15	04:59:59	-0.169	26	01:44:59	-0.159	22	12:45:00	-0.176	31	13:30:00	-0.277	28	11:30:00
AVONMOUTH																		
NEWPORT, (GWENT)	-0.682	09	01:30:00	-1.027	21	00:15:00	-0.823	13	14:15:00	-0.643	12	14:15:00	-0.62	06	07:45:00	-0.769	28	16:00:00
HINKLEY	-0.251	09	00:59:59	-0.617	21	00:29:59	-0.547	24	02:59:59	-0.428	21	01:14:59	-0.368	31	15:29:59	-0.449	29	15:29:59
ILFRACOMBE																		
MUMBLES, WALES	-0.283	19	18:30:00	-0.648	20	23:15:00	-0.377	26	21:00:00	-0.361	08	09:45:00	-0.364	31	14:15:00	-0.489	28	13:15:00
MILFORD HAVEN	-0.094	24	14:15:00	-0.605	20	23:00:00	-0.215	26	04:30:00	-0.157	22	13:00:00	-0.102	11	09:30:00	-0.201	28	02:00:00

	July			August			September			October			November			December		
	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time	Value	Day	Time
DOVER	-0.237	19	15:30:00	-0.266	31	02:45:00	-0.363	01	21:00:00	-0.98	27	13:15:00	-0.698	03	09:30:00	-0.536	24	02:15:00
NEWHAVEN	-0.224	14	03:30:00	-0.213	31	04:45:00	-0.268	01	18:30:00	-0.406	27	14:00:00	-0.356	03	09:15:00	-0.394	09	07:15:00
PORTSMOUTH	-0.189	14	06:15:00	-0.22	31	06:45:00	-0.197	30	06:45:00	-0.575	27	16:00:02	-0.283	03	10:45:00	-0.292	09	05:45:00
BOURNEMOUTH	-0.179	16	03:30:00	-0.226	26	12:15:00	-0.243	02	02:00:00	-0.637	27	16:30:00	-0.227	07	17:30:00	-0.374	06	00:00:00
WEYMOUTH	-0.172	15	07:45:00	-0.165	31	05:30:00	-0.226	02	01:00:00	-0.551	27	16:30:00	-0.229	07	18:15:00	-0.395	06	00:30:00
ST.HELIER, JERSEY	-0.286	13	22:30:00	-0.328	31	23:30:00	-0.323	01	12:30:00	-0.532	28	09:30:00	-0.272	07	17:45:00	-0.35	06	02:45:00
DEVONPORT	-0.199	12	23:00:00	-0.239	31	12:15:00	-0.27	02	02:00:00	-0.505	27	18:30:00	-0.308	07	18:15:00	-0.361	05	22:30:00
NEWLYN	-0.124	15	10:00:00	-0.113	31	12:45:00	-0.11	01	01:15:00	-0.385	27	19:00:00	-0.195	07	21:15:00	-0.24	06	01:00:00
ST. MARYS, IS. OF SCILLY	-0.23	13	20:45:00	-0.174	31	10:45:00	-0.195	01	13:15:00	-0.295	27	20:30:01	-0.16	30	07:45:00	-0.291	06	00:15:00
AVONMOUTH										-0.813	13	16:45:00	-0.495	02	11:45:00	-0.958	10	17:30:00
NEWPORT, (GWENT)	-0.595	27	15:45:00	-0.734	25	15:30:00	-0.692	11	17:15:00	-0.863	09	16:30:00	-0.673	07	16:00:00	-0.904	10	17:30:00
HINKLEY	-0.35	15	23:59:59	-0.409	25	14:14:59	-0.461	01	13:29:59	-0.558	13	14:14:59	-0.327	04	02:29:59	-0.613	09	02:30:00
ILFRACOMBE							-0.212	27	11:45:00	-0.367	27	22:00:00	-0.215	07	23:15:00	-0.481	10	06:15:00
MUMBLES, WALES	-0.344	13	23:30:00	-0.445	31	14:00:00	-0.495	01	14:30:00	-0.507	13	15:00:00	-0.382	07	16:00:00	-0.562	09	01:15:00
MILFORD HAVEN	-0.148	14	23:00:00	-0.211	31	12:00:00	-0.221	01	13:30:00	-0.365	27	22:00:00	-0.265	07	15:15:00	-0.252	05	22:30:00

Table 13 - Mean Sea Level for sites on the West Coast

	January		February		March		April		May		June	
	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL
STORNOWAY	31	3.117	28	3.07	31	2.885	30	2.87	31	2.878	30	2.901
ULLAPOOL	31	3.301	28	3.257	31	3.064	30	3.036	31	3.044	30	3.072
TOBERMORY	24	2.891	25	2.915	31	2.701	25	2.672	31	2.717	30	2.727
MILLPORT	31	2.206	28	2.187	24	2.022	12	2.006	31	2.018	19	2.012
PORT ELLEN (ISLAY)	28	0.666	28	0.623	31	0.44	30	0.423	31	0.484	30	0.461
PORTRUSH	31	1.46	28	1.458	31	1.261	30	1.243	31	1.288	30	1.287
PORTPATRICK	31	2.374	28	2.354	27	2.176	30	2.138	31	2.209	30	2.175
BANGOR, NORTHERN IRELAND	31	2.212	28	2.2	31	2.004	30	1.994	31	2.054	30	2.032
WORKINGTON	31	4.565	28	4.572	31	4.333	30	4.317	31	4.397	30	4.372
HEYSHAM	31	5.352	24	5.391	11	5.027	30	5.129	28	5.206	18	5.161
PORT ERIN, ISLE OF MAN			28	2.989	31	2.799	30	2.791	31	2.86	30	2.819
LIVERPOOL (GLADSTONE DOCK)	31	5.434	19	5.524	31	5.255	17	5.225	20	5.101	29	5.147
LLANDUDNO	6	4.332	26	4.137	9	3.964	18	4.013	16	3.963	1	3.978
HOLYHEAD	31	3.429	28	3.399	31	3.219	30	3.215	31	3.287	30	3.242
BARMOUTH,WALES	31	2.851	28	2.895	31	2.675	30	2.673	31	2.756	30	2.694
FISHGUARD	31	2.936	3	3.189			28	2.704	31	2.791	30	2.741

	July		August		September		October		November		December		sum days	avg
	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL		
STORNOWAY	31	2.831	31	2.857	30	2.884	31	2.947	30	3.114	31	2.958	365	2.943
ULLAPOOL	31	2.998	31	3.007	30	3.032	31	3.096	30	3.267	31	3.106	365	3.107
TOBERMORY	31	2.646	31	2.651	30	2.683	18	2.722	30	2.941	24	2.819	330	2.757
MILLPORT	15	1.893	31	1.914	30	1.955	31	2.048	30	2.241	31	2.054	313	2.046
PORT ELLEN (ISLAY)	31	0.388	31	0.394	30	0.435	31	0.528	30	0.712	31	0.54	362	0.508
PORTRUSH	14	1.229	11	1.176	30	1.251	31	1.334	30	1.494	31	1.347	328	1.319
PORTPATRICK	31	2.101	31	2.103	30	2.144	31	2.242	30	2.414	31	2.239	361	2.222
BANGOR, NORTHERN IRELAND	31	1.974	31	1.979	30	2.019	31	2.11	30	2.269	31	2.114	365	2.08
WORKINGTON	31	4.3	31	4.298	27	4.366	24	4.564	30	4.779	31	4.571	355	4.453
HEYSHAM	31	5.124	31	5.139	30	5.168	31	5.255	30	5.396	31	5.19	326	5.212
PORT ERIN, ISLE OF MAN	31	2.767	31	2.77	30	2.81	31	2.912	30	3.067	31	2.903	334	2.862
LIVERPOOL (GLADSTONE DOCK)	31	5.097	31	5.095	25	5.129	31	5.23	30	5.337	15	5.055	310	5.219
LLANDUDNO	2	3.882	18	3.95	30	3.995	31	4.07	24	4.208			181	4.045
HOLYHEAD	31	3.199	31	3.201	30	3.246	20	3.281	22	3.524	31	3.31	346	3.296
BARMOUTH,WALES	31	2.637	31	2.646	30	2.69	31	2.802	30	2.937	31	2.762	365	2.752
FISHGUARD	31	2.722	31	2.74	30	2.775	31	2.851	30	2.984	31	2.869	307	2.846

Table 14 - Mean Sea Level for sites on the East Coast

	January		February		March		April		May		June	
	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL
LERWICK												
WICK	21	2.205	23	2.279	27	2.067	22	2.042	31	2.029	30	2.068
MORAY FIRTH	16	2.701	21	2.674	31	2.549	30	2.528	13	2.433	25	2.587
ABERDEEN	31	2.716	28	2.744	31	2.535	30	2.51	31	2.515	30	2.552
LEITH	20	3.243	19	3.248	31	3.125	7	3.117	25	3.117	30	3.157
NORTH SHIELDS	31	3.064	28	3.141	31	2.937	30	2.906	31	2.915	30	2.954
WHITBY	31	3.451	28	3.513	24	3.347	16	3.286	31	3.288	30	3.324
IMMINGHAM	31	4.153	28	4.172	31	4.057	30	4.059	31	4.058	30	4.08
CROMER	28	2.968	24	3.034	28	2.909	30	2.885	31	2.886	30	2.934
LOWESTOFT	28	1.668	28	1.754	31	1.597	30	1.587	31	1.583	30	1.639
FELIXSTOWE	31	2.108	28	2.169	31	2.033	30	2.022	31	2.023	30	2.064
SHEERNESS			10	3.096	31	3.028	30	3.028	6	3.089	15	3.048

	July		August		September		October		November		December		sum days	avg
	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL		
LERWICK														
WICK	31	2.008	31	2.024	30	2.05	31	2.113	30	2.234	27	2.083	334	2.1
MORAY FIRTH	16	2.54	9	2.502	30	2.541	30	2.609	28	2.722	31	2.591	280	2.581
ABERDEEN	31	2.511	31	2.533	30	2.552	31	2.617	30	2.676	15	2.47	349	2.578
LEITH	28	3.102	31	3.142	30	3.138	31	3.209	30	3.244	31	3.153	313	3.166
NORTH SHIELDS			30	2.964	30	2.968	31	3.033	30	3.047	31	2.968	333	2.991
WHITBY	31	3.31	31	3.357	30	3.367	31	3.419	30	3.404	31	3.33	344	3.366
IMMINGHAM	31	4.071	31	4.115	27	4.14	28	4.191	30	4.131	31	4.106	359	4.111
CROMER	31	2.926	31	2.98	28	2.993	27	3.024	30	2.949	28	2.908	346	2.95
LOWESTOFT	31	1.635	31	1.685	30	1.705	26	1.768	30	1.66	31	1.598	357	1.657
FELIXSTOWE	31	2.066	29	2.134	30	2.16	31	2.16	22	2.076	31	2.058	355	2.089
SHEERNESS	17	3.024	20	3.088	27	3.142	31	3.114	28	3.069	31	3.051	246	3.071

Table 15 - Mean Sea Level for sites along the English Channel & SW approaches

	January		February		March		April		May		June	
	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL
DOVER	31	3.765	28	3.847	31	3.68	30	3.685	31	3.71	30	3.717
NEWHAVEN	28	3.702	28	3.739	31	3.576	30	3.575	31	3.626	30	3.601
PORTSMOUTH	31	2.971	28	2.993	31	2.853	30	2.845	31	2.908	30	2.864
BOURNEMOUTH	31	1.639	28	1.658	31	1.534	30	1.535	31	1.6	30	1.55
WEYMOUTH	31	1.228	28	1.23	31	1.108	30	1.104	31	1.172	30	1.122
ST.HELIER, JERSEY	31	6.086	28	6.065	31	5.91	30	5.919	31	5.99	30	5.934
DEVONPORT	31	3.452	28	3.429	31	3.331	30	3.32	31	3.387	30	3.319
NEWLYN	31	3.252	28	3.197	5	3.114	16	3.118	31	3.27	30	3.209
ST. MARYS, IS. OF SCILLY	23	3.276	20	3.192	23	3.203	24	3.182	20	3.164	22	3.113
AVONMOUTH												
NEWPORT, (GWENT)	31	6.125	28	6.195	31	5.997	30	5.997	31	6.072	30	6.002
HINKLEY	31	6.32	28	6.37	31	6.179	30	6.194	31	6.259	30	6.198
ILFRACOMBE												
MUMBLES, WALES	31	5.318	28	5.321	31	5.172	30	5.174	31	5.253	30	5.182
MILFORD HAVEN	31	3.985	28	3.955	31	3.827	30	3.83	31	3.908	30	3.84

	July		August		September		October		November		December		sum days	avg
	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL	No Days	MSL		
DOVER	31	3.718	31	3.755	30	3.772	31	3.838	30	3.838	31	3.748	365	3.756
NEWHAVEN	31	3.605	31	3.63	30	3.645	31	3.747	30	3.803	31	3.687	362	3.661
PORTSMOUTH	29	2.868	31	2.893	30	2.917	27	3.005	28	3.095	31	2.973	357	2.932
BOURNEMOUTH	31	1.552	31	1.578	30	1.606	28	1.687	30	1.783	31	1.676	362	1.617
WEYMOUTH	31	1.126	31	1.15	30	1.185	31	1.279	30	1.362	31	1.255	365	1.193
ST.HELIER, JERSEY	31	5.982	31	6.004	30	6.022	22	6.113	30	6.242	31	6.144	356	6.034
DEVONPORT	9	3.343	23	3.323	30	3.389	31	3.484	24	3.578	31	3.501	329	3.405
NEWLYN	31	3.2	31	3.229	30	3.299	31	3.384	28	3.445	31	3.355	323	3.256
ST. MARYS, IS. OF SCILLY	22	3.098	31	3.107	26	3.193	27	3.285	17	3.48	31	3.327	286	3.218
AVONMOUTH							27	7.039	30	7.102	31	6.936	88	7.026
NEWPORT, (GWENT)	31	5.993	31	5.997	30	6.03	31	6.136	30	6.255	31	6.069	365	6.072
HINKLEY	31	6.184	31	6.185	30	6.222	31	6.332	30	6.44	31	6.297	365	6.265
ILFRACOMBE					20	4.981	24	5.054	24	5.263	26	5.097	94	5.099
MUMBLES, WALES	31	5.148	18	5.167	30	5.193	31	5.298	30	5.439	31	5.295	352	5.247
MILFORD HAVEN	31	3.81	31	3.813	30	3.863	31	3.973	30	4.127	31	4.01	365	3.912

Residuals Appendix

Residuals plots by site

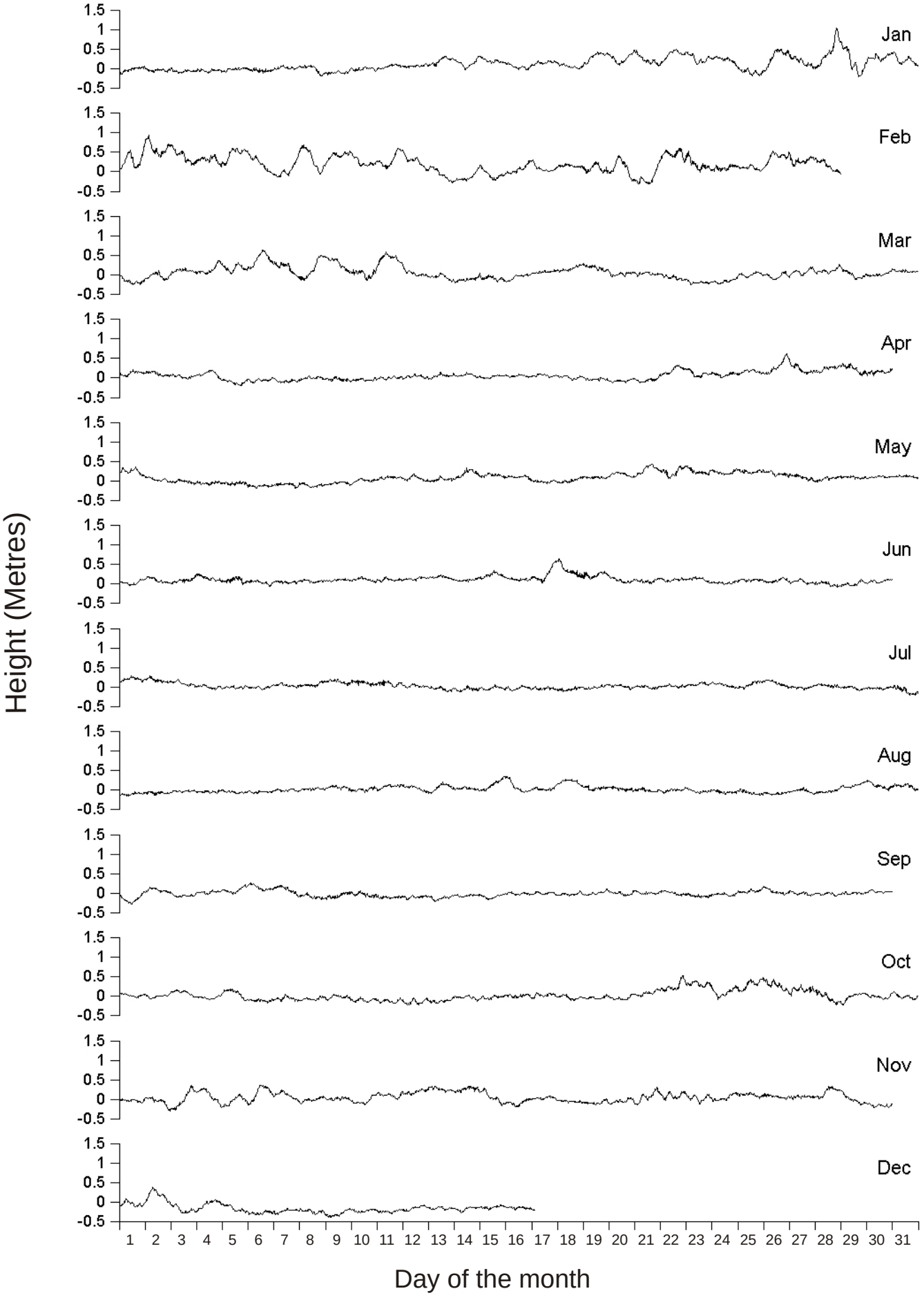
Residual plots for the West Coast

Residual plots for the East Coast

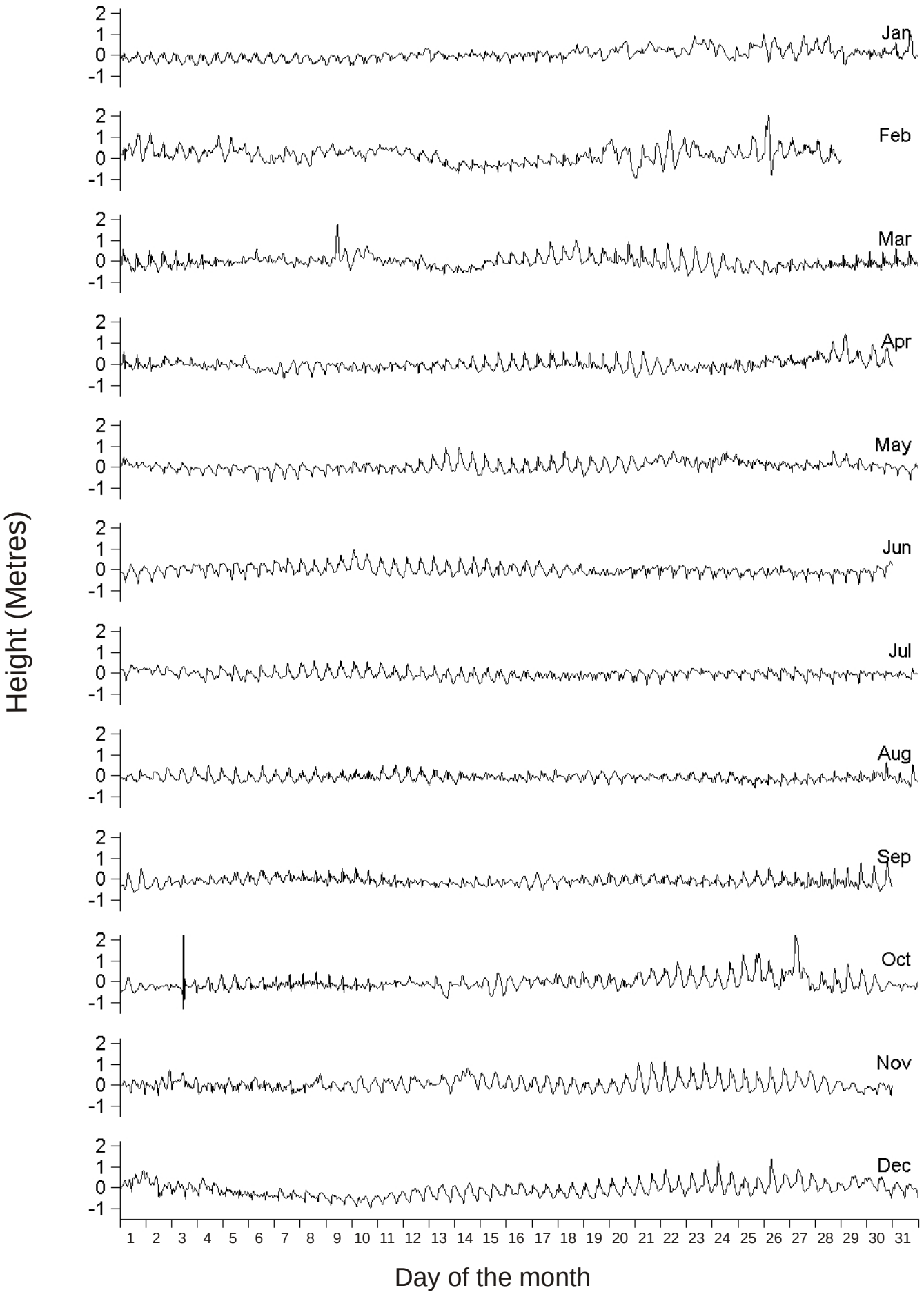
Residual plots for the Channel & SW approaches

Please note that where the residuals appear unusual that the actual data used to calculate them may have been flagged as suspect.

