MINISTRY OF AGRICULTURE FISHERIES AND FOOD
FISHERIES LABORATORY, LOWESTOFT SUFFOLK NR33 0HT

1995 RESEARCH VESSEL PROGRAMME

REPORT: CIROLANA 1/95

STAFF:

P A Gurbutt	(SIC)	6-31 January
P Greig-Smith		27-31 January
D S Kirkwood		6-23 January
K J Medler		10-23 January
N D Pearson		24-31 January
J N Aldridge		24-31 January
J M Rees		24-31 January
J W Read		6-10,24-31 January
S R Jones		6-23 January
D B Sivyer		10-23 January
M Rawlinson	WS Oceans	6-10 January
P B Murray	University of Cambridge	24-31 January
M Mason	University of Cambridge	24-31 January
J Humphery	POL	24-31 January
P Bell	POL	24-31 January
A Jolly	BBC OUPC	24-25 January
D Firmin	BBC OUPC	24-25 January
W Stott	BBC OUPC	24-25 January

DURATION: Depart Lowestoft 12:53, 6 January 1995
Arrived Lowestoft 12:12, 22 January 1995
Depart Lowestoft 13:47, 24 January 1995
Arrived Lowestoft 09:30, 31 January 1995

LOCATION: North Sea, English Channel and Irish Sea

AIMS:

1. To complete off shore nutrient survey for the MPMMG National Monitoring Programme. (AE0503)
2. To deploy a mooring to test the NAS Mark 2 nutrient sampler and Valeport current meter. This will be launched in the Wash at the beginning of the cruise and recovered at the end of the cruise. (AE0503)
3. To collect sediment samples near gas rigs in the southern North Sea for analysis for contamination with pseudo-oil based drilling muds. (AE0801)
4. To deploy the Tetrapod, the Quadrapod, 4 minipods, and the NERC STABLE benthic landers off the Holderness coast in phase 2 of the Holderness experiment. (AE0298(T))
5. To survey Race Bank and area 107 using sidescan sonar and coring to determine whether dredger plumes are impinging on Race Bank (AE0298(T)).

6. To collaborate with the BBC at the Open University Production Centre in the filming of the deployment of the benthic landers in the Holderness experiment. (AE0298(T))

NARRATIVE:

A negative tidal surge prevented RV CIROLANA from sailing on 5 January. Instead, RV CIROLANA sailed on 6 January and proceeded to the Wash.

A 7-hour anchor station was worked at NMP position 385 at the mouth of the Wash followed by a single CTD station at NMP 386 in the Wash. The mooring to test the WS Oceans NAS2 nitrate analyser and to compare the new Valeport BFM308 current meter with the RCM7 Aanderaa current meter was launched near the mouth of the Wash.

RV CIROLANA then proceeded to the mouth of the Humber, via NMP 376, for another 7-hour anchor station (NMP 375). This was followed by anchor stations at the mouths of the Tees (NMP 295) and the Tyne (NMP 245). Surface water samples were collected on sections running from the anchor stations into the mouths of the rivers.

RV CIROLANA then proceeded to the Tetrapod location off the Holderness coast to rendezvous with the diving team for an attempted recovery. Unfortunately, increasing winds meant that the divers did not sail, so RV CIROLANA recovered and re-laid two of the guard buoys after changing the light batteries.

With a planned scientific staff change on 10 January, RV CIROLANA sailed towards Lowestoft, collecting surface water samples at NMP 345 (off shore Humber) and NMP 395. Plans had to be altered when a member of the ship's crew had to be put ashore early because of a serious family illness. After the scientific change-over, RV CIROLANA proceeded to the Thames for an anchor station, collecting surface samples en route.

In improving weather, the NMP stations at South Varne (CTD - NMP 485), Selsey Bill (CTD for 7-hour anchor - NMP 495), central Channel (CTD - NMP 535) and Southwest Approaches (CTD - NMP 595) were worked. As winds then began to increase, NMP stations in the Irish Sea were occupied at the Celtic Deep (CTD - NMP 605), Bristol Channel (CTD for 7- hour anchor - NMP 615), Cardigan Bay (CTD - NMP 655, surface water - NMP 665), Liverpool Bay (CTD - NMP 715, CTD at 7-hour anchor - NMP 705), Morecambe Bay (surface water - NMP 805 and 795, CTD at 7-hour anchor - NMP 785). Finally a CTD station was worked near Anglesey (NMP 775) before RV CIROLANA anchored in Red Wharf Bay in anticipation of the forecasted 70 knot winds.