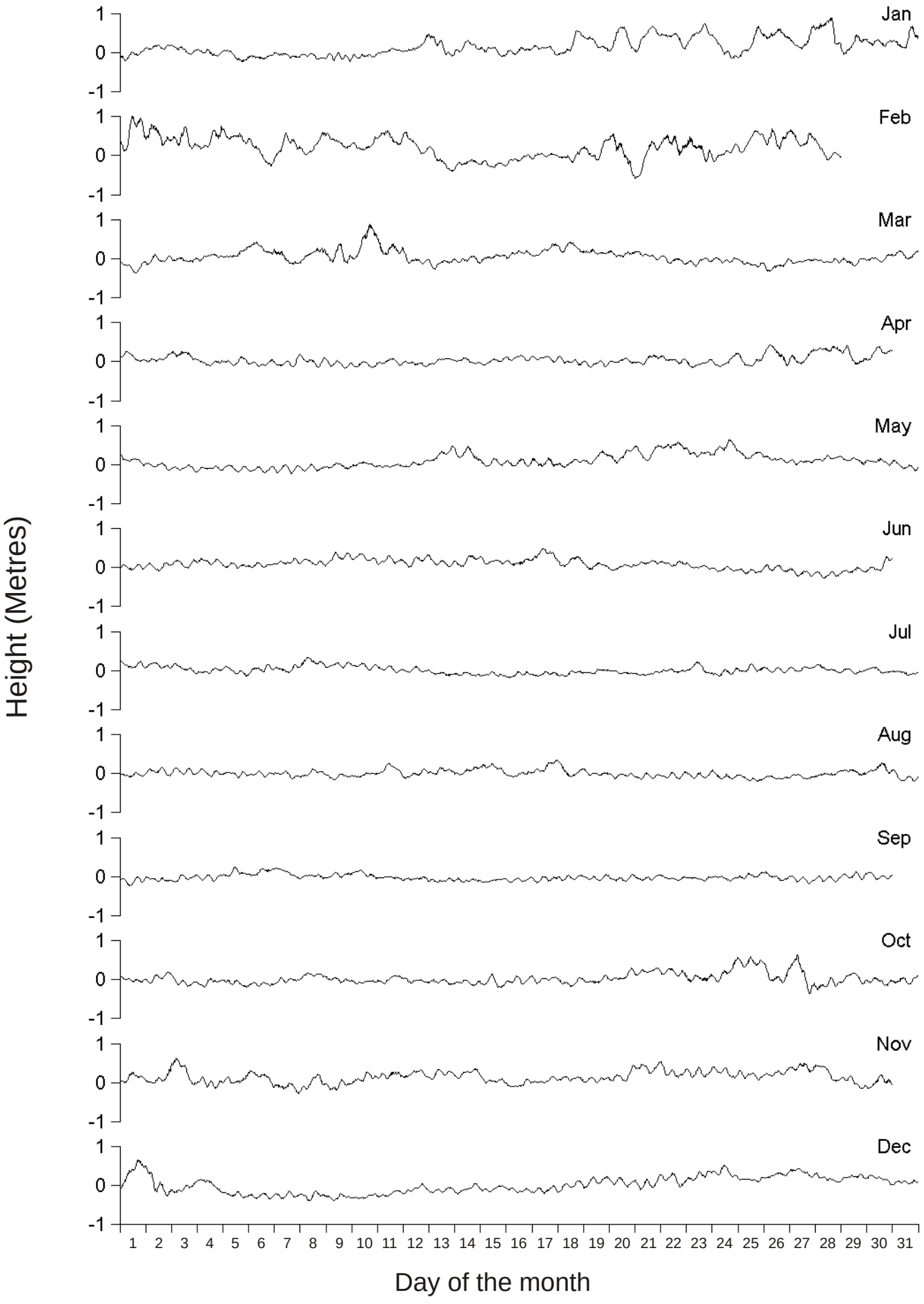
Residual Plots for Aberdeen, 2002



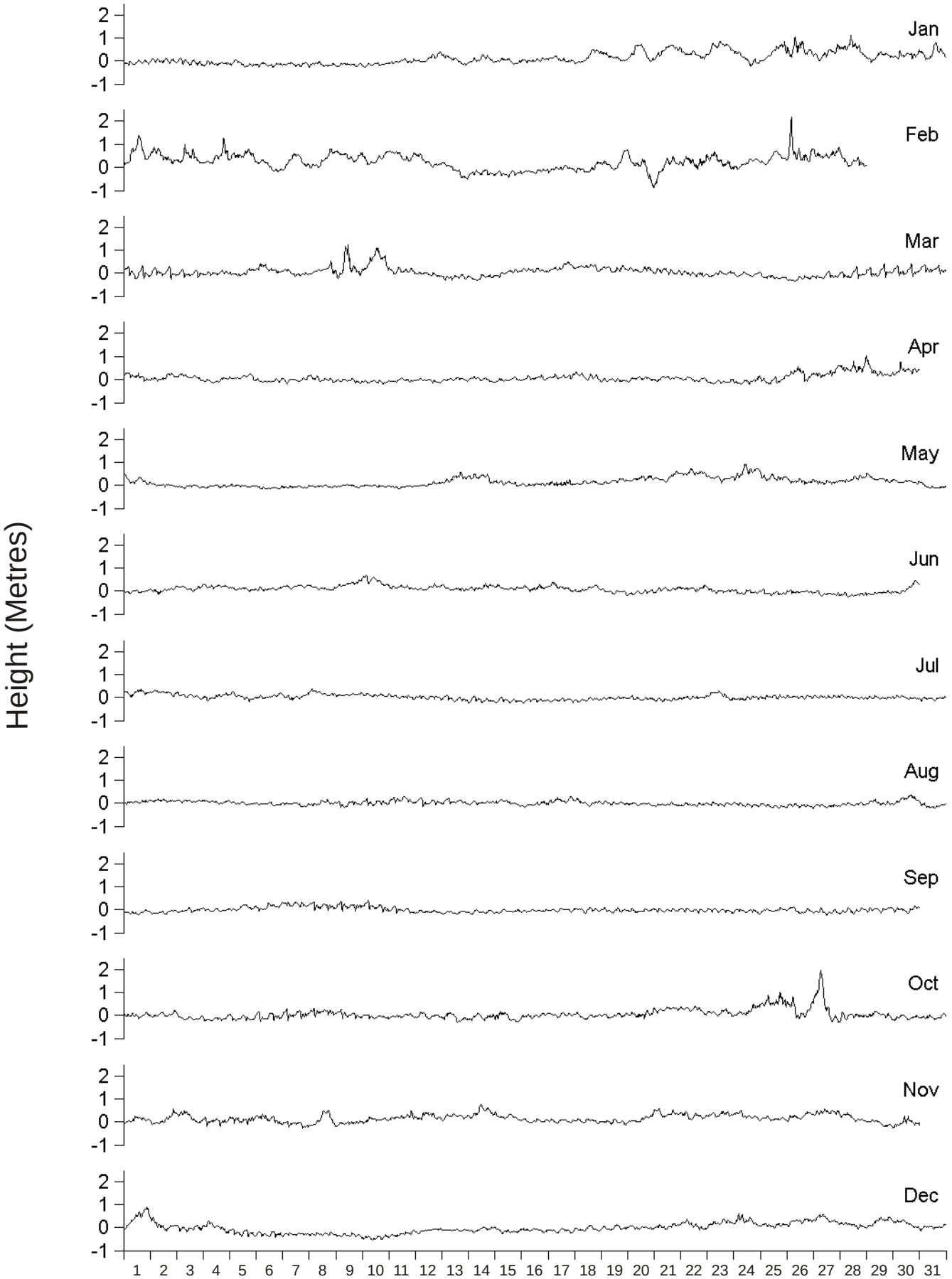
Residual Plots for Avonmouth, 2002



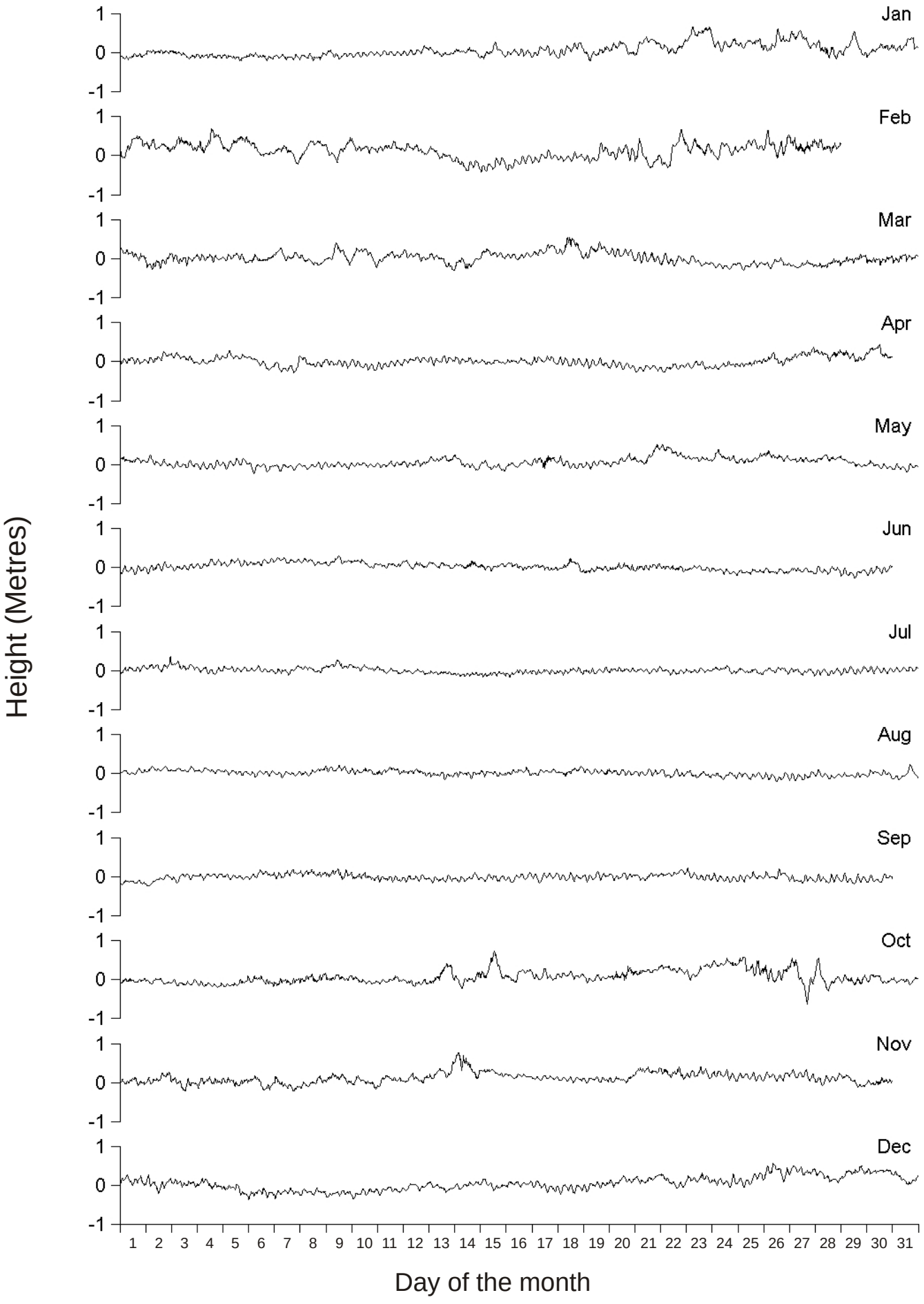
Residual Plots for Bangor, 2002



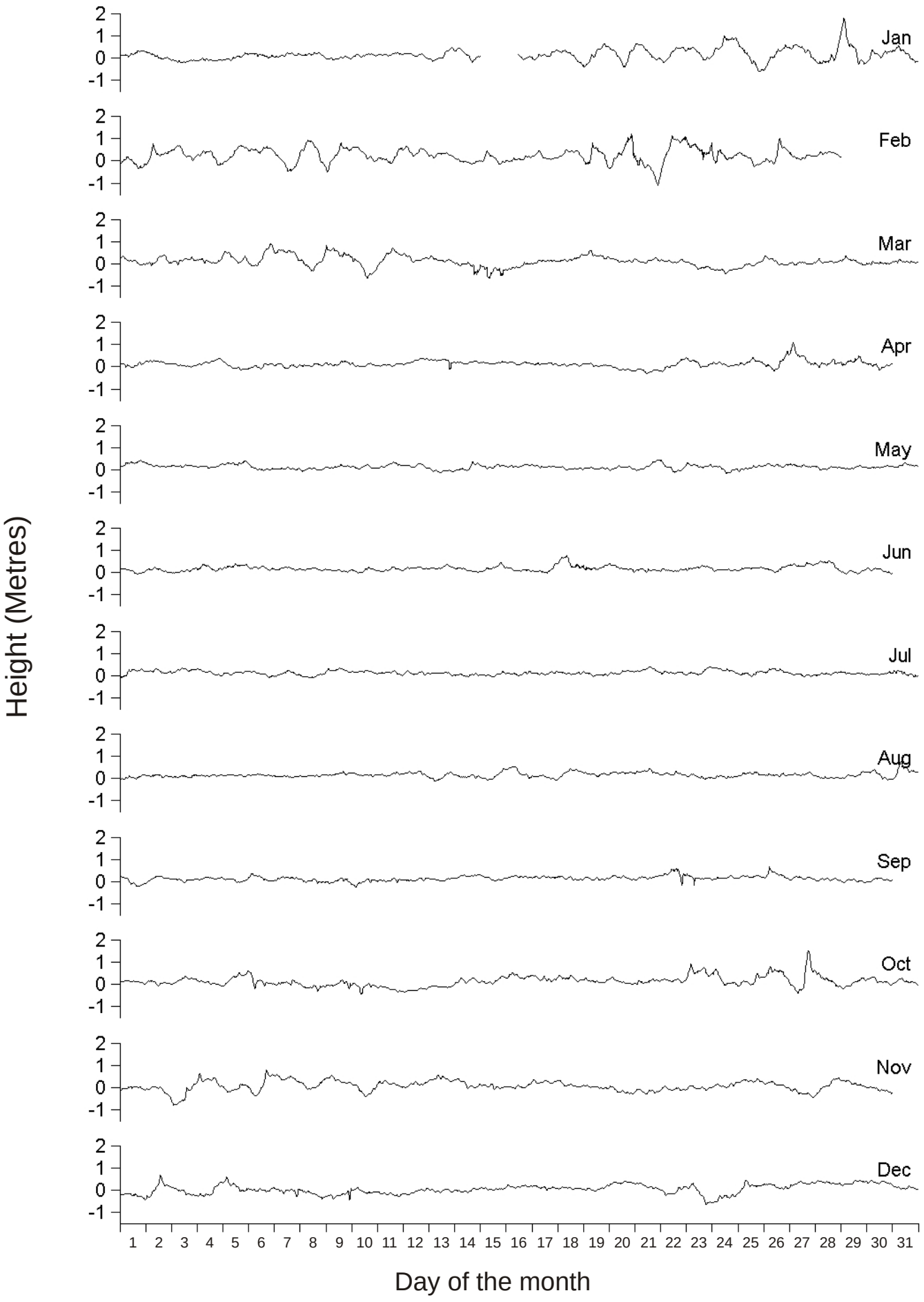
Residual Plots for Barmouth, 2002



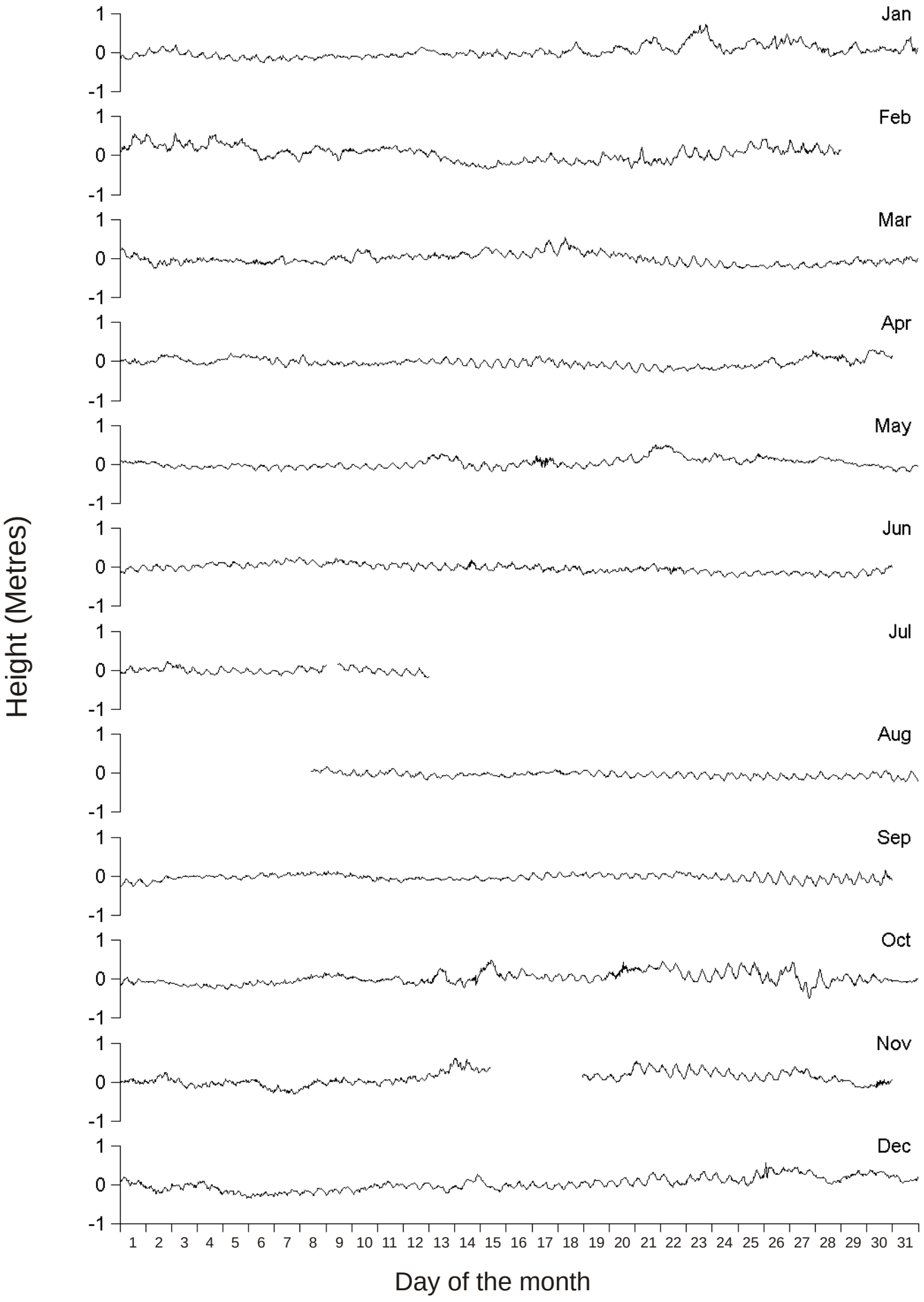
Residual Plots for Bournemouth, 2002



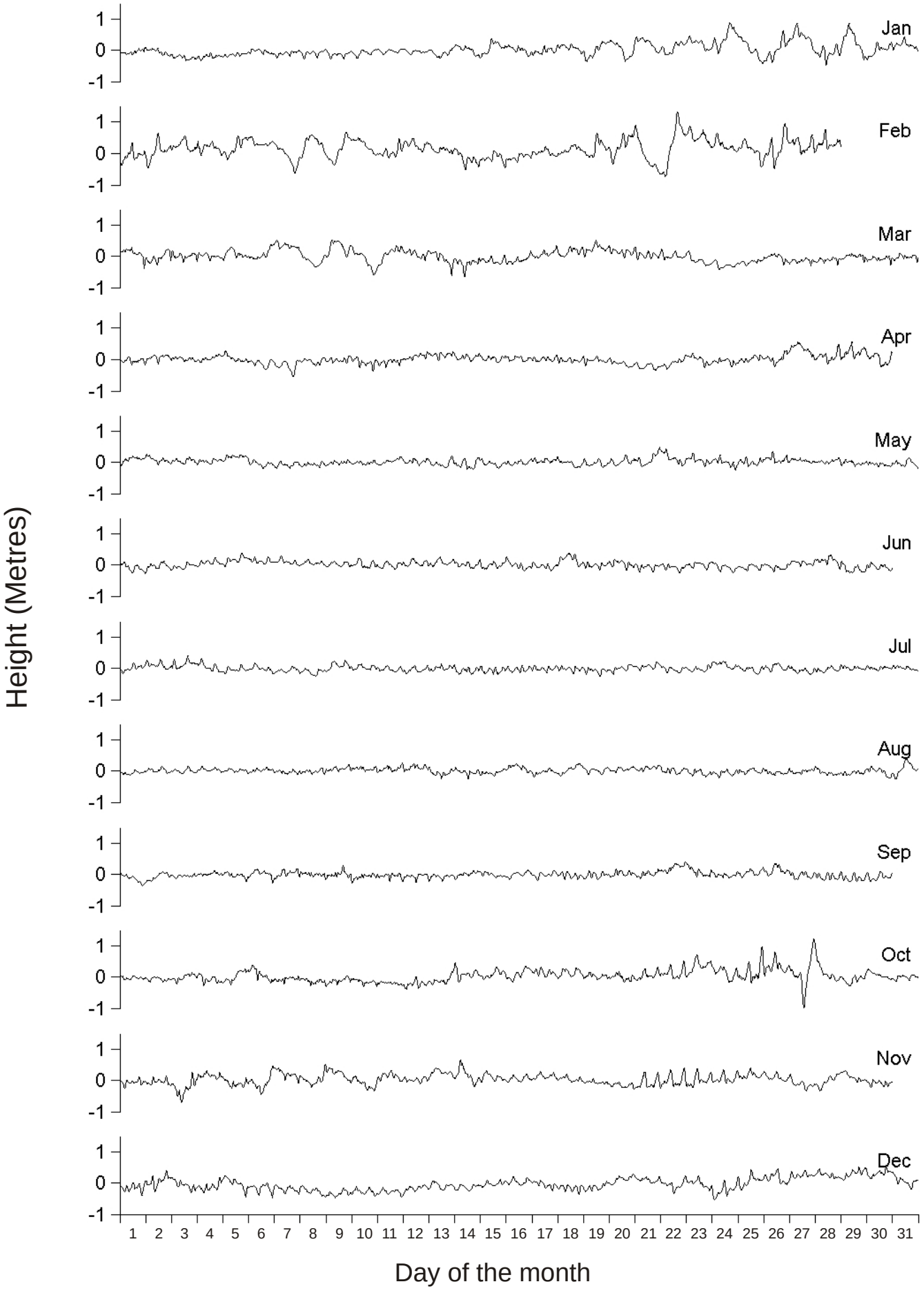
Residual Plots for Cromer, 2002



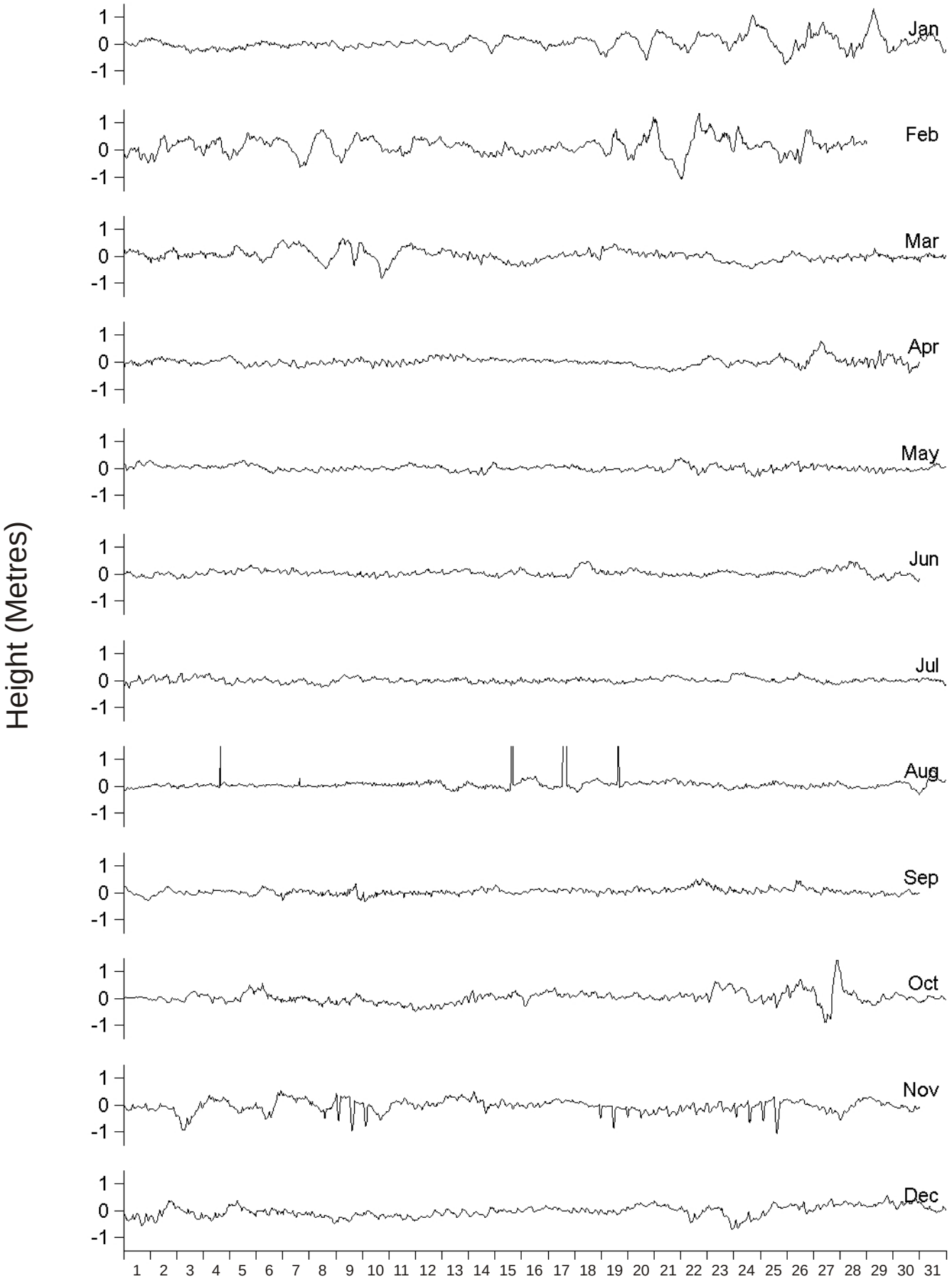
Residual Plots for Devonport, 2002



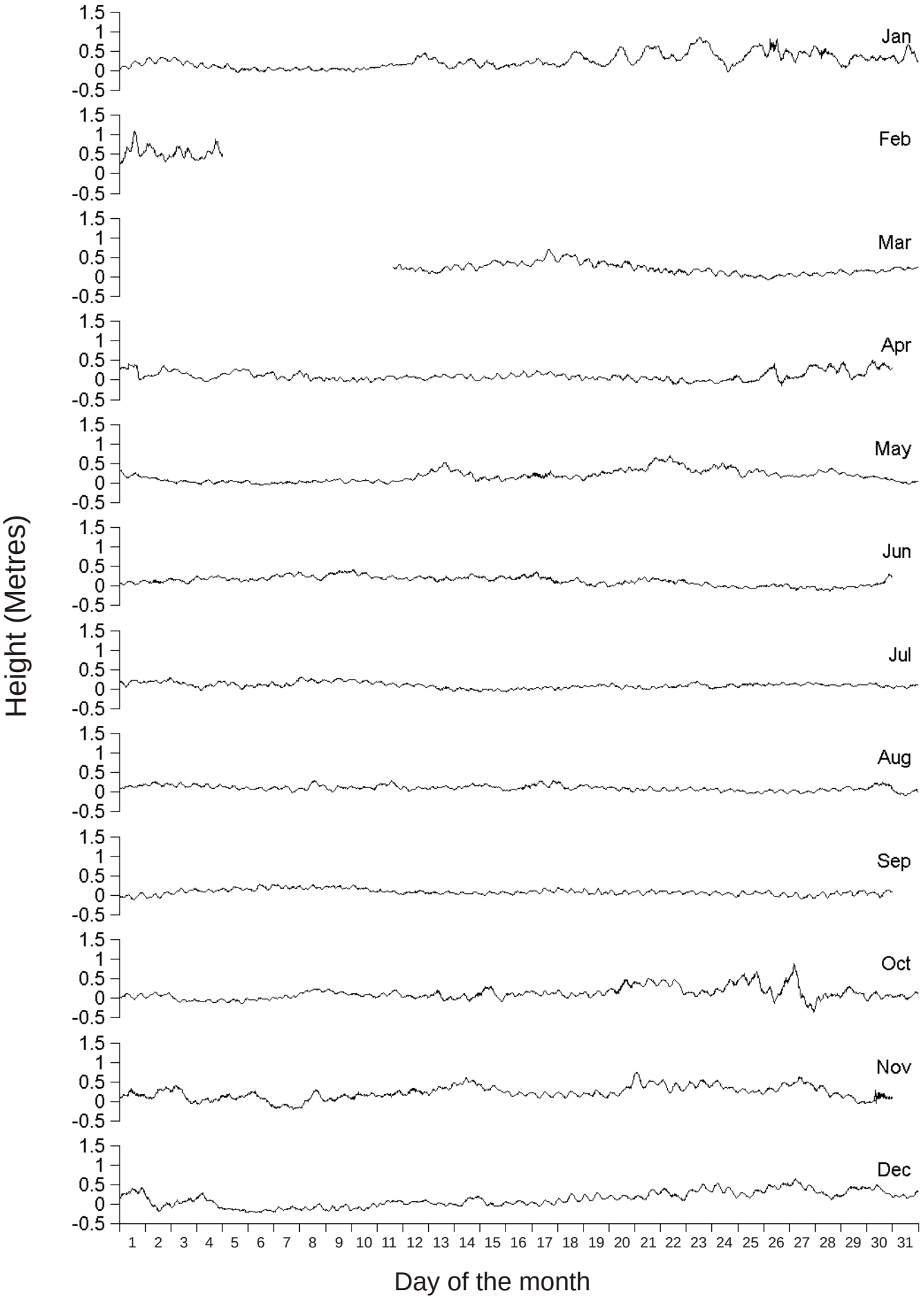
Residual Plots for Dover, 2002



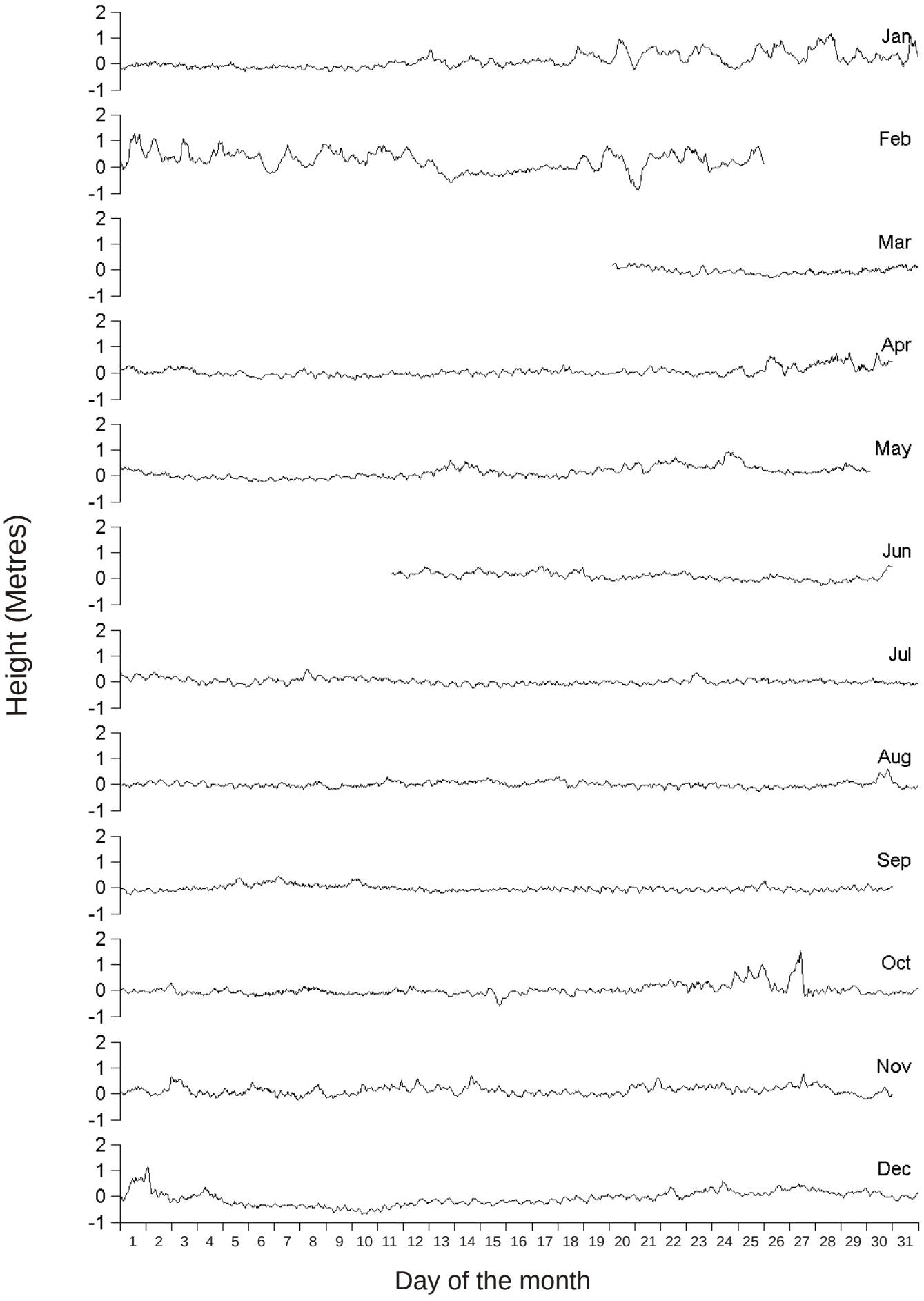
Residual Plots for Felixstowe, 2002



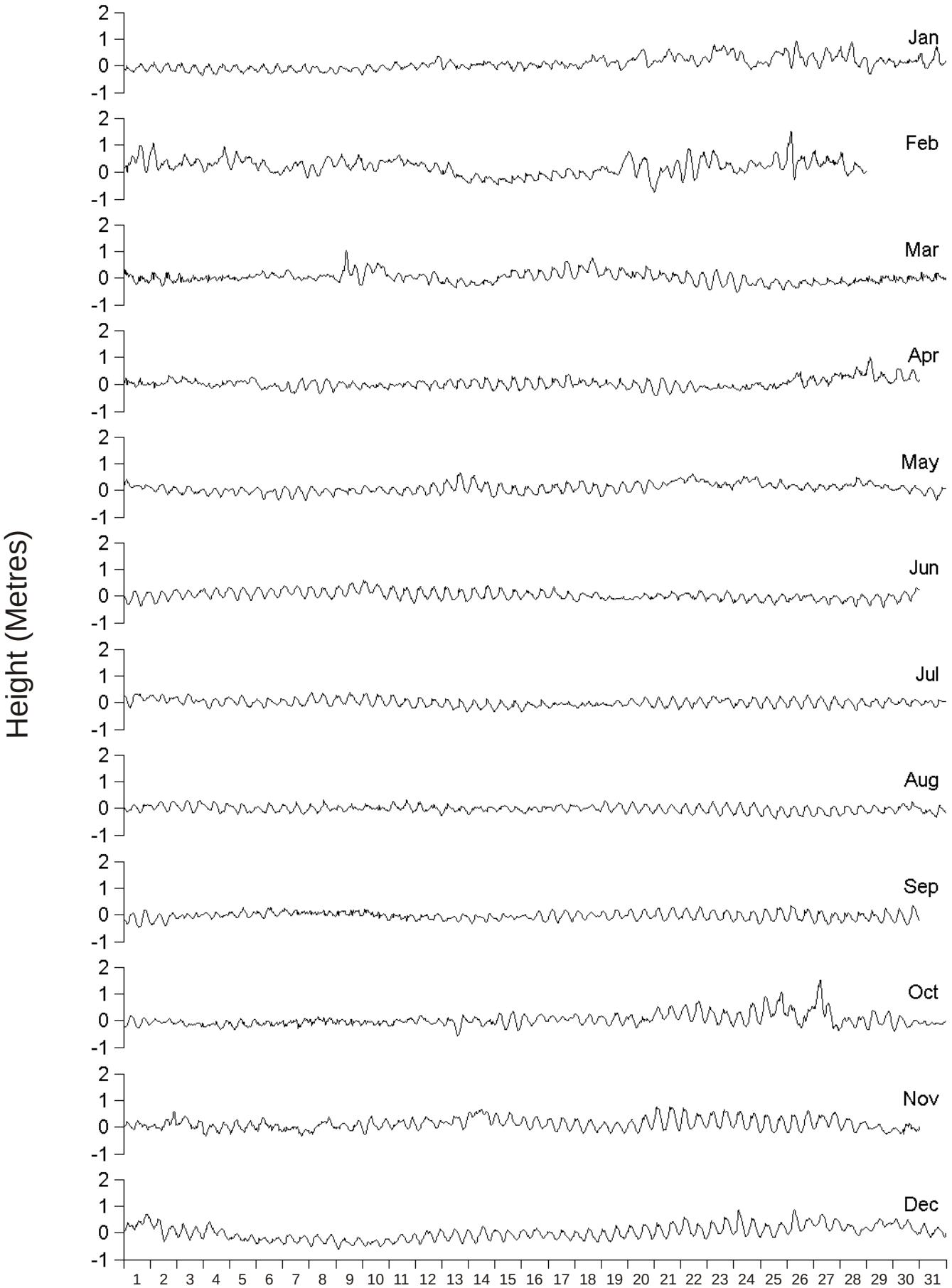
Residual Plots for Fishguard, 2002



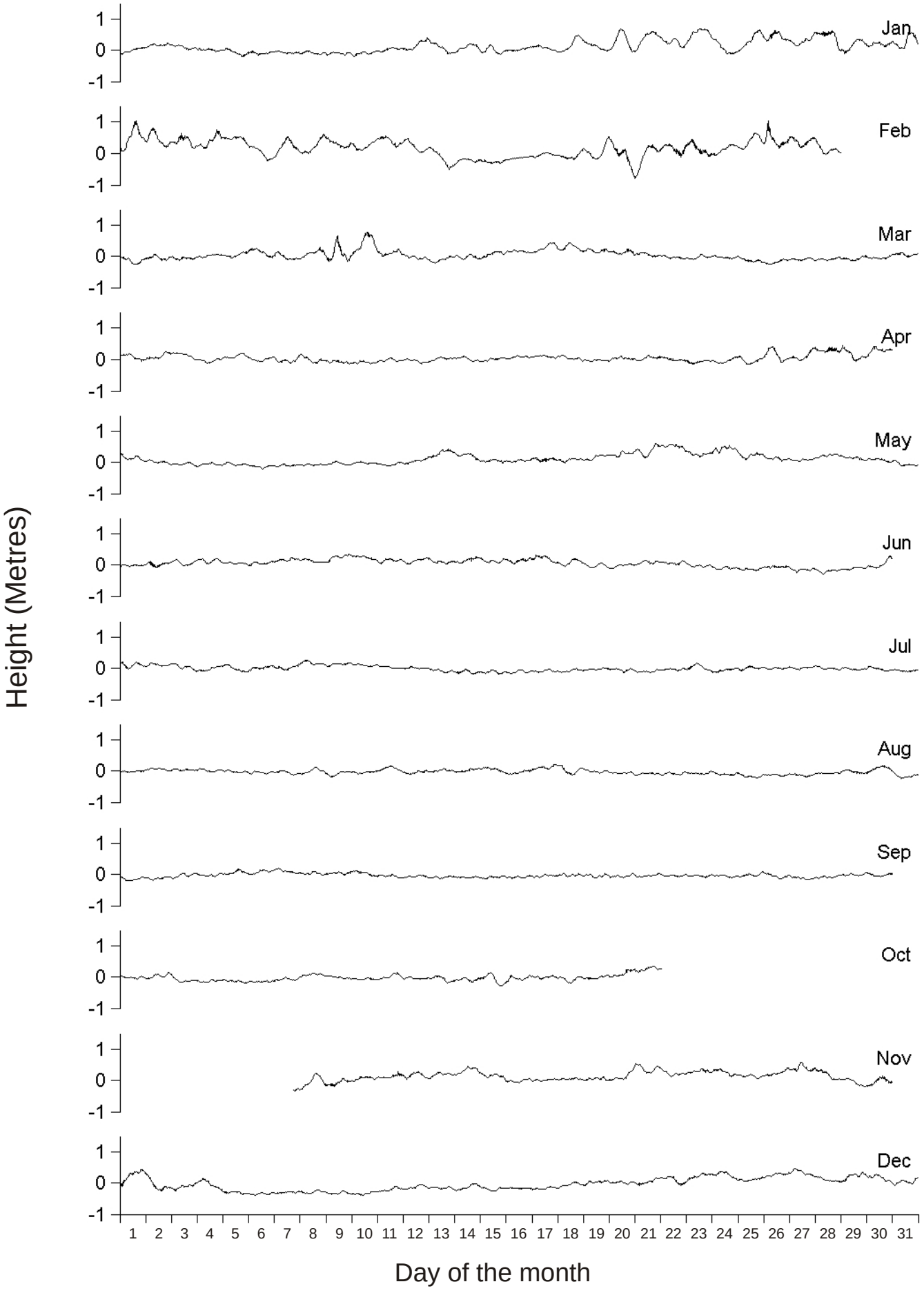
Residual Plots for Heysham, 2002



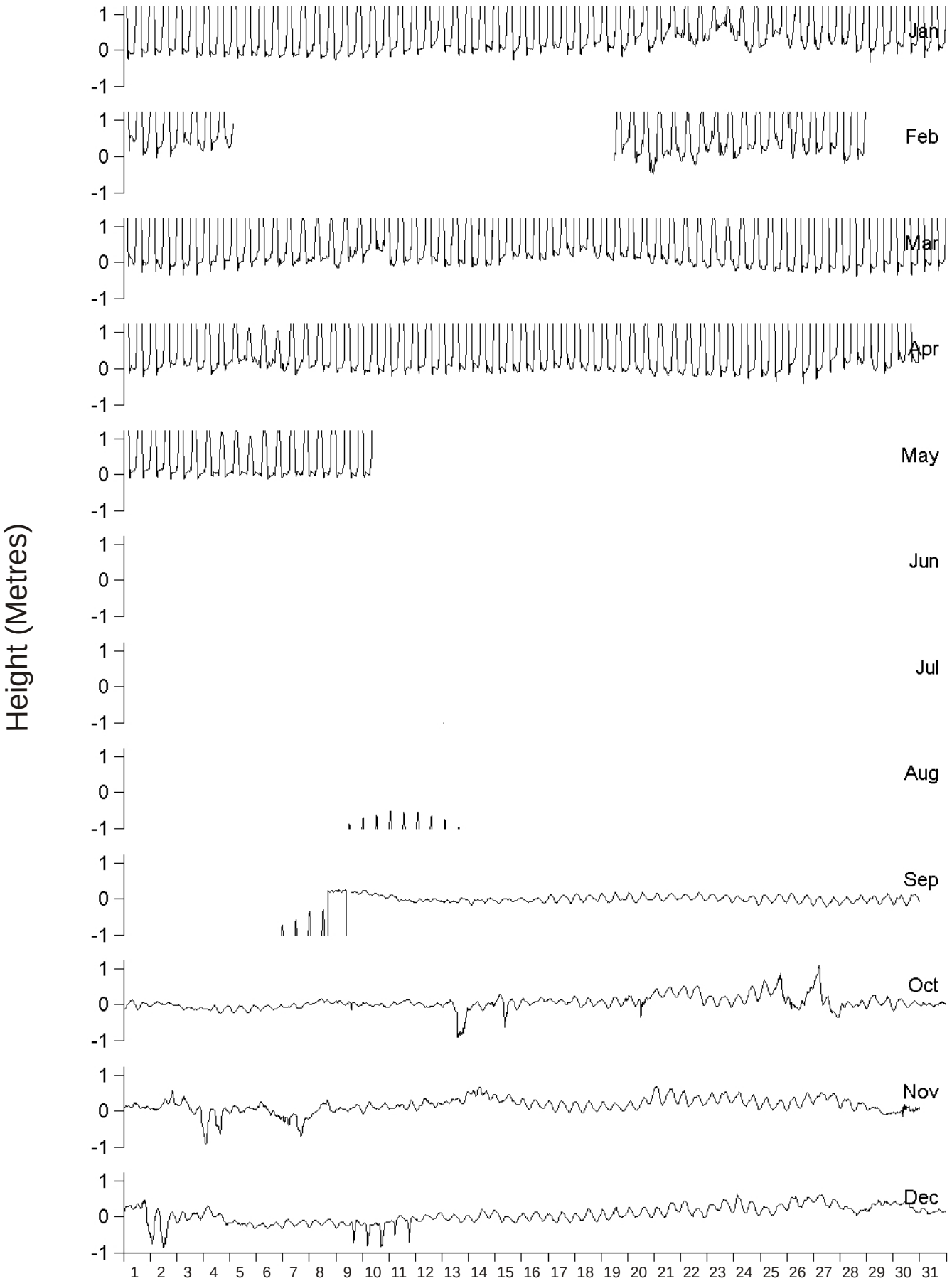
Residual Plots for Hinkley Point, 2002



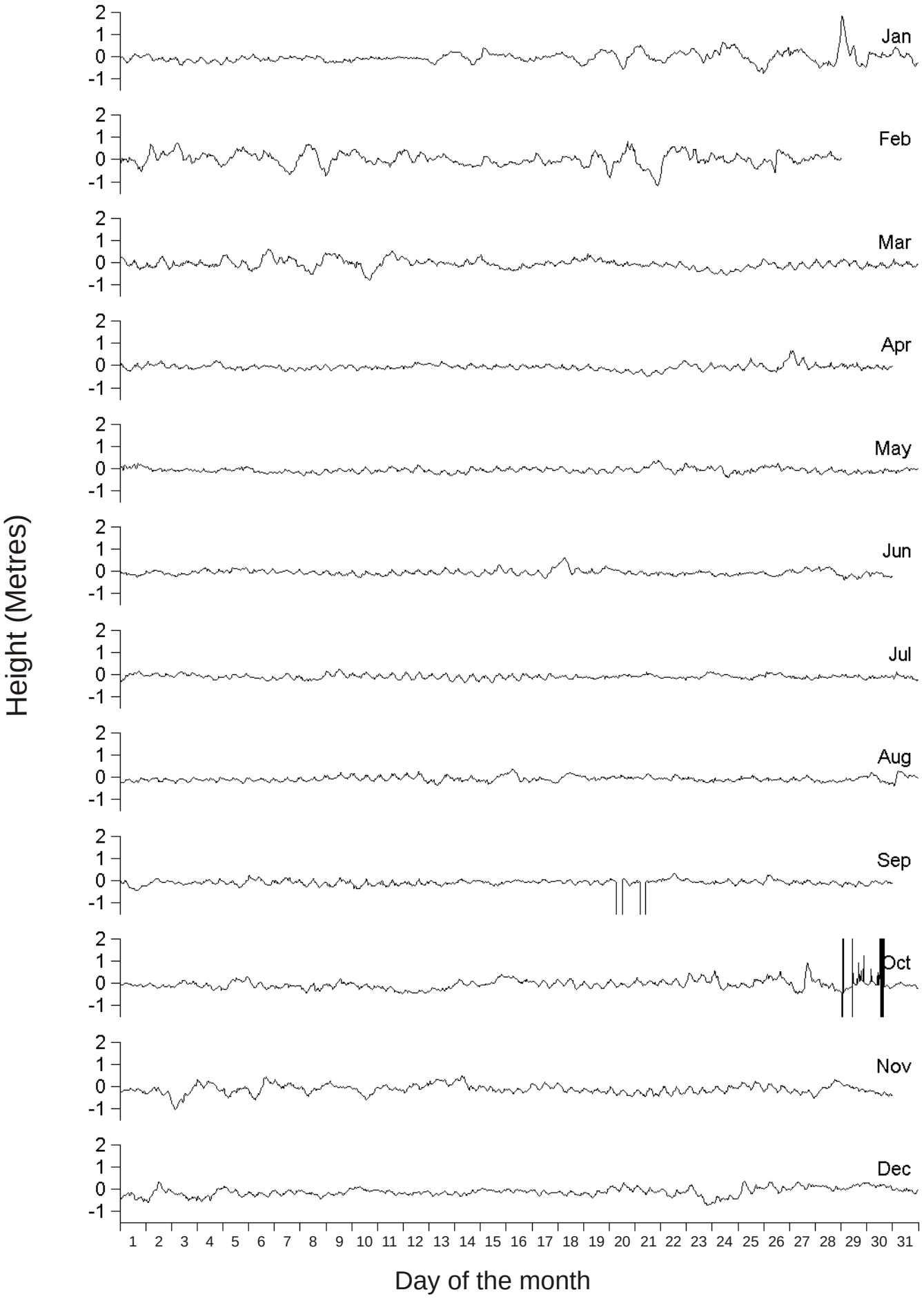
Residual Plots for Holyhead, 2002



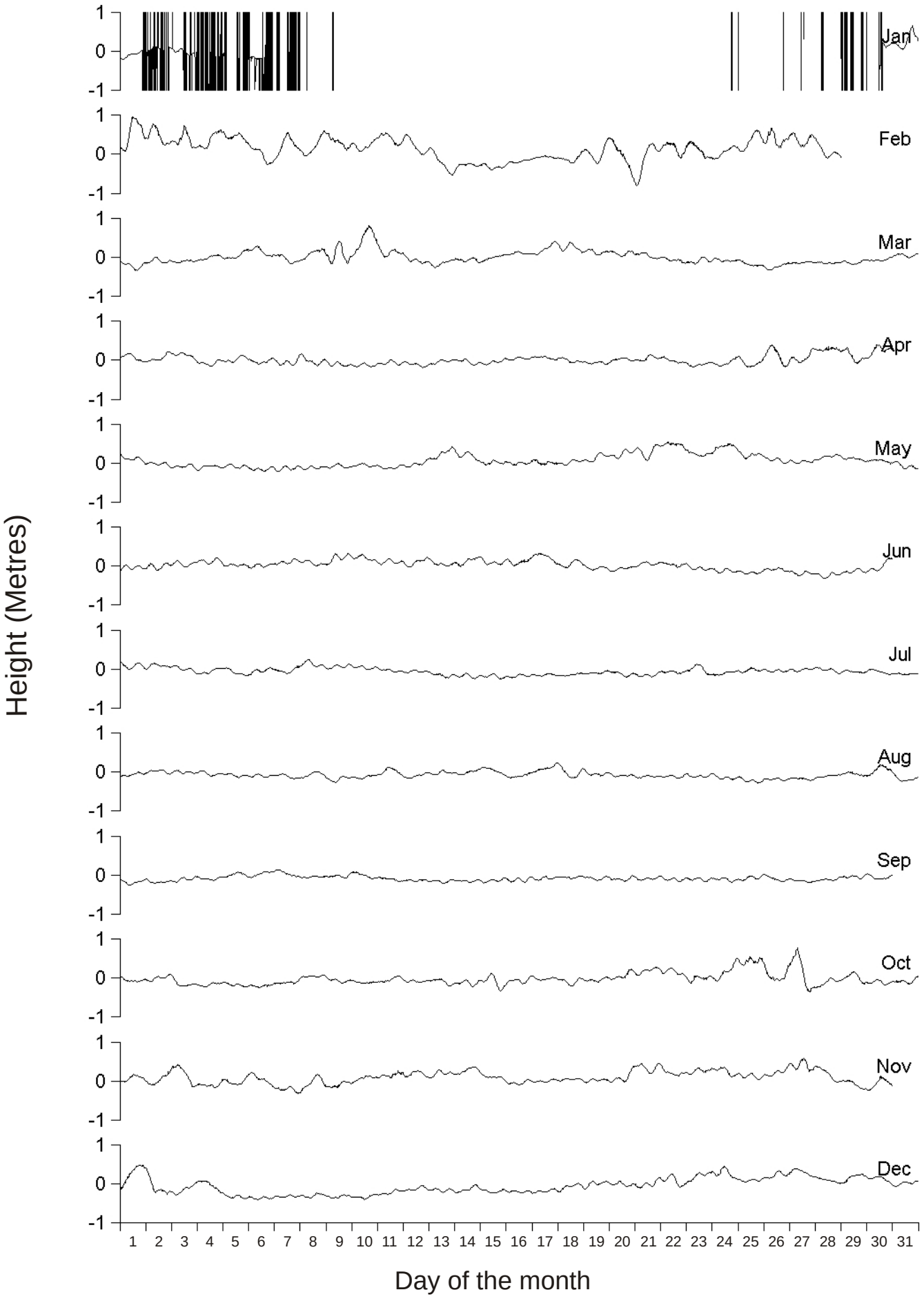
Residual Plots for Ilfracombe, 2002



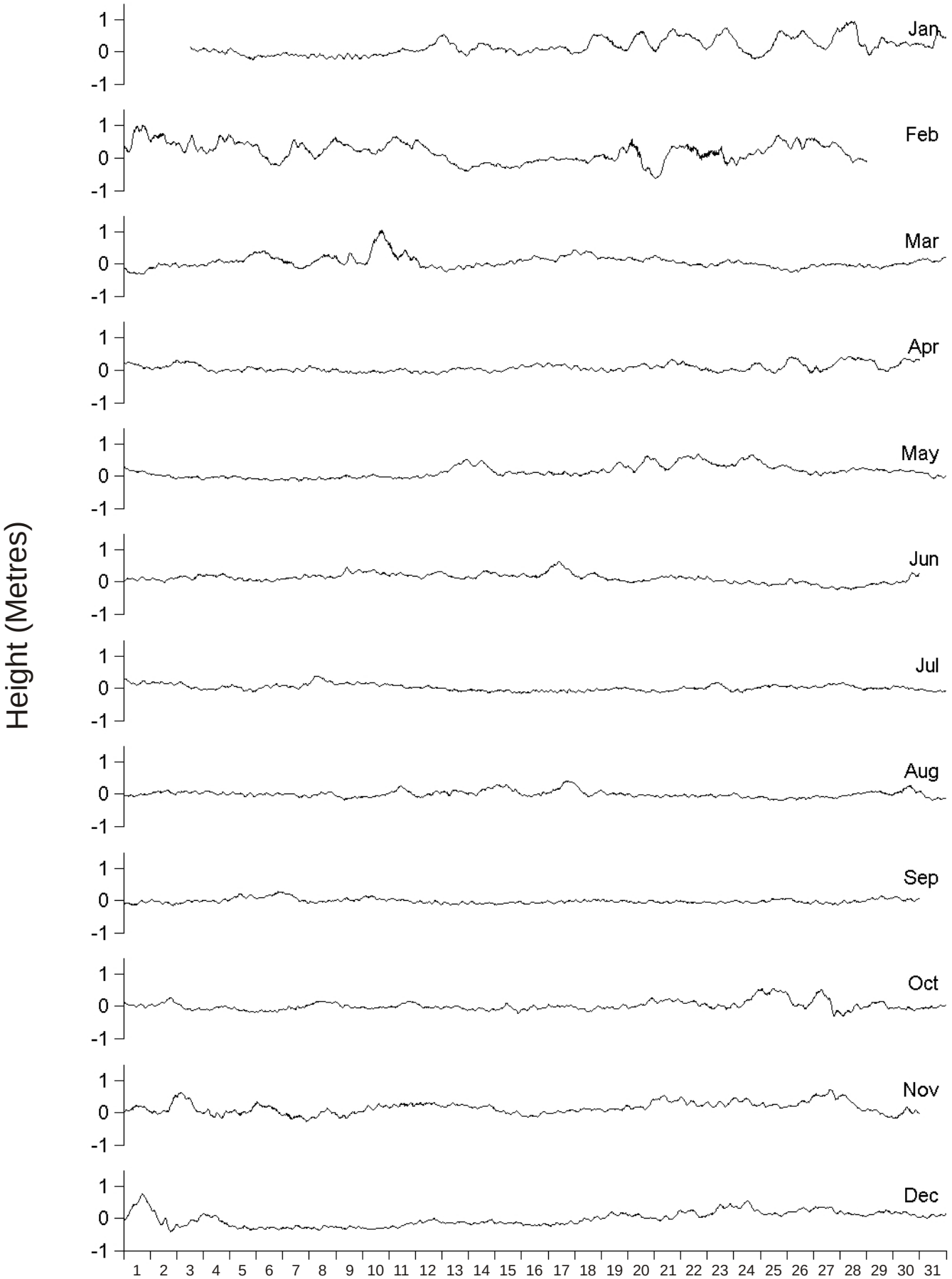
Residual Plots for Immingham, 2002



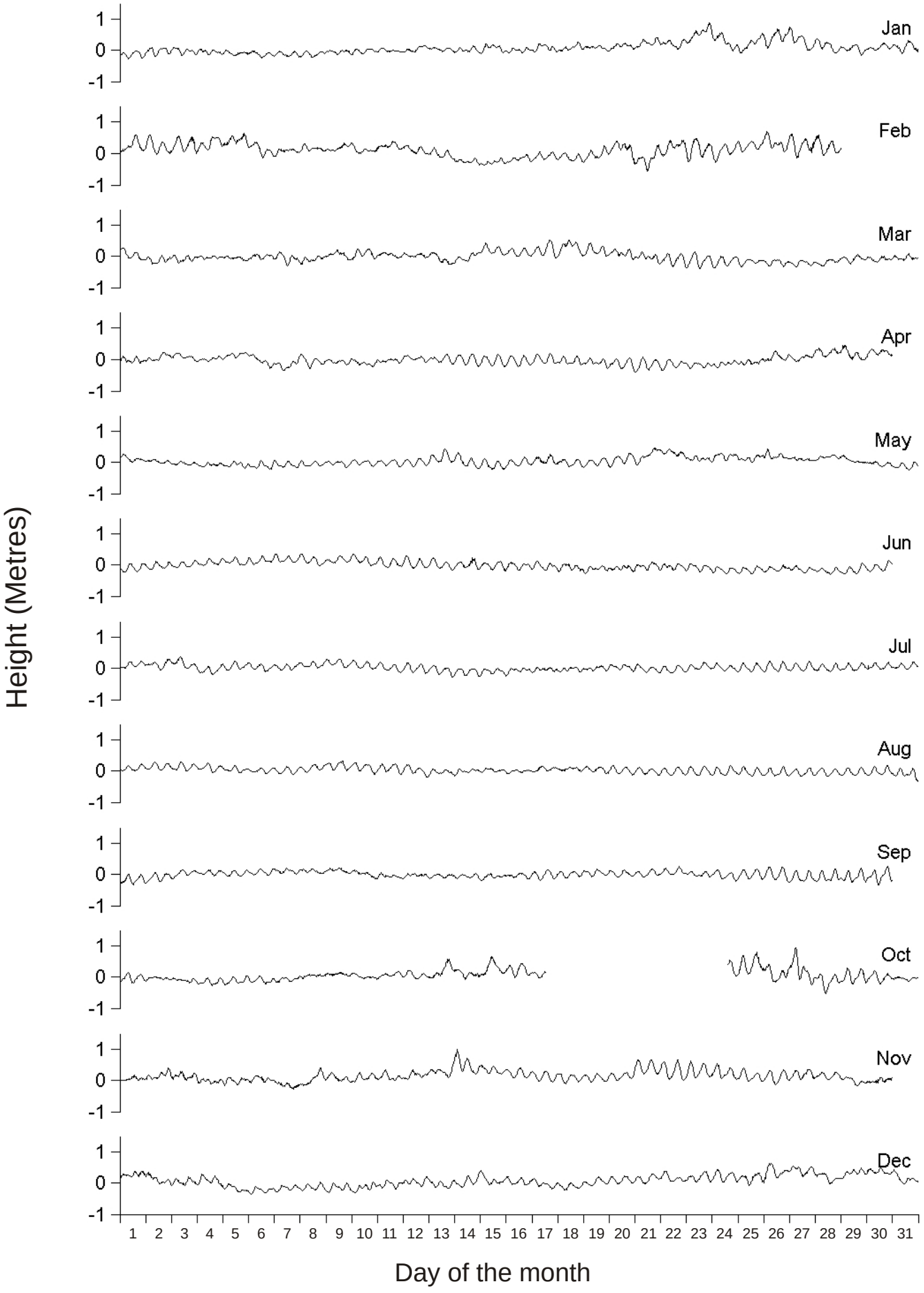
Residual Plots for Port Erin, IOM, 2002



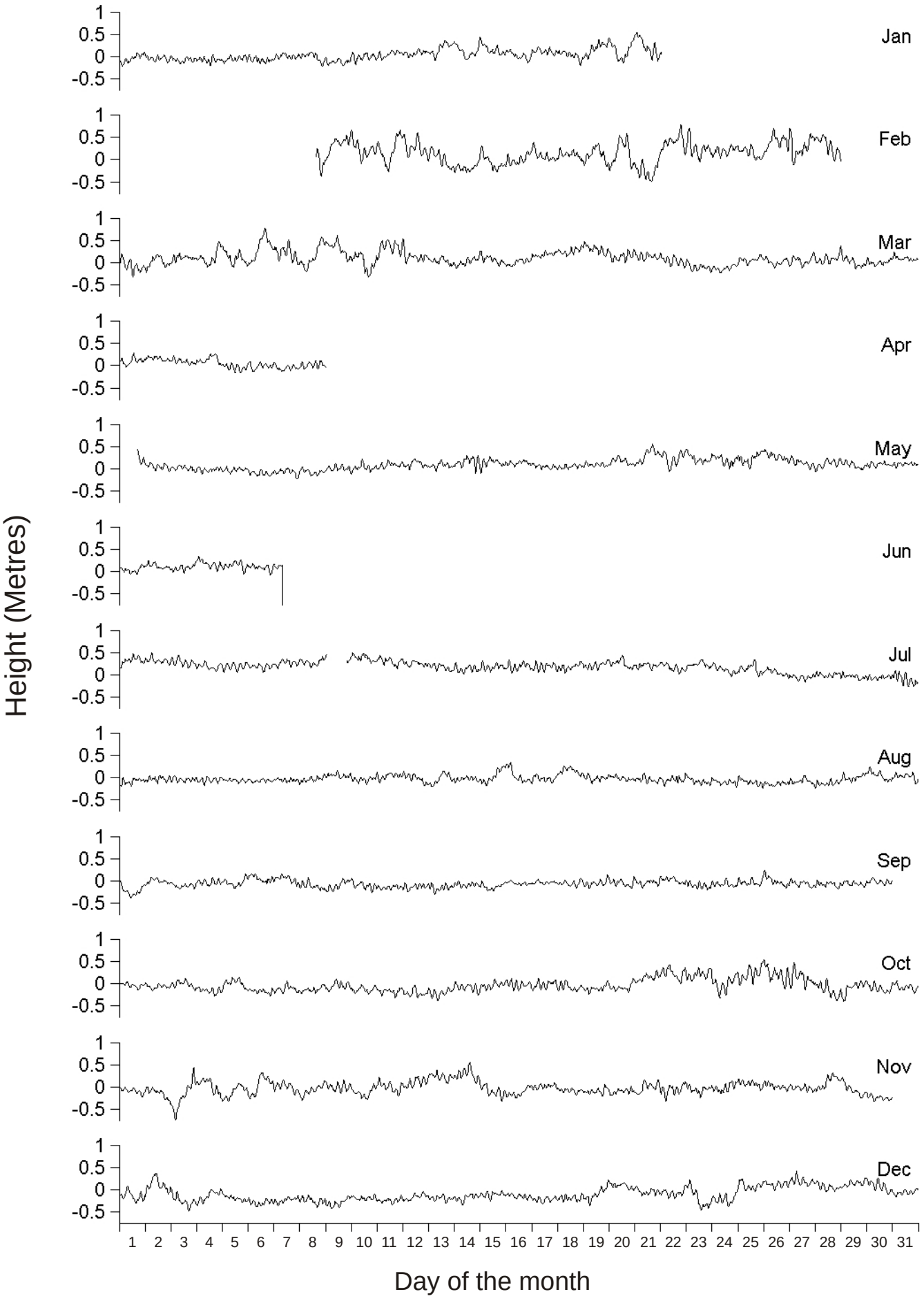
Residual Plots for Islay, 2002



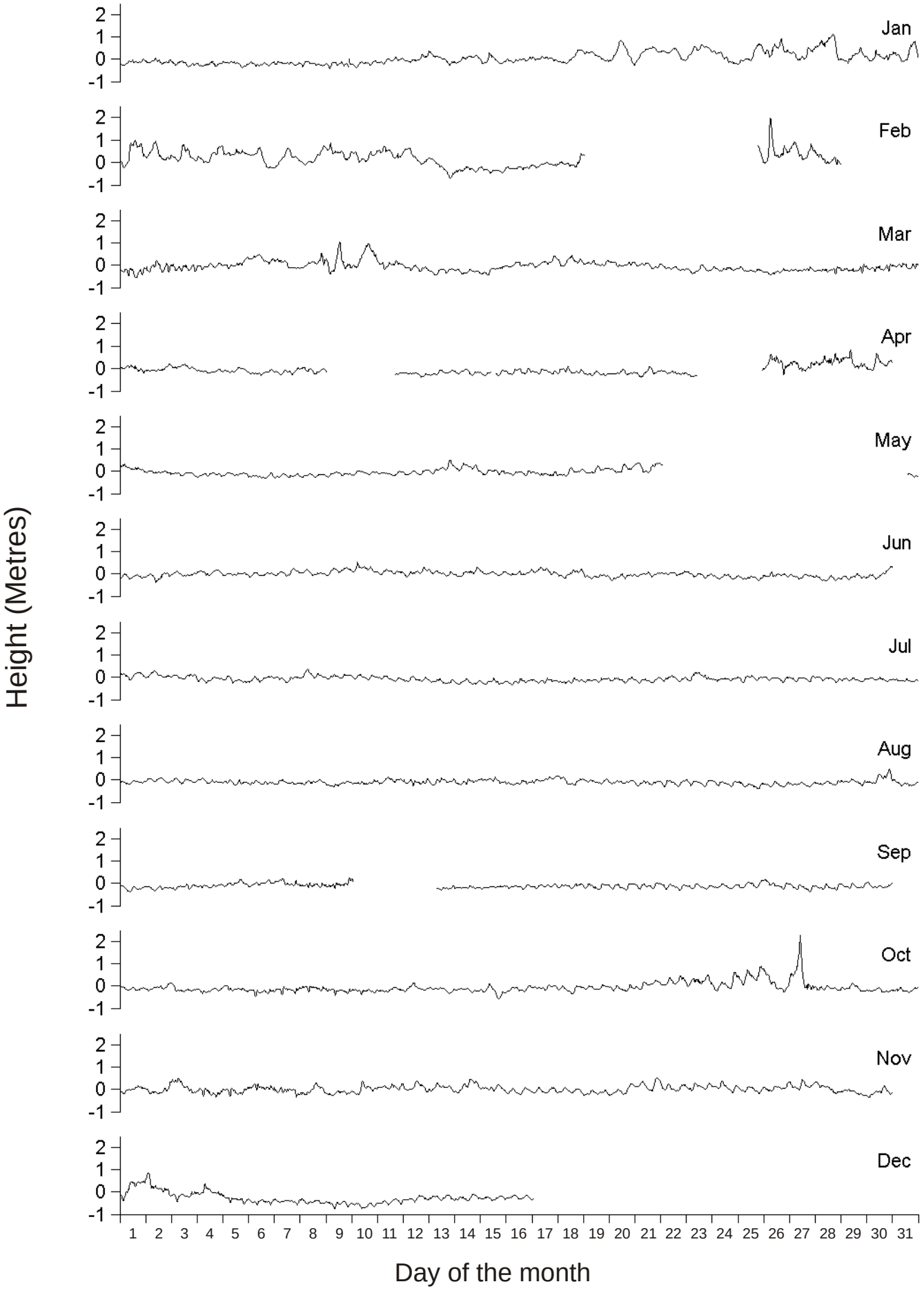
Residual Plots for St. Helier, Jersey, 2002