After 32 hours at anchor, RV CIROLANA sailed south, re-sampling the Celtic Deep station at the surface, because the original sample gave unexpectedly high values of ammonia and phosphate. With winds remaining strong to gale force from directions between southeast to southwest, only surface samples were collected near the Eddystone Light (NMP 585) and off the Tamar (NMP 575). Further surface samples were collected along the coast from Beachy Head through the Dover Straits to the Gabbard (NMP 475).

At first light on 21 January, RV CIROLANA approached the Conoco gas rig, Neddrill 4 - 'Ganymede', to obtain seabed samples at 100 m, 250 m, 500 m and 1000 m from the rig. Samples from Day grabs at 100 m and 250 m were obtained. The other two

stations were abandoned after repeated unsuccessful attempts. RV CIROLANA then sailed to Race Bank.

Rough seas prevented any work on Race Bank on Saturday, 21 January. With force 10 winds forecast for Sunday, it was decided to return to Lowestoft and dock on the midday tide.

After a change of scientific staff and equipment, RV CIROLANA sailed from Lowestoft on Tuesday at 1330 and proceeded to the Holderness coast area. On Wednesday, 25 January, STABLE was launched. RV CIROLANA then steamed south to position 'D' (see Figure 1) and deployed a minipod with a guard buoy. At site 'E' (see Figure 1), the ship anchored and deployed a guard buoy, the Quadrapod, a minipod and a second guard buoy in a line. It would appear that the last guard buoy was caught up by the ship when weighing anchor and the chain mooring line parted as the vessel moved away. The buoy was not in position when CIROLANA returned to the area the following morning. Each site was surveyed with side-scan sonar prior to instrument deployment.

The whole of the operations of the 24 and 25 January was filmed by a film crew from the BBC Open University Production Unit. They were put ashore by pilot cutter in the Humber on the evening of 25 January.

26 January was lost to bad weather.

A weak ridge of high pressure came through on Friday 27 January. This allowed the deployment of two further guard buoys around the Quadrapod and minipod group and of minipods at sites 'C' and 'B' (see Figure 1). With the weather deteriorating and force 8 to 9 winds forecast, RV CIROLANA anchored in the Humber where P. Greig-Smith joined the ship.

On Saturday, 28 January, there were light winds so RV CIROLANA proceeded to Race Bank to recover the minipod laid by Corystes in December. In the week since CIROLANA visited the site, one guard buoy had been towed out of position and was upside down. The minipod and two guard buoys were successfully recovered. A grid of 13 core stations was then worked between dredging area 107 and the Race Bank to collect sediments for grain size analysis.

On Sunday, 29 January, RV CIROLANA successfully recovered the mooring laid in the Wash at the beginning of the cruise. However, one guard buoy was missing. A side scan survey of the area cored on the previous day was undertaken before RV CIROLANA sailed north to the Tetrapod location off the Holderness coast.

The Tetrapod was located on the Simrad SM600 and a buoy dropped close to its location. An attempt was made to verify the location of the Tetrapod in relation to the new buoy using the side-scan sonar. One of the other guard buoys was moved closer to the Tetrapod position. As the swell was too large to launch small boats to drag for the Tetrapod, RV CIROLANA steamed to Lowestoft and docked on the morning tide of 31 January 1995.

RESULTS: (Not to be quoted without permission of author)

1. National Monitoring Programme Nutrients Survey

    1.1 All except one NMP station was occupied and 7-hour anchor stations were undertaken at the mouths of most of the major estuaries. The water

samples were analysed on board for nitrate, nitrite, ammonia and phosphate. Samples were also filtered for suspended load determination and sub-samples stored for return to the Laboratory for silicate determination.