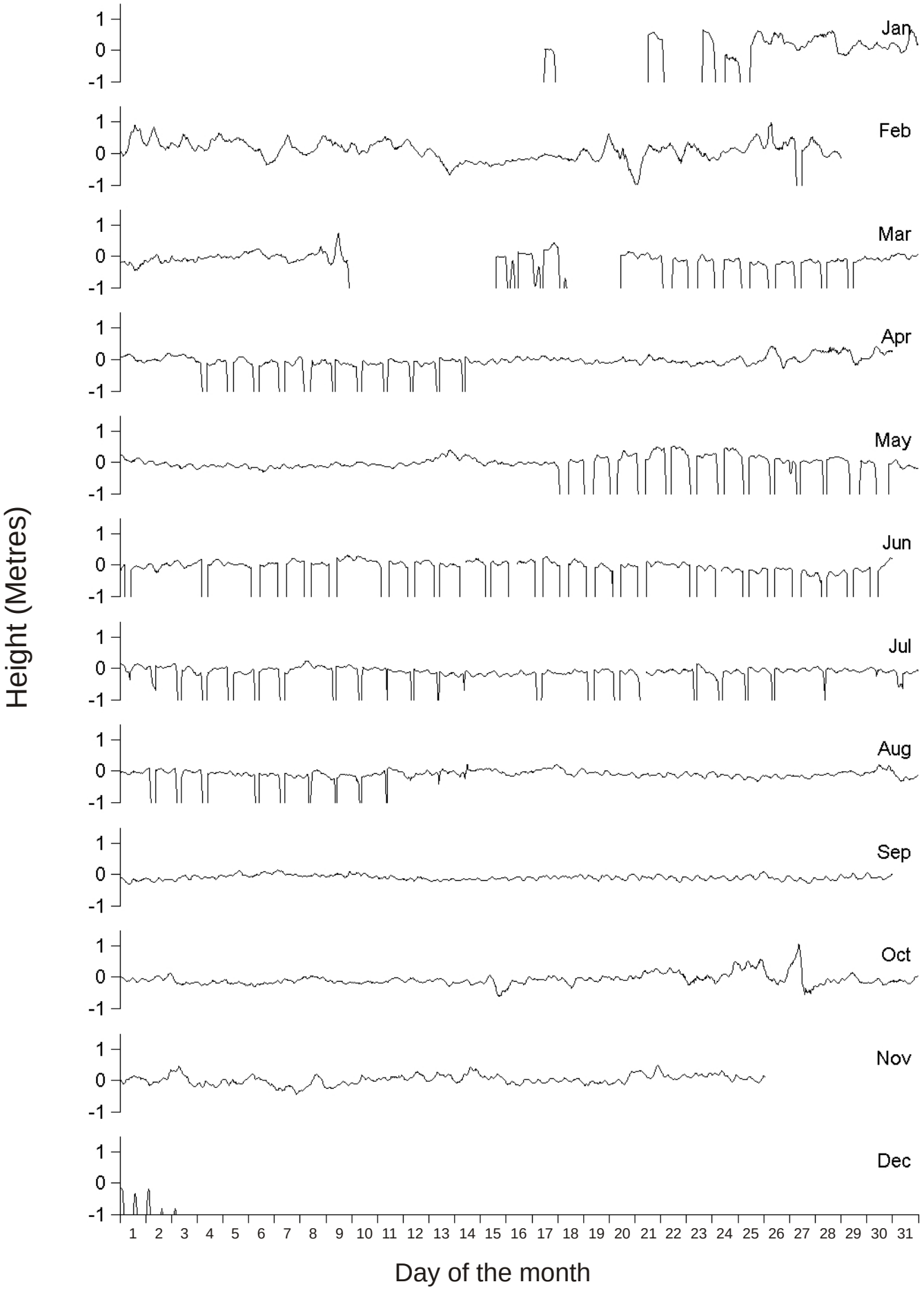
Residual Plots for Leith, 2002



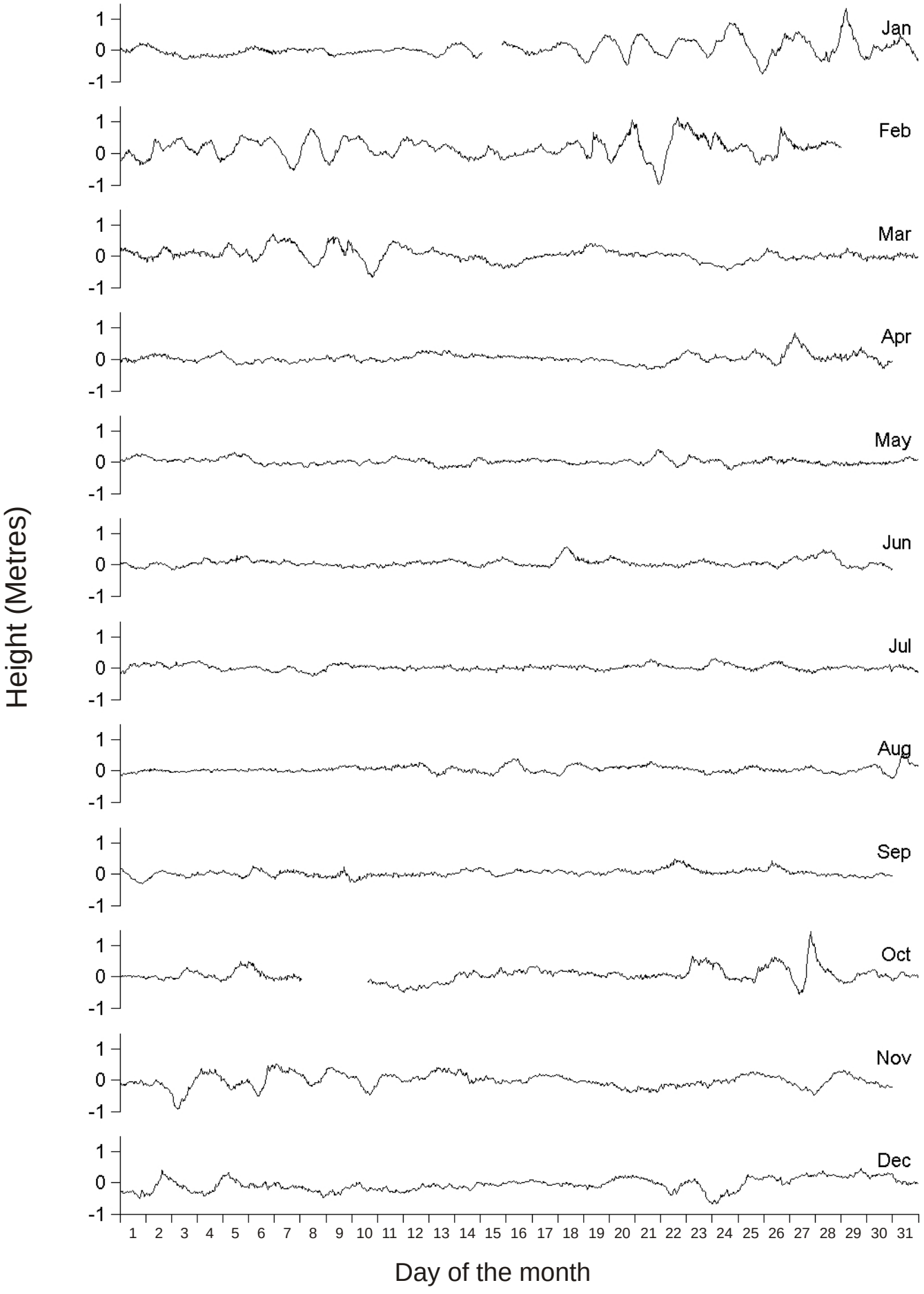
Residual Plots for Liverpool, 2002



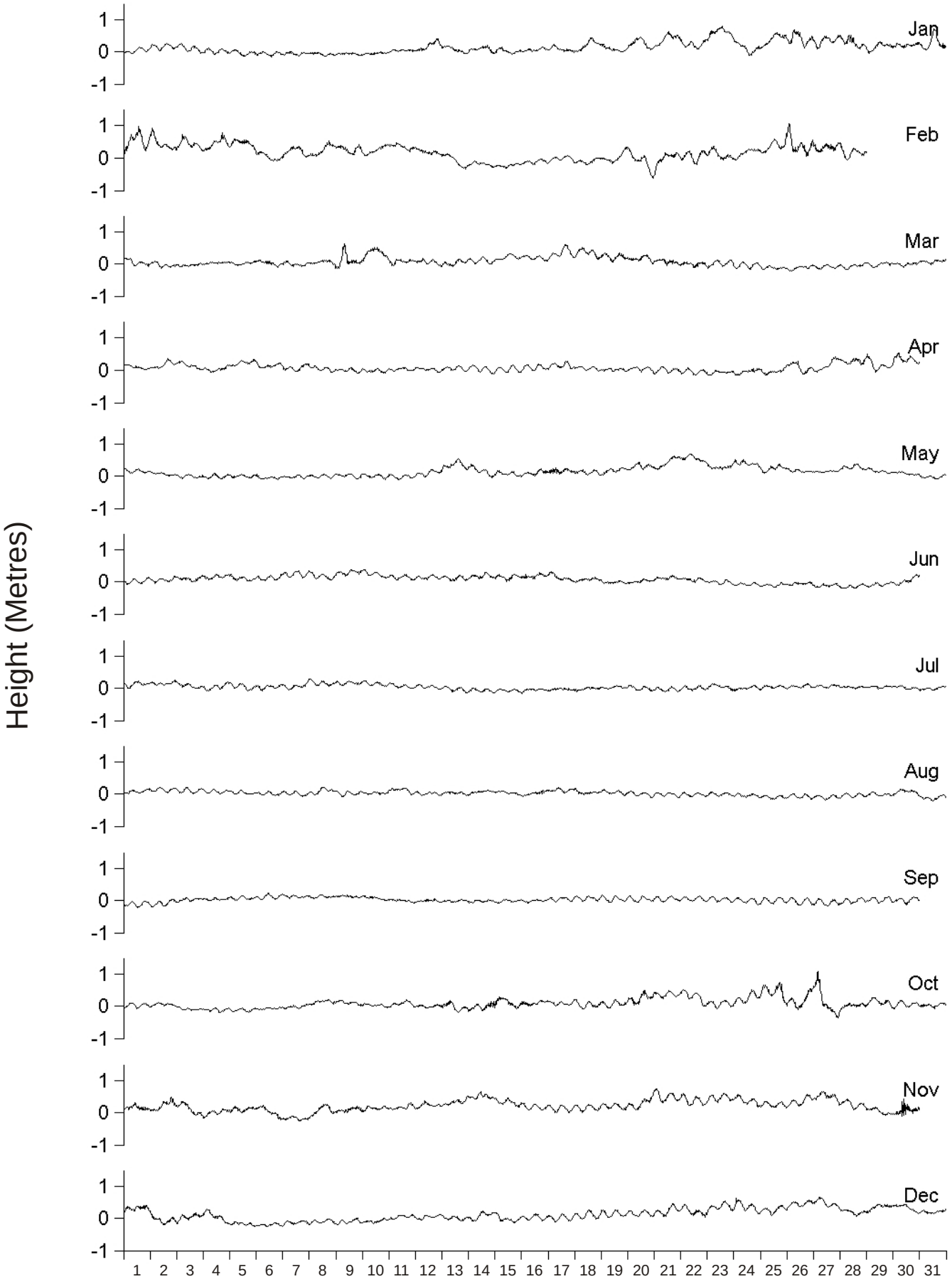
Residual Plots for Llandudno, 2002



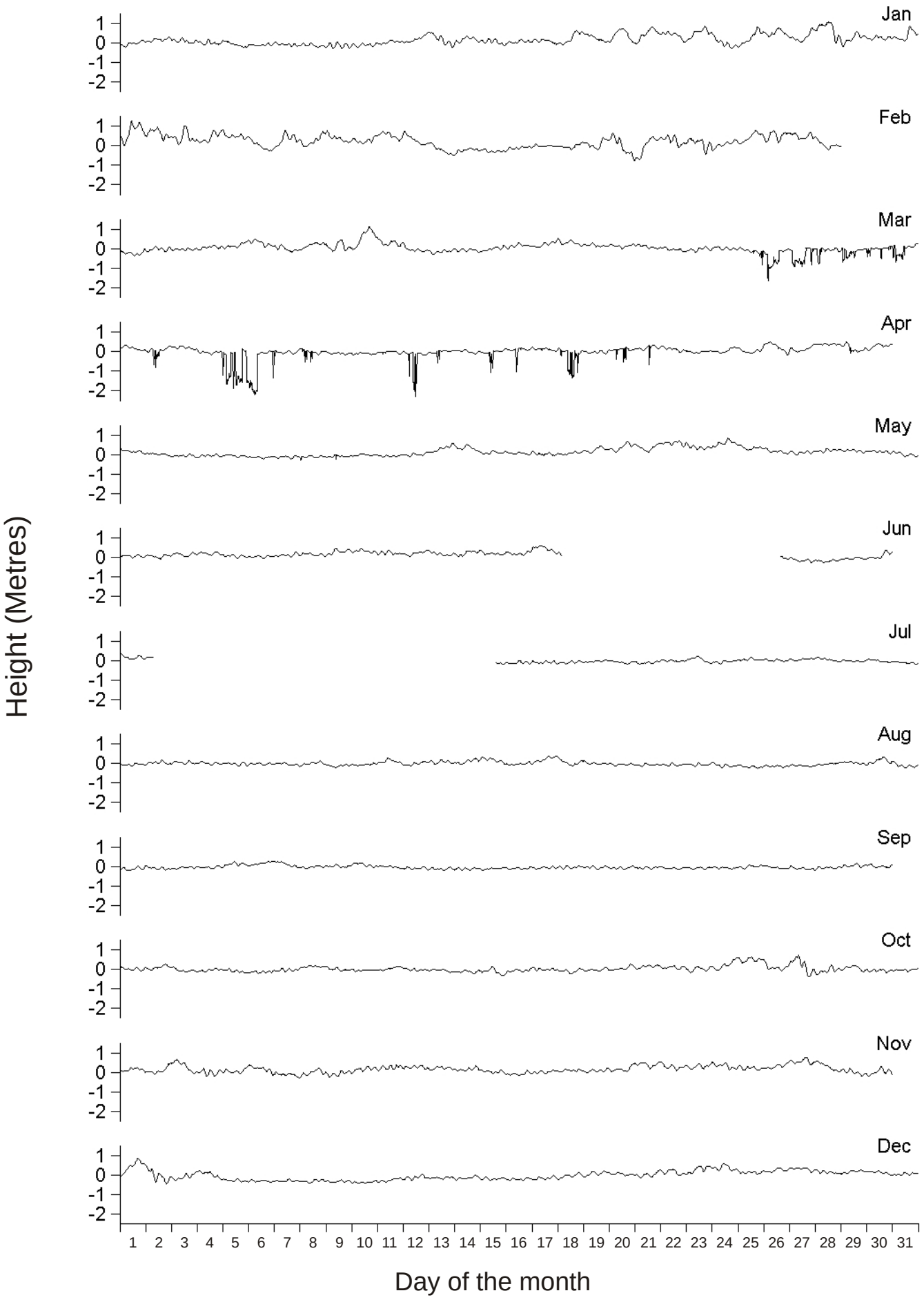
Residual Plots for Lowestoft, 2002



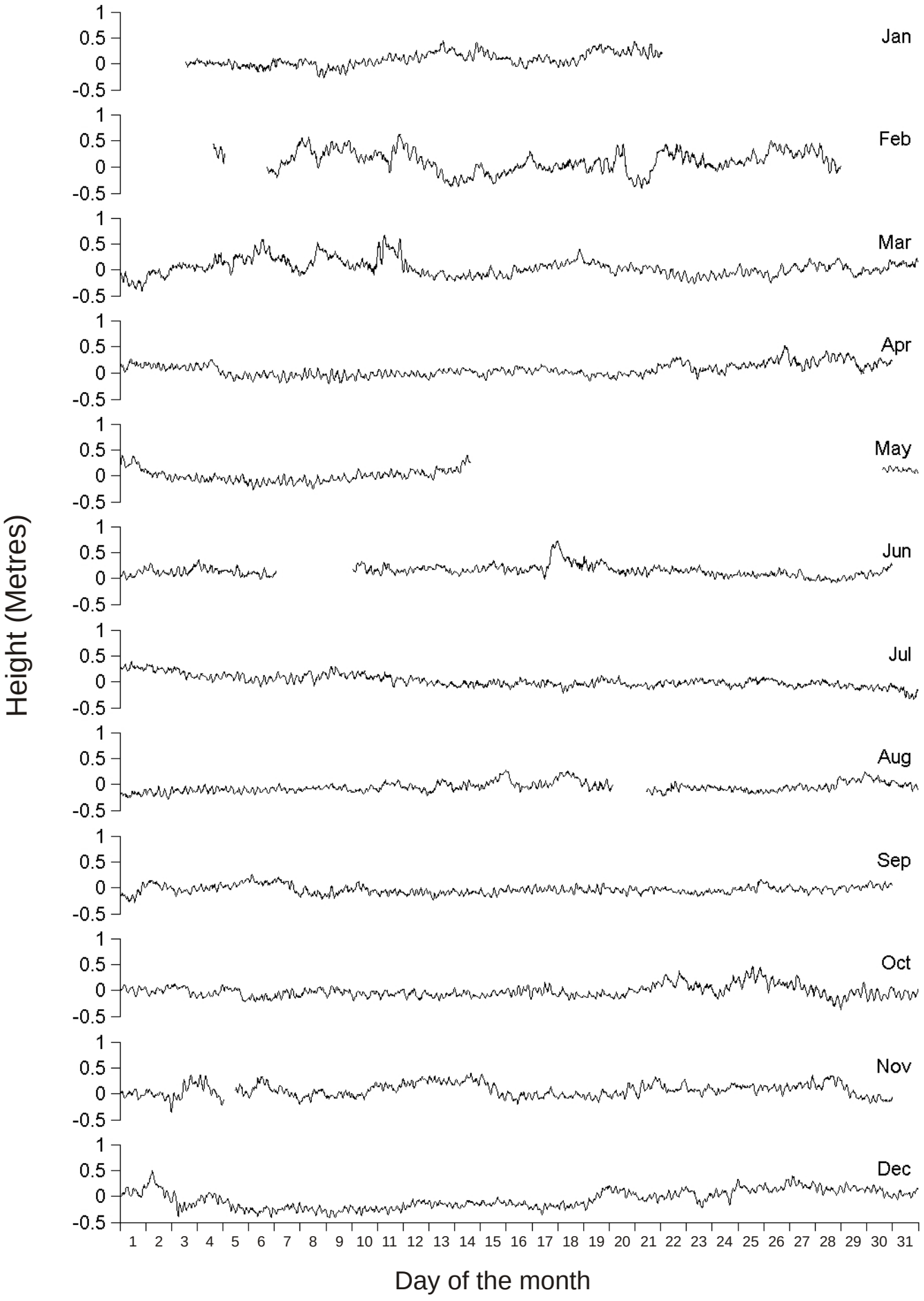
Residual Plots for Milford Haven, 2002



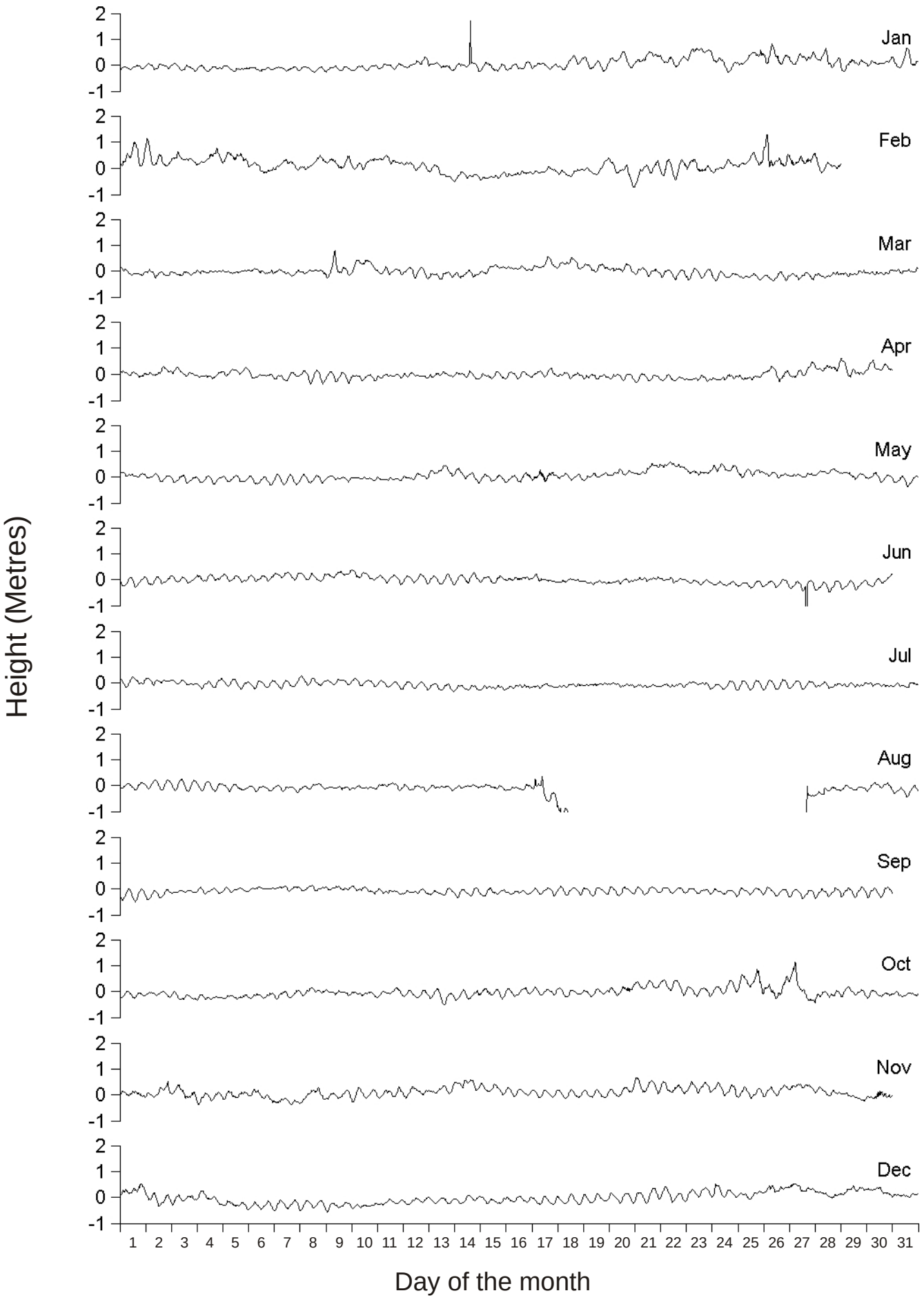
Residual Plots for Millport, 2002



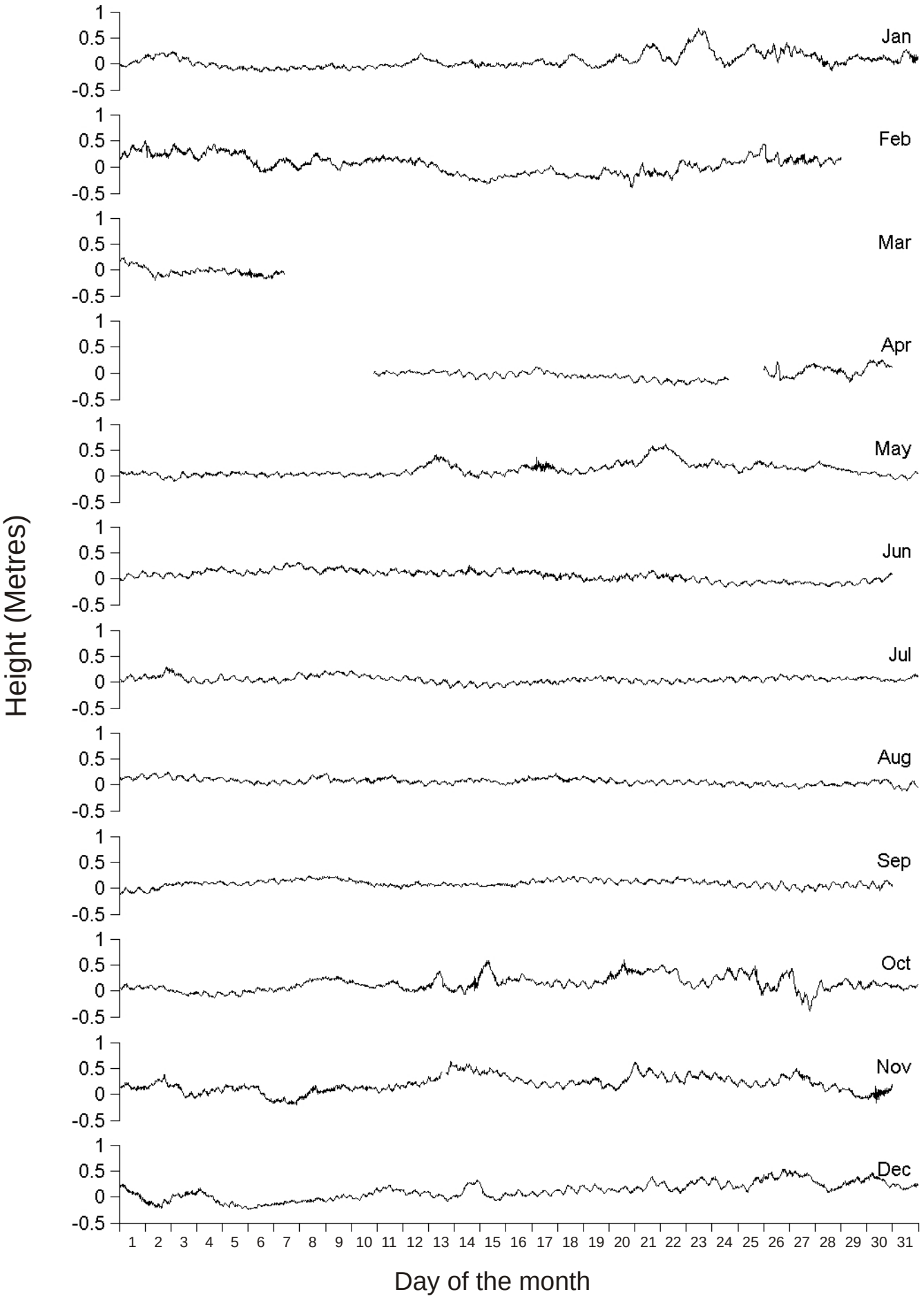
Residual Plots for Moray Firth, 2002



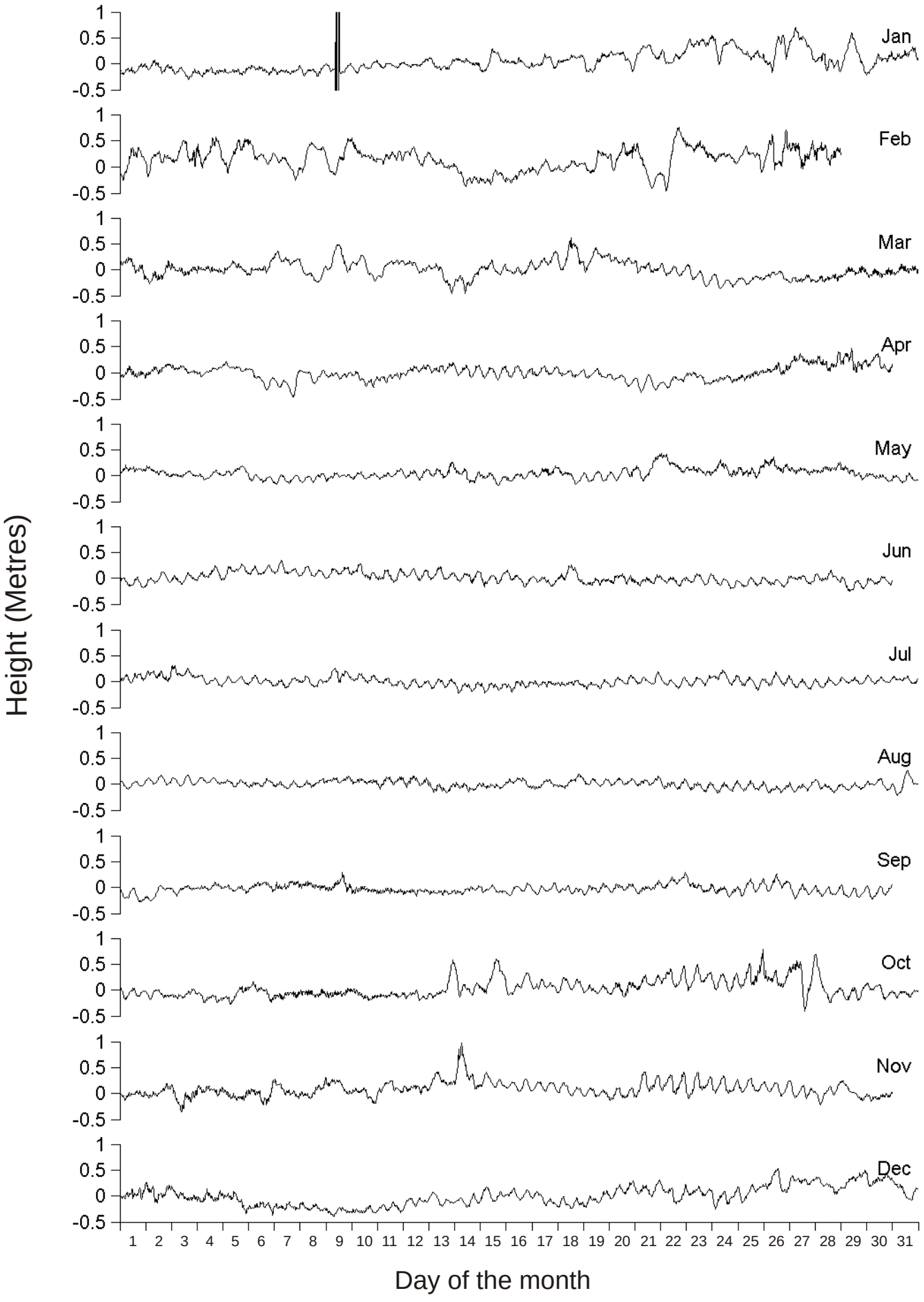
Residual Plots for Mumbles, 2002



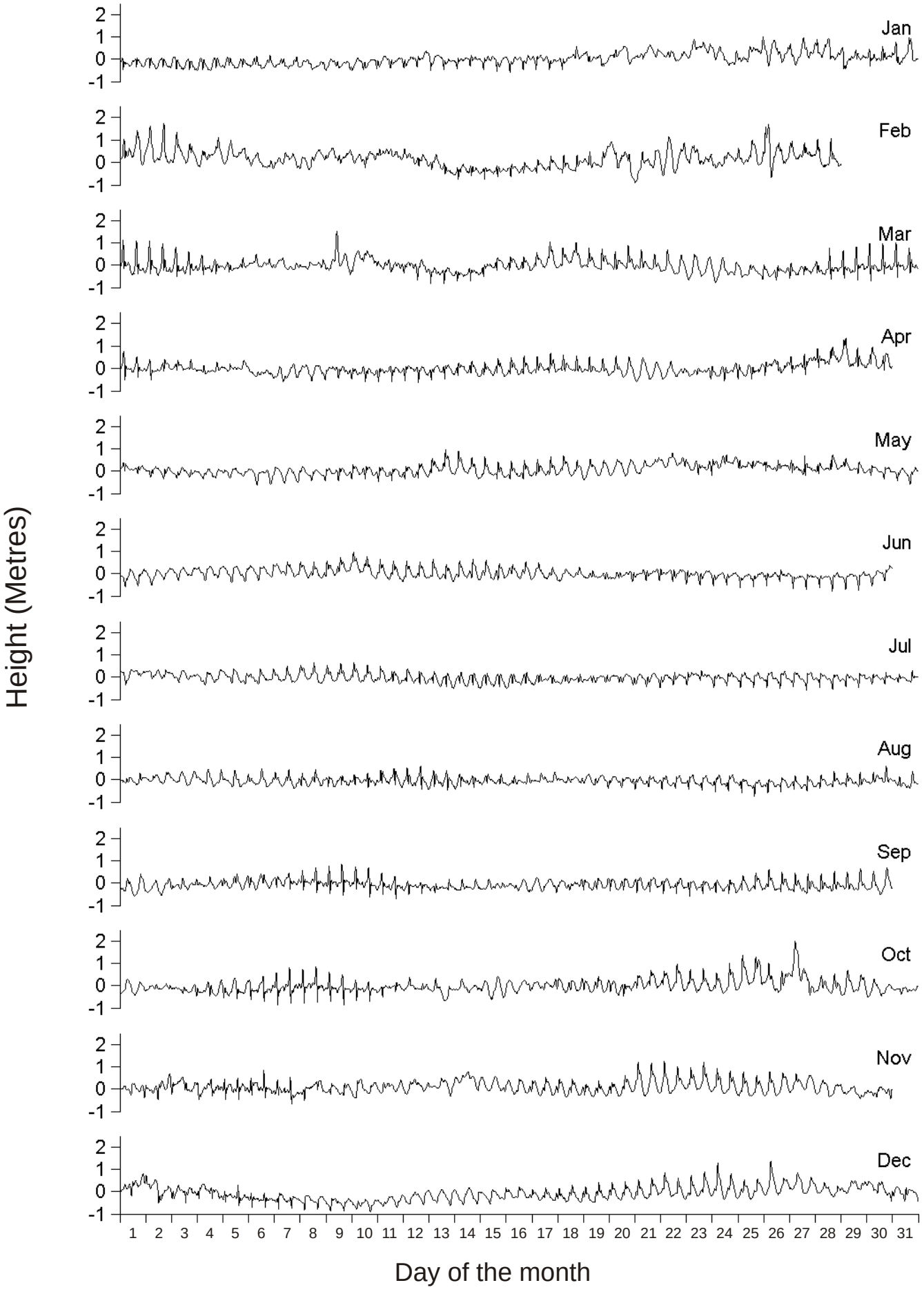
Residual Plots for Newlyn, 2002



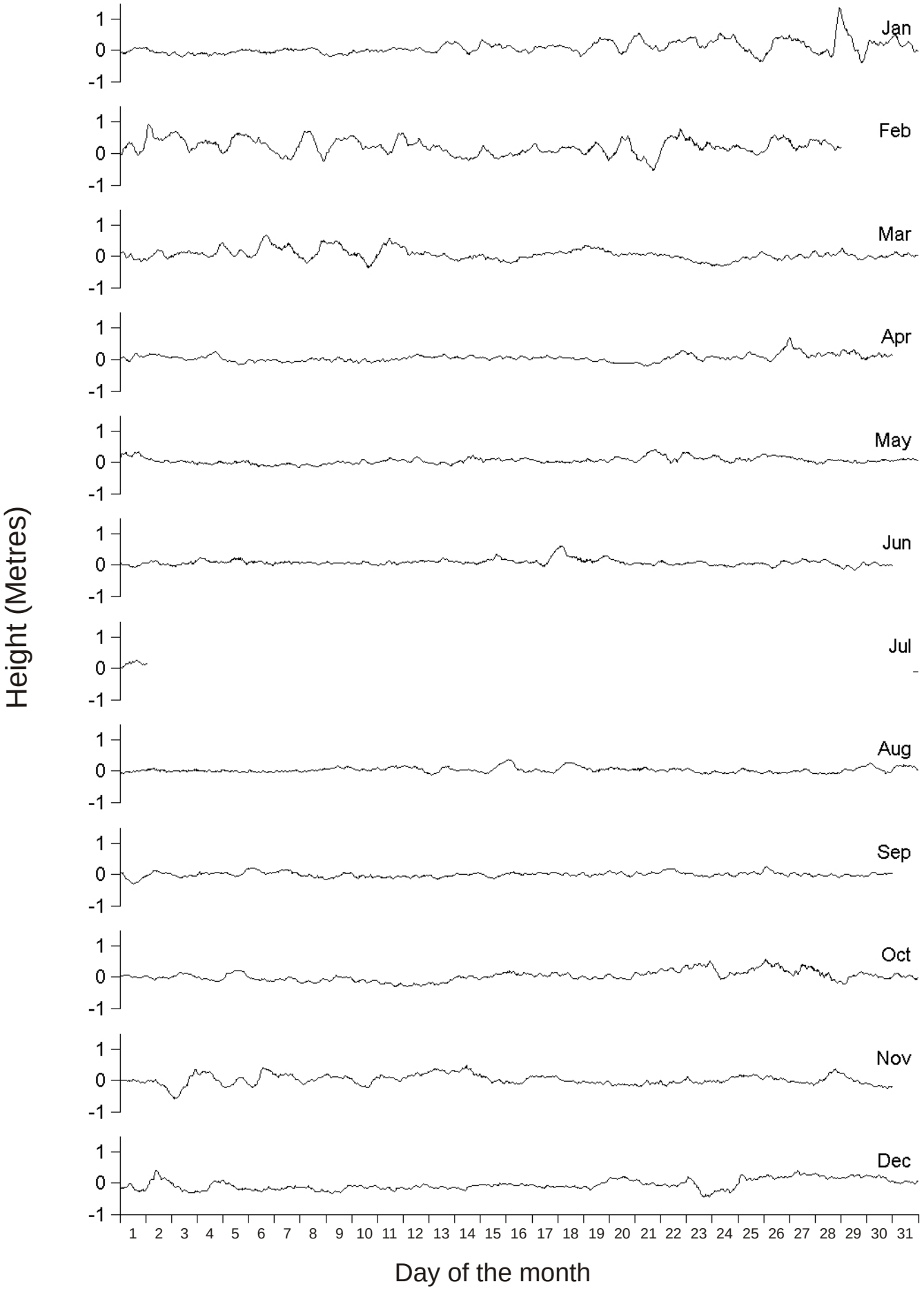
Residual Plots for Newhaven, 2002



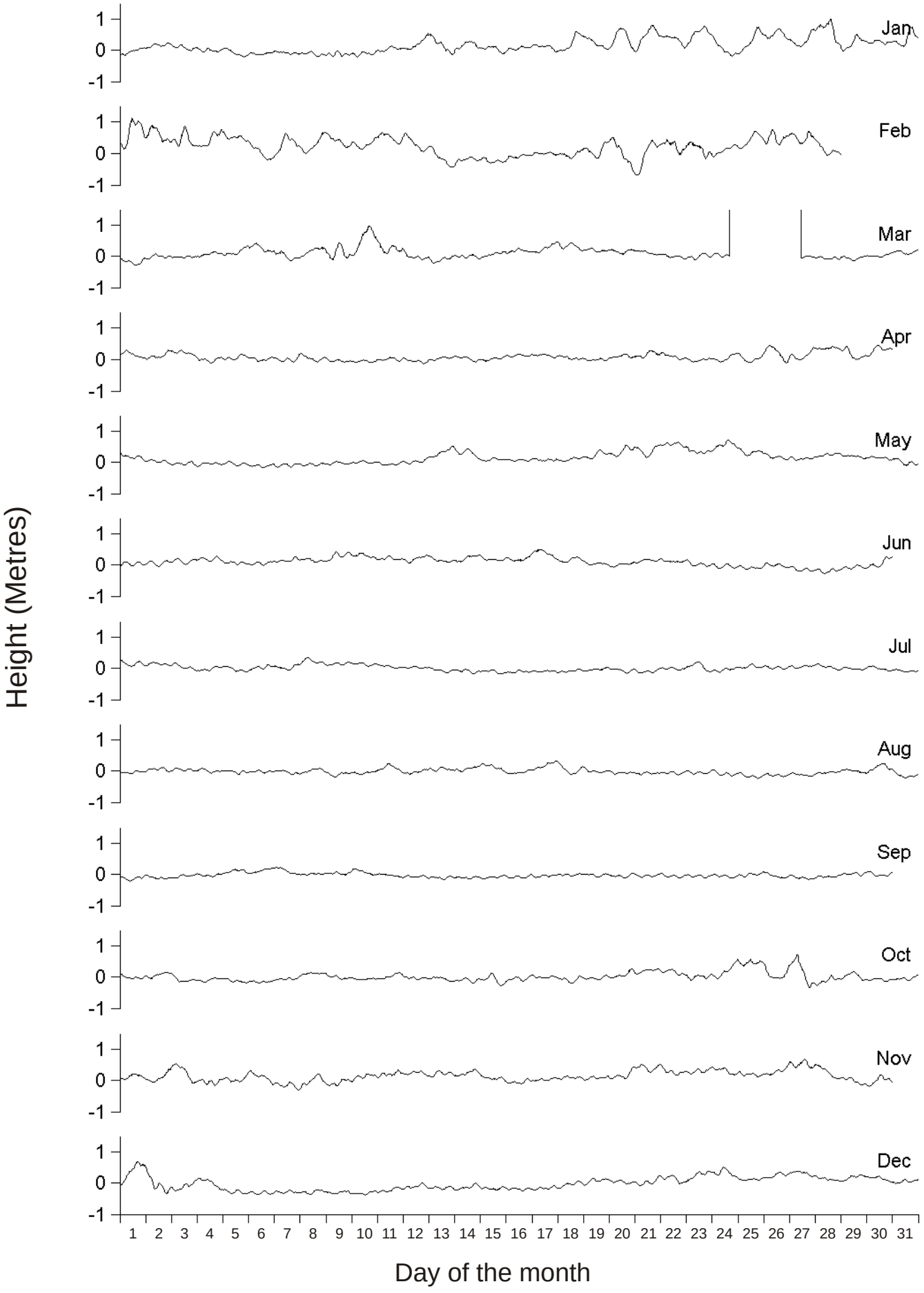
Residual Plots for Newport, 2002



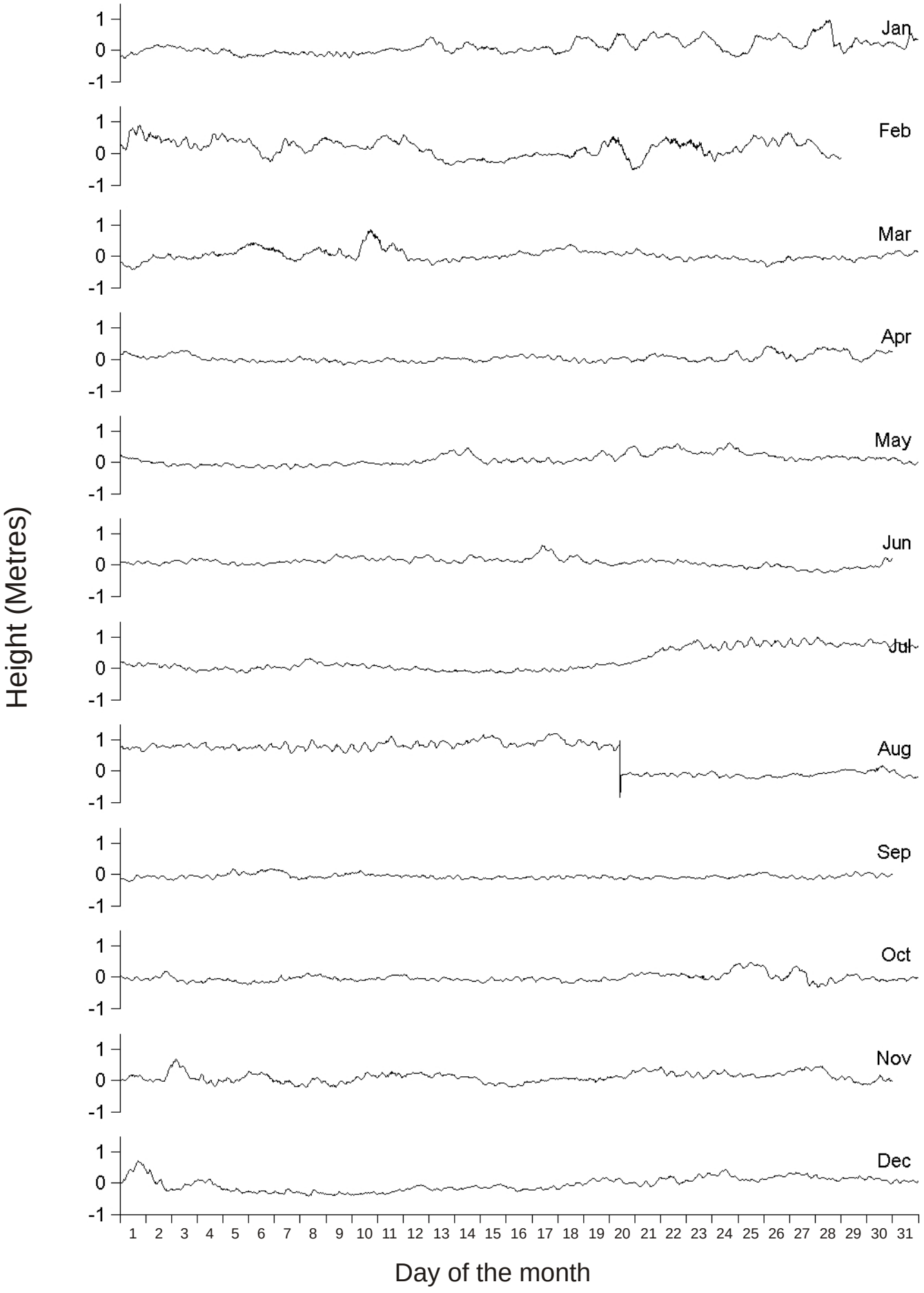
Residual Plots for North Shields, 2002



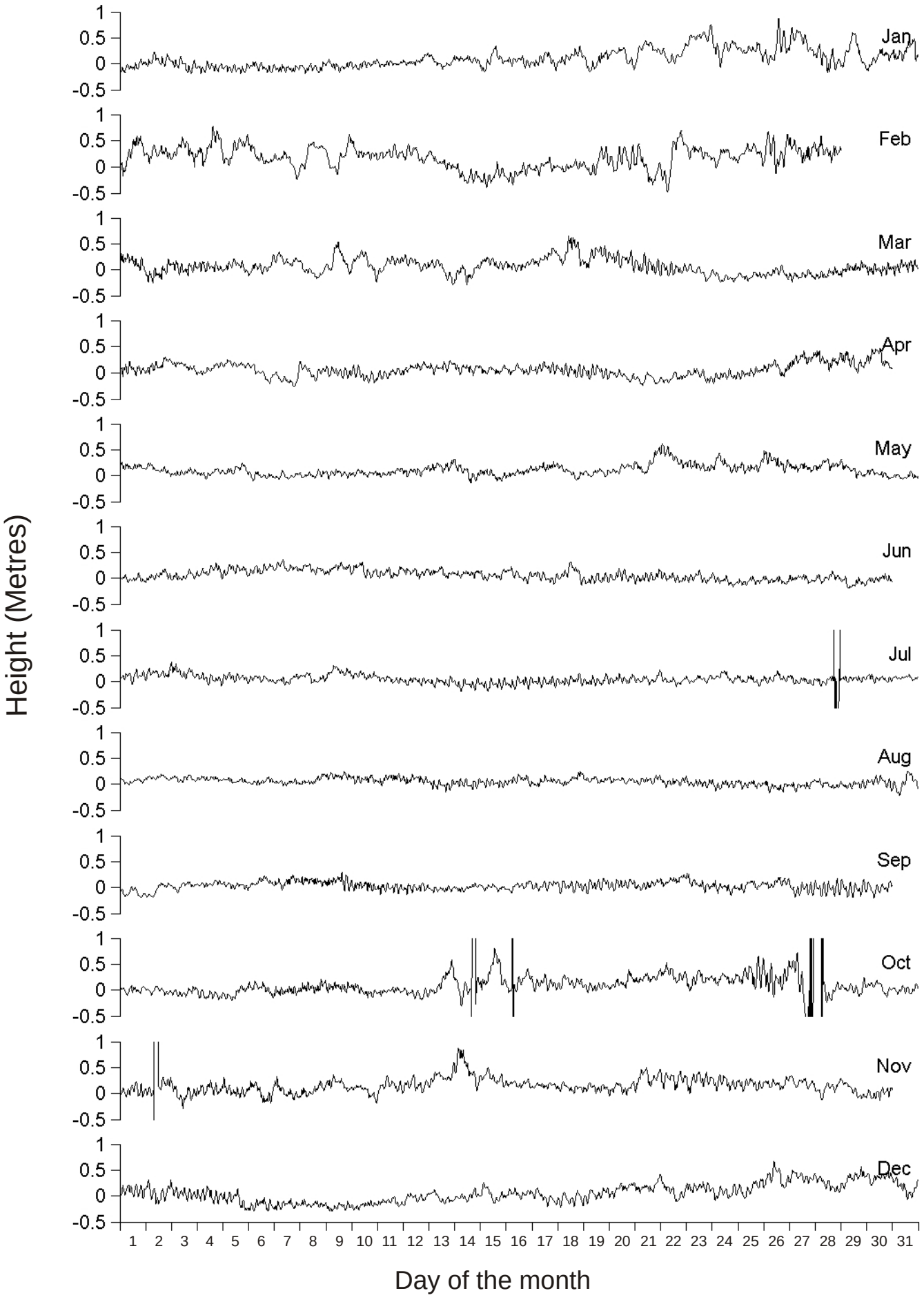
Residual Plots for Portpatrick, 2002



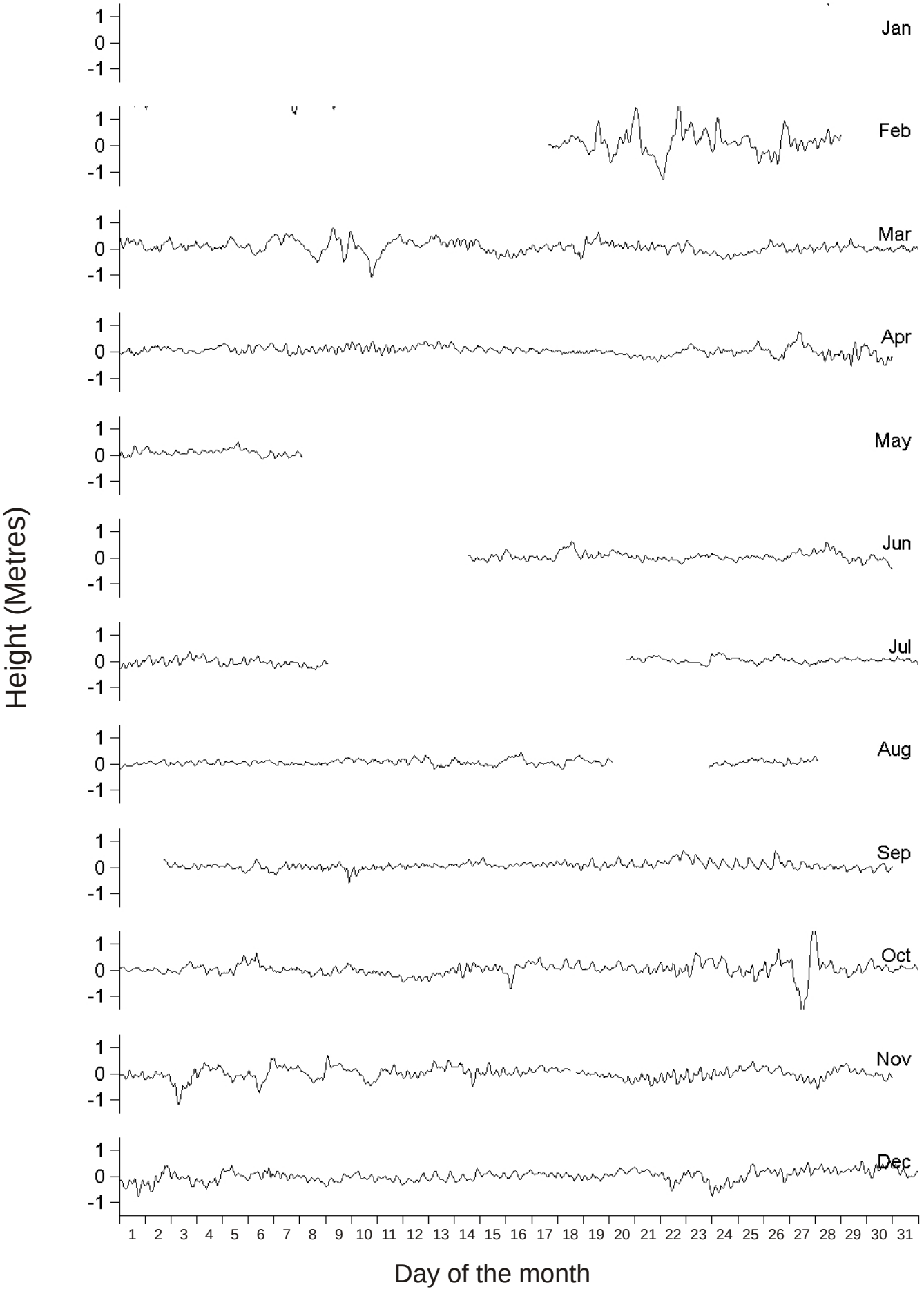
Residual Plots for Portrush, 2002



Residual Plots for Portsmouth, 2002



Residual Plots for Sheerness, 2002



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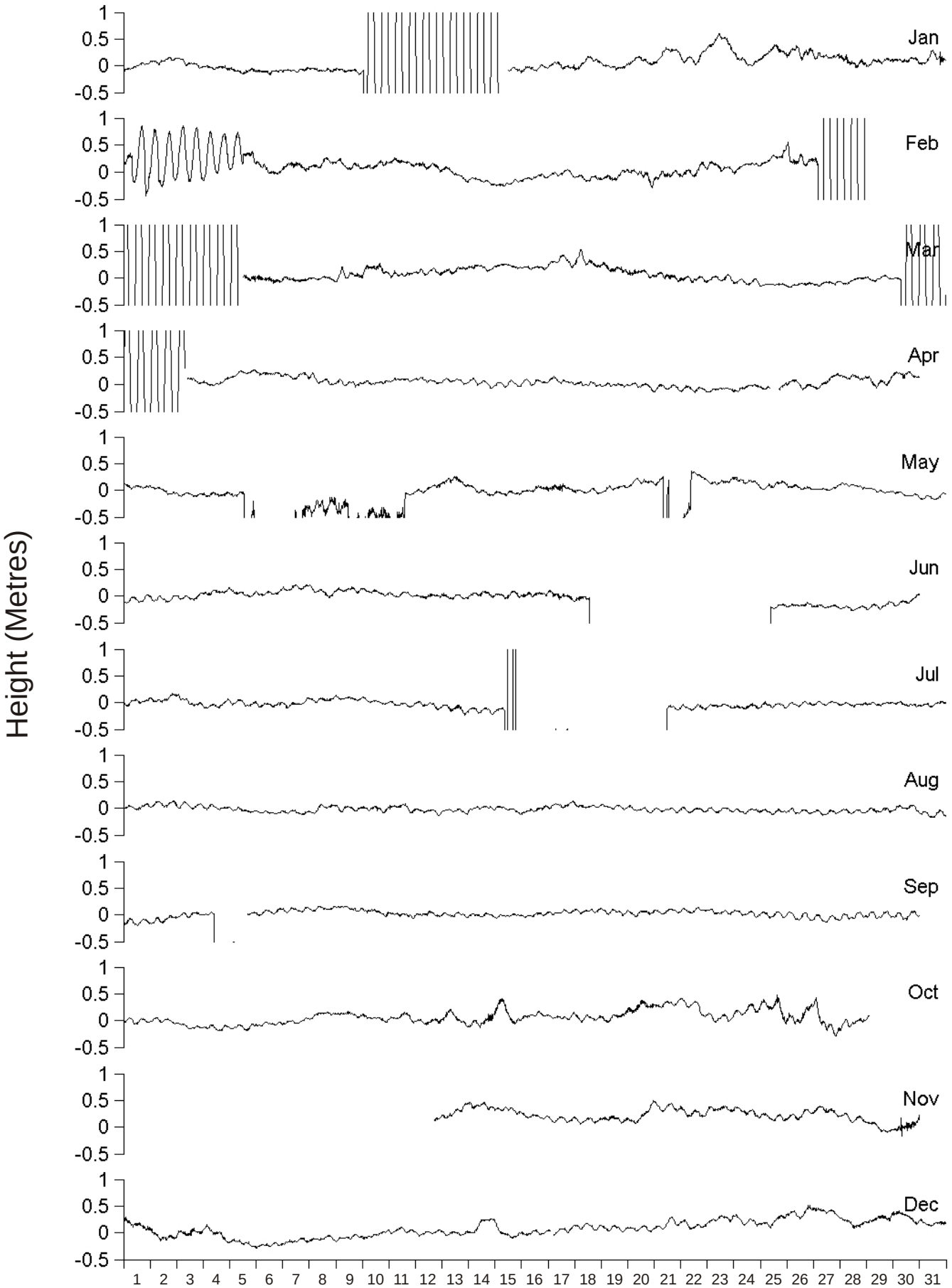

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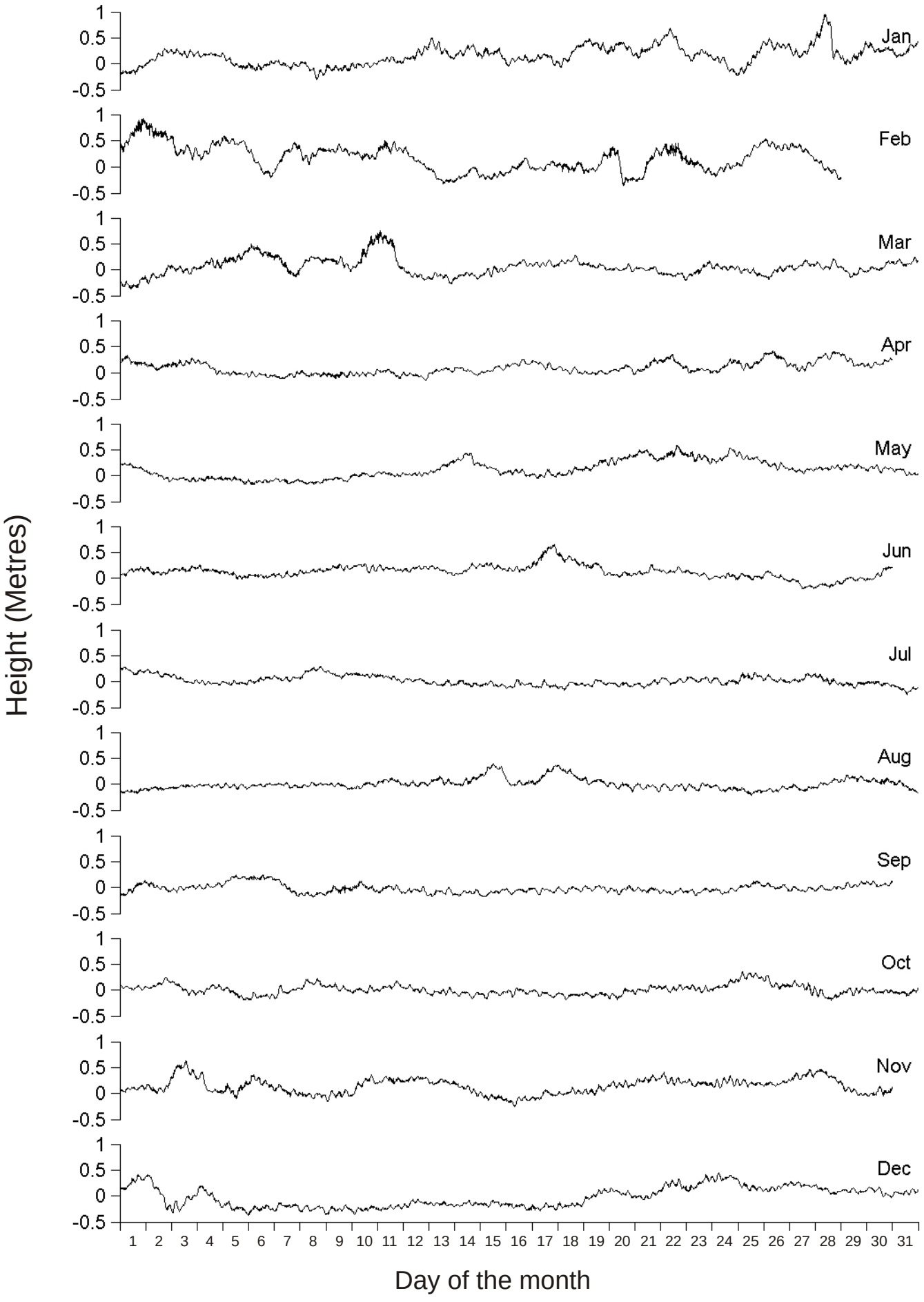

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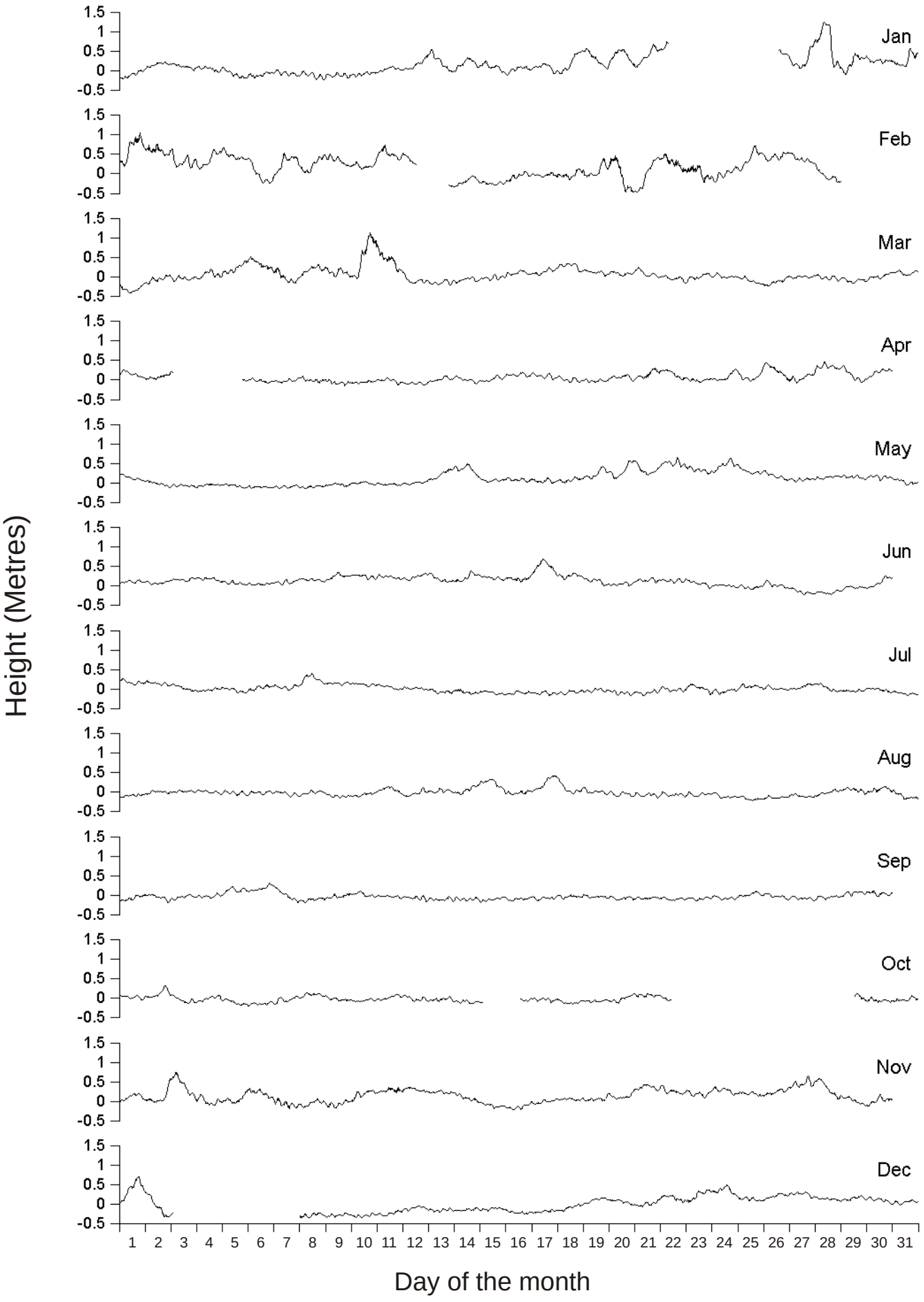

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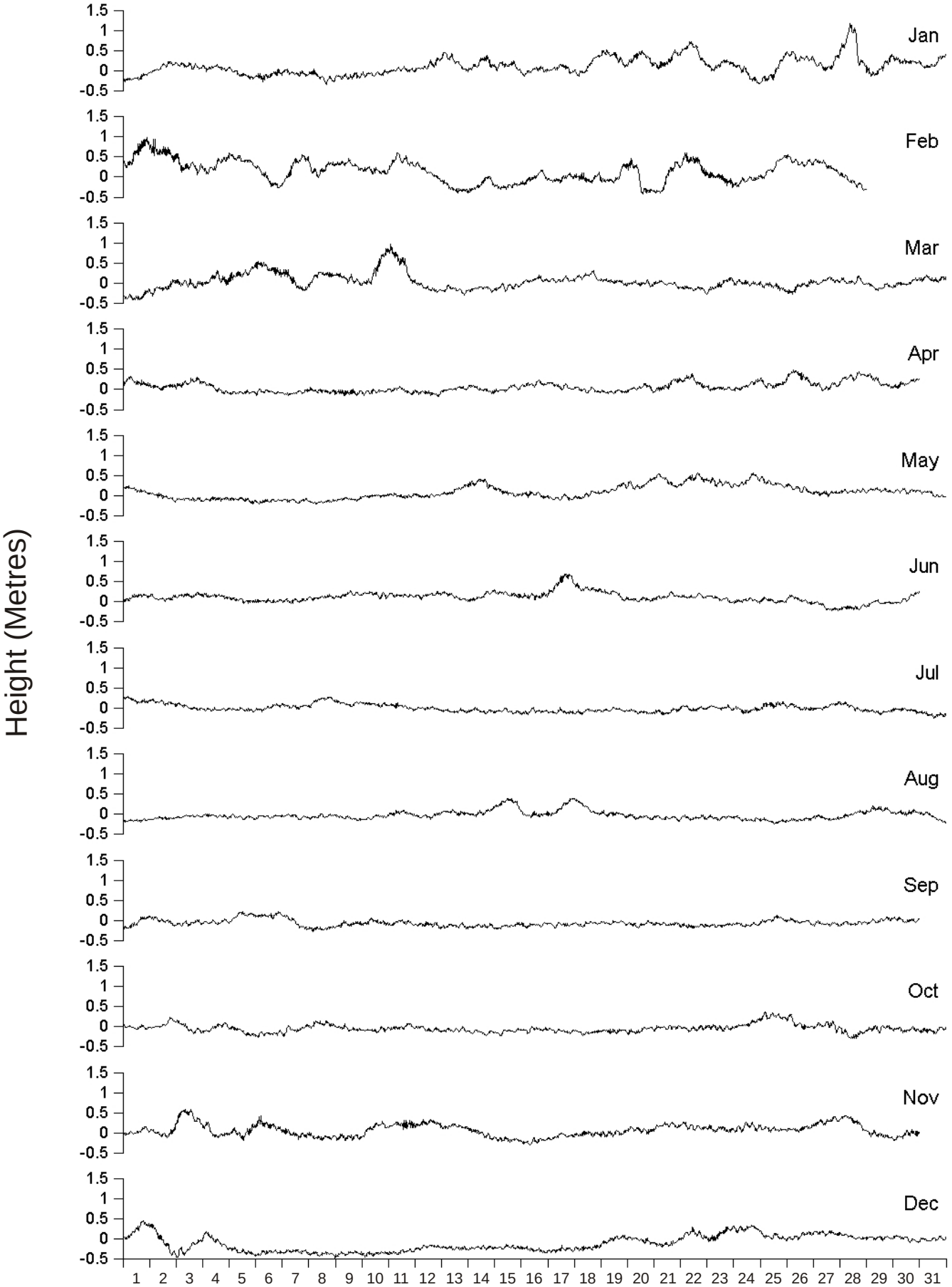