1.2 Some of the preliminary results are displayed in the attached figures.

Figure 2 shows the surface total oxidised nitrogen (nitrate plus nitrite) values for each station. The average value is shown where there was more than one sample taken. In Figure 2(a) near the Tyne and Tees, concentrations increase from 6.20 μmol l^{-1} to 10.30 μmol l^{-1} towards the estuary mouth. In Figure 2(b), the Humber average value is 32.2 μmol l^{-1}, but this is not a high as a concentration measured in the Wash. Concentrations increase to a maximum of 36.8 μmol l^{-1} in the Thames which is approximately double the concentration found near the Solent (Figure 2(c)). Towards the reference station (Figure 2(d)), concentrations are approximately constant, between 6 and 8 μmol l^{-1}. This contrasts markedly with the average concentration of 53.5 μmol l^{-1} measured in the Bristol Channel. Levels are also elevated in the Liverpool Bay and Morecambe Bay area (Figure 2(e)).

1.3 The maximum total oxidised nitrogen concentration (59.6 μmol l^{-1}) occurred in the Bristol Channel. Highest phosphate concentrations (3.09 μmol l^{-1}) were found in the Thames (NMP 465) and the highest ammonia (9.5 μmol l^{-1}) and the highest nitrite (0.91 μmol l^{-1}) were found in Liverpool Bay (NMP 705). The reference station (NMP 595) which was vertically well mixed, and showed concentrations typical of those found away from the major estuaries.

1.4 The variation in concentration at the hourly stations over the tidal cycle is shown in Figure 3 for the Humber (NMP 375), Thames (NMP 465), Solent (NMP 495), Bristol Channel (NMP 615) and Liverpool Bay (NMP 705). All concentrations are in μmol l^{-1} with the left-hand y-axis the scale for total oxidised nitrogen (T.Ox.N. - nitrate plus nitrite) and the right-hand y-axis for all other nutrients. The solid line is for shows the surface values and the symbols represent the bottom values. Some stations show the maximum concentration as much as twice the minimum (e.g. Humber (NMP 375) and Thames (NMP 465)) whereas others, with similarly large concentrations have much smaller changes (e.g., Bristol Channel - NMP 615). Nitrite shows little change at most of these stations, and is sometimes below detection limit (0.2 μmol l^{-1}).

2. Samples for Biomul

2.1 Sediment samples were successfully collected at 100 and 250 m from the Conoco gas rig Neddrill4 in the southern Bight.

3. Sediment samples from Race Bank

3.1 Thirteen cores were collected between aggregate extraction area 107 and Race Bank. From each one, 4 sub-samples were taken, 3 of which was sliced into 1 mm slices and the fourth into 5 mm slices for grain size analysis.

4. Minipod on Race Bank

4.1 The minipod was successfully recovered with 712 bursts of data recorded.

4.2 Preliminary analysis of the minipod record has been completed on board and the results are shown in Figure 4.

4.3 Figure 4(a) shows the pressure. At the start of the record there is part of the spring-neap cycle evident, but between 31 December and 2 January, a storm surge was seen (low water is higher than expected). On 5 January, the negative storm surge which prevented RV CIROLANA from sailing can easily be seen, as can the severe storms experienced around 10-12 January.

4.4 Around New Year, the compass (Figure 4(b)) and roll and pitch (Figure 4(c)) sensors all display a disturbance when the storm surge occurred.

4.5 The significant wave height over this period (Figure 4(d)) shows waves of up to 3 m, and waves of over 2 m on 13 January. The period of the waves changes throughout the record (Figure 4(e)). It is generally 9-10 s but the negative surge on 5 January has 6 s period waves.

4.6 Throughout the whole deployment the temperature at the site decreased, with a slightly steeper drop from 31 December until 5 January.

5. Holderness Experiment

5.1 The guard buoys around the Tetrapod position were replaced and an extra one was dropped close to the actual location.

5.2 Four minipods and the Quadrapod were laid on the southern line of the Holderness experiment.

5.3 STABLE was laid for the Proudman Oceanographic Laboratory on the northern of the two Holderness lines.

5.4 Side-scan sonar surveys were made of the areas where the benthic landers (minipods, Quadrapod and STABLE) were launched.

6. Mooring in the Wash

6.1 All the instruments were recovered un-damaged and appear to have worked for the whole period of the deployment.

P A Gurbutt
(Scientist-in-charge)

31 January 1995

SEEN IN DRAFT: WGA Guyatt MASTER
MSG Reynolds FISHING SKIPPER

INITIALLED: J E Portmann

DISTRIBUTION:

Basic List +
P A Gurbutt (SIC)
P Greig-Smith
D S Kirkwood
K J Medler
N D Pearson
J N Aldridge
J M Rees
J W Read
D B Sivyer
S R Jones
M Rawlinson - WS Oceans
P B Murray - University of Cambridge
M Mason - University of Cambridge
J Humphery - POL
P Bell - POL
A Jolly - BBC OUPC
D Firmin - BBC OUPC
W Stott - BBC OUPC

Figure 1

Cirolana 1/95 CTD and Surface Water Sample Stations

SHOWING :
STATION POSITION
COASTLINE

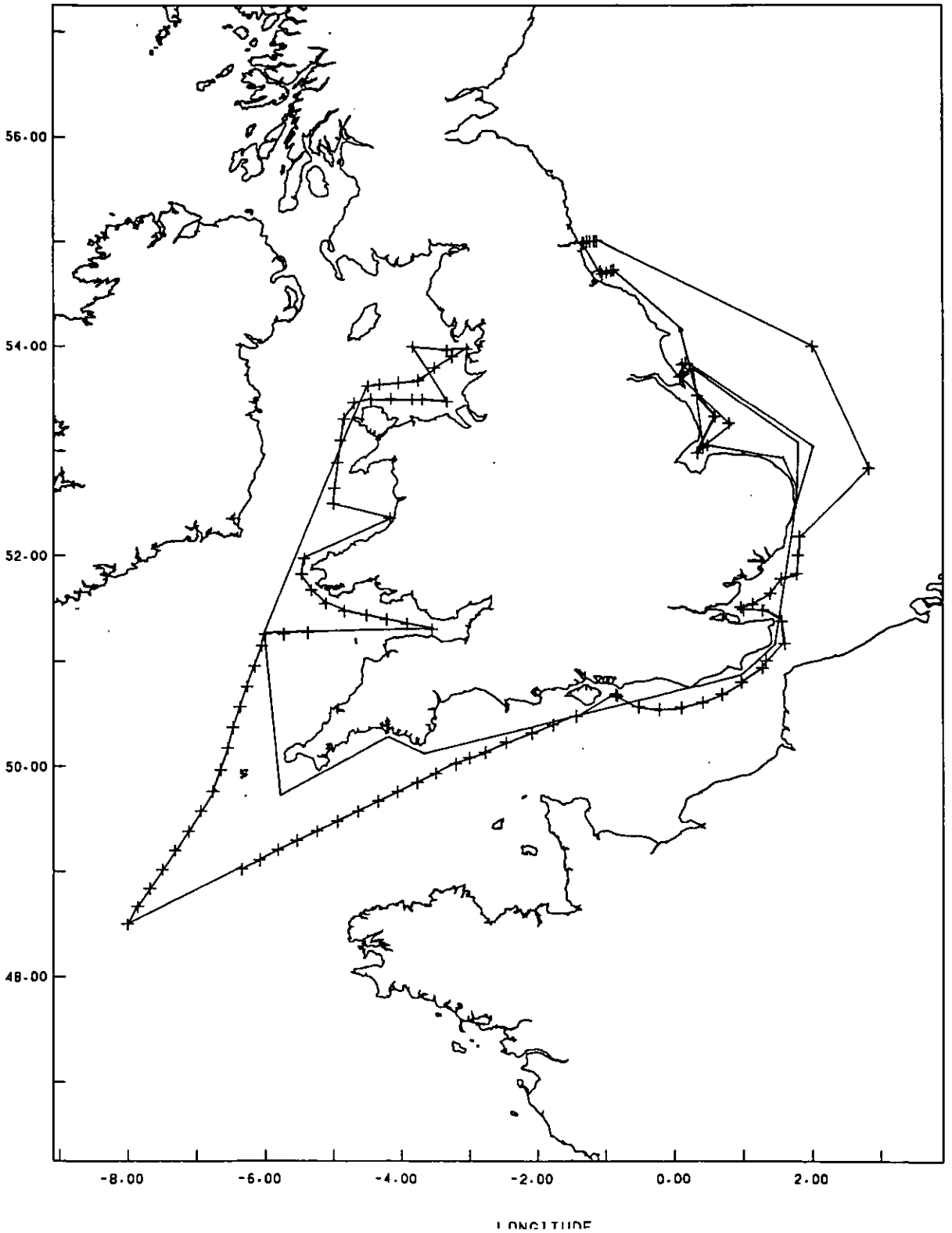


Figure 2a

Cirolana 1/95 Surface T.Ox.N concentration

SHOWING :
STATION POSITION
DATA VALUES REPRESENTING : Surface TOxN Conc.
COASTLINE

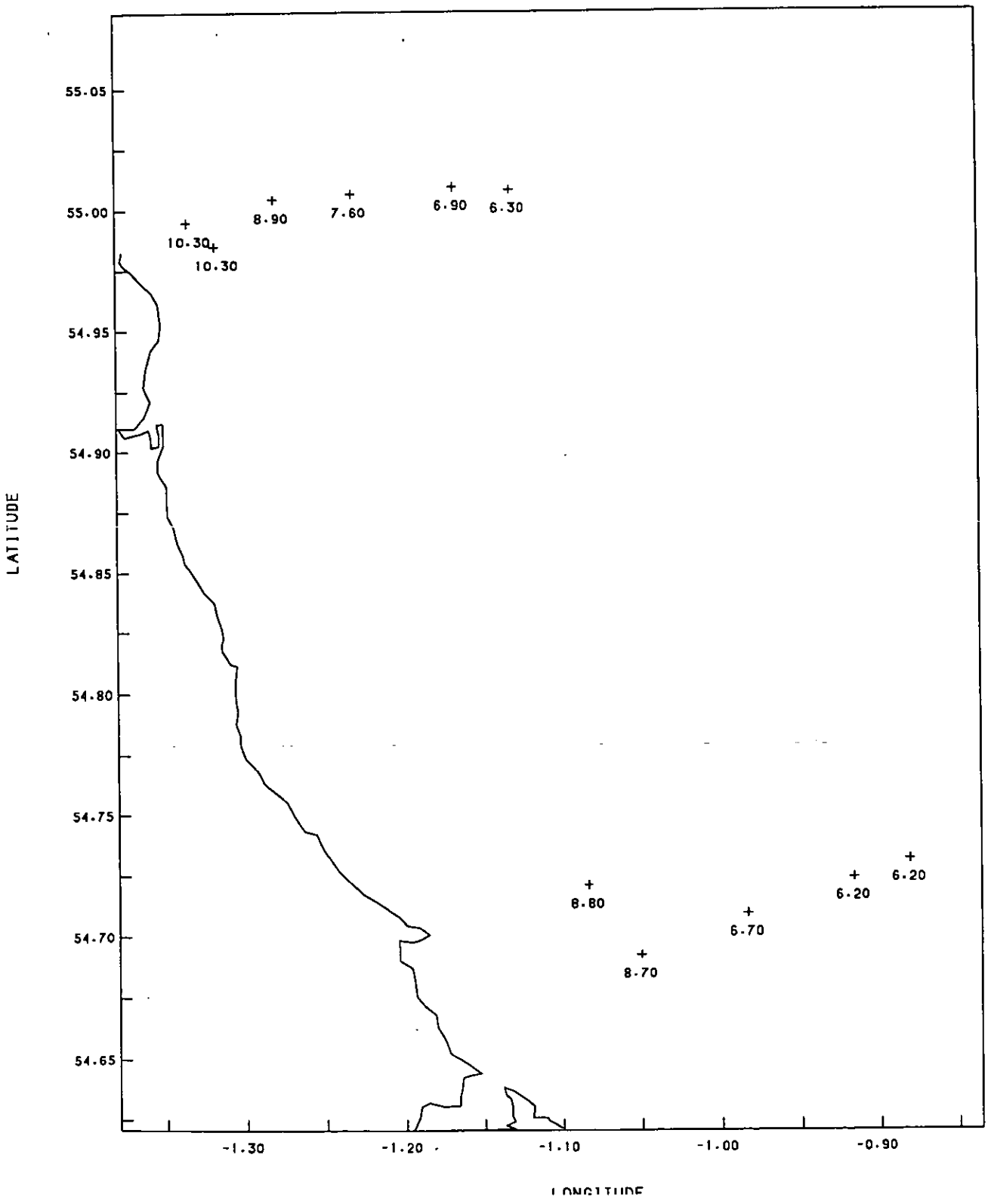


Figure 2b

Cirolana 1/95 Surface T·Ox·N concentration

SHOWING :
STATION POSITION
DATA VALUES REPRESENTING : Surface ToxN Conc.
COASTLINE

●-Instrument dep./rec.