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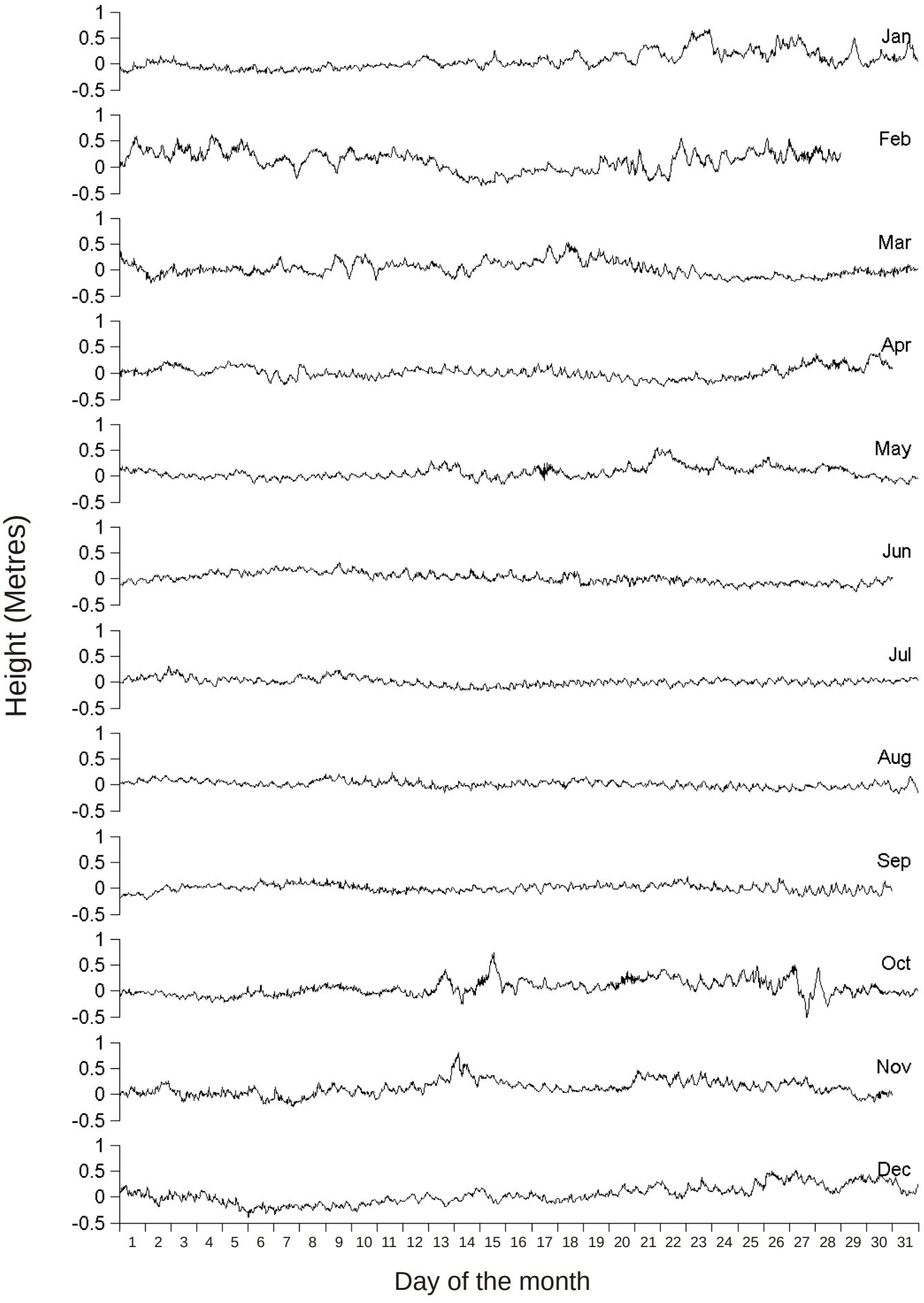

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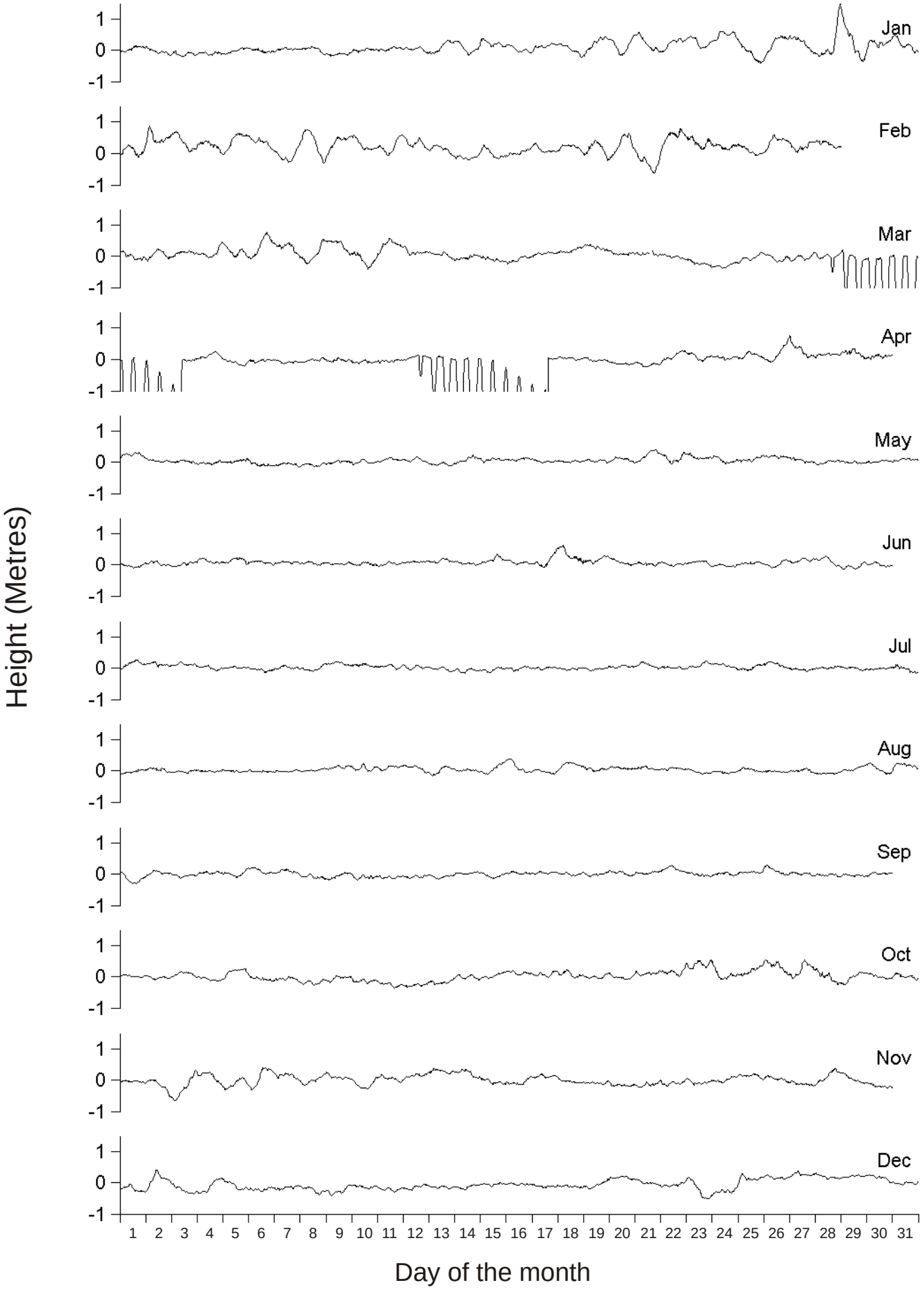

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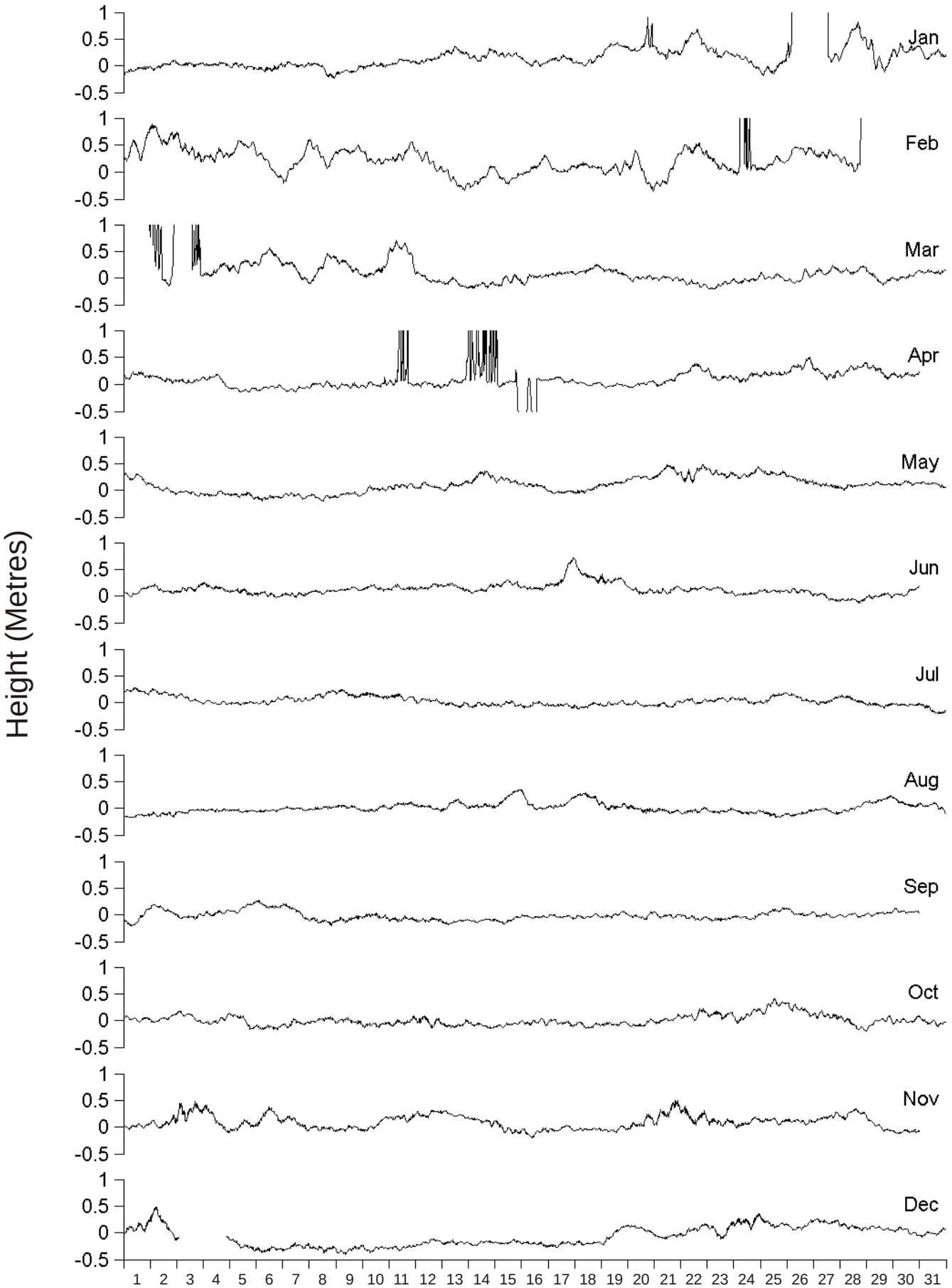

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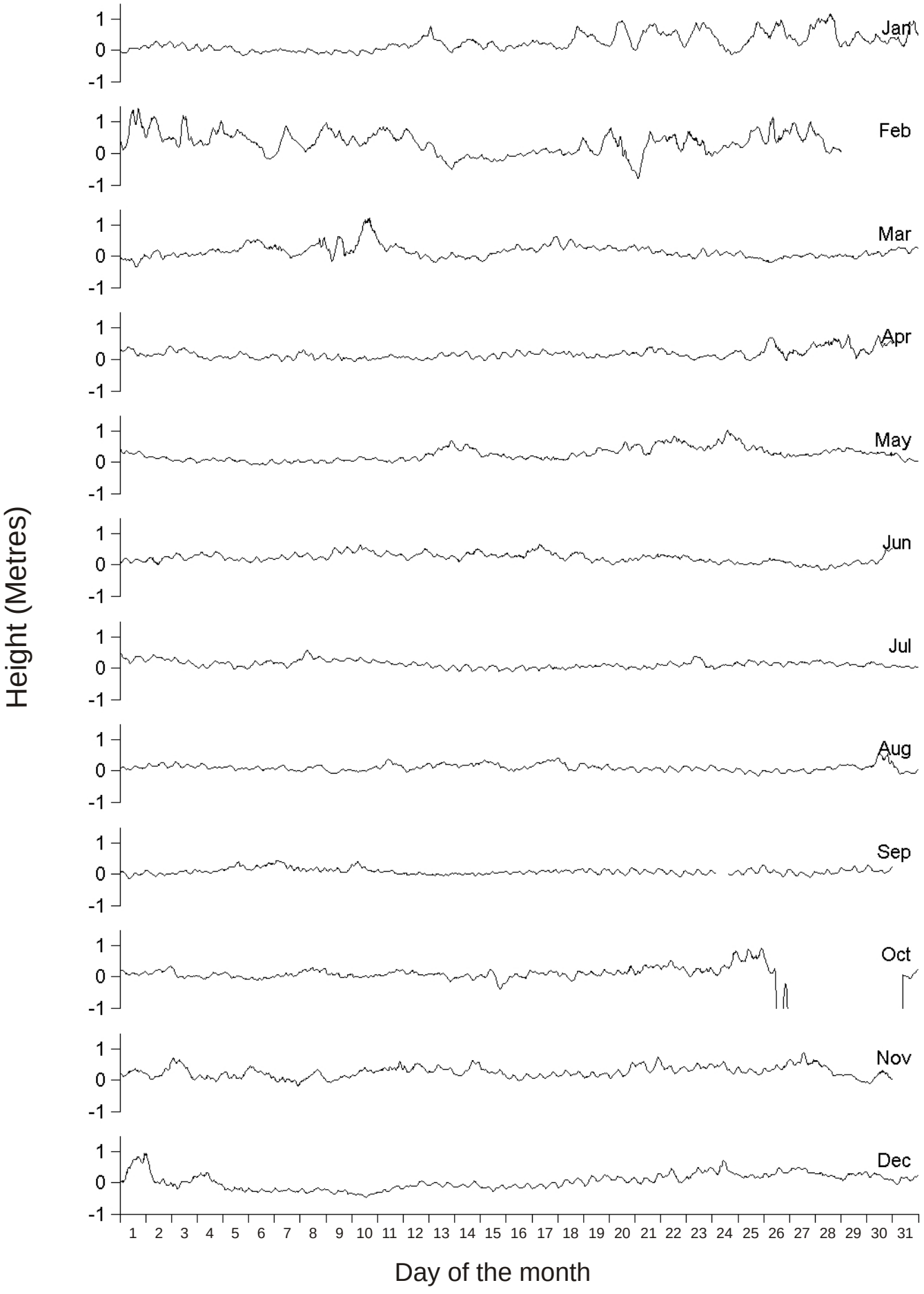

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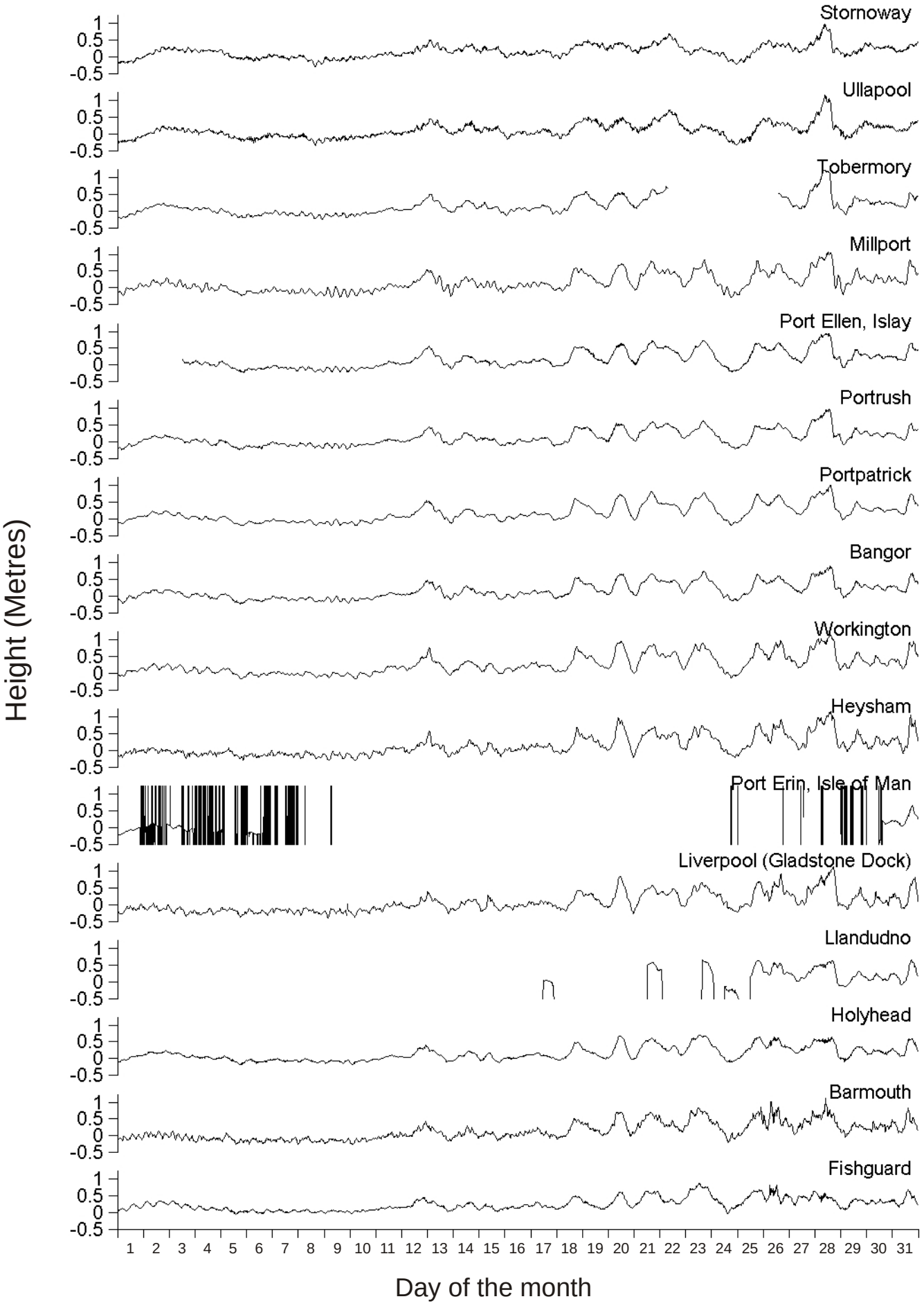

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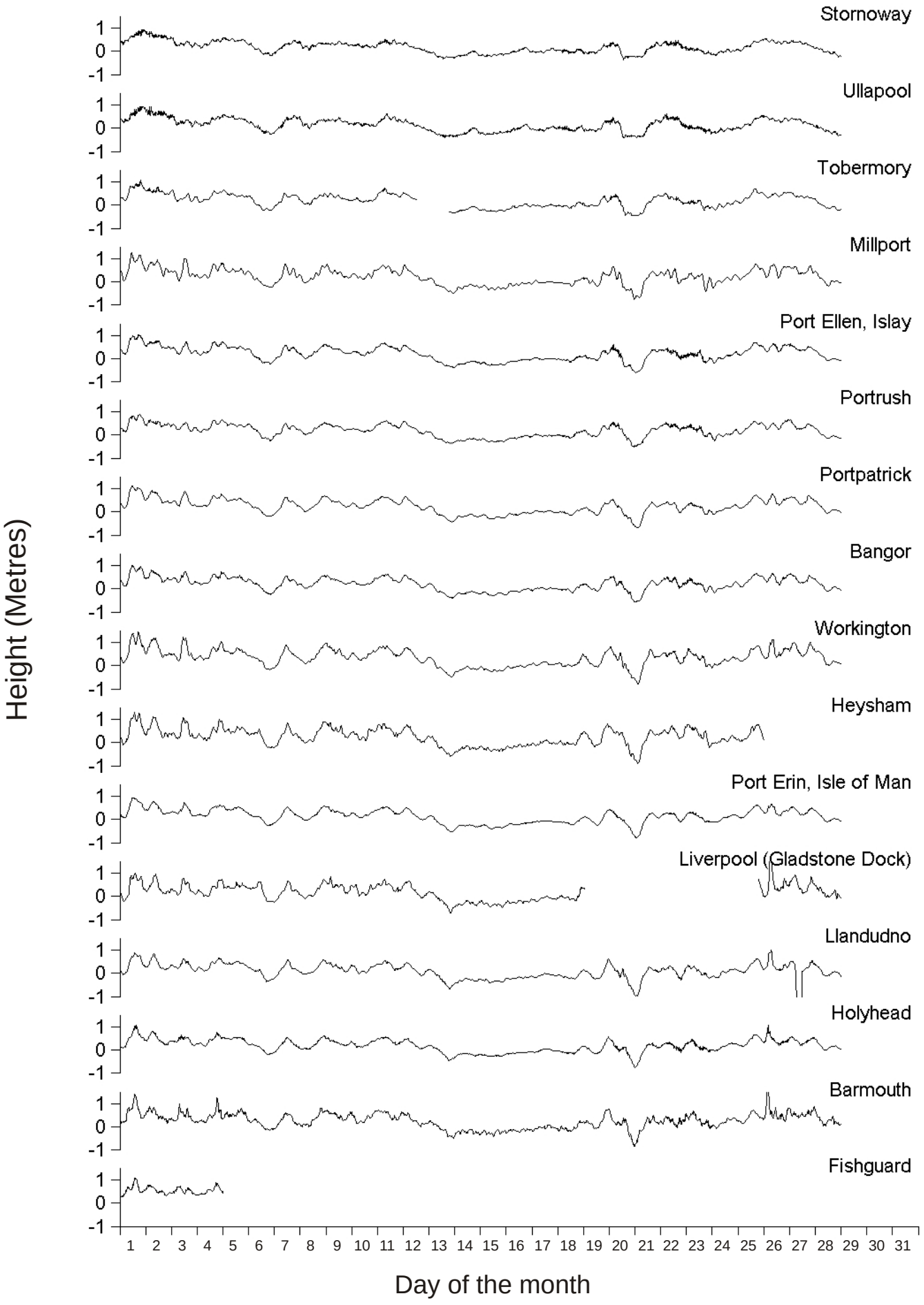

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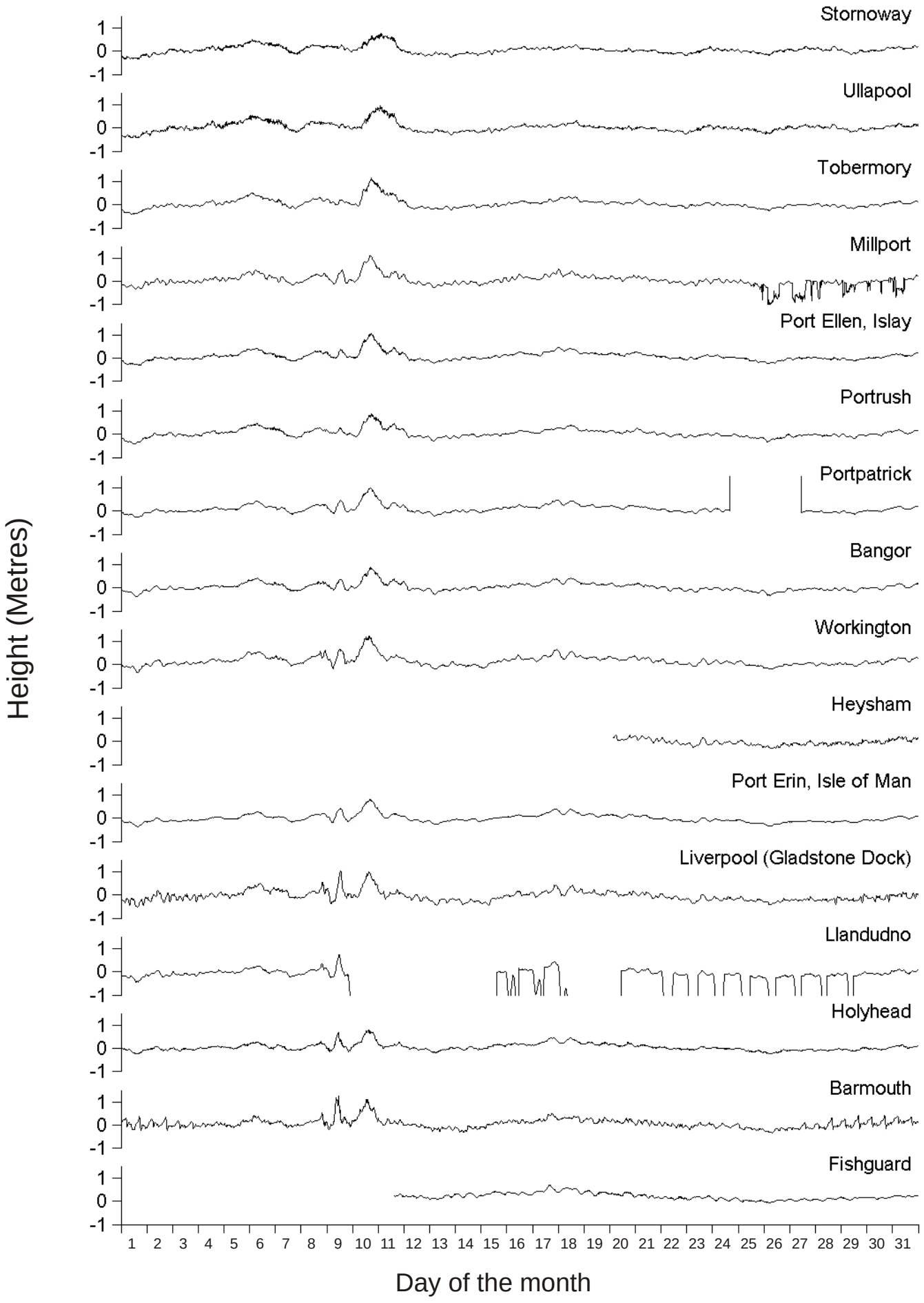

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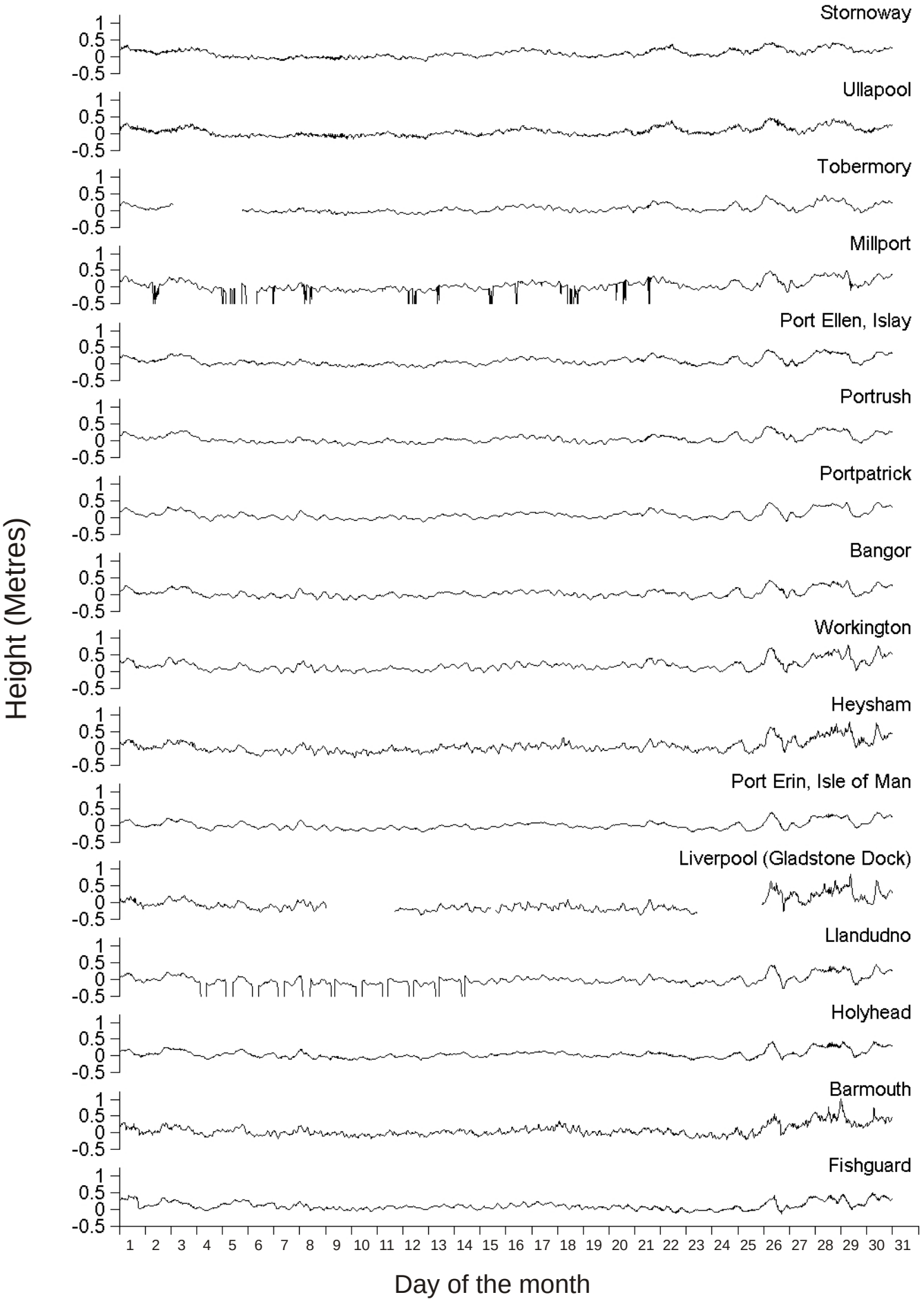

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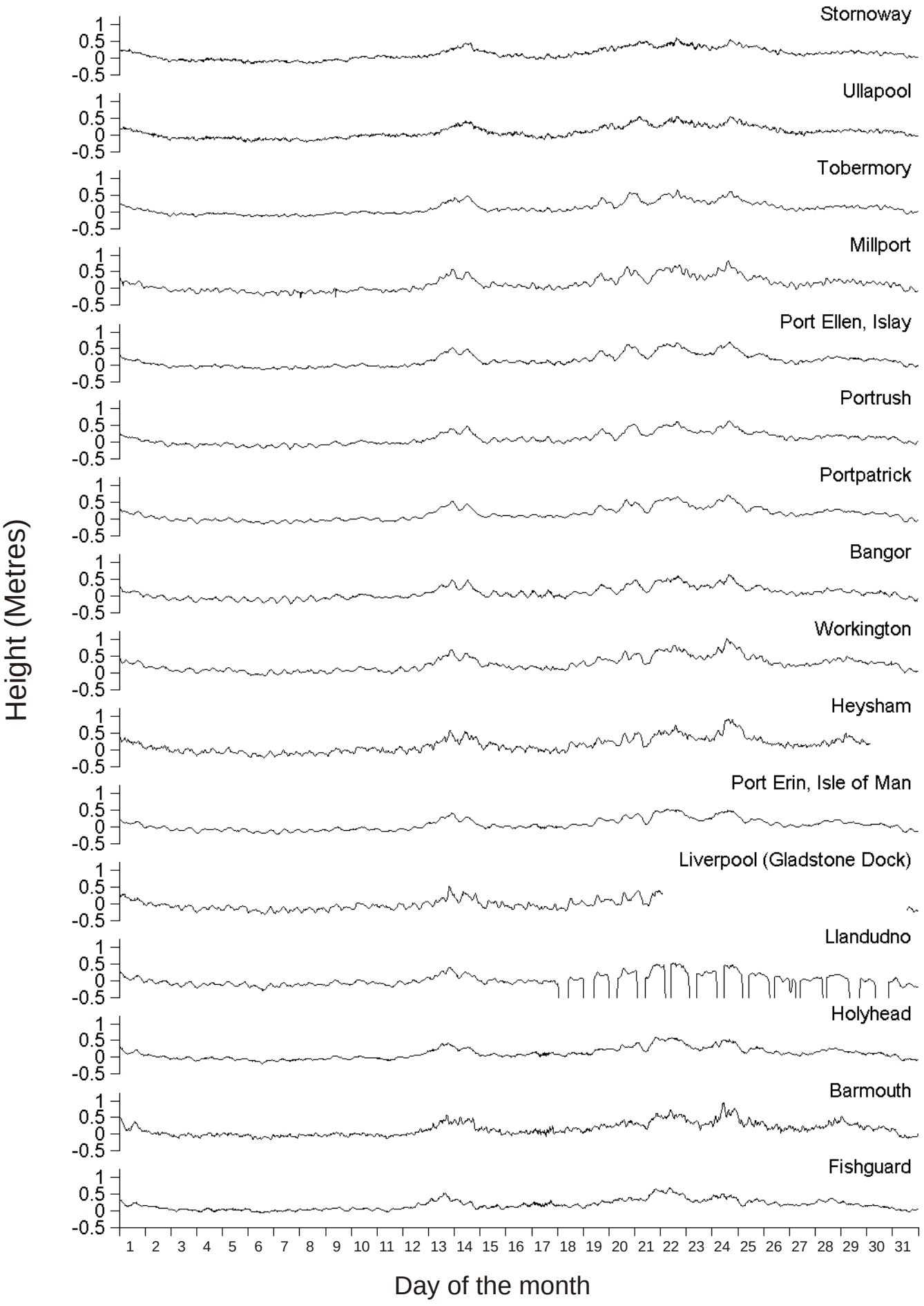

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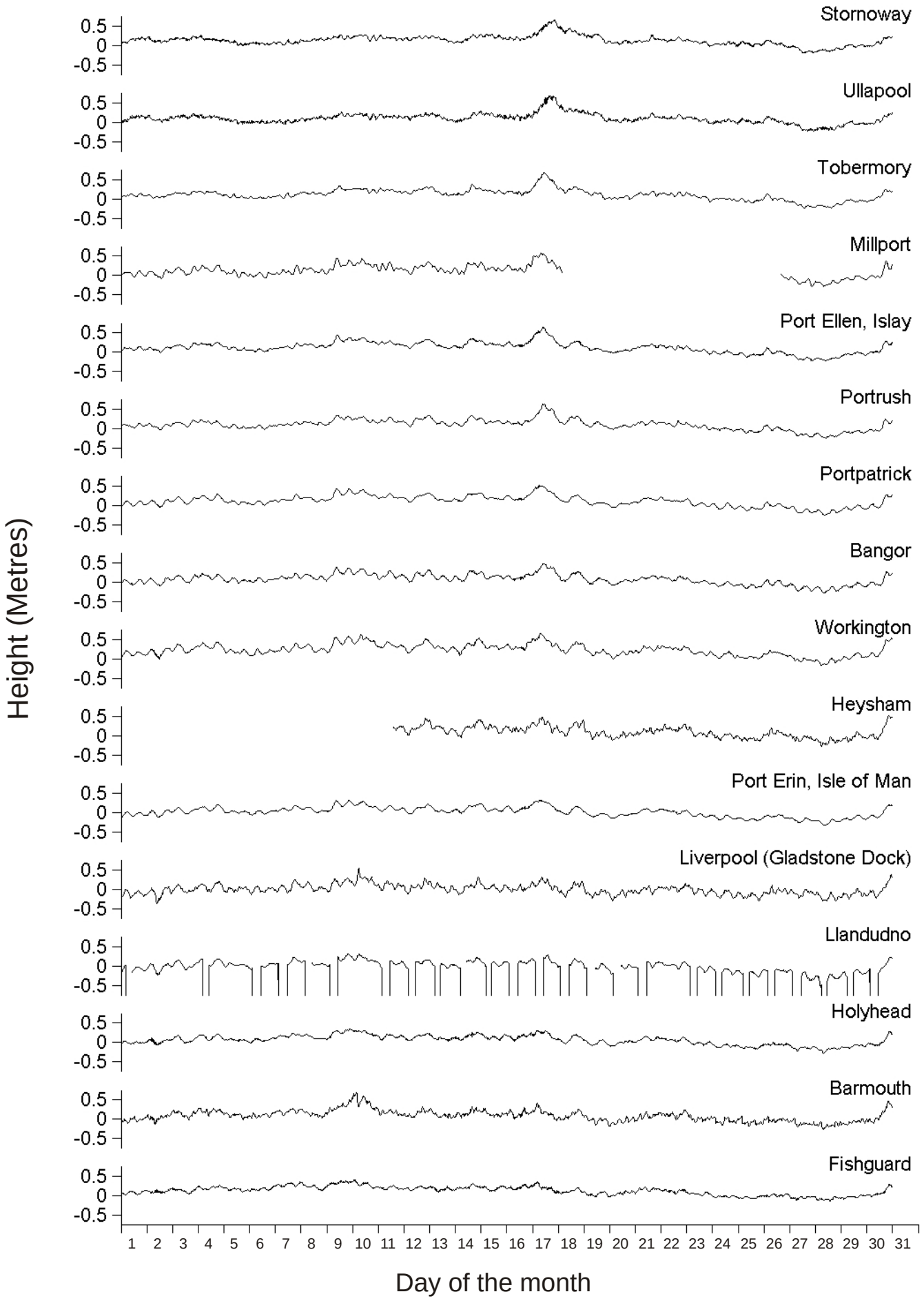

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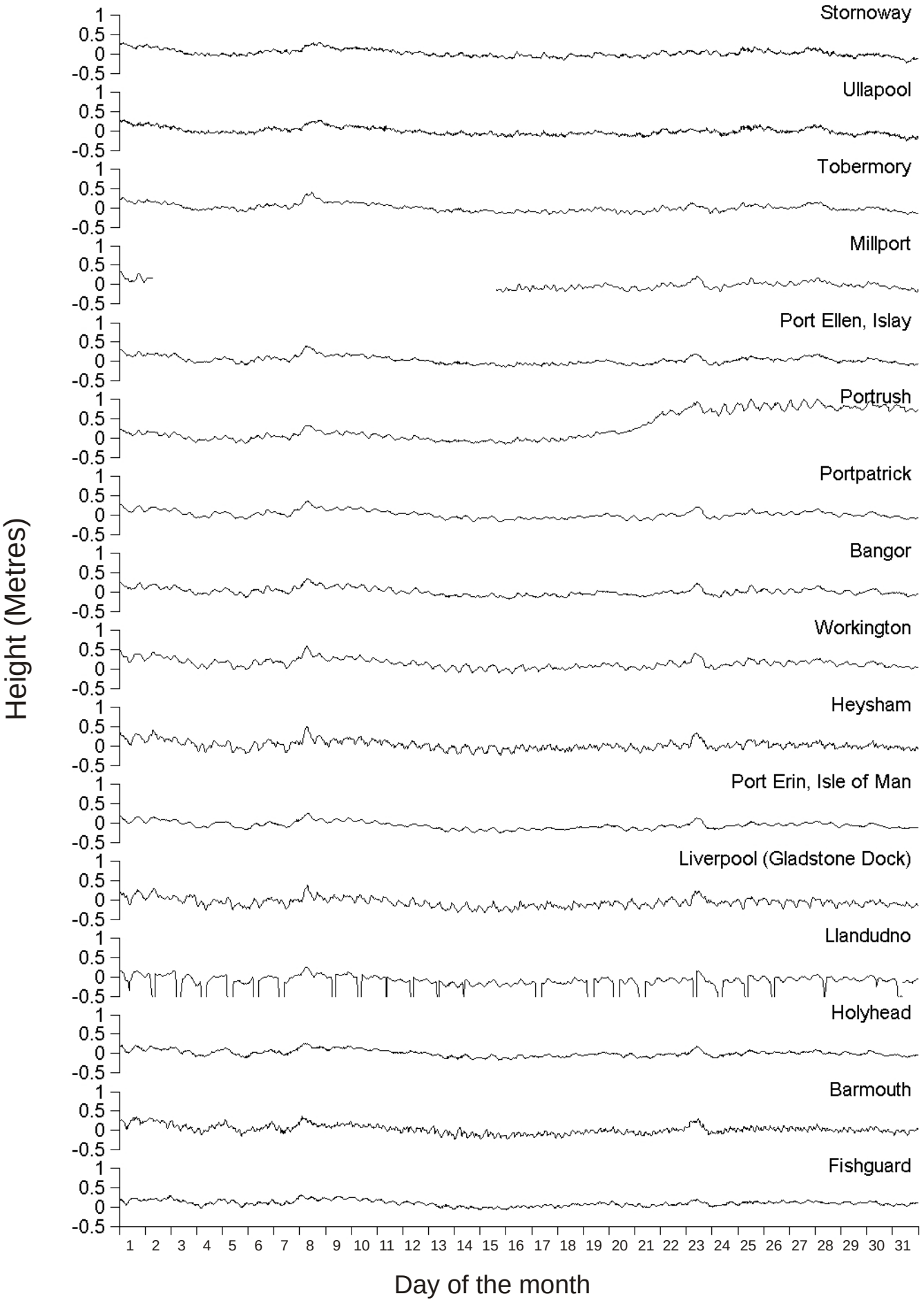

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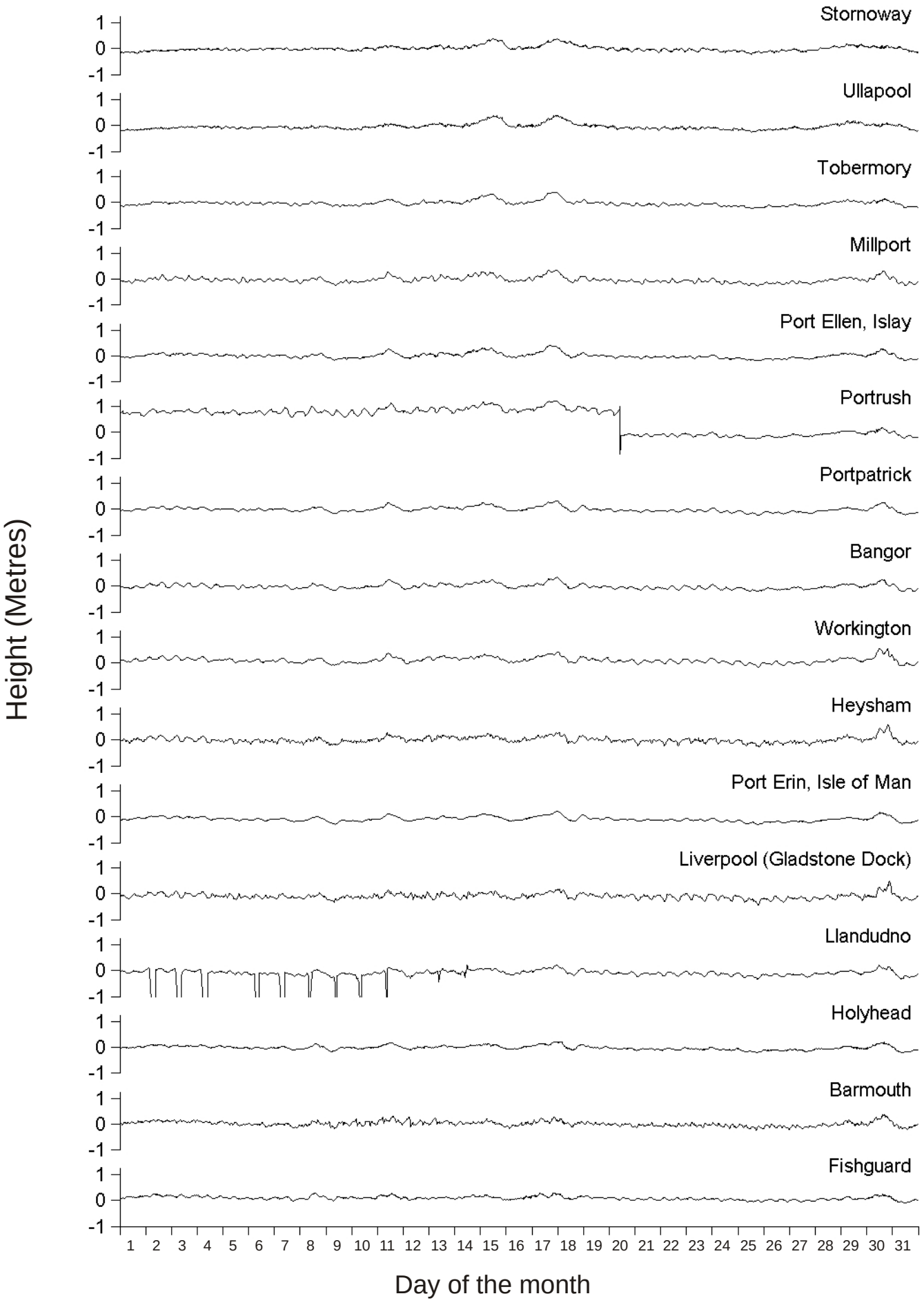

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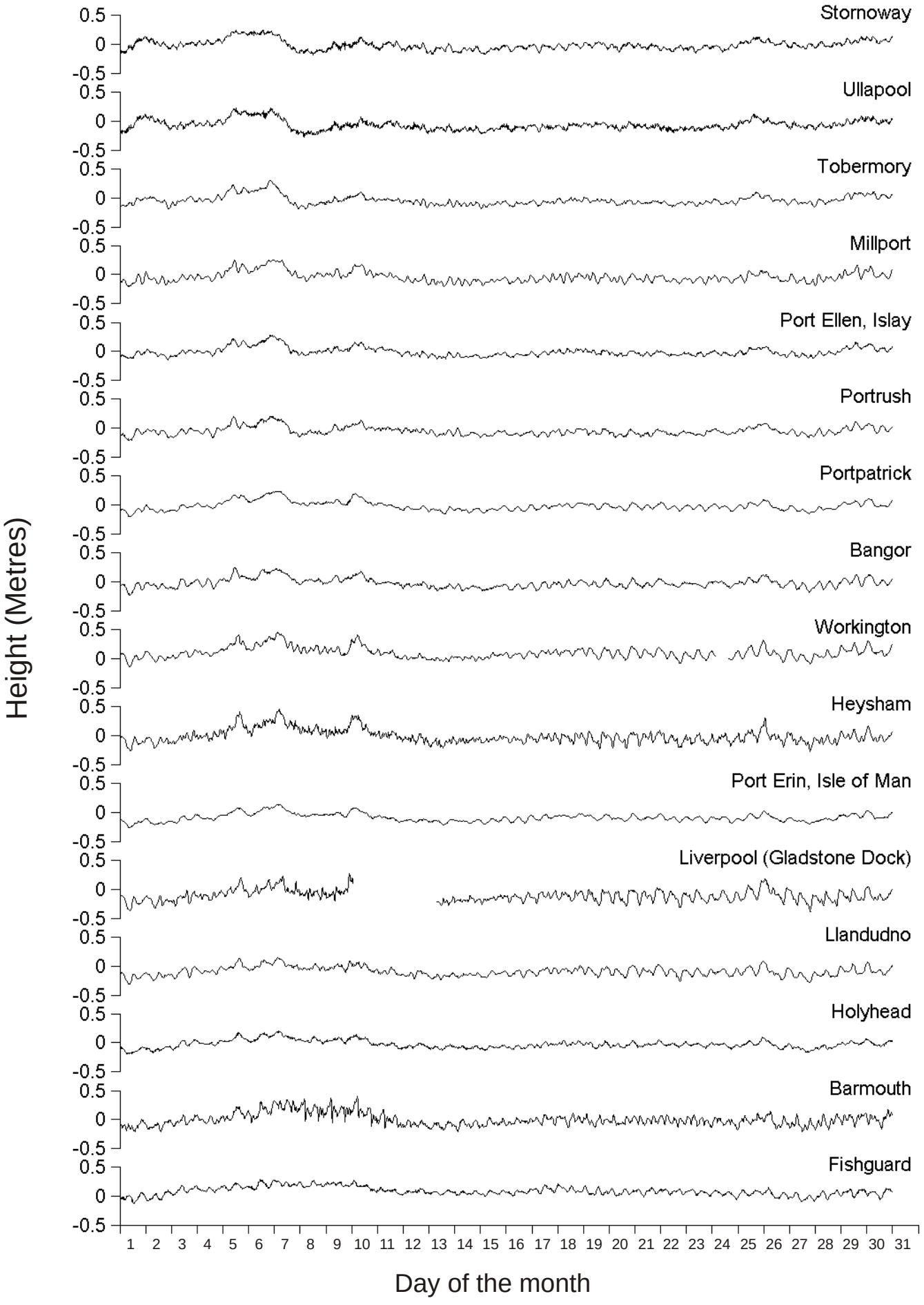

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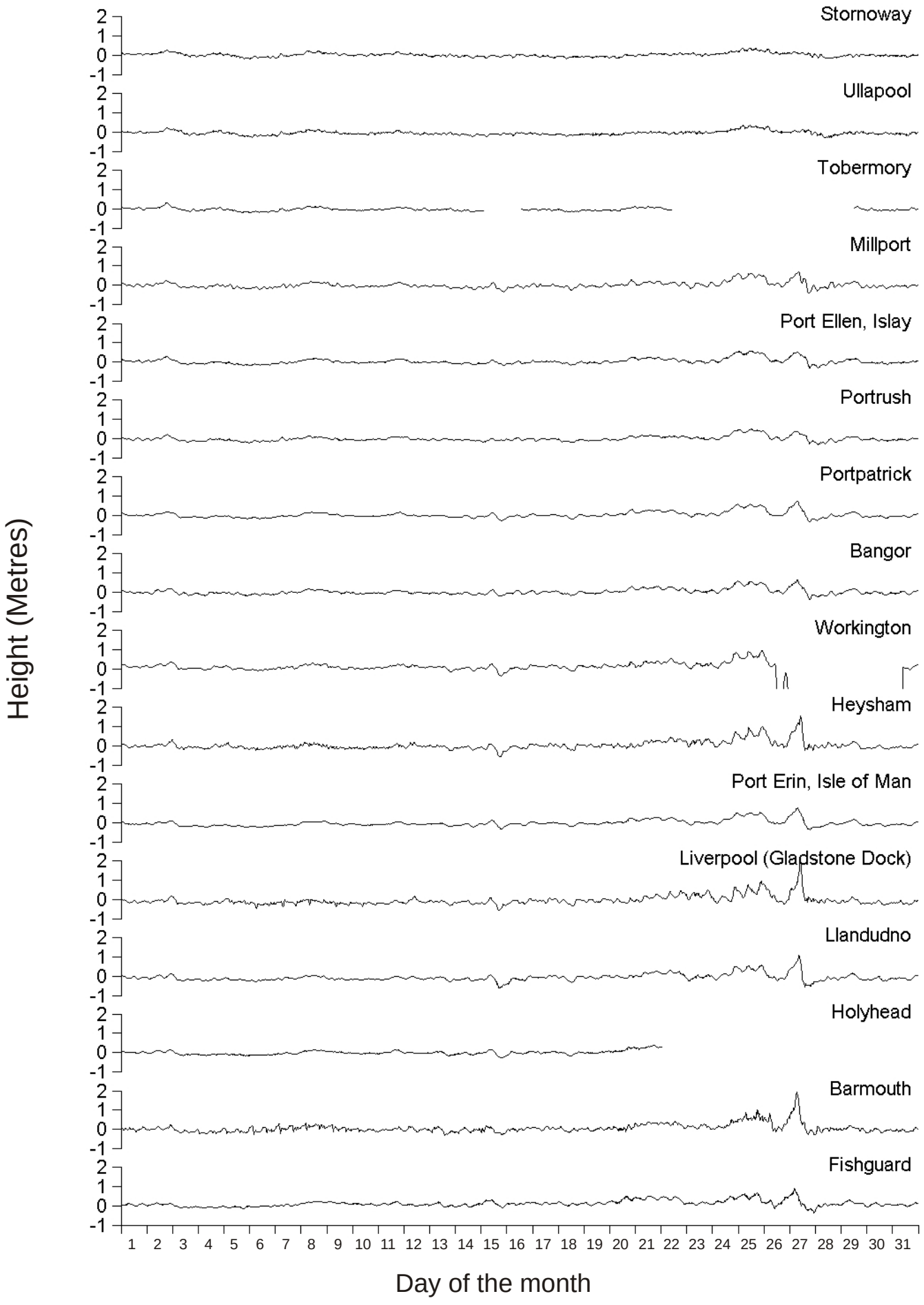

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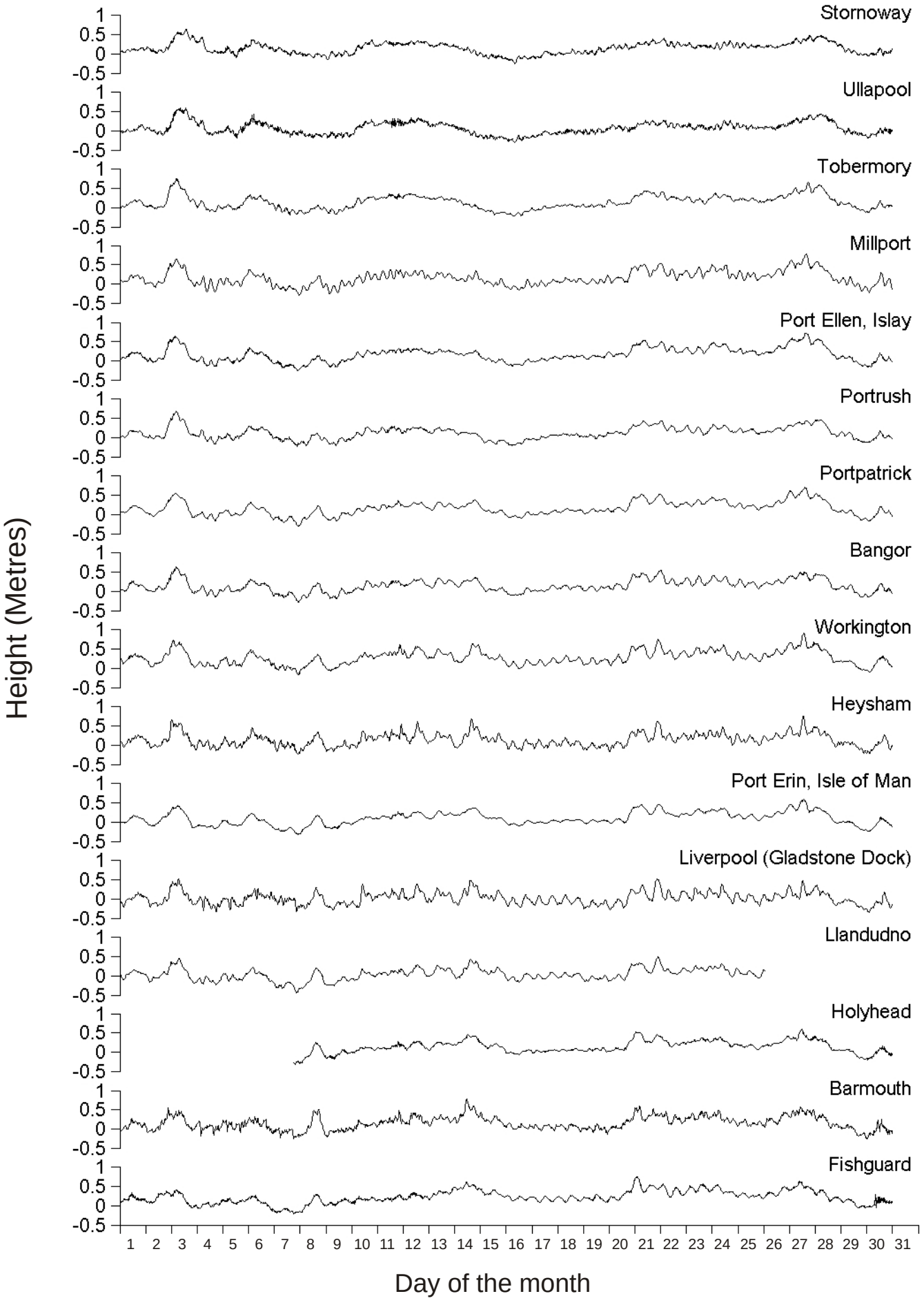

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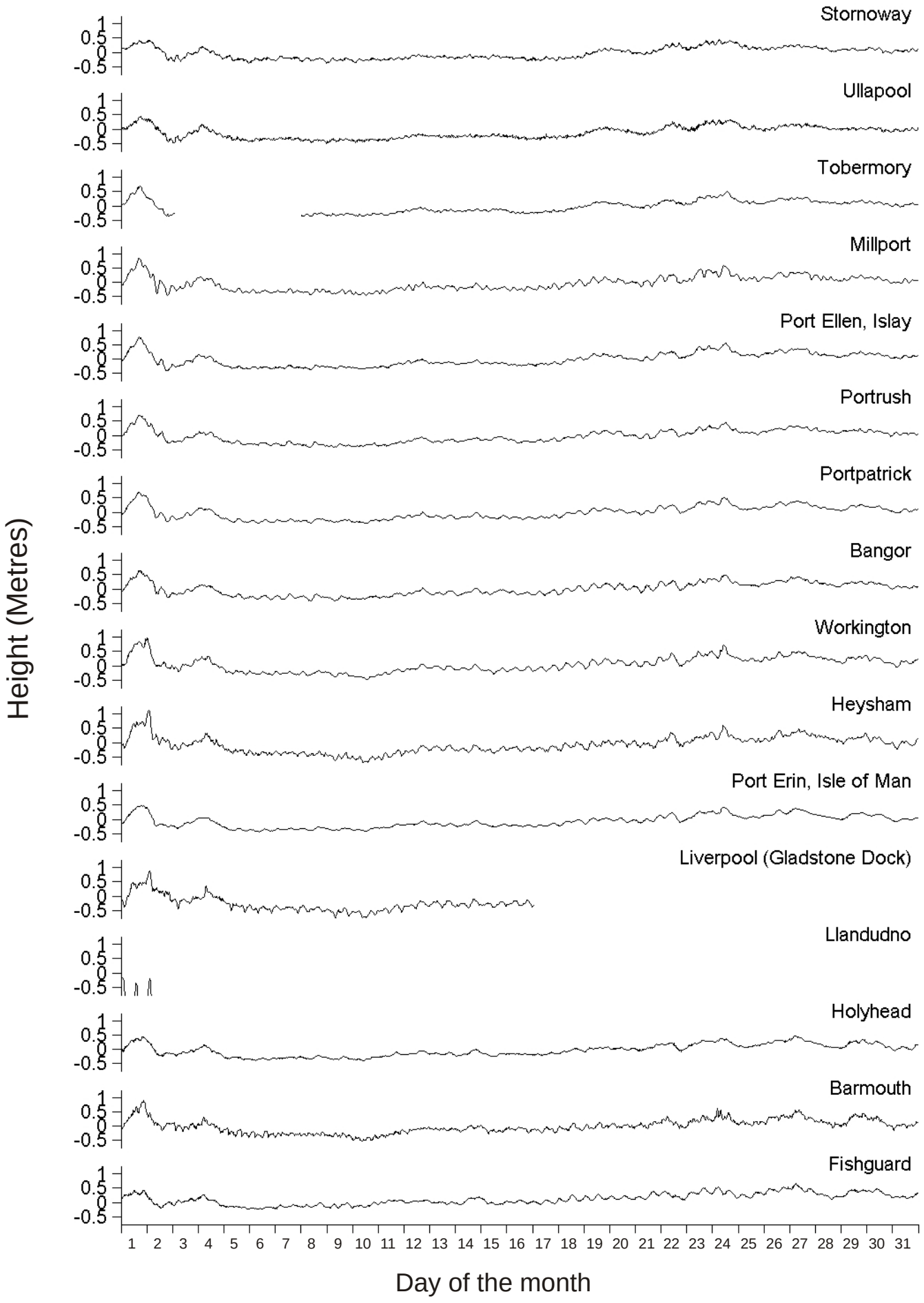

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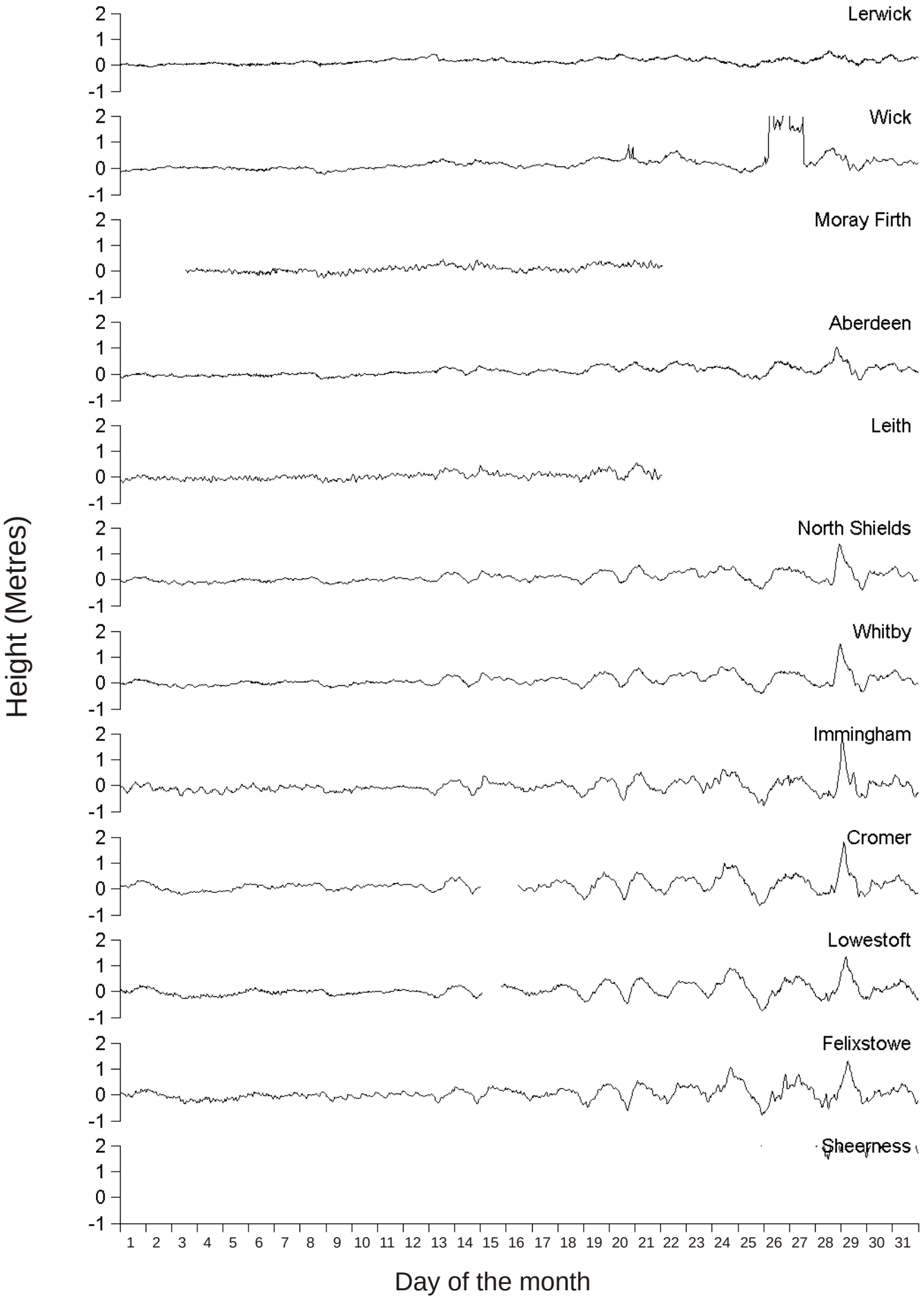

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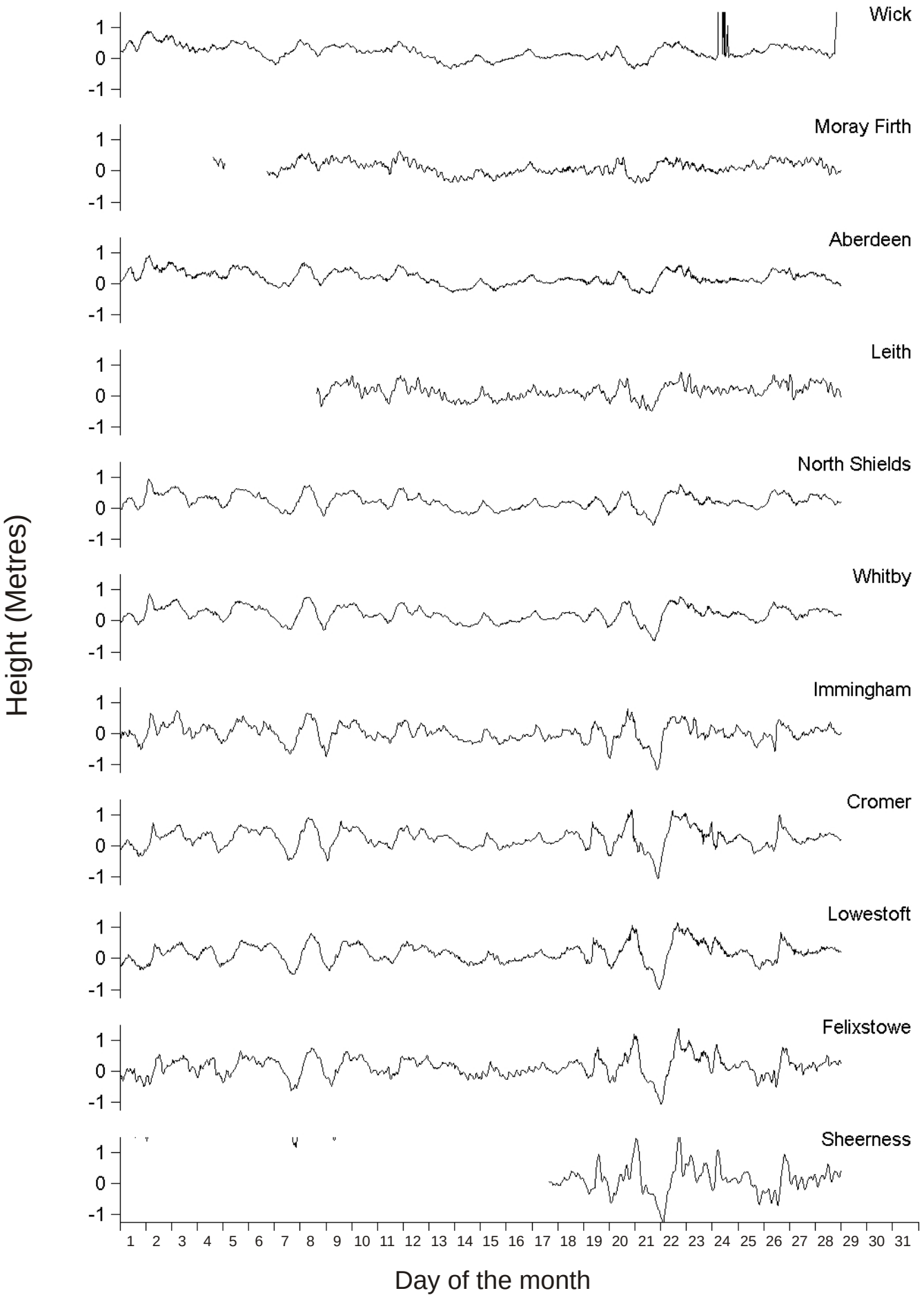

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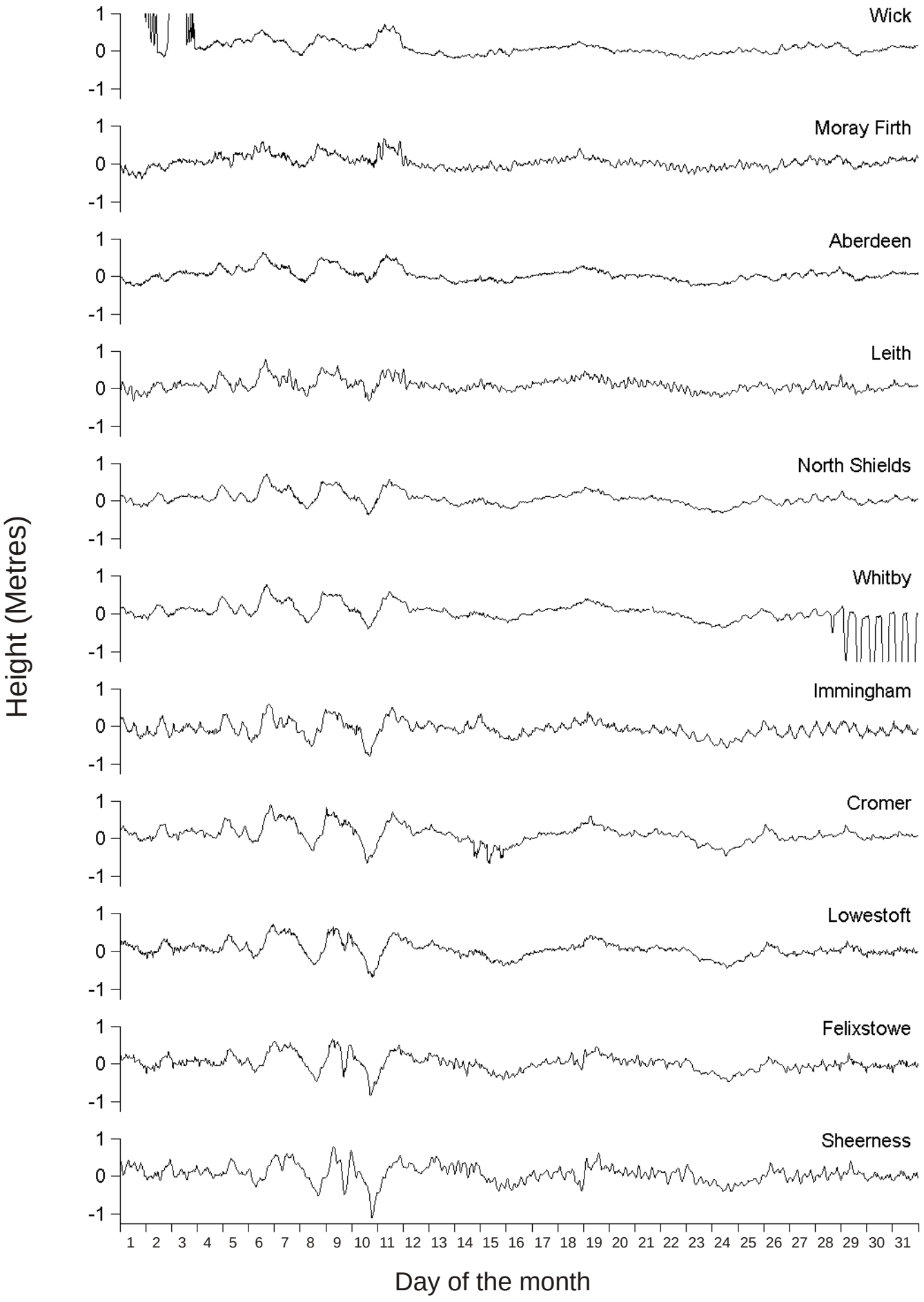

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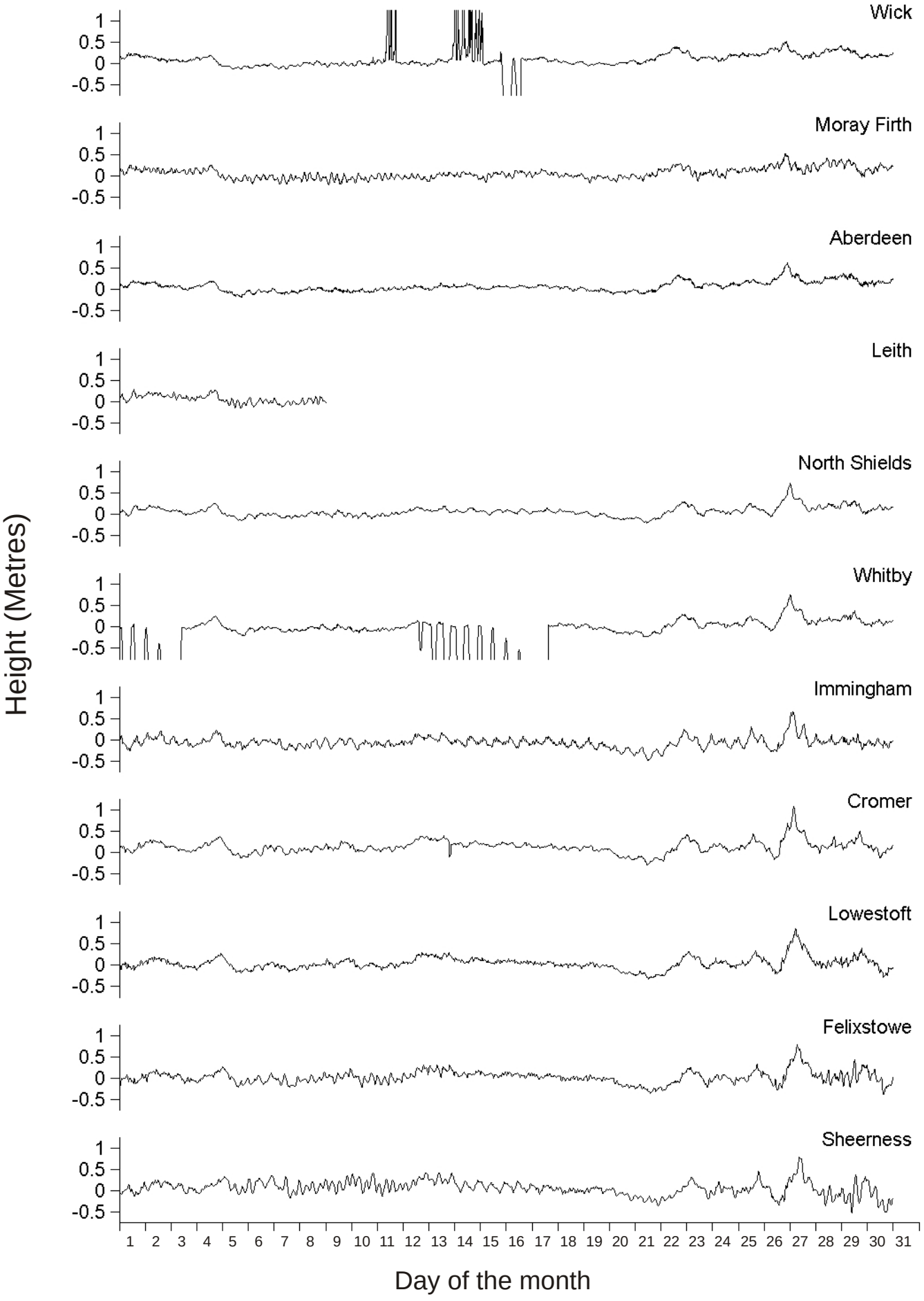

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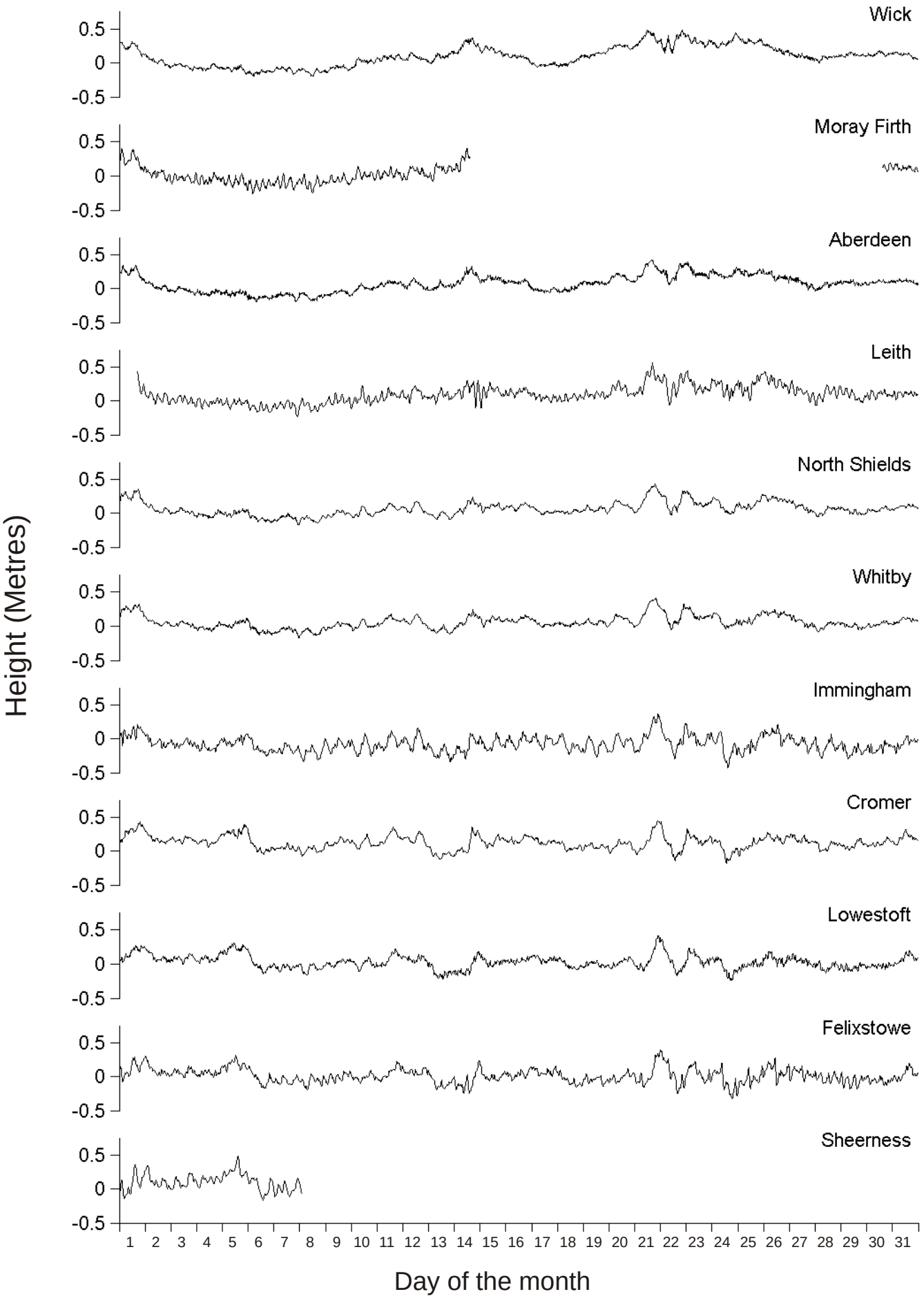

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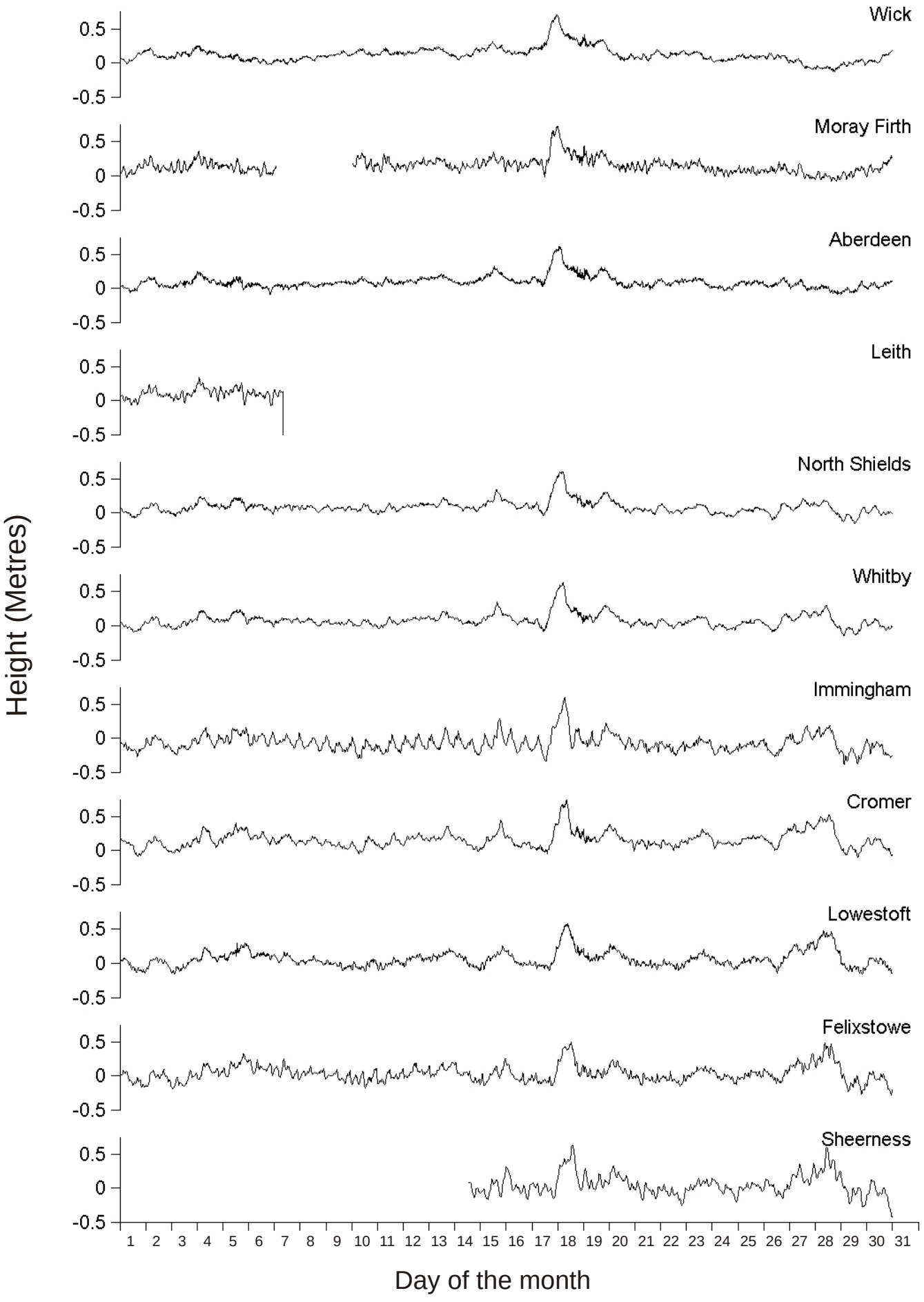

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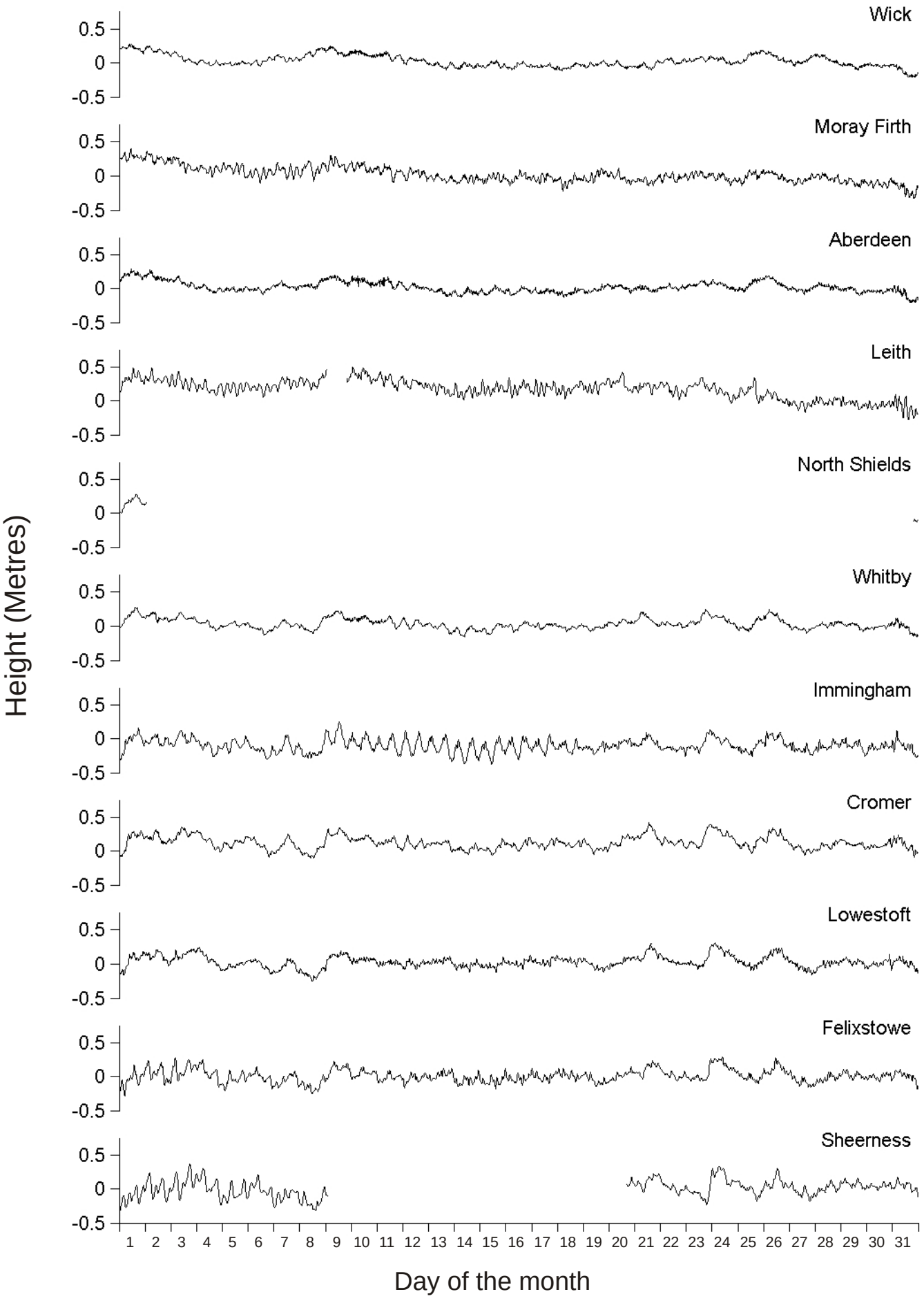

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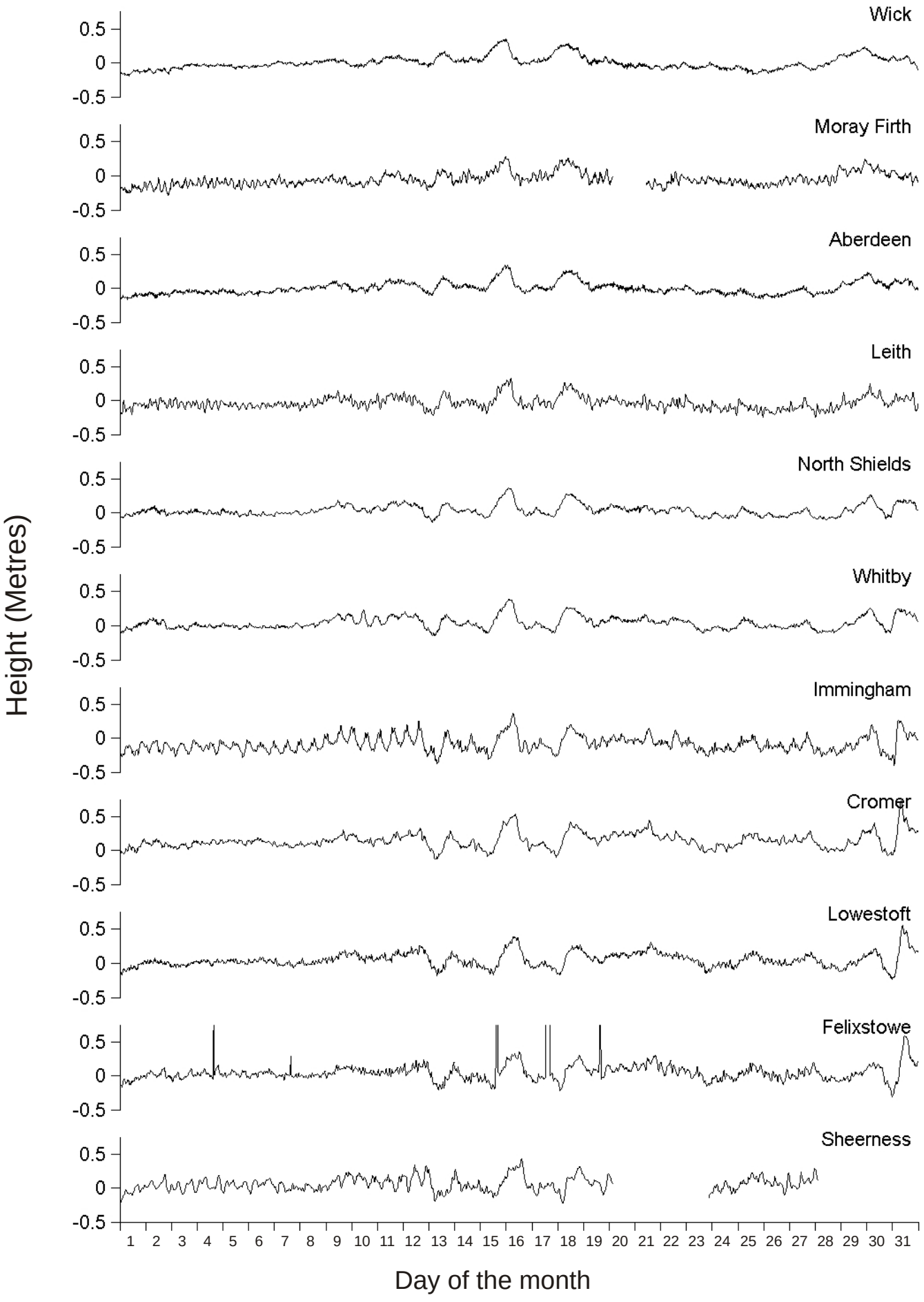

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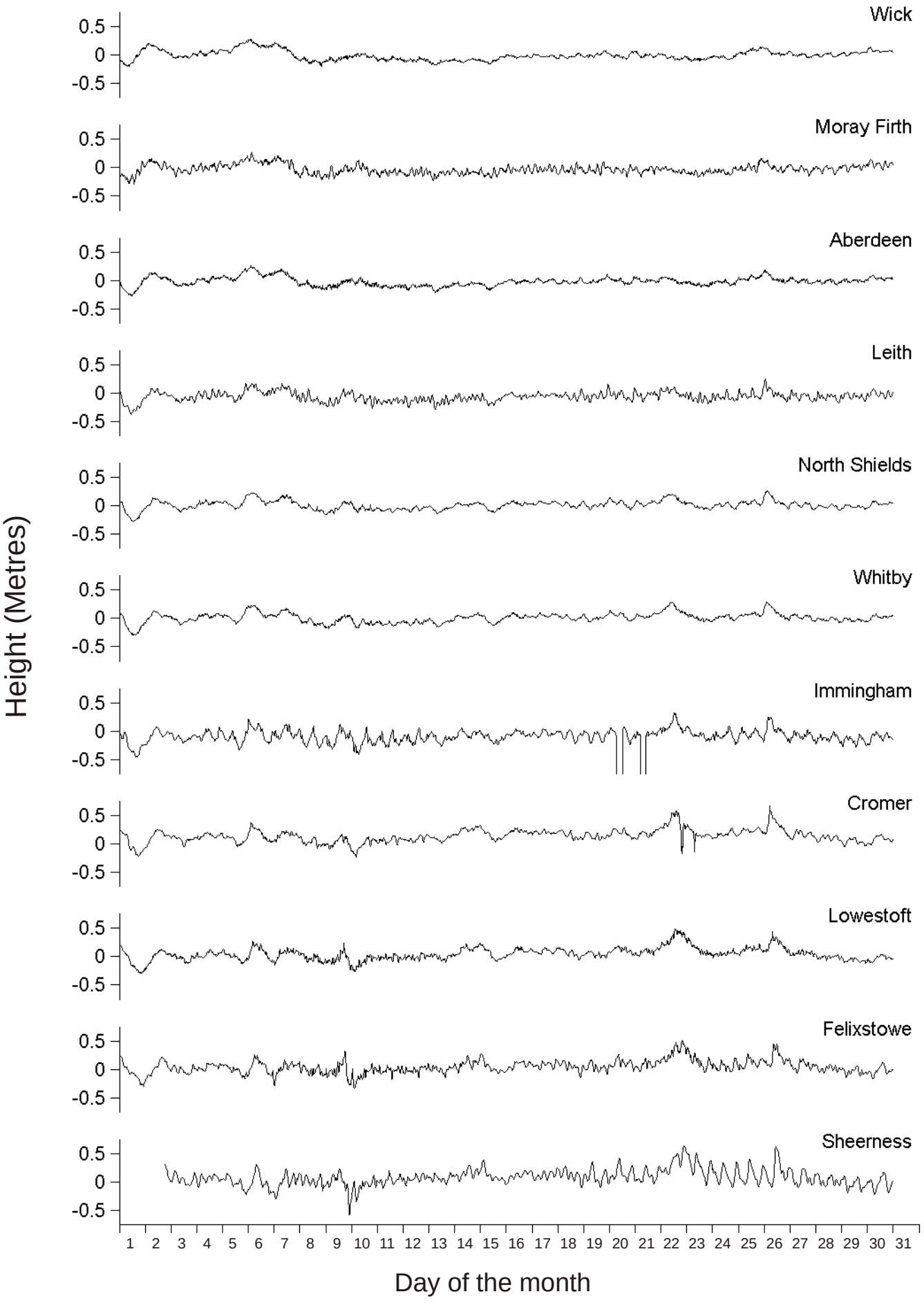

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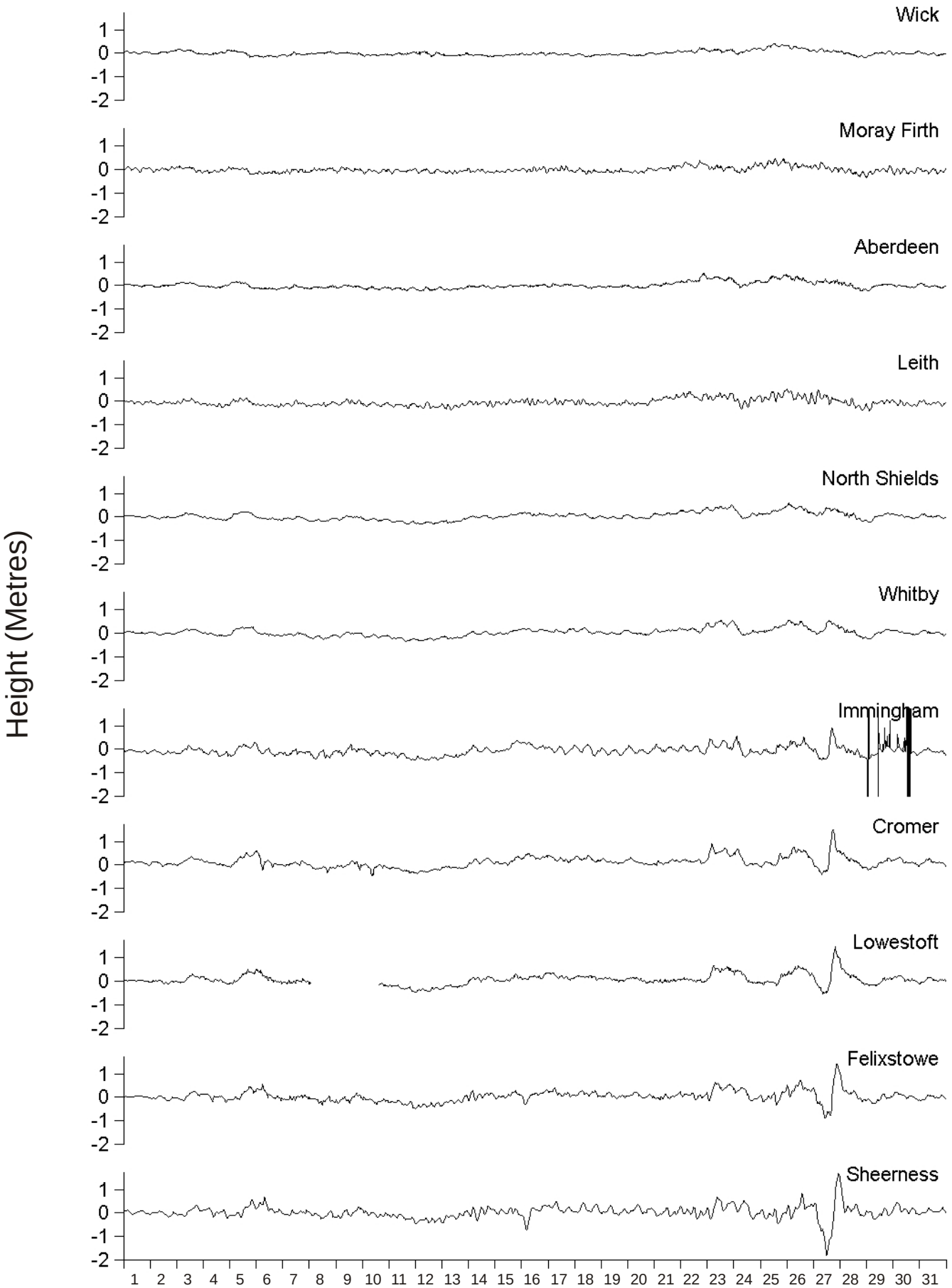

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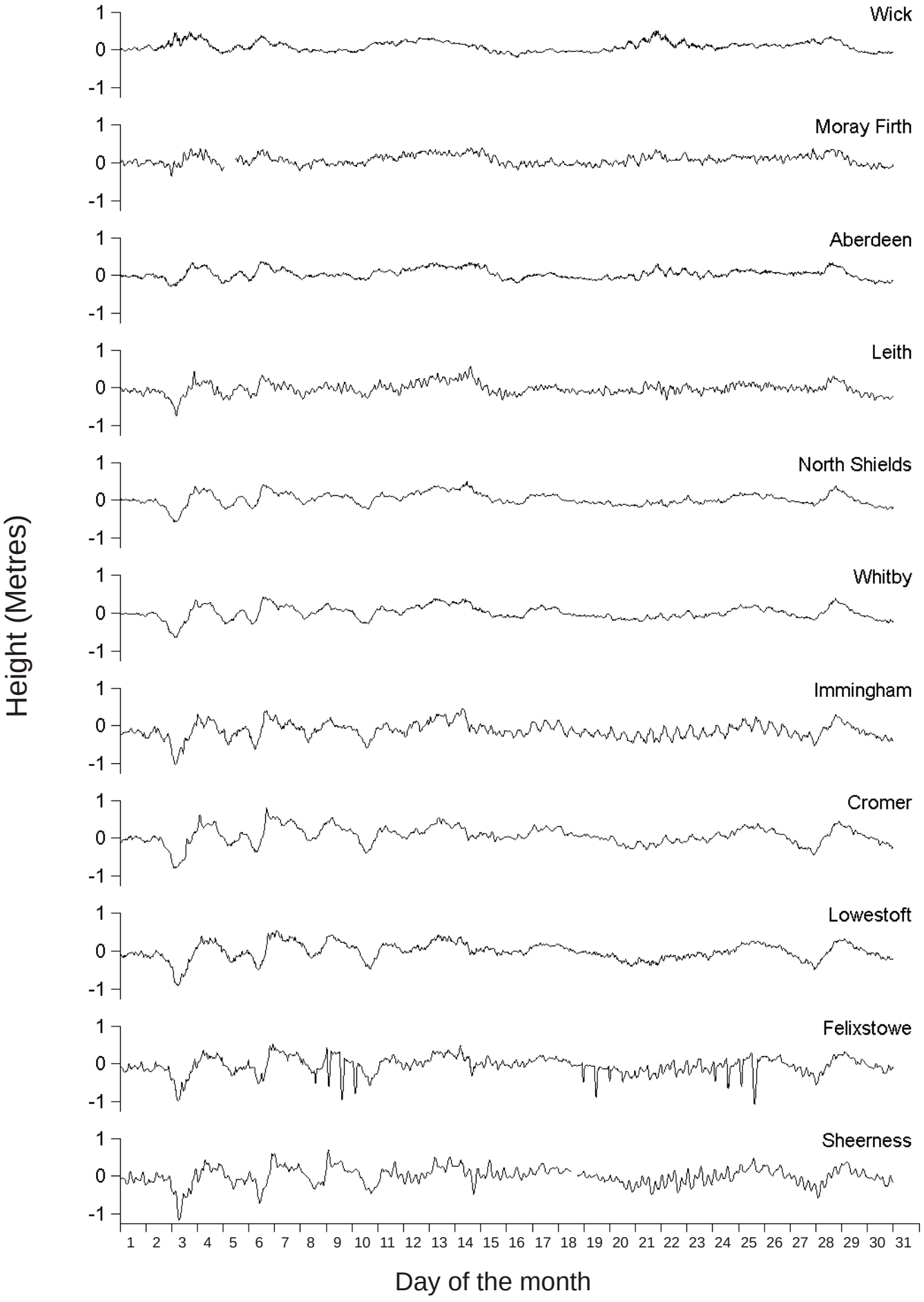

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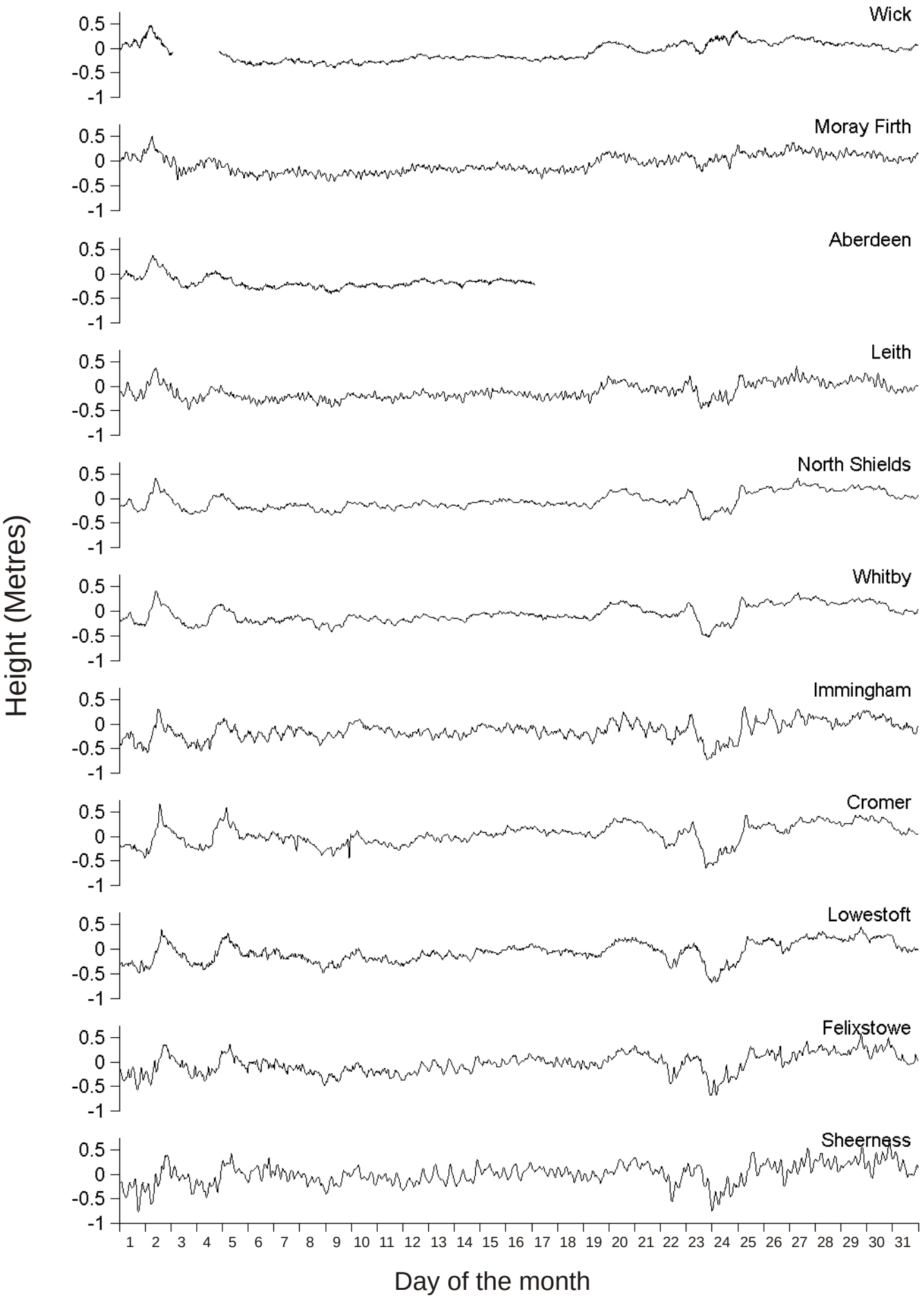

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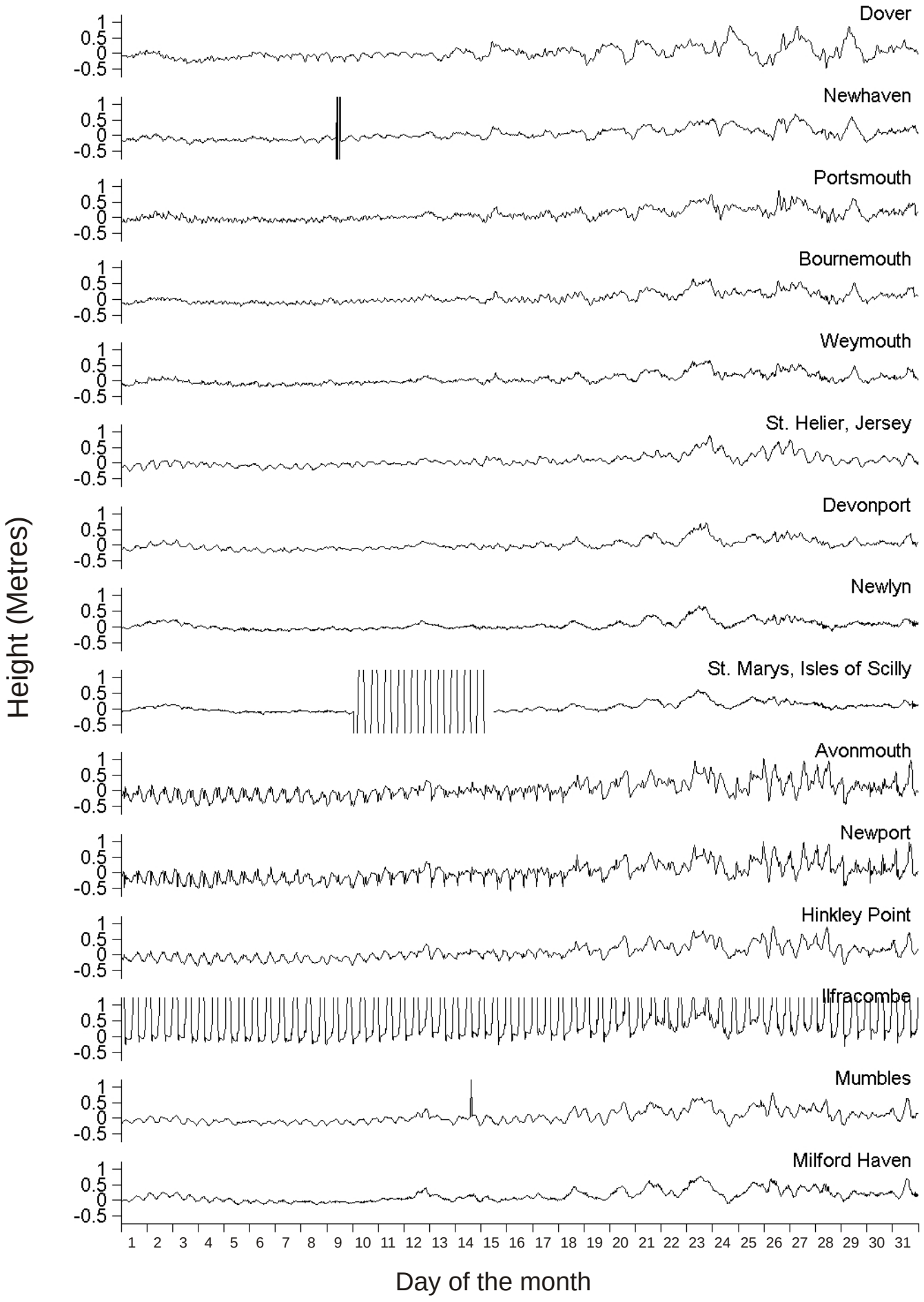