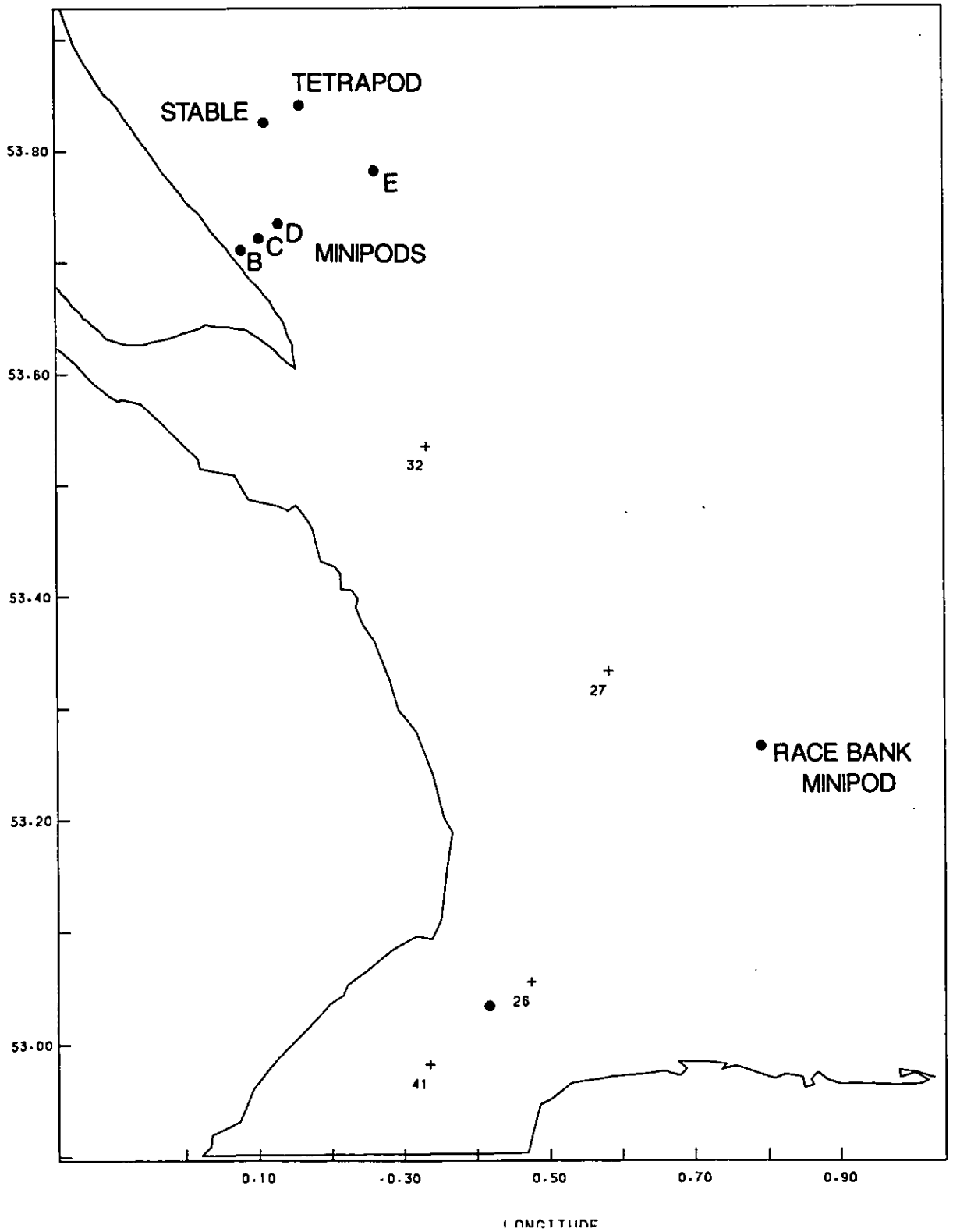


Figure 2c

Cirolana 1/95 Surface T.Ox.N concentration

SHOWING :
STATION POSITION
DATA VALUES REPRESENTING : Surface TOxN Conc.
COASTLINE