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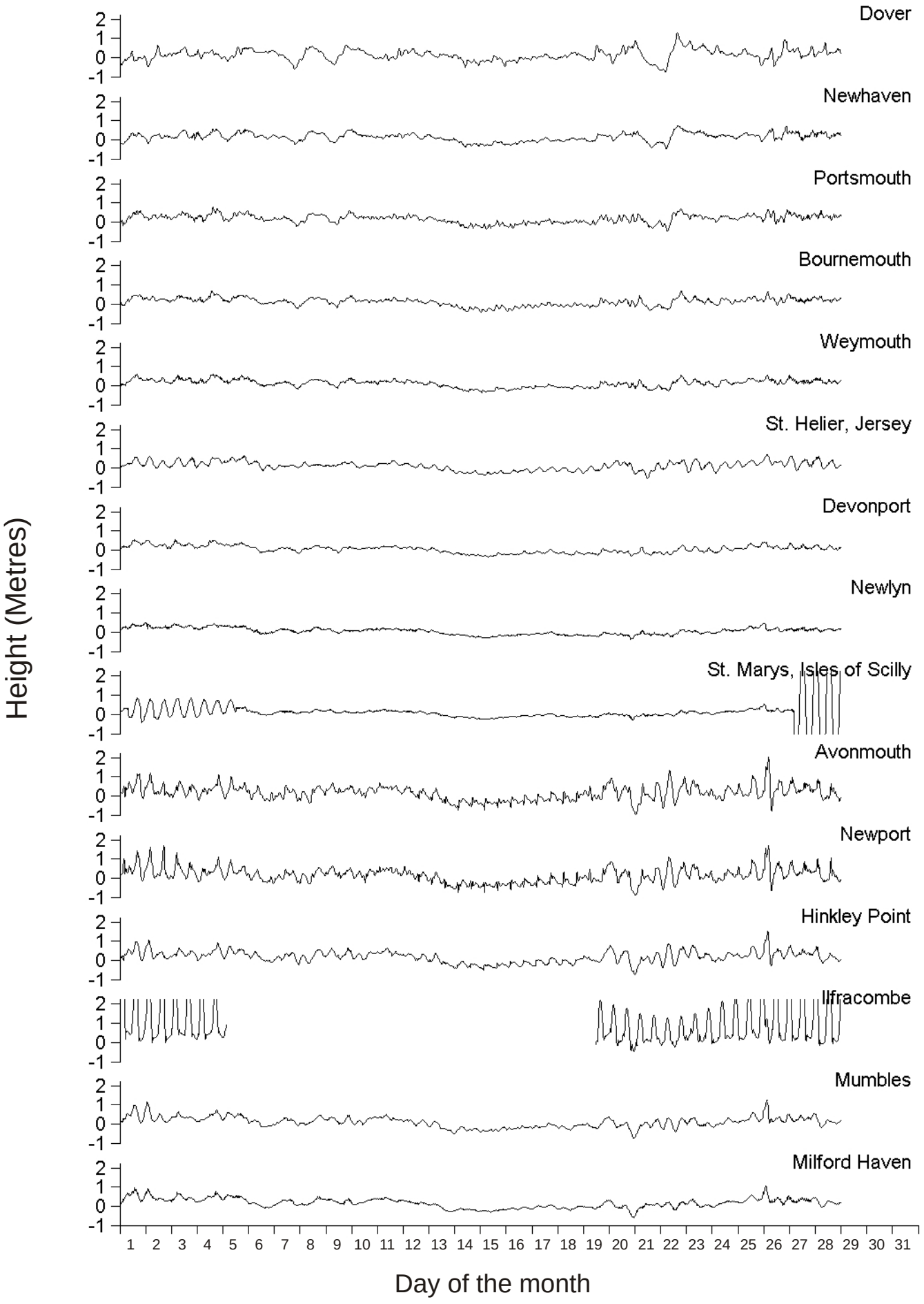

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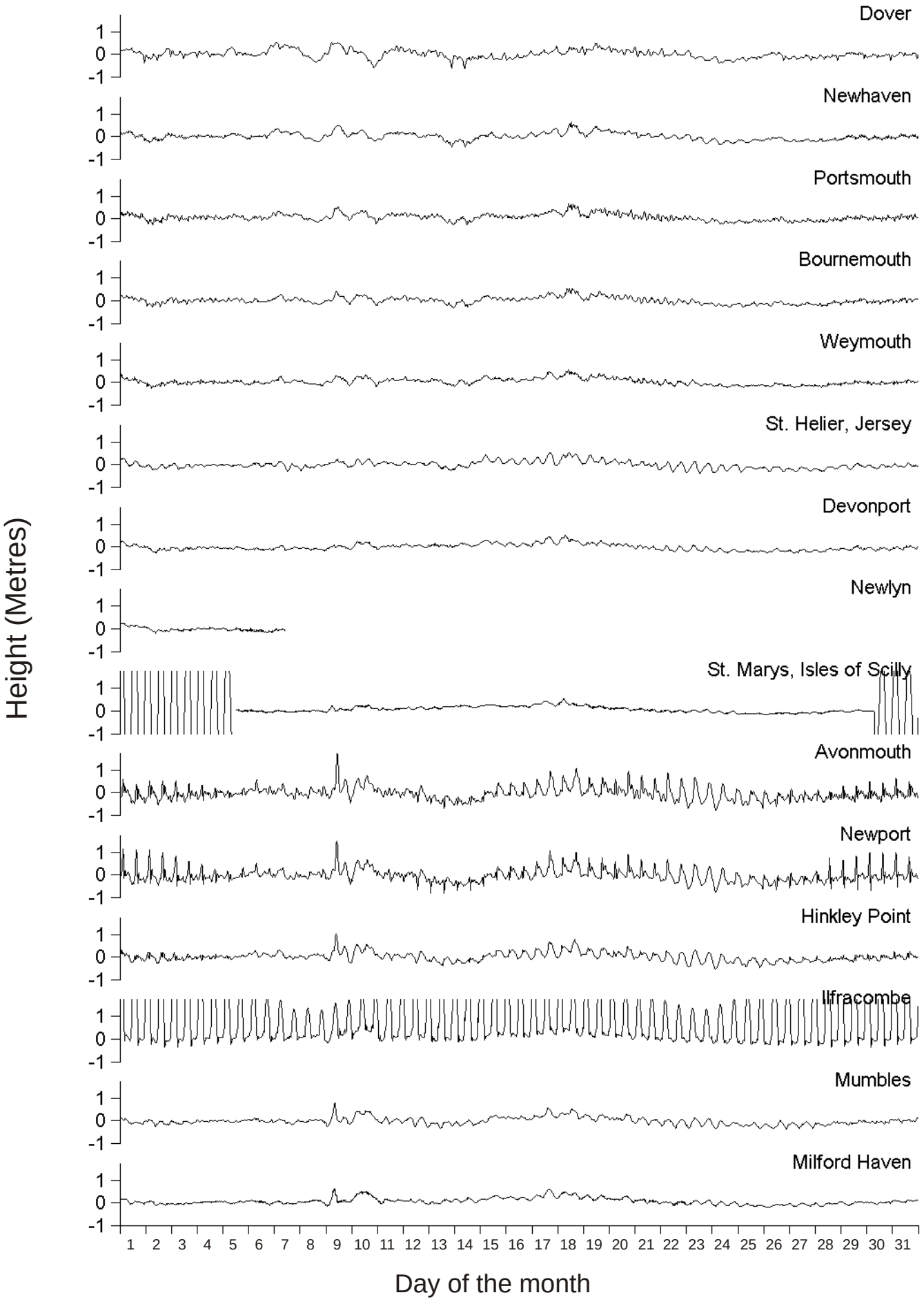

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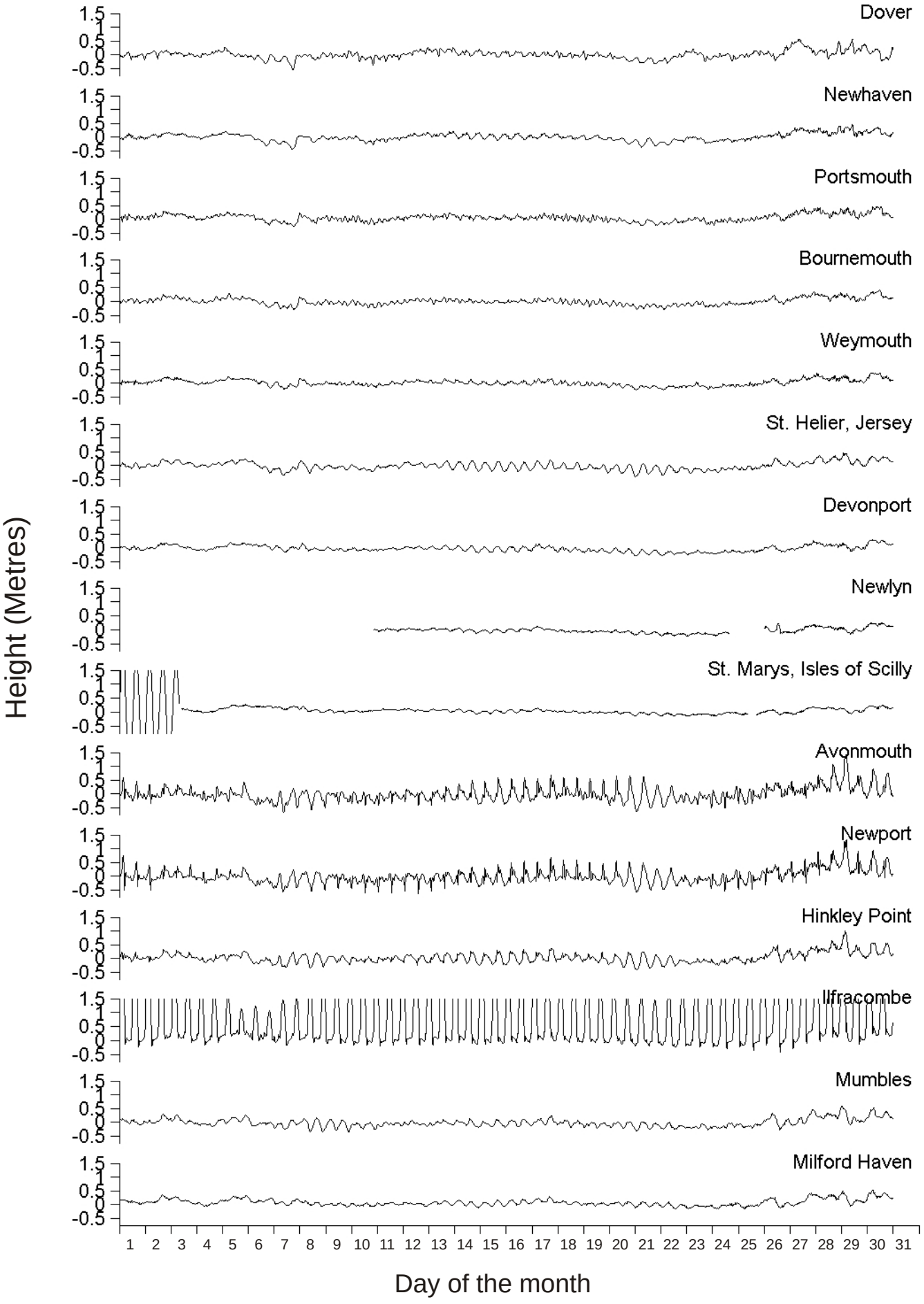

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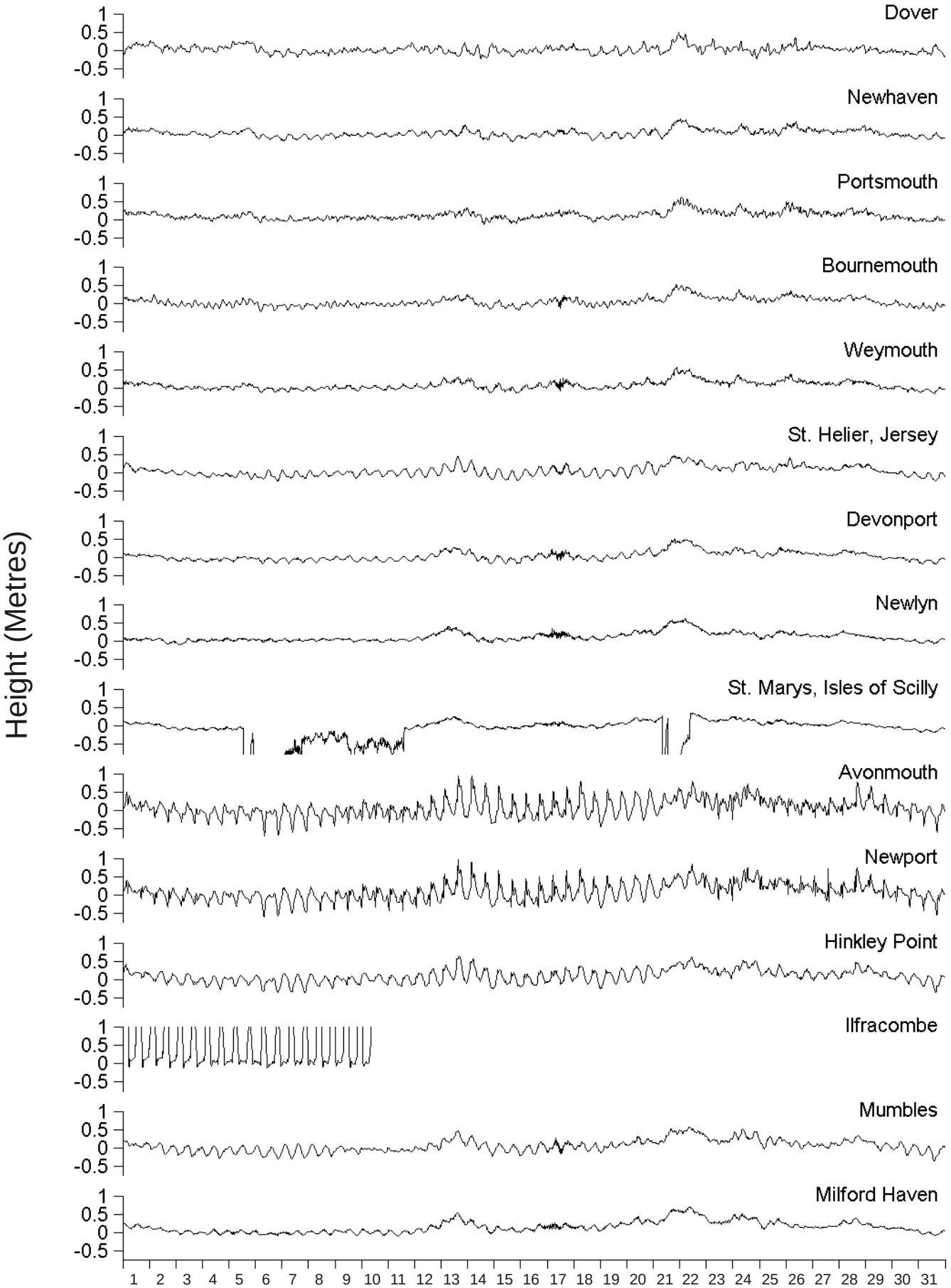

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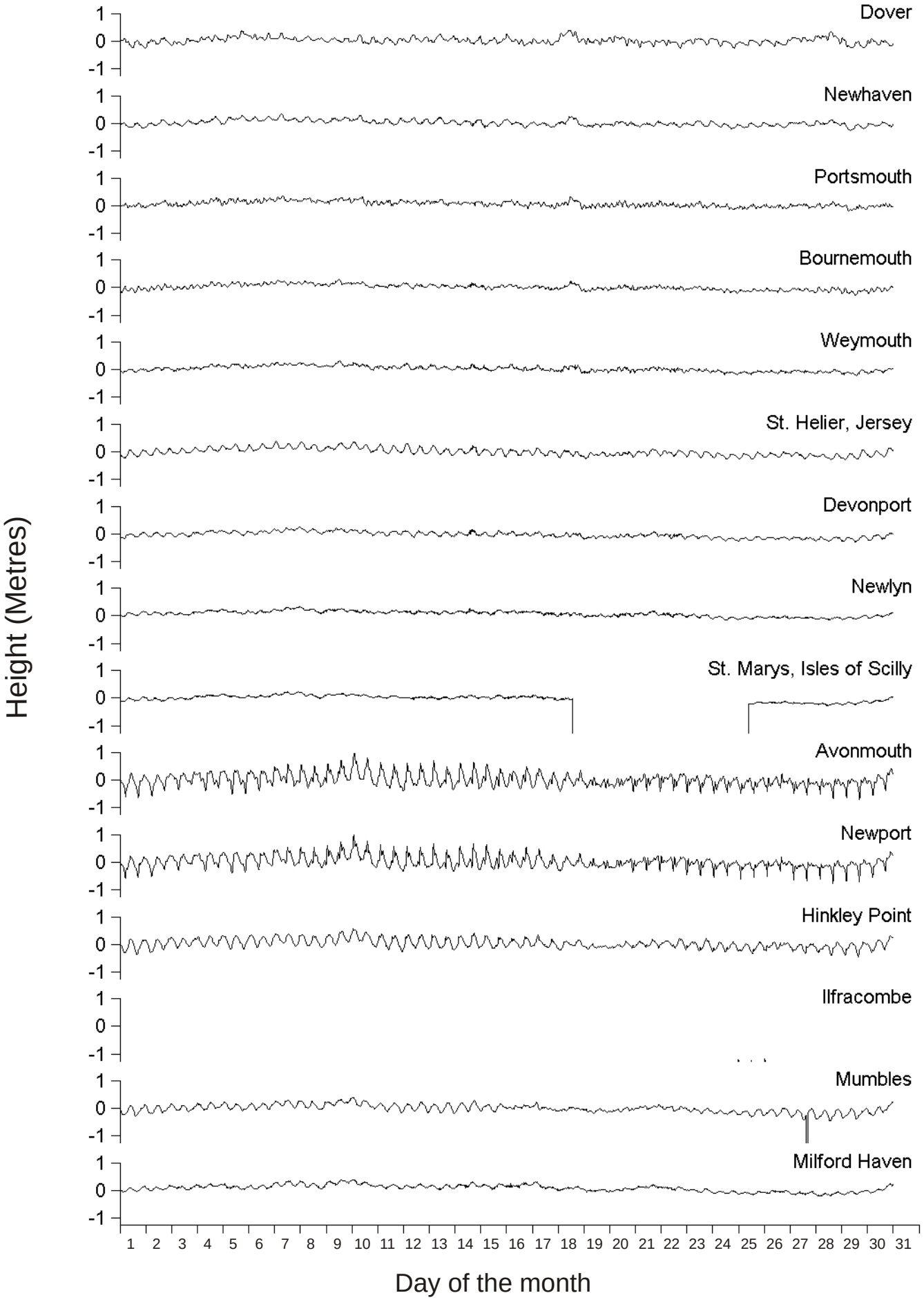

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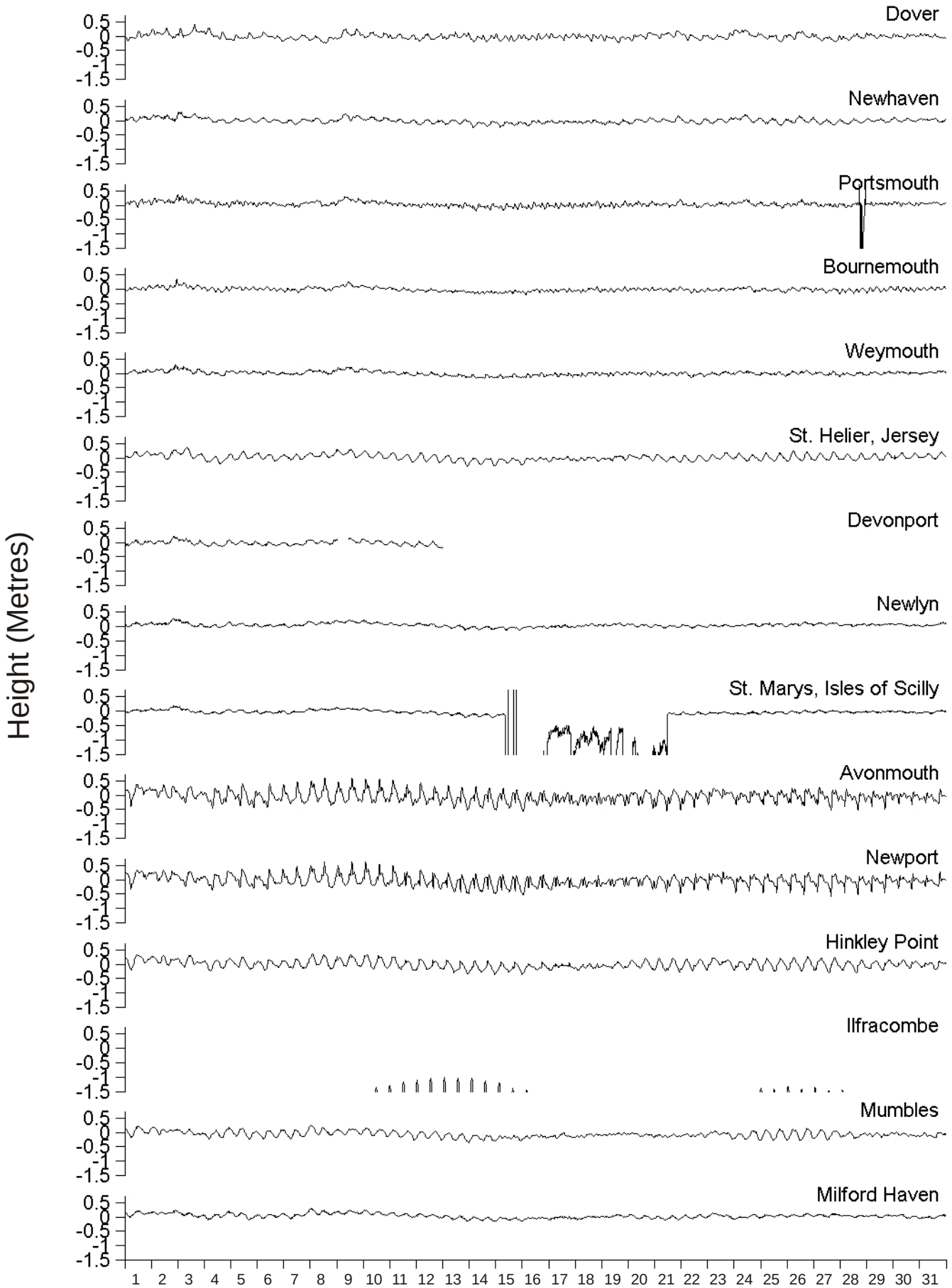

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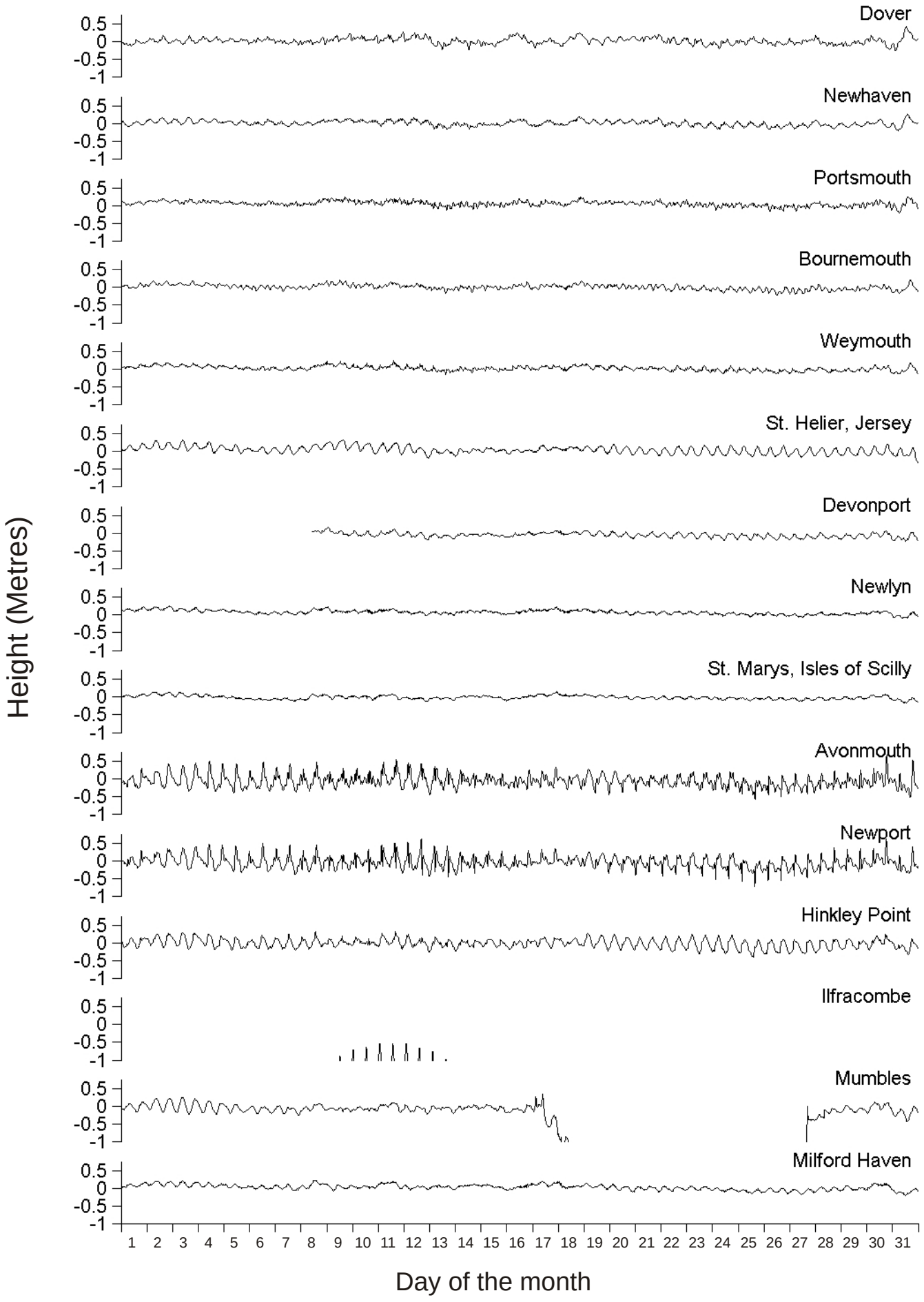

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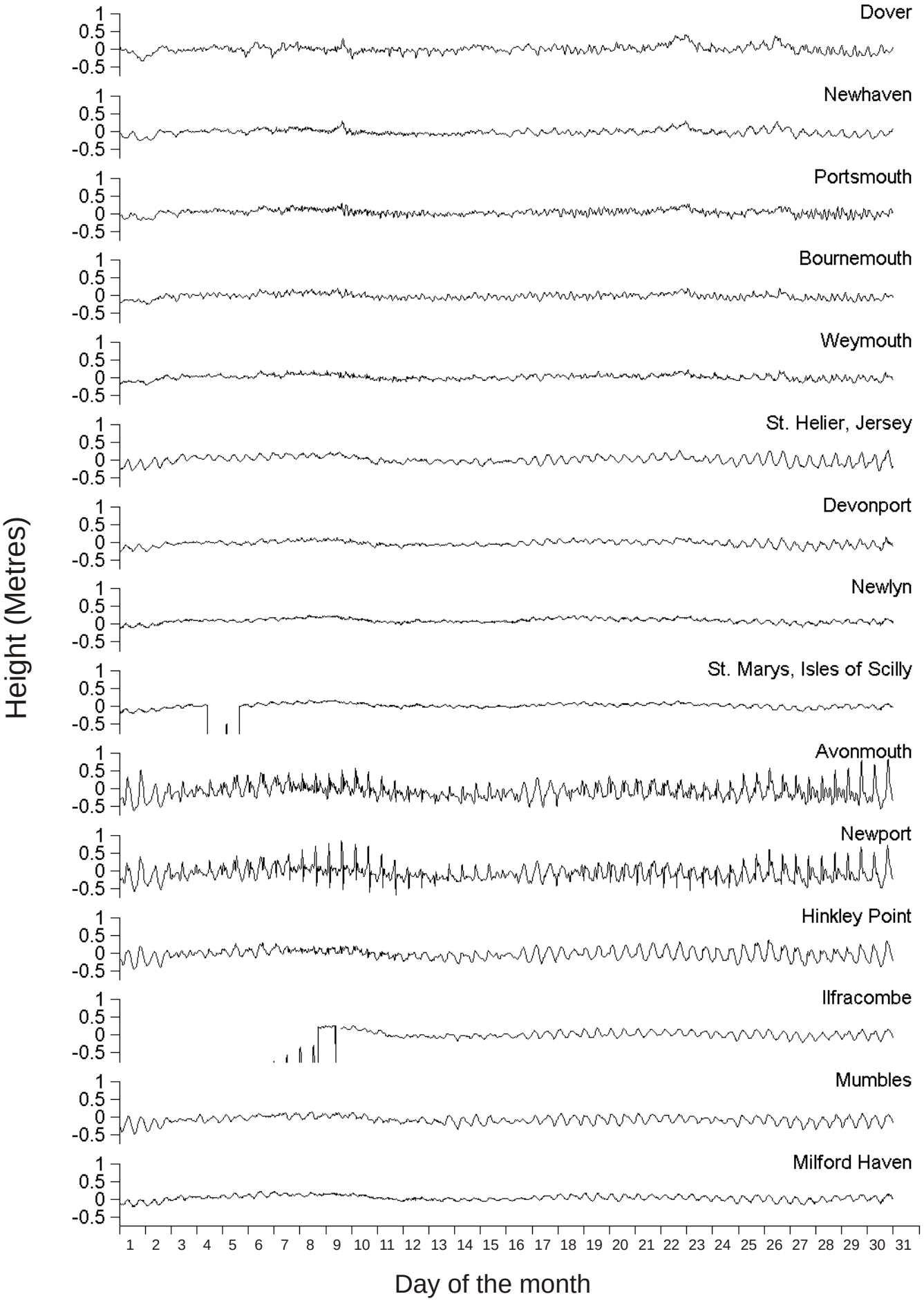

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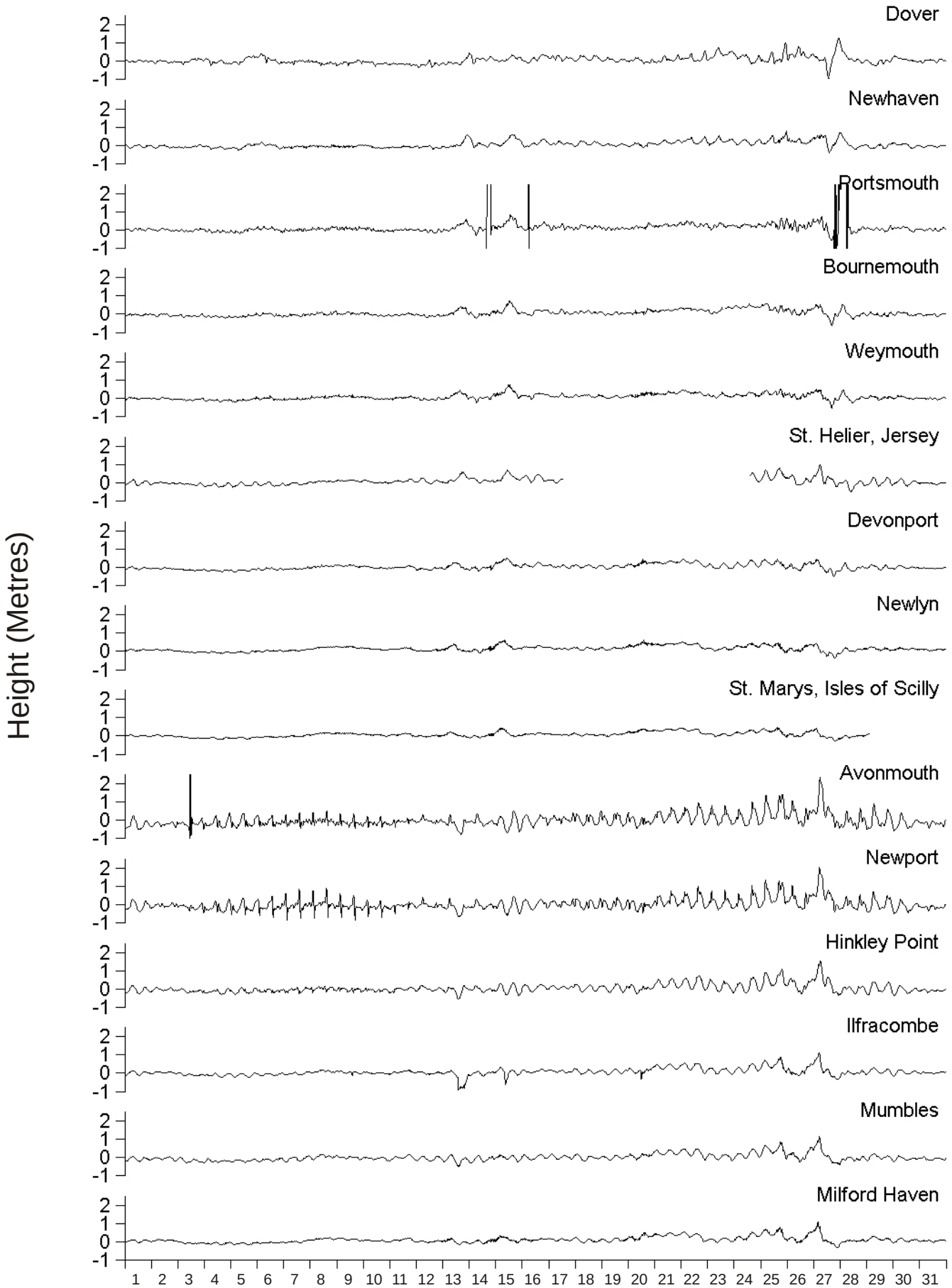

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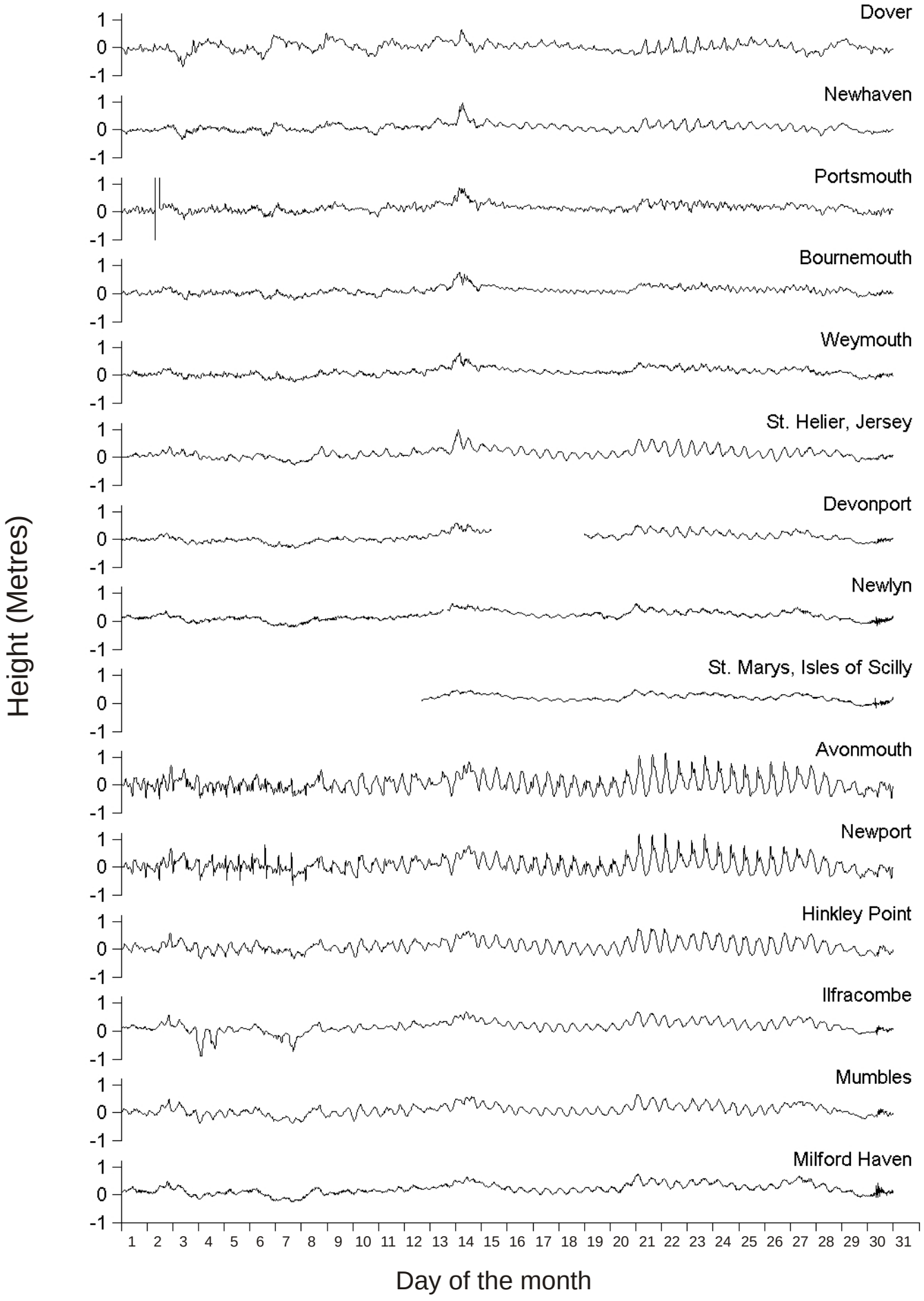

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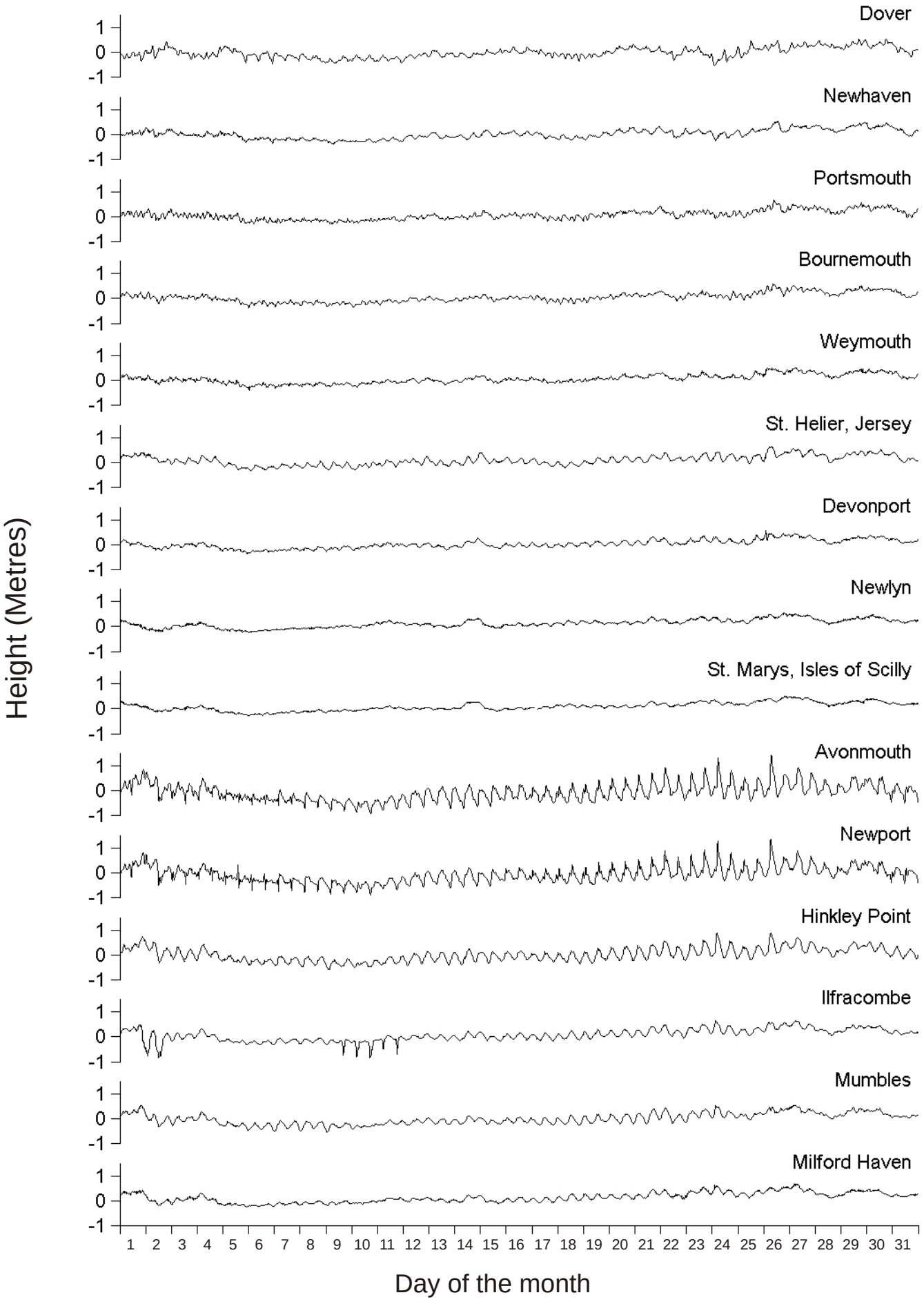

POL Internal Document No. 155

The Operational Storm Surge Model: Development, Performance and Maintenance During 2002

by

Jane A. Williams & Roger A. Flather

September 2003

CONTENTS

1. Background

NTSLF at POL develops and maintains tide-surge models used to forecast storm surges on the coasts of England and Wales for DEFRA. The models are run in real-time as part of the forecast suite of models at the Met Office. Results are transmitted to the Environment Agency and used, together with data from the National Tide Gauge Network for coastal flood warning in England and Wales. Figure 1 shows a schematic of the system.

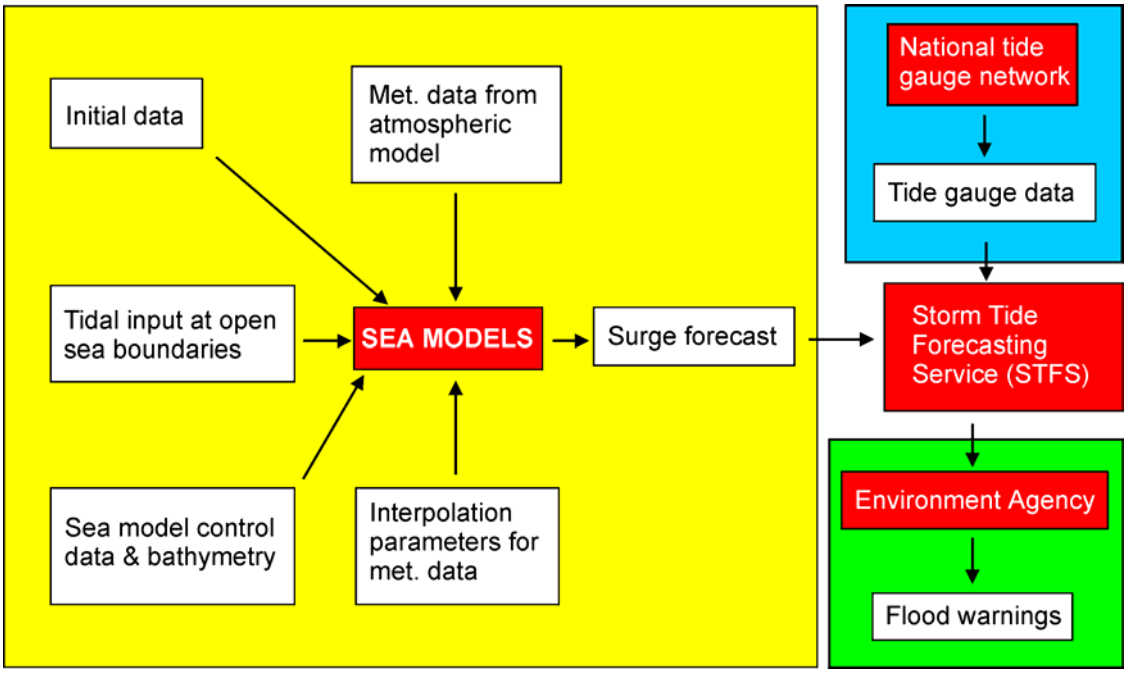

Figure 1: Schematic of the operational surge forecast and warning system.

First operational surge forecasts were run in 1978 using coarse (~35km) grid surge and (~100km) atmospheric models. The present system comprises a 12km shelf model (CS3, shown in Figure 2) with refinements to 1km and a 1-D river model to provide useful predictions in the complex regime of the Bristol Channel and Severn Estuary. The current models are forced by met data from the Met Office's 12km grid 'mesoscale' weather forecast model (Figure 2).

Surge models run four times per day producing forecasts up to 2 days ahead. The model surge is combined with tides predicted at tide gauge sites to give the best estimate of total water level. The Bristol Channel models have also been tuned to provide accurate water level forecasts, eliminating some problems in combining tide and surge in this highly non-linear area.

Model performance is routinely monitored at POL by comparing forecast results with observations every month. Typical RMS errors are about 10cm. Significant forecast errors are investigated and causes diagnosed so that the system can be progressively improved.

This report describes the operational surge model system in 2002. It includes developments and changes made to the system, problems encountered, model performance, data archiving issues, and a list of related publications produced during 2002 which are available from the POL library.

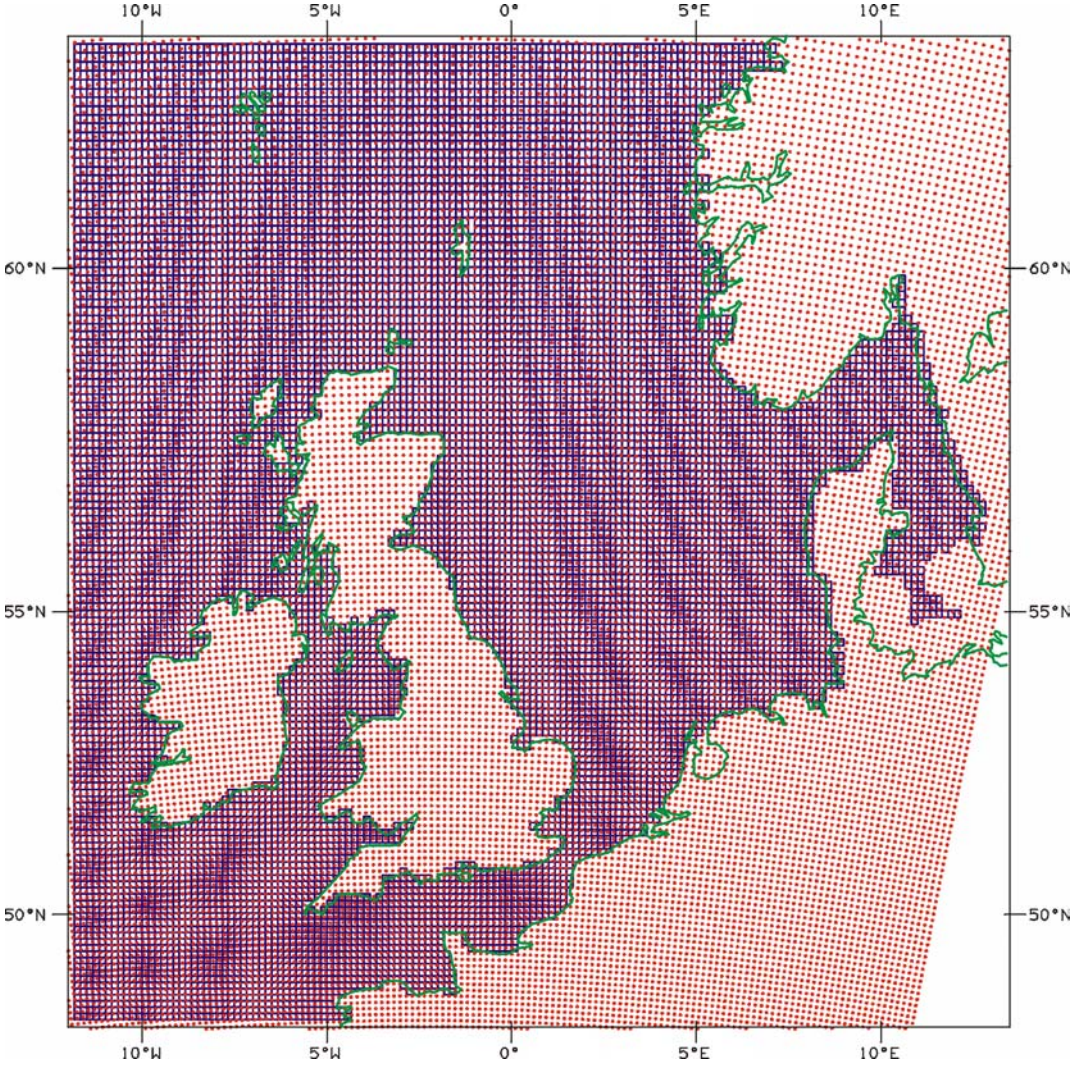

Figure 2: Surge model grid with mesoscale model points superimposed.

2. Operational Changes

2.1. New Dynamics

In 2002 major changes were made to the Met Office's atmospheric models, effectively introducing new models using "New Dynamics" (ND). ND differed in a number of respects from that used previously: calculations were now made on a 'C' grid rather than a 'B' grid, a height based (rather than pressure based) vertical co-ordinate system was used, and the ordering of grid points was changed. However, the coverage and spatial resolution remained the same.

The Met Office web site (www.metoffice.com) noted that, *"The New Dynamics is more accurate than the current dynamics and has been designed to have better balance with both the physics forcing from the parameterisations and with data assimilation."… "Since the New Dynamics is based upon an unapproximated equation set it can be used to model scales at a very high resolution and will enable the mesoscale model to be run with horizontal grid lengths of much less than 10km as greater computer power becomes available."*

From late 2001, the Met Office ran a trial version (v5.0) of the Unified Model incorporating ND, which was to replace the current mesoscale atmospheric model dynamics in summer 2002. The change to ND required a revised interface to link to the surge models. This was developed and tests were carried out during December 2001 to ensure that there were no problems with the new interface.

In January 2002 the surge model was incorporated into the operational test suite for ND. In its test mode, the surge model forced by mesoscale ND wind and pressure fields was run just once each day, with the forecast starting at 0000GMT. Each run consisted of 21 hours of “hindcast” followed by a 48 hour forecast. Hourly hindcast and forecast surge elevations for ports around the UK and continental coasts, including the “A Class” tide gauge locations, were archived as time series from each run. Additionally, from the hindcast part of the run, arrays of hourly surge were stored for the entire model grid. Useful archived model data were available from 28th January 2002. Model data were accumulated until the end of March when they were extracted and returned to POL for analysis.

The effect of ND on surge forecast accuracy was investigated in detail using data from the operational trial. Monthly statistics of differences between CS3 hourly surge elevations with standard and ND showed insignificant mean differences (±0.01m) between the two model sets, however RMS differences indicated significant variability (up to 0.10m) through time. Instantaneous deviations were found to be large (up to ±0.50m) during surge ‘events’, i.e. under conditions of strong winds/low pressures, and rapid meteorological development. In relatively quiet periods, the two forcing dynamics produced similar surge forecasts.

Five surge ‘events’ were looked at in detail. In each case, the ND forecast differed significantly from and in most cases was inferior to the standard. Only one event was better predicted with ND forcing. This was of concern, but there was no clear cause. It was possible that ND produced stronger winds than the original dynamics, thereby enhancing or reducing surge heights depending on the wind direction. Regrettably, no archive of ND met forcing was available so we were unable to examine the forcing data to understand why these differences occurred. A report of the findings was written (Williams and Flather, 2002).

2.2. Bug Fix

In December 2002, a bug in the met processing subroutine (METPROC) of the model code was identified and fixed. The extent to which the bug affected surge accuracy was also looked at. This is discussed further in the next section.

3. Model Performance

3.1. Forecast Errors at Sheerness

Under-forecasting of surges at Sheerness, which is used by EA as the reference port for decisions on Thames Barrier closure, continued to cause difficulties in 2001-2002. Routine comparisons showed significant errors, with model forecast surges on average ~10cm lower than the observations at Sheerness. At some high waters, errors of 30 to 40cm occurred. The problems were investigated and results reported to the DEFRA Storm Tide Forecasting Service Liaison Group (STFSLG) in July 2002.

Several factors suggested that the problem might not be due to the model but that the tide gauge might be responsible. TGI checked and confirmed that blockages were affecting the measured levels and it was decided to refurbish the gauge at the earliest possible opportunity. With suitable tidal conditions, this was done in mid-February 2002. Initial results at Sheerness, Figure 3, suggested that the under-prediction was reduced after the gauge was fixed.

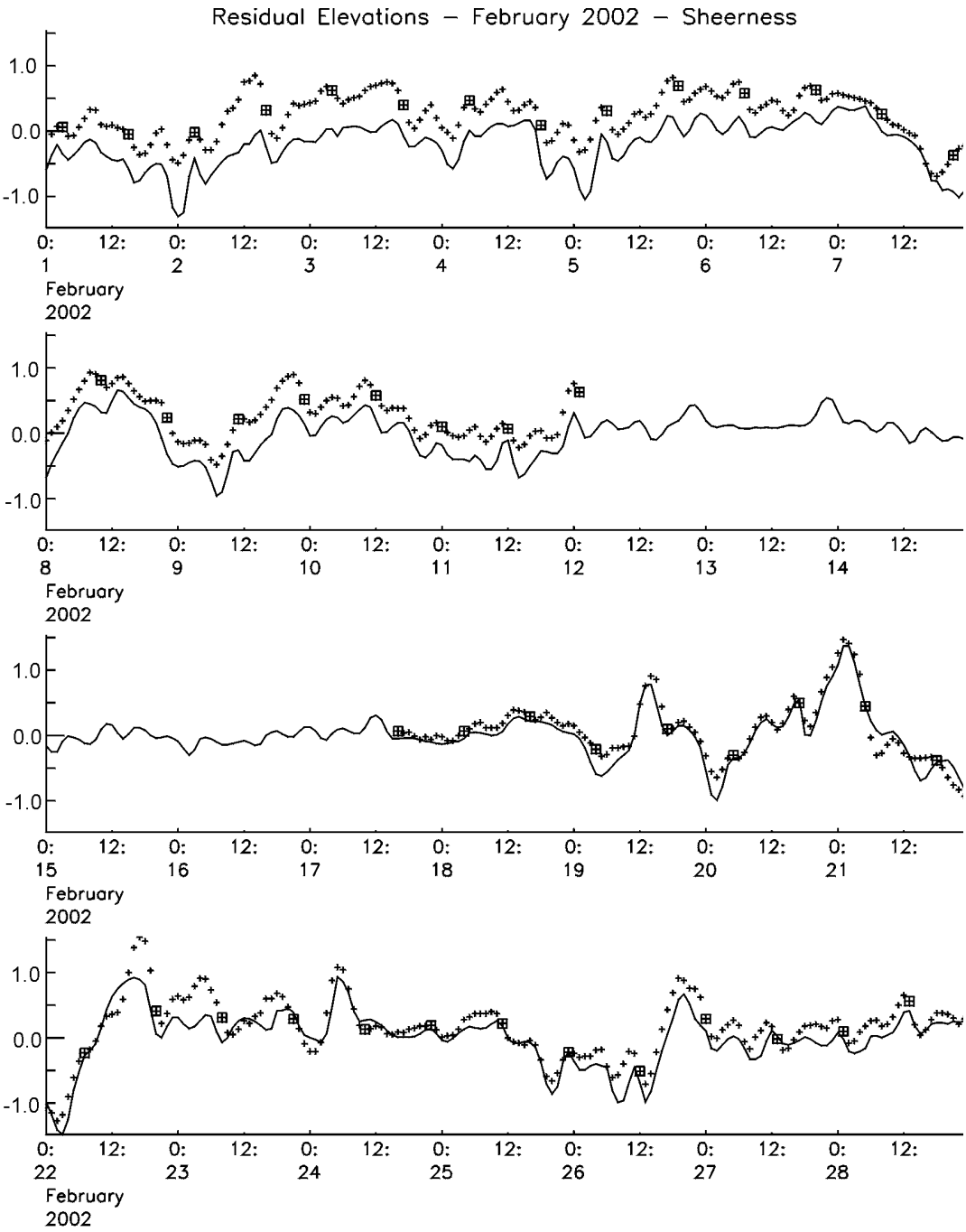

Figure 3: POL routine monthly comparison of observed (++++++) and CS3 forecast surges at Sheerness for February 2002. Squares indicate observed surge at model HW. The gap in observations mid-month is the period when the tide gauge was re-furbished. The reduced offset after the gauge was re-furbished is clear.

Unfortunately, the problems recurred in September 2002. A plot of model v observations for September 2002 is shown in Figure 4 and typifies the problems encountered.

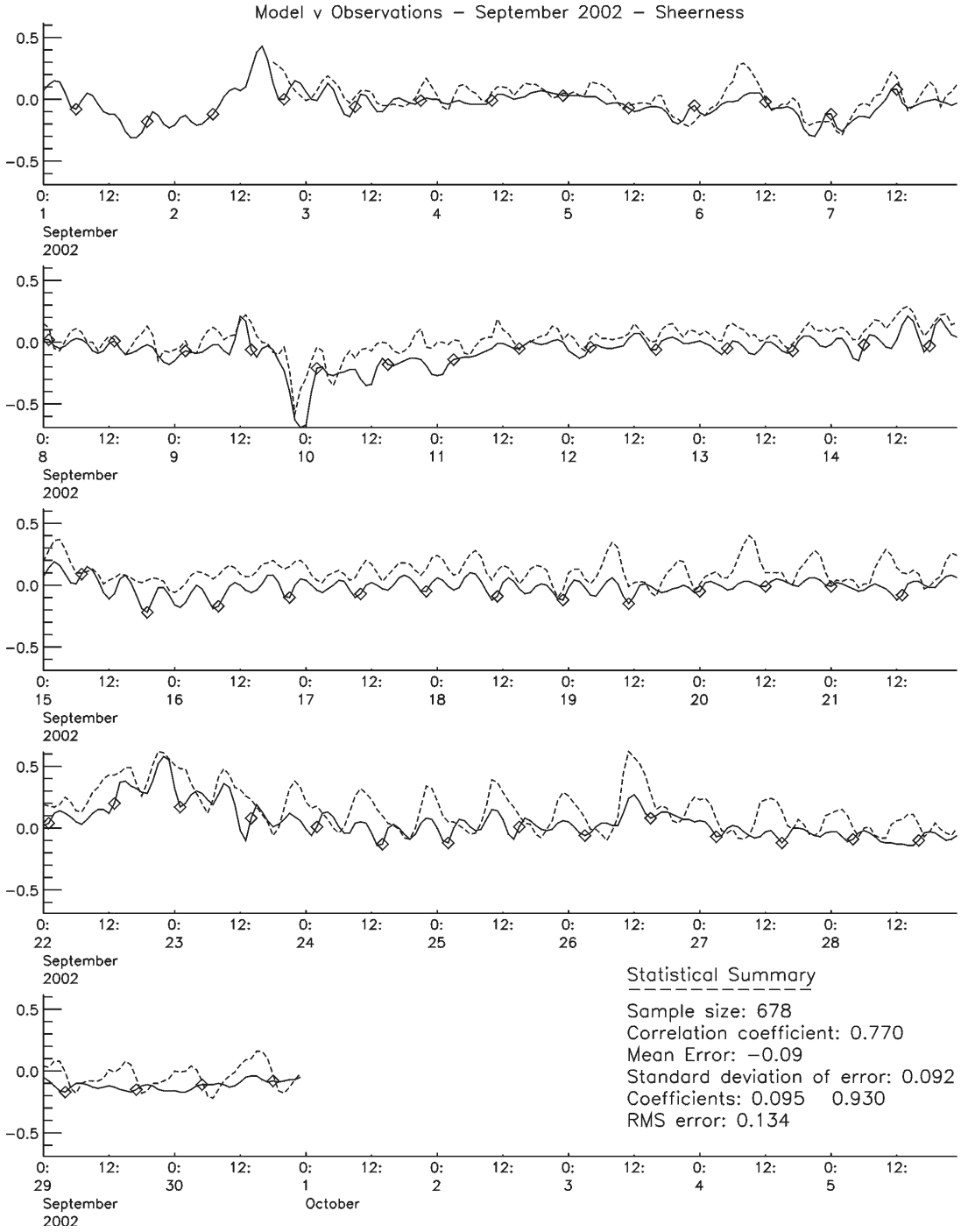

Figure 4: Standard comparison of CS3 residual elevations with observed surges at Sheerness, September 2002. Model results are plotted as a solid line and observed residuals as a dashed line. The symbol ◊ indicates times of model HW.

Figure 4 shows the offset as seen earlier in the year, with the model underestimating observed surges. Large oscillations of about 12 hour period also occur in the observations at certain times. These can have peak-to-peak amplitudes up to 50cm e.g. 19-30 September 2002, and are not reproduced by the model. Six-hourly

oscillations are also seen in the observations e.g.13-18 September. These have smaller amplitudes (up to ~10cm) are reproduced quite well by the model.

At the end of September we were advised by STFS of further poor results for Sheerness, with CS3 forecasts underestimating surges at high water (HW) by 30-35cm on spring tides during the week of 21-27 September. Winds at this time were from the N to NE and not strong. Surge errors were small but, critically, increased near HW. An initial response was made on the same day, and discussion and e-mail correspondence followed, including useful input from Dave Smith (ex Head of EMARC, the Met Office's "Emergency Monitoring and Response Centre" which incorporates STFS). New investigations started.

In mid-November, EA Thames Barrier (Colin Carron) 'phoned about the problems and provided useful inputs. He reported that EA were carrying out their own investigation and requested observed water levels at Sheerness for 1998-2001. These data were e-mailed to Colin Carron on 22 November and, in return, he provided data from EA's Southend gauge, which we thought would provide a useful comparison.

In the same period, Bob Chadwick (STFS) forwarded correspondence from EA Thames and formally requested that we investigate the problems. Specific cases cited were:

a) 23rd September 2002, HW at 0130GMT
b) 2nd November 2002, HW at 2230 and
c) 6th November 2002, HW at 0100, with forecast residual -0.266m, actual surge +0.18m giving an error of 0.45m.

We examined these events and noted that in all cases, the observed residual at HW was less than 0.6m and that the met situation was fairly quiet. The Sheerness gauge was checked by TGI and found to be functioning correctly. Tidal analyses and predictions were compared and found to be consistent. No analysis used for prediction had included the period from October 2001 when the gauge was faulty (see earlier). Checks on the CS3 model identified an error in the interface to a new version of the atmospheric model introduced on 7 August 2002. This shifted the met forcing by a grid length, about 12km. During storms this affected surge estimates by a few cm, but in quiet periods such as those cited above; the effect was negligible.

A formal letter summarising our findings to date and proposing further aspects for investigation was sent to STFS in December and copied to EA Thames, EA's National Flood Warning Centre (NFWC), DEFRA and the Met Office. Investigation of the problems at Sheerness continued into January with highest priority.

3.2. Immingham Problem

Dave Smith (Met Office) recalled problems on 29 January 2002 at Immingham. This was examined and it was shown that a delay in the peak of the forecast surge arose in the Humber Estuary; very crudely represented on the 12km CS3 grid. Pending possible implementation of finer grid models, an alternative CS3 output point, which better represented the timing of observed surges at Immingham, was suggested.

3.3. Bristol Channel Model Failures

The Bristol Channel forecast run at 1800GMT 10 December 2002 failed. We were advised of the failure by Wendy Hardy (Met Office Operational Core Team Leader) on 11 December and investigated. The cause was a failure in copying model tide data on the CRAY T3E system. This introduced spurious surge values which caused the system to fail. Why the data copying failed is not clear, but the same problem occurred once during 2001.

3.4. Statistical Analysis

As previously mentioned, archived port data are transferred back to POL at regular intervals in order to assess the model's performance by comparison with observations. In addition to time series plots, simple statistics are calculated based on the difference between hourly model and observations (model residual – observed residual). From this, mean, standard deviation, correlation coefficient, RMS error, maximum error and the time at which that occurred, are calculated. Additionally, these parameters are calculated for the hour closest to model high water for each month, as these are the most important for flood forecasting.

There are 24 statistics tables (Tables 1–12), two for each month. The first ("a") gives a summary of the hourly comparisons for the entire month, and the second ("b") contains the same statistics but at HW. All values are given in metres. The following abbreviations are used in the column headings:

PORT:	The location of the comparison
SIZE:	Sample size (i.e. where there exists both a model and observed value)
CORR:	Correlation coefficient
MEAN:	The arithmetic mean of the series
S.D.:	The standard deviation of the mean
RMSE:	The root mean square (RMS) error
MAX ERR:	The maximum difference between model and observation occurring in the series
DATE:	The hour and day of the month at which the maximum difference occurs

Note that the tables contain statistics for the Bristol Channel ports, however operational forecasts for these locations are taken from the higher resolution Bristol Channel system of models.

4. Other Operational Issues

4.1. Data Archives

Routine archiving of operational model and related outputs is undertaken to ensure data are always available for surge modelling work as well as other applications.

There are three archives:

a) *Port data archive*: this comprises model hindcast and forecast data for a selection of 42 locations (including "A class" gauge locations) around the UK and NW European coasts. There are 4 sets of hindcast and forecast data for

each day corresponding to each operational model run. Usually this comprises 6 hour hindcast and 48 hour forecast although this can change if there have been operational system failures at the Met Office. This archive is updated after each operational run. Once a month forecasts are extracted, returned to POL and time series plots and statistics are produced comparing model forecast to observed surges derived at tide gauges from observations. This is important for monitoring surge model performance. Data archived for 2002 are summarised in Appendix A.

b) *Met data archive*: fields of mesoscale met data comprising hindcast 10m wind components and mean sea level pressure (MSLP) are extracted from the Met Office's archive and transferred to POL via ftp. Such data are essential for surge model development and investigating problems such as poor forecasts or model failure. Data are reformatted, checked for consistency, sorted and stored in monthly files. Data have been archived at hourly intervals in monthly files for the whole of 2002.

c) *Model array archive*: the model array archive as described by Smith (1994) has now been superceded by a re-run archive based on the met data archive described above. CS3 is run using the hindcast mesoscale model data and yearly files of model arrays are compiled and stored at POL. The re-run archive is periodically updated when new met archive data have been returned to POL. The re-run archive comprises hourly z, u and v components of tide + surge and surge only for the entire model grid. The re-run archive covers 1992-2002 and is available on the POL mass store.

4.2. Meetings

4.2.1. *Operational Issues*

A meeting with Met Office staff from STFS and operational groups was held at Bidston on 31 January 2002. The agenda included changes at the Met Office (organisational, the relocation to Exeter, plans for a new supercomputer); performance of surge models; notification and logging of problems; activities of the EA/Met Office Coastal Working Group; changes to operational surge models in 2002; long-term plans; New Dynamics; and archive changes at the Met Office affecting the surge forecast system.

4.2.2. *Implementing Fine Grid Models*

A meeting to discuss possible implementation of fine grid models for the Southern Region of EA was held at DEFRA, London on 21 October 2002, attended by EA Southern Region and NFWC staff, DEFRA and POL. This followed completion by POL of "Fine grid surge model evaluation" (Flather et al., 2001), an R&D project funded by DEFRA (FD1203). Issues and possibilities were discussed, and it was agreed that EA would carry out a feasibility study.

4.3. Scoping Study

A "scoping study" to design an updated operational surge forecast system to better meet the needs of users and take advantage of developments at the Met Office and results of MAFF/DEFRA R&D projects was started. The aim was to establish and

agree a plan to progress from the existing scheme to a unified system with appropriate resolution, physics and procedures, taking advantage of the new Met Office supercomputer to be installed in mid 2003. Initial work was carried out but progress was delayed by the need to give priority to investigating forecast problems at Sheerness.

4.4. Porting Surge Model Codes to the new Met Office Supercomputer

The Met Office decided to buy an NEC SX-6 supercomputer to succeed the CRAY T3E systems in late 2003, providing approximately 6× the processing power of both T3Es combined. A test system was installed at Bracknell in August 2002. Initial help was provided by Met Office staff and we gained access in October 2002. Initial assessments of work required were made and included in the Met Office's project to port operational codes. POL staff attended a "porting" course at Bracknell in early January 2003.

5. Reports Produced

Flather, R.A. 2002. Note on the storm surge and floods on 1 February 2002 in the Irish Sea. *Proudman Oceanographic Laboratory Internal Document No. 146*. 24pp.

Williams, J.A. & Flather, R.A. 2002. Impact of new atmospheric model dynamics on operational surge model performance. *Proudman Oceanographic Laboratory Internal Document No. 145.* 14pp.

Acknowledgements

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References

Flather, R.A., Williams, J.A., Blackman, D.L. and Carlin, L.A. 2001. Fine grid surge model evaluation. *Proudman Oceanographic Laboratory Internal Document No. 141.* 52pp.

Smith, J.A. 1994. The operational model data archive. *POL Report No. 34.* 34pp.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	743	0.95	0.09	0.06	0.10	0.25	4z 20th
Wick	679	0.92	0.11	0.07	0.13	0.35	9z 29th
Aberdeen	743	0.92	0.04	0.07	0.08	-0.32	19z 28th
North Shields	743	0.93	-0.02	0.07	0.08	-0.46	21z 28th
Whitby	743	0.93	-0.09	0.08	0.12	-0.58	22z 28th
Immingham	743	0.88	0.03	0.12	0.12	-0.86	0z 29th
Cromer	708	0.94	-0.27	0.09	0.29	-0.79	0z 29th
Lowestoft	725	0.95	-0.08	0.08	0.12	-0.44	3z 29th
Felixstowe	743	0.92	-0.13	0.10	0.16	-0.71	19z 26th
Sheerness	743	0.88	-0.29	0.14	0.32	-1.15	20z 26th
Ilfracombe	No Observations Available						
Hinkley Point	743	0.81	-0.14	0.14	0.20	-0.51	14z 31st
Avonmouth	743	0.71	0.01	0.21	0.21	-0.77	0z 26th
Mumbles	743	0.82	-0.12	0.13	0.18	-0.51	18z 1st
Milford Haven	743	0.93	-0.16	0.07	0.18	-0.38	4z 30th
Fishguard	743	0.92	-0.18	0.07	0.20	-0.41	2z 2nd
Barmouth	743	0.93	-0.02	0.10	0.10	0.57	13z 27th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	743	0.95	-0.07	0.10	0.12	-0.38	17z 28th
Heysham	743	0.94	0.04	0.10	0.11	0.43	16z 27th
Workington	743	0.95	0.26	0.10	0.28	0.56	19z 28th
St. Marys	No Observations Available						
Newlyn	743	0.87	-0.06	0.07	0.10	-0.28	0z 2nd
Plymouth	743	0.90	-0.03	0.07	0.08	-0.28	3z 2nd
Weymouth	743	0.91	-0.07	0.07	0.10	-0.34	2z 2nd
Portsmouth	743	0.89	-0.13	0.09	0.16	0.47	16z 26th
Newhaven	739	0.89	-0.07	0.09	0.12	-0.41	5z 27th
Dover	743	0.90	-0.08	0.09	0.13	-0.39	5z 27th
Jersey	743	0.86	-0.17	0.10	0.20	-0.56	17z 1st
Port Erin	52	0.97	0.04	0.07	0.08	0.17	21z 31st
Portpatrick	743	0.96	0.02	0.07	0.07	0.33	12z 28th
Millport	743	0.94	0.08	0.10	0.13	0.49	18z 28th
Islay	683	0.96	-0.03	0.07	0.08	-0.23	18z 27th
Tobermory	640	0.95	0.12	0.10	0.16	0.54	10z 28th
Moray Firth	No Observations Available						
Leith	No Observations Available						
Ullapool	743	0.95	0.17	0.08	0.18	0.43	11z 28th
Kinlochbervie	No Observations Available						
Lerwick	611	0.90	0.01	0.06	0.06	0.19	16z 29th
Newport	743	0.70	0.00	0.22	0.22	0.75	17z 26th
Bournemouth	No Observations Available						

Table 1a: Statistics based on hourly data for January 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	60	0.94	0.09	0.06	0.11	0.20	15z 8th
Wick	54	0.90	0.07	0.07	0.10	0.23	7z 24th
Aberdeen	60	0.90	0.01	0.07	0.07	-0.28	13z 28th
North Shields	60	0.91	-0.06	0.08	0.10	-0.32	15z 28th
Whitby	60	0.92	-0.13	0.08	0.15	-0.45	15z 28th
Immingham	60	0.90	0.07	0.09	0.12	0.31	18z 29th
Cromer	57	0.95	-0.28	0.07	0.29	-0.41	20z 30th
Lowestoft	59	0.95	-0.08	0.09	0.12	-0.41	19z 26th
Felixstowe	60	0.93	-0.14	0.09	0.17	-0.40	0z 29th
Sheerness	60	0.91	-0.31	0.11	0.33	-0.59	0z 29th
Ilfracombe	No Observations Available						
Hinkley Point	60	0.87	-0.14	0.11	0.19	-0.35	19z 12th
Avonmouth	60	0.63	0.10	0.21	0.23	0.64	6z 27th
Mumbles	60	0.84	-0.11	0.11	0.16	-0.40	20z 1st
Milford Haven	60	0.92	-0.14	0.07	0.16	-0.31	13z 23th
Fishguard	60	0.94	-0.18	0.06	0.19	-0.29	14z 23th
Barmouth	60	0.95	-0.01	0.08	0.08	-0.31	6z 26th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	59	0.94	-0.09	0.10	0.14	-0.26	22z 26th
Heysham	59	0.95	0.02	0.09	0.09	0.19	15z 19th
Workington	60	0.94	0.27	0.10	0.28	0.53	16z 20th
St. Marys	No Observations Available						
Newlyn	60	0.90	-0.06	0.06	0.09	-0.20	18z 1st
Plymouth	60	0.92	-0.01	0.07	0.07	-0.23	12z 23th
Weymouth	60	0.90	-0.05	0.07	0.09	-0.20	13z 23th
Portsmouth	59	0.87	-0.12	0.10	0.15	-0.29	1z 2nd
Newhaven	59	0.87	-0.05	0.09	0.10	-0.25	13z 2nd
Dover	60	0.94	-0.10	0.07	0.13	-0.27	0z 29th
Jersey	60	0.85	-0.12	0.10	0.16	-0.26	19z 12th
Port Erin	3	0.97	0.04	0.10	0.09	0.15	13z 31st
Portpatrick	60	0.96	0.00	0.08	0.08	0.33	12z 28th
Millport	60	0.94	0.06	0.09	0.11	0.29	17z 20th
Islay	55	0.96	-0.02	0.07	0.07	0.14	10z 22th
Tobermory	52	0.92	0.11	0.10	0.15	0.37	10z 20th
Moray Firth	No Observations Available						
Leith	No Observations Available						
Ullapool	60	0.95	0.16	0.08	0.17	0.29	19z 28th
Kinlochbervie	No Observations Available						
Lerwick	49	0.91	0.01	0.06	0.06	0.12	20z 25th
Newport	60	0.71	0.10	0.18	0.21	0.64	3z 24th
Bournemouth	No Observations Available						

Table 1b: Statistics at HW for January 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	671	0.97	0.11	0.06	0.12	0.30	5z 20th
Wick	647	0.97	0.12	0.06	0.14	0.34	12z 20th
Aberdeen	671	0.95	0.05	0.07	0.09	-0.27	4z 2nd
North Shields	671	0.93	-0.05	0.09	0.11	-0.48	5z 2nd
Whitby	671	0.94	-0.10	0.09	0.14	-0.49	5z 2nd
Immingham	671	0.86	0.06	0.15	0.16	-0.53	5z 2nd
Cromer	652	0.92	-0.27	0.13	0.30	-0.74	5z 2nd
Lowestoft	671	0.92	-0.07	0.12	0.14	-0.55	9z 2nd
Felixstowe	671	0.90	-0.10	0.14	0.18	-0.59	12z 2nd
Sheerness	537	0.85	-0.27	0.22	0.35	-0.97	13z 2nd
Ilfracombe	No Observations Available						
Hinkley Point	671	0.78	-0.09	0.20	0.22	-0.80	3z 2nd
Avonmouth	671	0.79	0.06	0.23	0.24	1.46	7z 26th
Mumbles	671	0.86	-0.06	0.15	0.16	-0.64	2z 2nd
Milford Haven	671	0.92	-0.11	0.10	0.15	-0.52	5z 3rd
Fishguard	No Observations Available						
Barmouth	671	0.92	0.00	0.14	0.14	-0.82	4z 26th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	508	0.94	-0.10	0.12	0.16	-0.82	6z 26th
Heysham	600	0.94	0.08	0.13	0.15	0.57	1z 2nd
Workington	671	0.95	0.27	0.11	0.29	0.76	1z 2nd
St. Marys	No Observations Available						
Newlyn	671	0.91	-0.01	0.08	0.08	-0.32	3z 3rd
Plymouth	671	0.87	-0.01	0.09	0.09	-0.42	4z 3rd
Weymouth	671	0.89	-0.03	0.09	0.09	0.31	19z 20th
Portsmouth	671	0.86	-0.10	0.10	0.14	-0.41	19z 4th
Newhaven	671	0.90	-0.05	0.10	0.11	-0.34	20z 26th
Dover	671	0.91	-0.04	0.12	0.13	-0.38	3z 23th
Jersey	671	0.80	-0.09	0.13	0.16	-0.46	19z 3rd
Port Erin	671	0.96	0.11	0.08	0.14	0.38	17z 20th
Portpatrick	671	0.96	0.03	0.09	0.09	0.33	11z 20th
Millport	671	0.95	0.11	0.11	0.15	0.64	12z 20th
Islay	671	0.96	-0.01	0.09	0.09	0.37	10z 20th
Tobermory	641	0.95	0.18	0.09	0.20	0.50	11z 20th
Moray Firth	No Observations Available						
Leith	488	0.85	-0.01	0.12	0.12	-0.48	5z 9th
Ullapool	671	0.97	0.19	0.07	0.20	0.47	13z 20th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	671	0.65	0.03	0.30	0.30	-1.55	17z 2nd
Bournemouth	No Observations Available						

Table 2a: Statistics based on hourly data for February 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR & DATE
Stornoway	54	0.98	0.10	0.06	0.11	0.28 11z 20th
Wick	52	0.96	0.10	0.07	0.12	0.26 17z 21th
Aberdeen	54	0.95	0.03	0.07	0.08	-0.27 4z 2nd
North Shields	54	0.92	-0.08	0.09	0.13	-0.44 6z 2nd
Whitby	54	0.92	-0.14	0.09	0.17	-0.45 7z 2nd
Immingham	54	0.83	0.05	0.16	0.16	-0.44 9z 2nd
Cromer	51	0.91	-0.31	0.12	0.34	-0.64 10z 2nd
Lowestoft	54	0.94	-0.07	0.11	0.13	-0.37 13z 2nd
Felixstowe	54	0.91	-0.08	0.12	0.15	-0.36 4z 3rd
Sheerness	44	0.74	-0.27	0.23	0.36	-0.65 19z 5th
Ilfracombe	No Observations Available					
Hinkley Point	54	0.81	-0.08	0.17	0.19	0.56 6z 26th
Avonmouth	54	0.60	0.17	0.28	0.32	1.46 7z 26th
Mumbles	54	0.86	-0.04	0.14	0.14	-0.35 16z 8th
Milford Haven	54	0.91	-0.08	0.10	0.13	-0.33 16z 8th
Fishguard	No Observations Available					
Barmouth	54	0.93	0.01	0.12	0.12	-0.43 7z 26th
Holyhead	No Observations Available					
Llandudno	No Observations Available					
Liverpool	41	0.94	-0.12	0.11	0.17	-0.33 15z 3rd
Heysham	49	0.93	0.05	0.13	0.14	0.49 16z 20th
Workington	54	0.93	0.29	0.14	0.32	0.64 17z 20th
St. Marys	No Observations Available					
Newlyn	54	0.88	-0.01	0.09	0.09	0.24 22z 20th
Plymouth	54	0.84	0.01	0.09	0.09	-0.23 3z 8th
Weymouth	55	0.85	-0.01	0.09	0.09	0.29 23z 20th
Portsmouth	54	0.90	-0.06	0.11	0.12	0.34 11z 26th
Newhaven	54	0.92	-0.02	0.09	0.09	-0.25 9z 8th
Dover	54	0.91	-0.06	0.12	0.13	-0.33 3z 3rd
Jersey	54	0.70	0.00	0.15	0.15	-0.37 4z 8th
Port Erin	54	0.95	0.11	0.09	0.14	0.38 17z 20th
Portpatrick	54	0.94	0.03	0.10	0.10	0.31 12z 27th
Millport	54	0.93	0.11	0.12	0.16	0.34 9z 23th
Islay	54	0.96	-0.01	0.09	0.09	0.33 9z 20th
Tobermory	52	0.95	0.17	0.10	0.19	0.46 10z 20th
Moray Firth	No Observations Available					
Leith	39	0.82	-0.04	0.11	0.11	-0.29 9z 22th
Ullapool	54	0.97	0.17	0.07	0.18	0.35 11z 20th
Kinlochbervie	No Observations Available					
Lerwick	No Observations Available					
Newport	54	0.55	0.22	0.29	0.36	1.50 7z 26th
Bournemouth	No Observations Available					

Table 2b: Statistics at HW for February 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	743	0.94	0.04	0.06	0.07	-0.22	15z 11th
Wick	672	0.94	0.01	0.06	0.06	-0.32	15z 11th
Aberdeen	743	0.95	0.01	0.05	0.05	-0.19	11z 11th
North Shields	743	0.93	-0.04	0.06	0.08	-0.34	13z 11th
Whitby	No Observations Available						
Immingham	743	0.87	0.07	0.10	0.12	0.41	8z 7th
Cromer	710	0.93	-0.12	0.08	0.15	-0.46	17z 9th
Lowestoft	743	0.95	-0.05	0.06	0.08	-0.26	2z 11th
Felixstowe	743	0.93	-0.03	0.08	0.09	0.35	16z 9th
Sheerness	743	0.91	-0.08	0.10	0.13	-0.41	1z 19th
Ilfracombe	No Observations Available						
Hinkley Point	743	0.70	-0.03	0.15	0.15	-0.78	9z 9th
Avonmouth	743	0.64	0.01	0.22	0.22	-0.99	10z 9th
Mumbles	743	0.80	0.00	0.10	0.10	-0.56	8z 9th
Milford Haven	743	0.89	-0.08	0.06	0.10	-0.38	8z 9th
Fishguard	488	0.92	-0.05	0.06	0.08	-0.24	16z 17th
Barmouth	743	0.84	-0.04	0.11	0.12	-0.75	8z 9th
Holyhead	743	0.92	-0.02	0.06	0.07	0.28	15z 9th
Llandudno	267	0.77	0.08	0.10	0.12	0.51	14z 9th
Liverpool	743	0.90	-0.07	0.10	0.12	0.65	14z 9th
Heysham	285	0.84	0.00	0.07	0.07	-0.24	15z 23th
Workington	743	0.93	0.07	0.08	0.11	0.69	17z 9th
St. Marys	593	0.93	-0.08	0.05	0.10	-0.27	5z 18th
Newlyn	No Observations Available						
Plymouth	743	0.88	0.00	0.07	0.07	-0.29	7z 18th
Weymouth	743	0.88	-0.05	0.07	0.08	-0.32	7z 14th
Portsmouth	743	0.86	-0.09	0.08	0.12	-0.47	10z 18th
Newhaven	743	0.90	-0.03	0.07	0.08	-0.36	10z 18th
Dover	743	0.91	-0.02	0.08	0.08	0.40	17z 18th
Jersey	743	0.78	-0.02	0.10	0.10	-0.38	16z 17th
Port Erin	743	0.94	0.04	0.06	0.07	0.27	5z 11th
Portpatrick	741	0.93	-0.02	0.07	0.07	0.26	2z 11th
Millport	No Observations Available						
Islay	743	0.92	0.00	0.07	0.07	0.36	4z 11th
Tobermory	743	0.94	0.03	0.07	0.08	0.42	3z 11th
Moray Firth	743	0.83	0.02	0.09	0.09	-0.54	9z 11th
Leith	743	0.85	0.02	0.08	0.09	-0.31	0z 12th
Ullapool	743	0.95	0.08	0.06	0.10	0.28	23z 6th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	743	0.56	0.01	0.24	0.24	-1.24	10z 9th
Bournemouth	743	0.89	-0.03	0.07	0.07	-0.33	9z 18th

Table 3a: Statistics based on hourly data for March 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	60	0.95	0.04	0.05	0.07	0.19	7z 28th
Wick	54	0.97	0.01	0.04	0.04	-0.16	10z 11th
Aberdeen	60	0.93	0.00	0.06	0.06	-0.18	12z 11th
North Shields	60	0.90	-0.05	0.07	0.09	-0.30	14z 11th
Whitby	No Observations Available						
Immingham	60	0.80	0.09	0.11	0.15	-0.29	3z 9th
Cromer	57	0.90	-0.12	0.09	0.15	-0.37	18z 11th
Lowestoft	60	0.95	-0.03	0.06	0.07	-0.25	23z 18th
Felixstowe	60	0.94	-0.06	0.07	0.09	-0.24	3z 19th
Sheerness	60	0.91	-0.11	0.08	0.14	-0.37	3z 19th
Ilfracombe	No Observations Available						
Hinkley Point	60	0.80	-0.03	0.12	0.12	-0.30	5z 10th
Avonmouth	60	0.82	0.07	0.14	0.16	0.46	1z 23th
Mumbles	60	0.87	0.01	0.07	0.07	-0.18	18z 12th
Milford Haven	60	0.93	-0.05	0.05	0.07	-0.17	6z 13th
Fishguard	40	0.94	-0.02	0.05	0.05	-0.14	10z 18th
Barmouth	60	0.92	0.00	0.07	0.07	-0.27	19z 10th
Holyhead	59	0.90	-0.02	0.07	0.07	-0.21	8z 9th
Llandudno	20	0.76	0.06	0.09	0.11	0.26	17z 6th
Liverpool	60	0.88	-0.09	0.10	0.13	-0.45	20z 8th
Heysham	23	0.89	0.01	0.05	0.05	0.10	12z 29th
Workington	60	0.94	0.08	0.07	0.11	0.31	17z 6th
St. Marys	47	0.95	-0.08	0.05	0.10	-0.19	7z 17th
Newlyn	No Observations Available						
Plymouth	60	0.93	0.01	0.06	0.06	-0.14	6z 14th
Weymouth	62	0.88	-0.04	0.07	0.08	-0.32	7z 14th
Portsmouth	60	0.93	-0.09	0.06	0.11	-0.29	0z 14th
Newhaven	60	0.93	-0.02	0.06	0.07	-0.18	0z 14th
Dover	60	0.93	-0.01	0.07	0.07	-0.20	2z 19th
Jersey	60	0.84	0.04	0.09	0.10	-0.23	9z 18th
Port Erin	59	0.94	0.03	0.06	0.06	0.21	17z 6th
Portpatrick	60	0.95	-0.03	0.06	0.06	-0.15	0z 13th
Millport	No Observations Available						
Islay	62	0.92	0.00	0.07	0.07	0.27	5z 11th
Tobermory	60	0.95	0.04	0.07	0.07	0.23	5z 11th
Moray Firth	59	0.73	0.00	0.10	0.10	-0.43	22z 11th
Leith	60	0.87	0.01	0.07	0.07	0.27	13z 10th
Ullapool	60	0.95	0.09	0.06	0.10	0.26	6z 11th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	60	0.73	0.07	0.16	0.18	0.53	3z 24th
Bournemouth	87	0.87	-0.02	0.07	0.07	-0.28	2z 14th

Table 3b: Statistics at HW for March 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	719	0.92	-0.02	0.05	0.06	-0.17	23z 8th
Wick	719	0.91	-0.03	0.05	0.06	-0.19	23z 26th
Aberdeen	719	0.91	-0.03	0.05	0.06	-0.24	22z 26th
North Shields	719	0.89	-0.05	0.05	0.07	-0.29	1z 27th
Whitby	454	0.91	-0.05	0.06	0.08	-0.28	22z 26th
Immingham	719	0.77	0.04	0.09	0.10	0.42	17z 27th
Cromer	719	0.90	-0.15	0.07	0.17	-0.41	2z 27th
Lowestoft	719	0.92	-0.07	0.06	0.09	-0.30	15z 29th
Felixstowe	719	0.89	-0.04	0.07	0.08	-0.32	7z 27th
Sheerness	719	0.84	-0.08	0.10	0.13	-0.58	12z 29th
Ilfracombe	No Observations Available						
Hinkley Point	719	0.72	-0.03	0.14	0.14	-0.50	2z 8th
Avonmouth	719	0.67	0.00	0.20	0.20	-0.84	3z 29th
Mumbles	719	0.78	0.00	0.10	0.10	-0.40	3z 8th
Milford Haven	719	0.83	-0.09	0.07	0.12	-0.36	23z 7th
Fishguard	702	0.86	-0.10	0.06	0.13	-0.40	0z 8th
Barmouth	719	0.86	-0.05	0.09	0.10	-0.54	0z 29th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	589	0.78	-0.01	0.11	0.11	0.42	19z 26th
Heysham	719	0.91	-0.03	0.07	0.08	-0.33	8z 29th
Workington	719	0.89	0.03	0.08	0.09	0.37	1z 29th
St. Marys	No Observations Available						
Newlyn	451	0.89	-0.01	0.04	0.05	-0.28	13z 26th
Plymouth	719	0.78	0.00	0.07	0.07	-0.30	2z 8th
Weymouth	719	0.83	-0.05	0.07	0.09	-0.42	0z 8th
Portsmouth	719	0.84	-0.10	0.07	0.12	-0.44	0z 8th
Newhaven	719	0.88	-0.03	0.07	0.08	-0.34	22z 7th
Dover	719	0.85	-0.04	0.08	0.09	-0.30	0z 8th
Jersey	719	0.76	-0.02	0.10	0.10	-0.38	0z 8th
Port Erin	719	0.89	0.02	0.06	0.07	-0.26	0z 8th
Portpatrick	719	0.89	-0.05	0.07	0.09	-0.32	0z 8th
Millport	514	0.92	0.00	0.06	0.06	0.21	22z 26th
Islay	719	0.88	-0.04	0.07	0.08	-0.26	0z 8th
Tobermory	655	0.90	-0.01	0.07	0.07	-0.23	23z 7th
Moray Firth	No Observations Available						
Leith	No Observations Available						
Ullapool	719	0.91	0.01	0.06	0.06	0.20	1z 1st
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	719	0.64	0.00	0.20	0.20	-0.92	3z 29th
Bournemouth	No Observations Available						

Table 4a: Statistics based on hourly data for April 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR & DATE
Stornoway	58	0.92	-0.02	0.05	0.06	-0.13 19z 26th
Wick	58	0.92	-0.04	0.05	0.06	-0.19 23z 26th
Aberdeen	58	0.93	-0.03	0.04	0.05	0.12 13z 27th
North Shields	58	0.91	-0.06	0.04	0.08	-0.17 3z 27th
Whitby	36	0.92	-0.06	0.05	0.08	-0.20 5z 29th
Immingham	58	0.80	0.08	0.07	0.10	0.36 18z 27th
Cromer	58	0.89	-0.15	0.06	0.17	-0.32 8z 29th
Lowestoft	57	0.89	-0.06	0.06	0.09	-0.24 20z 26th
Felixstowe	58	0.88	-0.07	0.06	0.10	-0.22 8z 7th
Sheerness	58	0.77	-0.11	0.09	0.14	-0.43 9z 7th
Ilfracombe	No Observations Available					
Hinkley Point	58	0.66	-0.03	0.14	0.14	-0.39 16z 7th
Avonmouth	58	0.69	0.07	0.15	0.16	0.50 1z 21th
Mumbles	58	0.59	0.00	0.12	0.12	-0.37 4z 8th
Milford Haven	58	0.81	-0.06	0.08	0.10	-0.29 4z 8th
Fishguard	57	0.83	-0.08	0.07	0.11	-0.32 5z 8th
Barmouth	58	0.89	-0.02	0.07	0.08	-0.23 6z 8th
Holyhead	No Observations Available					
Llandudno	No Observations Available					
Liverpool	47	0.70	0.00	0.12	0.12	-0.30 21z 7th
Heysham	58	0.88	-0.04	0.07	0.09	-0.24 22z 8th
Workington	58	0.82	0.05	0.10	0.12	0.37 1z 29th
St. Marys	No Observations Available					
Newlyn	37	0.95	0.00	0.03	0.03	0.10 6z 29th
Plymouth	58	0.78	0.01	0.07	0.07	-0.26 3z 8th
Weymouth	59	0.75	-0.04	0.08	0.09	-0.33 4z 8th
Portsmouth	58	0.88	-0.09	0.08	0.12	-0.34 21z 7th
Newhaven	58	0.87	-0.03	0.07	0.08	-0.31 21z 7th
Dover	58	0.86	-0.03	0.07	0.07	-0.21 9z 7th
Jersey	58	0.78	0.04	0.09	0.10	0.24 9z 29th
Port Erin	58	0.85	0.01	0.07	0.07	-0.21 21z 7th
Portpatrick	58	0.85	-0.05	0.08	0.10	-0.29 22z 7th
Millport	42	0.90	-0.01	0.07	0.07	0.15 2z 29th
Islay	62	0.90	-0.03	0.06	0.07	-0.20 4z 8th
Tobermory	53	0.88	0.00	0.07	0.07	-0.20 4z 9th
Moray Firth	No Observations Available					
Leith	No Observations Available					
Ullapool	58	0.92	0.01	0.05	0.05	-0.13 19z 26th
Kinlochbervie	No Observations Available					
Lerwick	No Observations Available					
Newport	58	0.63	0.07	0.17	0.19	0.47 9z 29th
Bournemouth	No Observations Available					

Table 4b: Statistics at HW for April 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	743	0.97	-0.04	0.04	0.06	-0.22	16z 22th
Wick	743	0.96	-0.05	0.04	0.07	-0.23	19z 22th
Aberdeen	743	0.93	-0.05	0.04	0.07	-0.22	1z 23th
North Shields	743	0.86	-0.06	0.05	0.09	-0.23	22z 22th
Whitby	743	0.83	-0.07	0.05	0.09	-0.26	22z 22th
Immingham	743	0.65	0.04	0.09	0.10	-0.28	5z 14th
Cromer	743	0.73	-0.19	0.08	0.21	-0.46	5z 14th
Lowestoft	743	0.78	-0.08	0.07	0.11	-0.34	4z 25th
Felixstowe	743	0.77	-0.06	0.07	0.10	-0.31	23z 14th
Sheerness	No Observations Available						
Ilfracombe	No Observations Available						
Hinkley Point	743	0.68	-0.02	0.13	0.14	0.46	13z 24th
Avonmouth	743	0.61	0.00	0.19	0.19	-0.64	6z 18th
Mumbles	743	0.82	0.01	0.10	0.10	0.34	14z 24th
Milford Haven	743	0.93	-0.08	0.06	0.10	-0.30	15z 13th
Fishguard	743	0.94	-0.10	0.05	0.12	-0.28	20z 20th
Barmouth	743	0.92	-0.04	0.08	0.09	0.43	17z 24th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	515	0.87	0.06	0.07	0.09	0.28	8z 21th
Heysham	699	0.94	-0.04	0.07	0.09	-0.29	0z 21th
Workington	743	0.95	0.03	0.06	0.07	0.22	17z 24th
St. Marys	No Observations Available						
Newlyn	743	0.89	-0.09	0.06	0.11	-0.24	18z 21th
Plymouth	743	0.89	0.00	0.06	0.06	-0.20	19z 21th
Weymouth	743	0.88	-0.03	0.06	0.07	-0.20	21z 21th
Portsmouth	743	0.84	-0.09	0.06	0.11	-0.34	2z 26th
Newhaven	743	0.80	-0.03	0.06	0.07	-0.19	7z 26th
Dover	743	0.69	-0.03	0.08	0.08	-0.26	6z 22th
Jersey	743	0.79	-0.01	0.08	0.08	-0.27	15z 13th
Port Erin	743	0.95	0.02	0.05	0.06	0.18	5z 15th
Portpatrick	743	0.96	-0.05	0.05	0.07	-0.20	1z 21th
Millport	731	0.95	-0.02	0.07	0.07	-0.25	1z 21th
Islay	743	0.96	-0.05	0.06	0.08	-0.25	17z 20th
Tobermory	743	0.96	-0.01	0.05	0.05	0.18	5z 25th
Moray Firth	No Observations Available						
Leith	683	0.79	-0.01	0.07	0.07	0.33	10z 22th
Ullapool	743	0.97	0.00	0.04	0.04	-0.19	16z 22th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	743	0.60	-0.01	0.19	0.19	-0.65	14z 27th
Bournemouth	No Observations Available						

Table 5a: Statistics based on hourly data for May 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR & DATE
Stornoway	60	0.97	-0.04	0.04	0.07	-0.22 16z 22th
Wick	60	0.96	-0.06	0.05	0.08	-0.22 20z 22th
Aberdeen	60	0.93	-0.05	0.05	0.07	-0.20 22z 22th
North Shields	60	0.84	-0.08	0.06	0.10	-0.21 0z 23th
Whitby	60	0.79	-0.08	0.06	0.10	-0.23 17z 14th
Immingham	60	0.78	0.07	0.07	0.10	0.21 4z 8th
Cromer	60	0.69	-0.17	0.08	0.20	-0.36 20z 14th
Lowestoft	59	0.73	-0.07	0.08	0.11	-0.28 6z 22th
Felixstowe	60	0.85	-0.08	0.05	0.10	-0.20 7z 21th
Sheerness	No Observations Available					
Ilfracombe	No Observations Available					
Hinkley Point	60	0.69	-0.05	0.10	0.12	-0.24 10z 31st
Avonmouth	60	0.61	0.01	0.13	0.13	0.40 23z 17th
Mumbles	60	0.71	-0.03	0.09	0.10	-0.22 3z 7th
Milford Haven	60	0.93	-0.08	0.05	0.10	-0.18 13z 5th
Fishguard	60	0.94	-0.09	0.05	0.11	-0.18 14z 5th
Barmouth	59	0.93	-0.05	0.07	0.09	-0.29 17z 22th
Holyhead	No Observations Available					
Llandudno	No Observations Available					
Liverpool	42	0.92	0.03	0.05	0.06	0.13 22z 9th
Heysham	57	0.94	-0.07	0.06	0.10	-0.25 22z 24th
Workington	60	0.94	0.01	0.06	0.06	0.16 1z 15th
St. Marys	No Observations Available					
Newlyn	60	0.90	-0.10	0.05	0.12	-0.21 12z 21th
Plymouth	60	0.90	0.00	0.05	0.05	0.11 7z 14th
Weymouth	60	0.89	-0.02	0.05	0.06	-0.18 14z 21th
Portsmouth	60	0.86	-0.09	0.06	0.11	-0.24 19z 5th
Newhaven	60	0.80	-0.05	0.05	0.07	-0.17 19z 21th
Dover	60	0.77	-0.06	0.06	0.09	-0.23 1z 15th
Jersey	60	0.76	0.02	0.08	0.08	-0.19 14z 21th
Port Erin	60	0.95	0.00	0.05	0.05	-0.11 19z 5th
Portpatrick	60	0.96	-0.06	0.05	0.08	-0.16 16z 17th
Millport	58	0.95	-0.03	0.06	0.07	-0.17 21z 21th
Islay	60	0.96	-0.03	0.06	0.07	-0.19 15z 22th
Tobermory	60	0.96	-0.01	0.05	0.05	0.18 5z 25th
Moray Firth	No Observations Available					
Leith	55	0.80	-0.01	0.07	0.07	-0.18 0z 23th
Ullapool	60	0.97	1.05	0.04	0.04	-0.19 16z 22th
Kinlochbervie	No Observations Available					
Lerwick	No Observations Available					
Newport	60	0.58	0.05	0.14	0.15	0.35 0z 19th
Bournemouth	No Observations Available					

Table 5b: Statistics at HW for May 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	719	0.94	-0.03	0.04	0.06	-0.16	16z 14th
Wick	719	0.93	-0.04	0.04	0.06	-0.18	16z 17th
Aberdeen	719	0.90	-0.03	0.04	0.05	-0.14	12z 15th
North Shields	719	0.88	-0.05	0.04	0.07	-0.18	18z 15th
Whitby	719	0.90	-0.05	0.04	0.07	-0.18	5z 17th
Immingham	719	0.80	0.07	0.07	0.10	0.38	3z 29th
Cromer	719	0.90	-0.16	0.06	0.17	-0.29	16z 10th
Lowestoft	719	0.91	-0.06	0.05	0.08	-0.21	1z 15th
Felixstowe	719	0.86	-0.04	0.06	0.08	-0.24	21z 10th
Sheerness	394	0.86	-0.05	0.08	0.10	-0.32	13z 17th
Ilfracombe	274	0.01	4.82	2.42	5.40	8.81	19z 26th
Hinkley Point	719	0.61	-0.01	0.13	0.13	0.37	15z 29th
Avonmouth	719	0.49	0.02	0.20	0.20	-0.66	4z 13th
Mumbles	719	0.74	0.03	0.10	0.10	0.39	13z 28th
Milford Haven	719	0.90	-0.07	0.05	0.10	-0.24	16z 12th
Fishguard	719	0.93	-0.11	0.04	0.12	-0.22	3z 10th
Barmouth	719	0.89	-0.04	0.07	0.08	-0.39	4z 10th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	719	0.81	0.07	0.07	0.10	0.29	20z 28th
Heysham	466	0.89	-0.03	0.07	0.08	-0.22	23z 18th
Workington	719	0.90	0.03	0.07	0.07	0.23	7z 18th
St. Marys	No Observations Available						
Newlyn	719	0.89	-0.09	0.05	0.11	-0.23	14z 12th
Plymouth	719	0.84	0.01	0.06	0.06	0.18	12z 28th
Weymouth	719	0.85	-0.02	0.05	0.06	-0.21	3z 12th
Portsmouth	719	0.78	-0.07	0.06	0.10	-0.24	21z 11th
Newhaven	No Observations Available						
Dover	719	0.75	-0.01	0.07	0.08	0.22	22z 28th
Jersey	719	0.76	0.00	0.09	0.09	-0.30	3z 12th
Port Erin	719	0.92	0.04	0.05	0.07	0.18	22z 28th
Portpatrick	719	0.92	-0.03	0.05	0.07	-0.18	19z 7th
Millport	514	0.91	-0.01	0.07	0.07	0.20	21z 30th
Islay	719	0.94	-0.04	0.05	0.06	-0.17	20z 7th
Tobermory	719	0.94	-0.02	0.05	0.05	0.16	20z 30th
Moray Firth	No Observations Available						
Leith	719	0.77	0.00	0.07	0.07	0.23	19z 3rd
Ullapool	719	0.95	0.00	0.04	0.04	0.16	15z 10th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	719	0.53	0.01	0.18	0.18	0.73	16z 28th
Bournemouth	No Observations Available						

Table 6a: Statistics based on hourly data for June 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	58	0.95	-0.04	0.04	0.06	-0.13	12z 17th
Wick	58	0.92	-0.06	0.04	0.08	-0.18	16z 17th
Aberdeen	58	0.92	-0.04	0.03	0.05	-0.12	4z 15th
North Shields	58	0.85	-0.07	0.04	0.09	-0.18	18z 15th
Whitby	58	0.88	-0.06	0.04	0.08	-0.16	19z 15th
Immingham	58	0.81	0.09	0.06	0.11	0.26	20z 28th
Cromer	58	0.91	-0.15	0.05	0.16	-0.25	18z 10th
Lowestoft	58	0.93	-0.05	0.05	0.07	-0.16	4z 3rd
Felixstowe	58	0.88	-0.09	0.05	0.11	-0.22	5z 3rd
Sheerness	32	0.89	-0.11	0.05	0.13	-0.20	0z 24th
Ilfracombe	22	0.56	8.21	0.37	8.21	8.81	19z 26th
Hinkley Point	58	0.40	-0.05	0.12	0.13	-0.32	11z 1st
Avonmouth	58	0.33	0.01	0.15	0.15	0.34	22z 14th
Mumbles	58	0.73	-0.01	0.07	0.07	-0.19	23z 1st
Milford Haven	58	0.90	-0.09	0.04	0.10	-0.20	17z 22th
Fishguard	58	0.92	-0.11	0.04	0.12	-0.20	4z 21th
Barmouth	57	0.89	-0.05	0.06	0.08	-0.25	8z 10th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	58	0.82	0.03	0.06	0.06	0.19	4z 18th
Heysham	37	0.87	-0.07	0.06	0.10	-0.20	0z 13th
Workington	58	0.91	0.00	0.05	0.05	0.13	5z 18th
St. Marys	No Observations Available						
Newlyn	58	0.91	-0.10	0.04	0.11	-0.20	17z 11th
Plymouth	58	0.82	0.00	0.05	0.05	0.13	0z 19th
Weymouth	58	0.84	-0.02	0.04	0.05	-0.12	10z 1st
Portsmouth	58	0.82	-0.08	0.05	0.10	-0.18	16z 1st
Newhaven	No Observations Available						
Dover	58	0.85	-0.05	0.05	0.07	-0.19	4z 1st
Jersey	58	0.70	0.01	0.07	0.07	-0.15	17z 22th
Port Erin	58	0.93	0.02	0.05	0.05	0.13	5z 18th
Portpatrick	58	0.92	-0.05	0.05	0.07	-0.15	10z 8th
Millport	41	0.91	-0.02	0.06	0.07	-0.16	17z 1st
Islay	59	0.94	-0.03	0.05	0.06	-0.14	3z 8th
Tobermory	58	0.94	-0.02	0.04	0.05	0.13	21z 30th
Moray Firth	No Observations Available						
Leith	58	0.78	-0.02	0.06	0.06	-0.15	21z 3rd
Ullapool	58	0.96	0.00	0.04	0.04	0.11	23z 30th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	58	0.36	0.04	0.16	0.16	0.40	22z 14th
Bournemouth	No Observations Available						