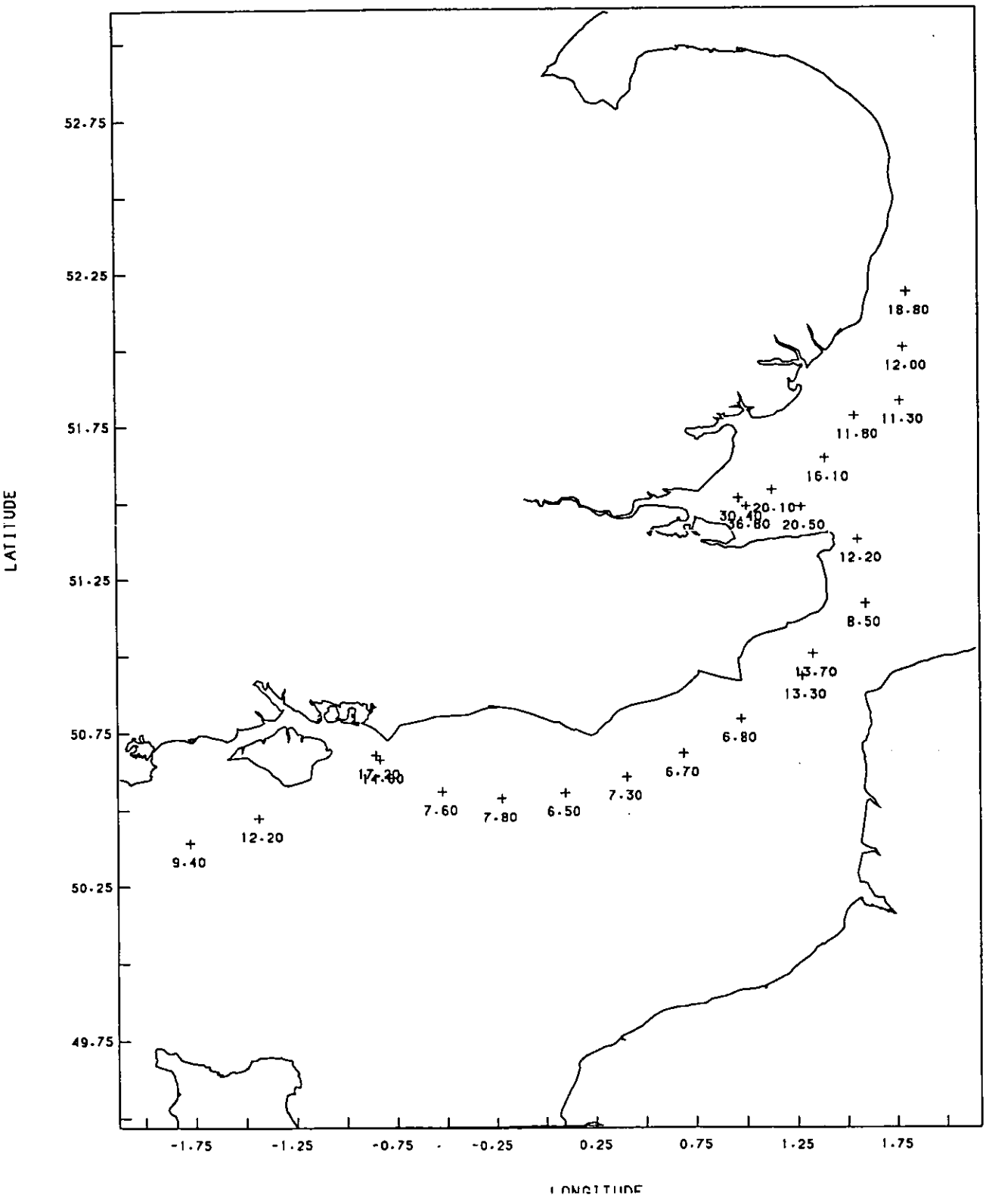


Figure 2d

Cirolana 1/95 Surface T·Ox·N concentration

SHOWING :
STATION POSITION
DATA VALUES REPRESENTING : Surface TOxN Conc.
COASTLINE