Table 6b: Statistics at HW for June 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	743	0.92	-0.02	0.04	0.04	-0.14	11z 17th
Wick	743	0.93	-0.02	0.03	0.04	-0.13	16z 16th
Aberdeen	743	0.89	-0.01	0.04	0.04	-0.12	15z 16th
North Shields	29	0.96	-0.02	0.03	0.04	-0.07	9z 1st
Whitby	743	0.84	-0.03	0.04	0.06	-0.17	18z 16th
Immingham	743	0.62	0.08	0.08	0.11	0.30	11z 15th
Cromer	743	0.85	-0.14	0.05	0.15	-0.28	0z 9th
Lowestoft	743	0.87	-0.04	0.04	0.06	-0.18	22z 15th
Felixstowe	743	0.81	-0.02	0.05	0.06	-0.22	20z 9th
Sheerness	464	0.83	-0.04	0.07	0.08	-0.27	20z 8th
Ilfracombe	No Observations Available						
Hinkley Point	743	0.49	-0.01	0.12	0.12	-0.33	19z 26th
Avonmouth	743	0.40	0.03	0.17	0.18	-0.52	4z 12th
Mumbles	743	0.62	0.04	0.08	0.09	0.25	17z 1st
Milford Haven	743	0.81	-0.07	0.05	0.09	-0.19	4z 12th
Fishguard	743	0.86	-0.12	0.04	0.13	-0.22	4z 12th
Barmouth	743	0.87	-0.02	0.05	0.06	-0.20	5z 13th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	743	0.80	0.07	0.07	0.10	0.27	10z 5th
Heysham	743	0.81	-0.01	0.07	0.07	-0.19	9z 12th
Workington	743	0.87	0.05	0.06	0.07	0.23	17z 23th
St. Marys	No Observations Available						
Newlyn	743	0.75	-0.10	0.04	0.11	-0.20	18z 14th
Plymouth	No Observations Available						
Weymouth	743	0.78	-0.03	0.05	0.06	-0.16	18z 17th
Portsmouth	736	0.72	-0.06	0.06	0.09	-0.24	21z 19th
Newhaven	743	0.73	-0.01	0.06	0.06	-0.18	6z 9th
Dover	743	0.71	0.00	0.07	0.07	-0.25	11z 12th
Jersey	743	0.59	-0.04	0.09	0.10	-0.30	18z 26th
Port Erin	743	0.92	0.05	0.04	0.07	0.19	22z 1st
Portpatrick	743	0.90	-0.01	0.04	0.05	-0.14	10z 9th
Millport	424	0.88	0.01	0.05	0.05	0.18	23z 1st
Islay	743	0.94	-0.03	0.04	0.05	-0.15	5z 8th
Tobermory	743	0.93	0.00	0.04	0.04	-0.12	5z 8th
Moray Firth	No Observations Available						
Leith	723	0.72	0.02	0.06	0.07	0.27	14z 31st
Ullapool	743	0.94	0.01	0.04	0.04	0.14	13z 7th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	743	0.43	0.02	0.16	0.16	0.50	16z 28th
Bournemouth	No Observations Available						

Table 7a: Statistics based on hourly data for July 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	60	0.91	-0.03	0.04	0.05	-0.13	11z 16th
Wick	60	0.94	-0.03	0.03	0.05	-0.13	16z 16th
Aberdeen	60	0.92	-0.02	0.03	0.04	-0.09	1z 10th
North Shields	3	1.00	-0.03	0.02	0.04	-0.05	20z 31st
Whitby	60	0.87	-0.04	0.04	0.06	-0.15	3z 9th
Immingham	60	0.87	0.11	0.04	0.12	0.21	4z 8th
Cromer	60	0.89	-0.14	0.04	0.15	-0.25	17z 8th
Lowestoft	60	0.89	-0.04	0.04	0.06	-0.14	20z 9th
Felixstowe	60	0.81	-0.05	0.05	0.07	-0.15	8z 20th
Sheerness	38	0.86	-0.09	0.06	0.11	-0.19	14z 26th
Ilfracombe	No Observations Available						
Hinkley Point	59	0.59	-0.04	0.11	0.12	-0.30	4z 21th
Avonmouth	59	0.57	0.04	0.14	0.14	0.32	22z 13th
Mumbles	60	0.67	0.03	0.08	0.08	0.18	15z 5th
Milford Haven	60	0.85	-0.08	0.04	0.09	-0.17	15z 20th
Fishguard	59	0.85	-0.11	0.04	0.12	-0.21	15z 19th
Barmouth	59	0.90	-0.04	0.04	0.06	-0.16	4z 20th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	60	0.90	0.05	0.05	0.07	0.21	17z 2nd
Heysham	60	0.90	-0.05	0.05	0.07	-0.14	17z 17th
Workington	60	0.92	0.03	0.04	0.06	0.19	17z 2nd
St. Marys	No Observations Available						
Newlyn	60	0.82	-0.10	0.04	0.11	-0.17	16z 22th
Plymouth	No Observations Available						
Weymouth	60	0.80	-0.02	0.05	0.05	-0.12	14z 19th
Portsmouth	60	0.81	-0.08	0.05	0.10	-0.20	13z 26th
Newhaven	60	0.75	-0.04	0.05	0.07	-0.15	8z 20th
Dover	60	0.78	-0.02	0.05	0.06	-0.13	22z 8th
Jersey	60	0.63	-0.02	0.08	0.09	0.17	13z 3rd
Port Erin	60	0.95	0.04	0.03	0.05	0.15	17z 2nd
Portpatrick	60	0.93	-0.03	0.04	0.05	-0.13	11z 9th
Millport	35	0.93	0.00	0.04	0.04	-0.10	21z 19th
Islay	60	0.91	-0.02	0.04	0.05	-0.13	9z 30th
Tobermory	60	0.93	0.00	0.04	0.04	-0.11	4z 8th
Moray Firth	No Observations Available						
Leith	58	0.83	0.01	0.05	0.05	-0.15	6z 31st
Ullapool	60	0.94	0.01	0.03	0.03	0.09	7z 24th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	59	0.58	0.07	0.14	0.16	0.32	22z 13th
Bournemouth	No Observations Available						

Table 7b: Statistics at HW for July 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	743	0.93	-0.01	0.04	0.04	-0.14	11z 15th
Wick	743	0.94	-0.01	0.03	0.03	-0.12	16z 15th
Aberdeen	743	0.92	-0.01	0.03	0.03	-0.11	18z 15th
North Shields	743	0.87	-0.04	0.04	0.06	-0.15	5z 1st
Whitby	743	0.88	-0.04	0.04	0.06	-0.16	11z 10th
Immingham	743	0.73	0.08	0.08	0.11	0.29	9z 13th
Cromer	743	0.89	-0.13	0.05	0.15	-0.27	9z 1st
Lowestoft	743	0.90	-0.04	0.04	0.06	-0.19	14z 25th
Felixstowe	743	0.85	0.02	0.06	0.06	0.19	9z 13th
Sheerness	No Observations Available						
Ilfracombe	No Observations Available						
Hinkley Point	743	0.28	-0.01	0.13	0.13	-0.34	5z 23th
Avonmouth	743	0.29	0.04	0.17	0.17	-0.59	19z 31st
Mumbles	458	0.41	0.04	0.09	0.10	0.28	20z 11th
Milford Haven	743	0.78	-0.07	0.05	0.09	-0.21	9z 2nd
Fishguard	743	0.81	-0.13	0.04	0.14	-0.25	12z 8th
Barmouth	743	0.77	-0.04	0.06	0.07	-0.32	6z 12th
Holyhead	743	0.87	0.00	0.04	0.04	-0.13	3z 4th
Llandudno	677	0.78	0.05	0.06	0.08	0.31	5z 10th
Liverpool	743	0.69	0.07	0.07	0.10	0.29	4z 13th
Heysham	743	0.80	-0.02	0.07	0.07	-0.26	20z 30th
Workington	743	0.84	0.05	0.06	0.08	0.20	2z 12th
St. Marys	743	0.73	-0.03	0.04	0.05	-0.14	17z 25th
Newlyn	743	0.79	-0.11	0.04	0.12	-0.24	22z 3rd
Plymouth	565	0.61	0.01	0.06	0.06	-0.14	4z 26th
Weymouth	743	0.70	-0.04	0.05	0.07	-0.18	20z 2nd
Portsmouth	743	0.70	-0.07	0.05	0.09	-0.20	16z 3rd
Newhaven	743	0.65	-0.01	0.06	0.06	-0.19	14z 3rd
Dover	743	0.74	-0.01	0.06	0.06	-0.20	16z 3rd
Jersey	743	0.54	-0.05	0.09	0.10	-0.29	6z 26th
Port Erin	743	0.87	0.06	0.04	0.07	0.18	21z 9th
Portpatrick	743	0.89	-0.01	0.04	0.05	-0.15	6z 3rd
Millport	743	0.85	0.01	0.06	0.06	0.19	14z 18th
Islay	743	0.89	-0.02	0.05	0.06	-0.15	7z 2nd
Tobermory	743	0.91	0.01	0.04	0.04	-0.14	10z 15th
Moray Firth	226	0.80	0.00	0.06	0.06	0.17	18z 30th
Leith	743	0.75	0.01	0.06	0.06	0.26	4z 13th
Ullapool	743	0.94	0.04	0.04	0.05	0.14	23z 21th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	743	0.25	0.02	0.17	0.17	-0.56	16z 12th
Bournemouth	743	0.70	-0.02	0.05	0.06	-0.17	19z 2nd

Table 8a: Statistics based on hourly data for August 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	59	0.90	-0.01	0.04	0.05	-0.13	12z 15th
Wick	60	0.92	-0.01	0.04	0.04	-0.12	16z 15th
Aberdeen	60	0.90	-0.01	0.03	0.04	-0.10	2z 25th
North Shields	60	0.81	-0.05	0.04	0.07	-0.13	20z 15th
Whitby	60	0.83	-0.04	0.05	0.07	-0.15	21z 15th
Immingham	60	0.72	0.10	0.07	0.12	0.29	9z 13th
Cromer	59	0.82	-0.13	0.06	0.15	-0.26	5z 20th
Lowestoft	60	0.92	-0.04	0.04	0.06	-0.14	10z 25th
Felixstowe	60	0.81	-0.02	0.05	0.05	-0.12	5z 16th
Sheerness	No Observations Available						
Ilfracombe	No Observations Available						
Hinkley Point	59	0.29	-0.01	0.10	0.10	-0.25	4z 19th
Avonmouth	59	0.23	0.08	0.13	0.15	0.39	21z 11th
Mumbles	36	0.56	0.06	0.06	0.09	0.28	21z 11th
Milford Haven	59	0.78	-0.06	0.05	0.08	-0.15	1z 3rd
Fishguard	59	0.81	-0.11	0.04	0.12	-0.20	3z 18th
Barmouth	60	0.74	-0.02	0.06	0.06	-0.18	3z 3rd
Holyhead	60	0.80	-0.02	0.05	0.05	-0.11	5z 3rd
Llandudno	53	0.70	0.04	0.06	0.07	0.19	12z 10th
Liverpool	60	0.65	0.05	0.06	0.08	0.21	12z 9th
Heysham	60	0.66	-0.06	0.07	0.09	-0.20	5z 2nd
Workington	60	0.76	0.03	0.06	0.07	0.20	2z 12th
St. Marys	60	0.65	-0.02	0.04	0.05	-0.10	19z 25th
Newlyn	60	0.77	-0.12	0.04	0.13	-0.19	22z 1st
Plymouth	46	0.59	0.01	0.05	0.05	0.11	20z 11th
Weymouth	60	0.70	-0.02	0.04	0.05	-0.12	12z 2nd
Portsmouth	60	0.74	-0.08	0.05	0.10	-0.20	23z 21th
Newhaven	60	0.68	-0.03	0.06	0.06	-0.13	17z 2nd
Dover	60	0.78	-0.03	0.05	0.07	-0.13	20z 18th
Jersey	59	0.40	-0.01	0.08	0.08	0.21	21z 11th
Port Erin	60	0.83	0.04	0.05	0.06	0.15	0z 10th
Portpatrick	60	0.89	-0.03	0.04	0.05	-0.13	7z 3rd
Millport	60	0.88	0.01	0.05	0.05	0.10	1z 9th
Islay	60	0.92	-0.02	0.04	0.05	-0.13	10z 15th
Tobermory	60	0.88	0.01	0.05	0.05	-0.14	10z 15th
Moray Firth	18	0.86	0.00	0.05	0.05	0.09	2z 29th
Leith	60	0.72	0.01	0.06	0.06	0.18	5z 13th
Ullapool	59	0.93	0.03	0.04	0.05	0.13	8z 10th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	59	0.28	0.09	0.14	0.17	0.44	22z 11th
Bournemouth	95	0.62	-0.02	0.07	0.07	-0.17	19z 2nd

Table 8b: Statistics at HW for August 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	719	0.87	-0.03	0.05	0.06	-0.14	16z 1st
Wick	719	0.89	-0.03	0.04	0.05	-0.14	2z 6th
Aberdeen	719	0.84	-0.02	0.04	0.05	-0.14	8z 10th
North Shields	719	0.78	-0.04	0.05	0.07	-0.17	17z 10th
Whitby	719	0.81	-0.04	0.05	0.07	-0.18	1z 26th
Immingham	719	0.66	0.06	0.08	0.10	0.29	16z 6th
Cromer	719	0.84	-0.16	0.06	0.17	-0.39	5z 26th
Lowestoft	719	0.87	-0.06	0.05	0.09	-0.30	17z 9th
Felixstowe	719	0.81	-0.07	0.07	0.10	-0.32	9z 26th
Sheerness	678	0.75	-0.09	0.10	0.13	-0.46	11z 26th
Ilfracombe	513	0.42	-0.10	0.08	0.13	-0.27	4z 25th
Hinkley Point	719	0.29	-0.04	0.14	0.15	-0.43	20z 1st
Avonmouth	719	0.32	0.01	0.20	0.20	-0.86	19z 30th
Mumbles	719	0.47	0.01	0.10	0.10	0.32	15z 1st
Milford Haven	719	0.68	-0.10	0.06	0.12	-0.25	4z 25th
Fishguard	719	0.78	-0.15	0.05	0.16	-0.28	12z 17th
Barmouth	719	0.78	-0.06	0.07	0.10	-0.35	5z 9th
Holyhead	719	0.85	-0.04	0.04	0.06	-0.16	23z 22th
Llandudno	719	0.75	0.02	0.06	0.06	0.16	10z 7th
Liverpool	641	0.66	0.04	0.08	0.09	0.23	19z 27th
Heysham	719	0.82	-0.05	0.07	0.09	-0.25	2z 7th
Workington	706	0.62	-0.02	0.10	0.10	-0.33	12z 25th
St. Marys	688	0.74	-0.09	0.04	0.10	-0.22	16z 22th
Newlyn	719	0.74	-0.16	0.04	0.17	-0.30	16z 24th
Plymouth	719	0.58	-0.03	0.07	0.07	-0.24	16z 24th
Weymouth	719	0.66	-0.08	0.06	0.10	-0.26	14z 24th
Portsmouth	719	0.66	-0.11	0.06	0.13	-0.31	15z 9th
Newhaven	719	0.65	-0.05	0.07	0.08	-0.27	12z 26th
Dover	719	0.69	-0.05	0.08	0.10	-0.33	11z 24th
Jersey	719	0.53	-0.08	0.10	0.13	-0.34	5z 25th
Port Erin	719	0.84	0.02	0.04	0.05	0.14	12z 7th
Portpatrick	719	0.86	-0.04	0.04	0.06	-0.16	2z 24th
Millport	719	0.84	-0.01	0.05	0.06	0.17	14z 5th
Islay	719	0.88	-0.05	0.04	0.07	-0.16	11z 25th
Tobermory	719	0.86	-0.01	0.05	0.05	0.15	15z 7th
Moray Firth	719	0.70	-0.01	0.07	0.07	0.25	20z 6th
Leith	719	0.65	0.02	0.07	0.07	0.25	12z 5th
Ullapool	719	0.87	0.02	0.05	0.05	0.16	16z 7th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	719	0.26	0.00	0.20	0.20	-0.75	3z 9th
Bournemouth	719	0.66	-0.06	0.06	0.09	-0.23	19z 14th

Table 9a: Statistics based on hourly data for September 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	57	0.89	-0.03	0.04	0.05	-0.12	19z 20th
Wick	58	0.85	-0.03	0.05	0.06	-0.12	1z 26th
Aberdeen	58	0.79	-0.02	0.05	0.06	-0.12	15z 10th
North Shields	58	0.78	-0.05	0.05	0.07	-0.17	17z 10th
Whitby	58	0.78	-0.04	0.05	0.07	-0.15	18z 10th
Immingham	58	0.72	0.10	0.07	0.12	0.26	17z 6th
Cromer	57	0.83	-0.16	0.06	0.17	-0.29	21z 10th
Lowestoft	58	0.85	-0.05	0.06	0.08	-0.18	9z 21th
Felixstowe	58	0.82	-0.10	0.07	0.12	-0.24	12z 22th
Sheerness	55	0.67	-0.12	0.09	0.15	-0.34	13z 22th
Ilfracombe	41	0.39	-0.10	0.06	0.12	-0.23	19z 22th
Hinkley Point	57	0.38	-0.04	0.13	0.13	-0.33	4z 17th
Avonmouth	57	0.27	0.05	0.16	0.17	0.46	12z 30th
Mumbles	57	0.70	0.00	0.07	0.07	0.20	12z 30th
Milford Haven	57	0.70	-0.08	0.05	0.10	-0.21	19z 22th
Fishguard	58	0.76	-0.12	0.05	0.13	-0.21	13z 14th
Barmouth	58	0.79	-0.03	0.06	0.07	-0.16	21z 8th
Holyhead	58	0.81	-0.05	0.05	0.07	-0.16	23z 22th
Llandudno	58	0.69	0.02	0.06	0.06	0.15	11z 7th
Liverpool	52	0.63	0.03	0.07	0.08	0.17	11z 7th
Heysham	58	0.75	-0.08	0.07	0.11	-0.24	1z 26th
Workington	57	0.60	-0.02	0.09	0.09	-0.23	14z 25th
St. Marys	55	0.70	-0.07	0.05	0.09	-0.17	18z 22th
Newlyn	58	0.73	-0.15	0.04	0.16	-0.25	17z 21th
Plymouth	58	0.64	-0.02	0.06	0.06	-0.17	18z 22th
Weymouth	58	0.55	-0.06	0.07	0.09	-0.23	14z 16th
Portsmouth	58	0.69	-0.13	0.07	0.15	-0.25	1z 24th
Newhaven	58	0.68	-0.05	0.07	0.09	-0.19	9z 17th
Dover	58	0.83	-0.05	0.06	0.08	-0.17	15z 27th
Jersey	57	0.58	-0.03	0.09	0.09	-0.24	16z 17th
Port Erin	58	0.82	0.01	0.05	0.05	0.12	11z 7th
Portpatrick	58	0.84	-0.05	0.05	0.07	-0.16	2z 24th
Millport	58	0.84	-0.02	0.05	0.06	-0.13	2z 24th
Islay	63	0.91	-0.04	0.03	0.05	-0.14	23z 15th
Tobermory	58	0.88	-0.01	0.04	0.04	0.12	18z 7th
Moray Firth	58	0.68	0.00	0.07	0.07	0.19	23z 7th
Leith	58	0.57	0.02	0.07	0.07	0.19	13z 5th
Ullapool	57	0.88	0.02	0.05	0.05	0.14	12z 30th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	58	0.25	0.06	0.16	0.17	0.42	13z 30th
Bournemouth	89	0.53	-0.05	0.07	0.09	-0.23	19z 14th

Table 9b: Statistics at HW for September 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	743	0.90	0.02	0.04	0.05	0.17	13z 23th
Wick	743	0.88	0.02	0.05	0.06	0.21	0z 29th
Aberdeen	743	0.91	0.02	0.06	0.06	-0.28	21z 22th
North Shields	743	0.93	-0.01	0.06	0.06	-0.31	16z 23th
Whitby	743	0.94	0.00	0.06	0.06	0.29	5z 29th
Immingham	29	0.90	0.09	0.07	0.11	0.23	6z 18th
Cromer	722	0.93	-0.12	0.09	0.15	-0.67	15z 27th
Lowestoft	682	0.93	-0.05	0.08	0.10	-0.55	16z 27th
Felixstowe	743	0.91	-0.04	0.10	0.11	-0.46	0z 26th
Sheerness	743	0.89	-0.07	0.13	0.15	-0.74	14z 27th
Ilfracombe	713	0.77	-0.03	0.12	0.12	0.73	8z 27th
Hinkley Point	743	0.72	0.02	0.17	0.17	0.96	9z 27th
Avonmouth	739	0.66	0.07	0.25	0.26	-1.11	6z 27th
Mumbles	743	0.78	0.07	0.12	0.14	0.84	8z 27th
Milford Haven	743	0.84	-0.05	0.09	0.11	-0.41	4z 27th
Fishguard	743	0.85	-0.06	0.09	0.11	-0.35	10z 15th
Barmouth	743	0.86	0.00	0.12	0.12	-0.91	7z 27th
Holyhead	No Observations Available						
Llandudno	No Observations Available						
Liverpool	743	0.90	0.10	0.10	0.14	-0.78	10z 27th
Heysham	743	0.89	0.02	0.10	0.10	0.66	13z 27th
Workington	622	0.87	-0.10	0.09	0.14	-0.50	21z 24th
St. Marys	No Observations Available						
Newlyn	743	0.83	-0.10	0.08	0.14	-0.41	2z 20th
Plymouth	743	0.79	0.02	0.09	0.10	0.42	23z 25th
Weymouth	743	0.77	-0.01	0.10	0.10	0.45	16z 27th
Portsmouth	15	0.69	0.02	0.14	0.14	0.48	16z 27th
Newhaven	743	0.82	0.01	0.10	0.10	0.58	14z 27th
Dover	743	0.86	0.00	0.10	0.10	-0.52	22z 25th
Jersey	574	0.75	-0.01	0.13	0.13	0.71	9z 27th
Port Erin	743	0.90	0.07	0.07	0.10	0.36	15z 27th
Portpatrick	743	0.89	0.02	0.07	0.07	0.34	17z 27th
Millport	743	0.85	0.04	0.09	0.09	0.51	17z 27th
Islay	743	0.90	0.01	0.06	0.06	0.32	18z 27th
Tobermory	538	0.81	0.03	0.04	0.06	0.23	7z 22th
Moray Firth	No Observations Available						
Leith	743	0.81	0.05	0.09	0.10	0.49	3z 29th
Ullapool	743	0.89	0.09	0.05	0.10	0.23	20z 27th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	743	0.62	0.05	0.24	0.25	-1.34	5z 27th
Bournemouth	No Observations Available						

Table 10a: Statistics based on hourly data for October 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR & DATE
Stornoway	59	0.88	0.03	0.05	0.05	0.15 20z 23th
Wick	60	0.90	0.02	0.05	0.05	0.14 12z 22th
Aberdeen	61	0.93	0.02	0.05	0.06	0.12 0z 29th
North Shields	60	0.90	-0.02	0.08	0.08	-0.31 16z 23th
Whitby	59	0.91	0.00	0.07	0.07	-0.21 17z 23th
Immingham	2	1.00	0.14	0.02	0.14	0.15 3z 3rd
Cromer	52	0.91	-0.14	0.08	0.16	-0.39 21z 25th
Lowestoft	55	0.93	-0.05	0.09	0.10	-0.26 23z 25th
Felixstowe	60	0.91	-0.04	0.09	0.10	-0.41 15z 27th
Sheerness	60	0.85	-0.10	0.12	0.15	-0.41 3z 26th
Ilfracombe	59	0.79	0.03	0.10	0.11	0.48 9z 27th
Hinkley Point	59	0.67	0.07	0.17	0.18	0.86 10z 27th
Avonmouth	59	0.74	0.16	0.18	0.24	0.89 10z 27th
Mumbles	59	0.81	0.07	0.10	0.13	0.40 21z 25th
Milford Haven	59	0.86	0.00	0.08	0.08	0.25 21z 25th
Fishguard	60	0.80	-0.02	0.09	0.09	0.29 11z 27th
Barmouth	60	0.89	0.03	0.09	0.09	-0.26 10z 25th
Holyhead	No Observations Available					
Llandudno	No Observations Available					
Liverpool	60	0.89	0.11	0.09	0.14	0.43 14z 27th
Heysham	60	0.85	0.01	0.11	0.11	0.40 15z 27th
Workington	50	0.87	-0.08	0.08	0.12	-0.34 8z 15th
St. Marys	No Observations Available					
Newlyn	59	0.86	-0.09	0.08	0.12	-0.33 0z 15th
Plymouth	59	0.83	0.04	0.09	0.09	0.29 9z 27th
Weymouth	60	0.78	0.01	0.09	0.09	0.39 9z 27th
Portsmouth	2	1.00	0.07	0.05	0.07	0.10 14z 25th
Newhaven	60	0.78	0.02	0.11	0.11	0.53 15z 27th
Dover	60	0.86	-0.01	0.09	0.09	0.33 15z 27th
Jersey	46	0.67	0.05	0.15	0.16	0.67 10z 27th
Port Erin	60	0.87	0.07	0.08	0.11	0.36 15z 27th
Portpatrick	60	0.86	0.01	0.08	0.08	0.33 16z 27th
Millport	61	0.84	0.04	0.08	0.09	0.34 16z 27th
Islay	64	0.92	0.01	0.06	0.06	0.14 8z 28th
Tobermory	43	0.77	0.03	0.05	0.06	0.21 6z 22th
Moray Firth	No Observations Available					
Leith	60	0.85	0.06	0.09	0.11	0.28 0z 17th
Ullapool	59	0.90	0.09	0.04	0.10	0.20 20z 23th
Kinlochbervie	No Observations Available					
Lerwick	No Observations Available					
Newport	60	0.47	0.16	0.23	0.28	0.94 22z 25th
Bournemouth	No Observations Available					

Table 10b: Statistics at HW for October 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	719	0.93	0.05	0.05	0.07	-0.19	5z 4th
Wick	719	0.78	0.03	0.08	0.09	-0.41	3z 3rd
Aberdeen	719	0.89	0.02	0.06	0.06	-0.19	13z 6th
North Shields	719	0.92	-0.02	0.06	0.07	-0.32	16z 6th
Whitby	719	0.92	-0.01	0.06	0.07	-0.31	16z 6th
Immingham	719	0.86	0.07	0.10	0.13	0.34	7z 8th
Cromer	719	0.94	-0.15	0.08	0.17	-0.51	17z 6th
Lowestoft	719	0.94	-0.06	0.07	0.10	-0.37	16z 6th
Felixstowe	672	0.91	-0.05	0.09	0.10	-0.40	20z 6th
Sheerness	713	0.88	-0.10	0.11	0.15	-0.49	21z 3rd
Ilfracombe	719	0.81	-0.04	0.10	0.11	-0.32	18z 24th
Hinkley Point	719	0.61	0.01	0.17	0.17	-0.53	2z 21th
Avonmouth	719	0.51	0.07	0.24	0.25	-0.70	6z 26th
Mumbles	719	0.77	0.04	0.12	0.12	0.42	1z 10th
Milford Haven	719	0.89	-0.07	0.09	0.12	-0.42	10z 30th
Fishguard	719	0.89	-0.07	0.08	0.11	-0.31	6z 24th
Barmouth	719	0.83	0.01	0.10	0.10	-0.35	7z 27th
Holyhead	557	0.91	0.05	0.07	0.08	0.29	19z 7th
Llandudno	No Observations Available						
Liverpool	719	0.80	0.13	0.09	0.16	0.40	21z 3rd
Heysham	719	0.84	0.03	0.09	0.09	0.37	23z 3rd
Workington	719	0.89	-0.07	0.08	0.11	-0.32	13z 27th
St. Marys	439	0.89	-0.06	0.06	0.09	-0.22	23z 30th
Newlyn	715	0.90	-0.09	0.07	0.12	-0.26	3z 5th
Plymouth	633	0.88	0.01	0.08	0.08	0.25	9z 22th
Weymouth	719	0.83	-0.01	0.08	0.08	-0.39	4z 14th
Portsmouth	714	0.82	-0.07	0.08	0.11	-0.41	3z 14th
Newhaven	719	0.80	-0.01	0.09	0.09	-0.41	4z 14th
Dover	719	0.85	-0.02	0.09	0.09	-0.35	10z 23th
Jersey	719	0.72	-0.03	0.12	0.13	-0.51	2z 14th
Port Erin	719	0.91	0.08	0.07	0.11	0.38	20z 3rd
Portpatrick	719	0.90	0.03	0.08	0.08	0.38	21z 3rd
Millport	719	0.87	0.04	0.09	0.10	0.42	21z 3rd
Islay	719	0.90	0.03	0.08	0.09	0.33	19z 3rd
Tobermory	No Observations Available						
Moray Firth	708	0.76	0.05	0.09	0.10	0.35	0z 3rd
Leith	No Observations Available						
Ullapool	719	0.94	0.14	0.06	0.15	0.34	20z 11th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	719	0.54	0.04	0.22	0.23	-0.92	16z 23th
Bournemouth	No Observations Available						

Table 11a: Statistics based on hourly data for November 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	58	0.94	0.06	0.05	0.08	0.15	23z 10th
Wick	58	0.82	0.03	0.07	0.07	0.19	9z 15th
Aberdeen	58	0.90	0.02	0.06	0.06	-0.17	14z 6th
North Shields	57	0.88	-0.05	0.08	0.10	-0.32	16z 6th
Whitby	57	0.90	-0.04	0.07	0.08	-0.29	17z 6th
Immingham	58	0.88	0.07	0.11	0.12	0.28	4z 3rd
Cromer	58	0.92	-0.15	0.09	0.18	-0.38	18z 3rd
Lowestoft	58	0.94	-0.08	0.08	0.11	-0.31	22z 6th
Felixstowe	45	0.94	-0.08	0.07	0.10	-0.28	0z 6th
Sheerness	58	0.88	-0.17	0.10	0.20	-0.41	1z 6th
Ilfracombe	58	0.80	0.00	0.08	0.08	0.20	7z 22th
Hinkley Point	58	0.55	0.04	0.13	0.14	0.33	8z 22th
Avonmouth	58	0.42	0.13	0.18	0.22	0.52	1z 28th
Mumbles	58	0.80	0.03	0.10	0.10	0.23	20z 7th
Milford Haven	58	0.88	-0.05	0.08	0.09	-0.21	19z 5th
Fishguard	58	0.88	-0.04	0.07	0.08	0.20	18z 3rd
Barmouth	58	0.79	0.03	0.09	0.10	0.30	19z 3rd
Holyhead	45	0.92	0.04	0.07	0.07	0.22	0z 8th
Llandudno	No Observations Available						
Liverpool	58	0.84	0.11	0.07	0.13	0.37	22z 3rd
Heysham	58	0.83	0.01	0.08	0.07	0.31	22z 3rd
Workington	58	0.87	-0.06	0.08	0.10	0.21	23z 3rd
St. Marys	35	0.89	-0.06	0.06	0.08	-0.15	7z 24th
Newlyn	58	0.91	-0.09	0.07	0.11	-0.23	17z 5th
Plymouth	51	0.92	0.02	0.07	0.07	0.21	19z 7th
Weymouth	58	0.86	0.00	0.07	0.07	-0.27	2z 14th
Portsmouth	57	0.87	-0.04	0.07	0.08	-0.22	8z 14th
Newhaven	58	0.88	0.00	0.07	0.07	-0.15	8z 14th
Dover	58	0.94	-0.05	0.07	0.09	-0.25	1z 7th
Jersey	58	0.72	0.02	0.11	0.11	-0.42	3z 14th
Port Erin	58	0.90	0.07	0.07	0.10	0.36	22z 3rd
Portpatrick	58	0.91	0.02	0.07	0.07	0.25	23z 3rd
Millport	58	0.91	0.02	0.07	0.08	0.22	23z 3rd
Islay	58	0.90	0.04	0.07	0.09	0.24	9z 10th
Tobermory	No Observations Available						
Moray Firth	58	0.73	0.03	0.10	0.10	0.26	10z 3rd
Leith	No Observations Available						
Ullapool	58	0.93	0.15	0.06	0.16	0.26	23z 10th
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	58	0.45	0.16	0.17	0.23	0.53	9z 22th
Bournemouth	No Observations Available						

Table 11b: Statistics at HW for November 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	743	0.96	0.03	0.05	0.06	0.28	20z 2nd
Wick	700	0.95	0.02	0.06	0.07	-0.28	20z 24th
Aberdeen	No Observations Available						
North Shields	743	0.94	-0.05	0.07	0.08	-0.30	6z 25th
Whitby	743	0.94	-0.04	0.07	0.08	-0.28	7z 25th
Immingham	743	0.84	0.02	0.10	0.10	-0.37	12z 2nd
Cromer	714	0.93	-0.18	0.08	0.21	-0.50	13z 2nd
Lowestoft	743	0.93	-0.09	0.07	0.12	-0.31	12z 27th
Felixstowe	743	0.91	-0.10	0.09	0.14	-0.37	12z 25th
Sheerness	743	0.85	-0.14	0.12	0.18	-0.57	13z 24th
Ilfracombe	699	0.83	-0.09	0.12	0.15	-0.45	3z 24th
Hinkley Point	743	0.71	-0.02	0.19	0.19	-0.74	4z 24th
Avonmouth	743	0.69	0.06	0.25	0.26	-0.96	7z 26th
Mumbles	743	0.81	0.01	0.13	0.13	0.46	2z 2nd
Milford Haven	743	0.87	-0.11	0.10	0.15	-0.39	12z 18th
Fishguard	743	0.88	-0.11	0.09	0.15	-0.39	13z 18th
Barmouth	743	0.90	0.02	0.10	0.10	0.43	14z 2nd
Holyhead	740	0.91	0.03	0.09	0.09	0.35	20z 2nd
Llandudno	No Observations Available						
Liverpool	No Observations Available						
Heysham	743	0.92	0.05	0.10	0.12	0.49	23z 2nd
Workington	743	0.92	-0.05	0.10	0.12	-0.36	8z 19th
St. Marys	739	0.88	-0.07	0.09	0.12	-0.29	11z 18th
Newlyn	743	0.86	-0.11	0.09	0.14	-0.33	23z 18th
Plymouth	743	0.81	-0.02	0.10	0.10	-0.37	2z 26th
Weymouth	743	0.83	-0.06	0.10	0.12	-0.37	8z 26th
Portsmouth	743	0.83	-0.09	0.10	0.14	-0.60	10z 26th
Newhaven	743	0.85	-0.05	0.10	0.11	0.36	8z 2nd
Dover	743	0.88	-0.06	0.10	0.12	-0.35	9z 18th
Jersey	743	0.76	-0.07	0.13	0.15	-0.49	4z 26th
Port Erin	743	0.93	0.06	0.08	0.10	0.36	20z 2nd
Portpatrick	743	0.93	0.01	0.08	0.09	0.39	8z 2nd
Millport	743	0.92	0.03	0.10	0.10	0.53	9z 2nd
Islay	743	0.93	0.01	0.09	0.09	0.43	17z 2nd
Tobermory	625	0.94	0.02	0.07	0.08	0.32	21z 2nd
Moray Firth	743	0.83	0.01	0.10	0.10	0.42	6z 3rd
Leith	743	0.85	0.02	0.08	0.09	0.34	21z 2nd
Ullapool	743	0.96	0.13	0.06	0.14	0.38	19z 2nd
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	743	0.69	0.05	0.23	0.23	-1.11	5z 24th
Bournemouth	743	0.85	-0.06	0.09	0.12	-0.44	9z 26th

Table 12a: Statistics based on hourly data for December 2002.

PORT	SIZE	CORR	MEAN	S.D.	RMSE	MAX ERR	& DATE
Stornoway	60	0.96	0.04	0.05	0.06	0.18	6z 3rd
Wick	57	0.94	0.02	0.08	0.08	-0.17	9z 2nd
Aberdeen	No Observations Available						
North Shields	59	0.92	-0.07	0.08	0.11	-0.29	7z 25th
Whitby	60	0.91	-0.06	0.08	0.10	-0.28	7z 25th
Immingham	60	0.91	0.01	0.09	0.09	0.19	20z 23th
Cromer	52	0.92	-0.21	0.08	0.23	-0.37	17z 2nd
Lowestoft	60	0.93	-0.10	0.08	0.13	-0.29	16z 27th
Felixstowe	60	0.93	-0.18	0.07	0.19	-0.30	20z 14th
Sheerness	60	0.90	-0.22	0.09	0.24	-0.40	18z 27th
Ilfracombe	58	0.88	-0.07	0.08	0.11	-0.29	3z 1st
Hinkley Point	60	0.79	-0.04	0.13	0.14	0.38	10z 24th
Avonmouth	60	0.77	0.07	0.16	0.17	0.47	10z 24th
Mumbles	60	0.86	0.00	0.09	0.09	0.31	17z 2nd
Milford Haven	60	0.90	-0.11	0.08	0.13	-0.27	15z 14th
Fishguard	60	0.90	-0.08	0.08	0.12	-0.24	19z 18th
Barmouth	60	0.91	0.03	0.09	0.10	0.26	12z 10th
Holyhead	60	0.91	0.01	0.09	0.09	0.30	21z 2nd
Llandudno	No Observations Available						
Liverpool	No Observations Available						
Heysham	60	0.92	0.01	0.10	0.10	0.42	22z 2nd
Workington	60	0.91	-0.08	0.10	0.13	0.32	22z 2nd
St. Marys	59	0.87	-0.08	0.08	0.12	-0.27	16z 18th
Newlyn	60	0.87	-0.10	0.08	0.14	-0.27	16z 18th
Plymouth	60	0.88	-0.02	0.07	0.08	0.20	16z 2nd
Weymouth	60	0.83	-0.06	0.09	0.11	-0.23	18z 18th
Portsmouth	60	0.85	-0.09	0.10	0.13	-0.32	4z 26th
Newhaven	60	0.89	-0.07	0.08	0.11	-0.25	22z 31st
Dover	60	0.93	-0.10	0.07	0.12	-0.26	0z 5th
Jersey	60	0.81	-0.04	0.10	0.11	-0.33	4z 1st
Port Erin	60	0.93	0.04	0.08	0.09	0.30	10z 2nd
Portpatrick	60	0.93	0.00	0.08	0.08	0.27	10z 2nd
Millport	60	0.94	0.01	0.08	0.08	0.22	23z 2nd
Islay	62	0.94	0.02	0.08	0.08	0.36	16z 2nd
Tobermory	50	0.94	0.02	0.07	0.07	0.31	16z 2nd
Moray Firth	62	0.79	-0.01	0.11	0.11	-0.29	2z 25th
Leith	59	0.85	0.00	0.09	0.09	-0.19	8z 27th
Ullapool	60	0.95	0.13	0.06	0.15	0.31	6z 3rd
Kinlochbervie	No Observations Available						
Lerwick	No Observations Available						
Newport	60	0.75	0.09	0.16	0.18	0.58	11z 24th
Bournemouth	85	0.86	-0.06	0.09	0.11	-0.29	1z 19th

Table 12b: Statistics at HW for December 2002.

FILENAME	START DATE OF HINDCAST IN RUN	CONTENTS
FILE05.CS302	12Z 21/12/01-00Z 29/01/02	155 h'& f'casts
FILE06.CS302	12Z 29/01/02-00Z 22/02/02	96 h'& f'casts
FILE07.CS302	06Z 22/02/02-00Z 21/03/02	108 h'& f'casts
FILE08.CS302	06Z 21/03/02-00Z 18/04/02	112 h'& f'casts
FILE09.CS302	06Z 18/04/02-00Z 10/05/02	88 h'& f'casts
FILE10.CS302	06Z 10/05/02-18Z 05/06/02	107 h'& f'casts
FILE11.CS302	06Z 06/06/02-18Z 25/07/02	203 h'& f'casts
FILE12.CS302	06Z 26/07/02-18Z 20/08/02	99 h'& f'casts
FILE01.CS303	06Z 20/08/02-18Z 26/09/02	151 h'& f'casts
FILE02.CS303	06Z 27/09/02-06Z 29/10/02	128 h'& f'casts
FILE03.CS303[a]	12Z 29/10/02-00Z 28/11/02	119 h'& f'casts
FILE04.CS303[b]	06Z 28/11/02-00Z 23/12/02	100 h'& f'casts
FILE05.CS303[c]	06Z 23/12/02-00Z 21/01/03	116 h'& f'casts

Appendix A: Port data archive files for 2002.

[a] 12Z 6/11 occurs 3* in CS3 with 6h, 12h & 18h h'casts. Gap in BCM,SRM and levels between 6Z 6/11 & 6Z 7/11.
[b] 12Z 10/11 occurs 3* in CS3 with 6h, 12h & 18h h'casts. Gaps in BCM, SRM and levels.
[c] 12Z 29/12/2002 hindcast has duff data (tidal) in 0h and 1h.

Gauges in the South Atlantic

The following provides a brief overview of South Atlantic sea level recording by POL, which constitutes the major contribution by the UK to the Global Sea Level Observing System (GLOSS) of the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) of the Intergovernmental Oceanographic Commission (IOC) and World Meteorological Organisation (WMO). At the time of writing, plans are advanced for the inclusion of gauges at Gibraltar and South Georgia into the network, and more detailed information of these developments will be included in further NTSLF reports.

Gauges in the South Atlantic

The ACCLAIM (Antarctic Circumpolar Current Levels by Altimetry and Island Measurements) programme in the South Atlantic and Southern Oceans consists of measurements from coastal tide gauges and bottom pressure stations, together with an ongoing research programme in satellite altimetry.

Phase 1 of ACCLAIM Coastal Gauges

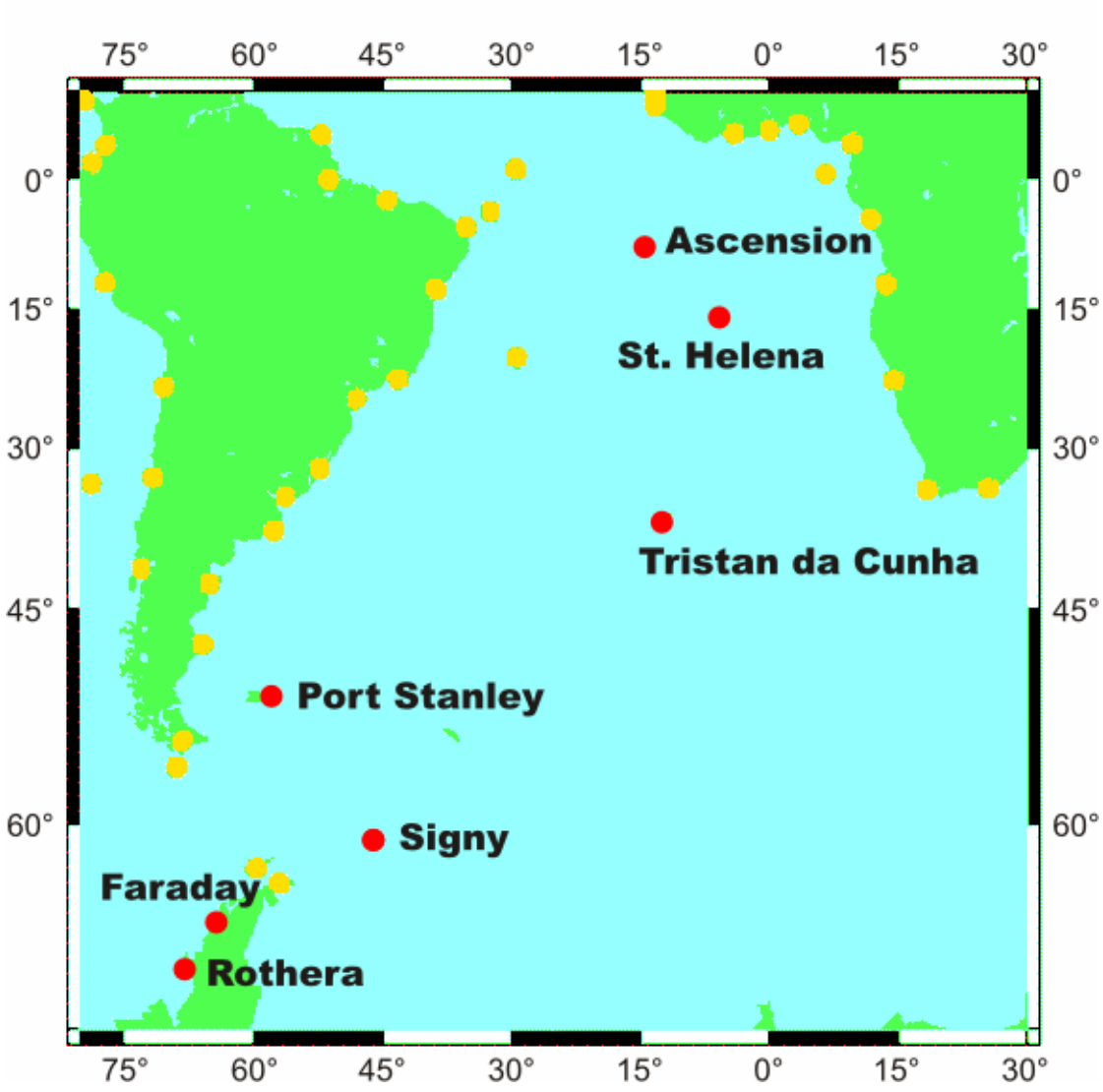
In Phase 1 of ACCLAIM from 1983, measurements at coastal tide gauge sites took the form of sub-surface pressure (SSP) measurements (units of pressure e.g. mbar) rather than sea level (units of length e.g. centimetres). SSP is here defined as the total, measured pressure recorded by a sub-surface pressure transducer, a measurement which includes the pressure load from the atmosphere as well as from the water column. It is absolutely essential that any user of ACCLAIM data realises which data type (either SSP or sea level) is being analysed.

The Phase 1 coastal SSP data were acquired in different ways (e.g. with a diver-replaced Aanderaa pressure gauge at Ascension, or with a Digiquartz in the sea sensor at St. Helena, see Spencer et al. 1993 for details) and with different pressure integration periods (e.g. quarter hour, half hour, one hour). For some data sets, the original data have been filtered to give one hour sampling. However, common to all records is an uncertainty connected with potential offset biases and drifts in the pressure sensors. At some sites (e.g. St. Helena) extensive tide pole data are also available and biases and long term drifts in the sensor data may eventually be rectified (this is under study at present). However, the drifts in general mean that in most cases the records should not be used, without further careful attention in particular studies, for the study of timescales seasonal or longer.

Phase 2 of ACCLAIM Coastal Gauges

From around early 1993, the gauges at several sites were replaced by 'B gauges' which record SSP, air pressure and sea level. These gauges have precise datum control and are used to provide long term sea level change data to the PSMSL.

Some Phase 1 and all Phase 2 coastal data will contain ancillary information on air pressures and sea temperatures from ACCLAIM sensors. Several of these records contain large gaps. However, POL has collected extensive sets of such ancillary data from meteorological agencies for its own analysis purposes, and should be able to provide further advice.



Red dots on the above map indicate sites of POL's South Atlantic coastal tide gauge network (ACCLAIM), while the yellow dots show gauges (not necessarily operational) committed to the GLOSS programme by other countries in the region.

At the present time the tide gauge sites at Ascension, St. Helena and Port Stanley can be considered to be complete 'Phase 2' sites, while Tristan, Signy and Rothera remain 'Phase 1' (i.e. simple pressure transducer sites). At Faraday (which contains the longest tide gauge record in Antarctica and which is now called Vernadsky and operated by groups from the Ukraine) there is a conventional float gauge together with a 'Phase 1' transducer.

Information on data presented below is from the latest series collected. More information on this and previous data collected can be found at the ACCLAIM website:

http://www.pol.ac.uk/psmslh

There are three directories: bprs, phase1 and phase2. Each has an inventory file, giving more information about the tide gauges.

Rothera Tide Gauge

Latitude : 67° 34.3' S Longitude : 068° 07.7' W

Instrument type : Sub-surface pressure gauge

Site of Gauge: The tide gauge is mounted in a sea water well, approximately 100 metres shorewards of the main jetty.

Data information
The series has been quality controlled and any problems have been flagged.

05/12/1998 – 02/10/1999

Other parameters:
Sea temperature, Logger temperature, Air temperature, Barometric pressure, Sub surface (total) pressure, Half tide (total) pressure

Completeness Index:
1998 98.8% * but 91 % of the total record is corrupted. Therefore, index should read 7.4%
1999 75.1%

Full tide pressure failed at : Scan 27617
Half tide pressure ended at : Scan 28894 (End of file)
Air pressure failed at : Scan 28885
Sea temp failed at : Scan 27996
Logger temp failed at : Scan 28884 (poor record after scan 28866)
Half tide temperature failed at : Scan 28890

The Logger started to fail in October 1999. Bad data points have been set to 0.000 and flagged after the full tide sensor failed. The offset between the half tide pressure and the atmospheric pressure varies between 8.4 mb at the start of the record, increasing to 10.5 mb towards the end. The offset increases steadily and may be a simple sensor drift. Comparing the half tide and full tide sensors shows a similar magnitude drift, so it looks like the problem is with the half tide sensor.

Signy (South Orkney Islands)

Latitude : 60° 42.0' S Longitude : 045° 36.0' W

Instrument type : Digiquartz pressure sensor

Site of Gauge: Data logger in nearby British Antarctic Survey building.

Data information
The series has been quality controlled and any problems have been flagged.

19/11/1999 – 30/03/2000

Tristan da Cunha

Latitude : 37° 03.0' S Longitude : 012° 18.0' W

Instrument type : Digiquartz pressure sensor

Site of Gauge: Tristan da Cunha harbour (data logger in the nearby settlement of Edinburgh).

Data information
The series has been quality controlled and any problems have been flagged.

09/01/1998 – 28/12/1998

Other parameters:
Sea temperature, Logger temperature, Air temperature, Barometric pressure, Sub surface (total) pressure, Half tide (total) pressure, Total sub-surface pressure -1000.

Completeness Index:
1998 39.7% (barometric pressure available for 96.6%)

First 1100 scans of half tide sensor do not look good
Half tide sensor fails at scan 10558 (day 119, 20.625 hours)
Full tide sensor fails at scan 13896 (day 154, 14.875 hours)

Some data in the original file had glitches in the day channel which needed correction. The early half tide data (first 1100 scans) do not look good. After scan 100, comparing the level of the half tide point with the barometer record shows the sensor to be very stable (variation <= +/- 0.5 mbar) with no apparent drift.

The full tide sensor does drift slightly, relative to the half tide (1 mbar in 7000 scans = 73 days). In general, however, the agreement between the two sensors is superb.

There are air pressure and temperature data available after the tide gauge failed.

Ascension

Latitude : 07° 54.0' S Longitude : 014° 23.0' W

Instrument type : B gauge (pressure gauge)

Site of Gauge: English Bay

Data information
The series has been quality controlled and any problems have been flagged.

14/06/2000 – 02/04/2001
Recording frequency 15 minutes

Other parameters:
Sea temperature, Air temperature, Barometric pressure, Sub surface (total) pressure, Half tide (total) pressure

Port Stanley-B

Latitude : 51° 41.0' S Longitude : 057° 49.0' W

Instrument type : B gauge (pressure gauge)

Site of Gauge: Eastern end of Port Stanley harbour by the 'floating warehouses'.

Data information
The series has been quality controlled and any problems have been flagged.

18/11/2000 – 05/05/2002
Recording frequency 15 minutes

Other parameters:
Sea temperature, Air temperature, Barometric pressure, Sub surface (total) pressure, Half tide (total) pressure
Residuals also look ok but with a lot of seiche-type HF noise.

St. Helena

Latitude : 15° 55.0' S Longitude : 005° 43.0' W

Instrument type : B gauge (pressure gauge)

Site of Gauge: Jamestown Harbour, by the landing steps.

Data information
The series has been quality controlled and any problems have been flagged.

20/06/2000 – 02/10/2001
Recording frequency 15 minutes

Other parameters:
Sea temperature, Air temperature, Barometric pressure, Sub surface (total) pressure, Half tide (total) pressure

This file goes up to October 2001, after which a rock fall destroyed power supplies to the gauge so that there will be a gap until August 2002. In addition, the gauge was taken out by the local people and reinstalled in the gap. Special attention must be paid to the reinstalled datum in the next batch of data.

Faraday / Vernadsky

Latitude : 65° 15.0' S Longitude : 064° 16.0' W

Instrument type : Float gauge

Site of Gauge: Located in tide gauge hut near to camp.

Data information
The series has been quality controlled and any problems have been flagged.

Jan 2002 - Dec 2002
Hourly values of sea level were read off the paper charts and entered into computer files.