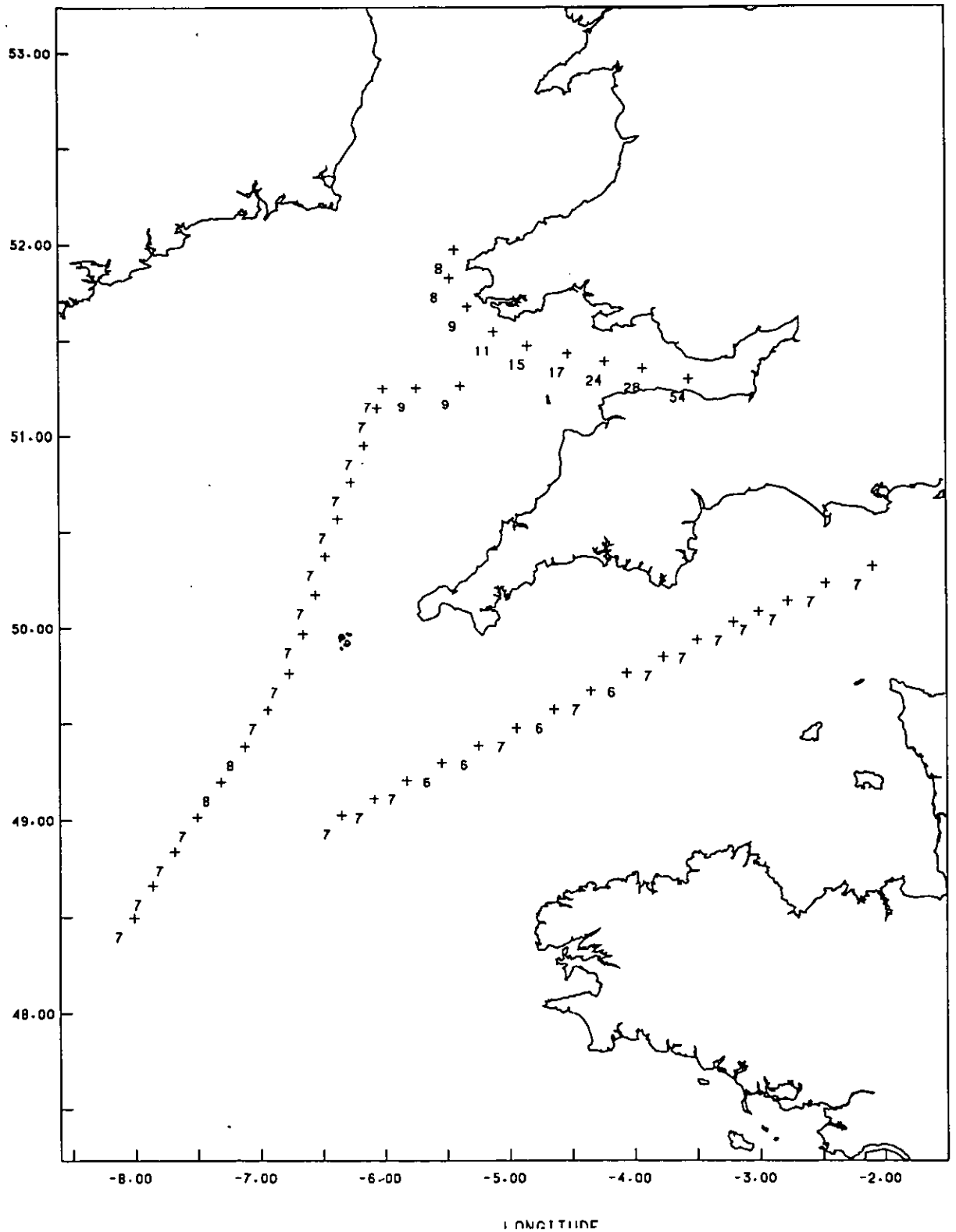


Figure 2e

Cirolana 1/95 Surface T.Ox.N concentration

SHOWING :
STATION POSITION
DATA VALUES REPRESENTING : Surface TOxN Conc.
COASTLINE

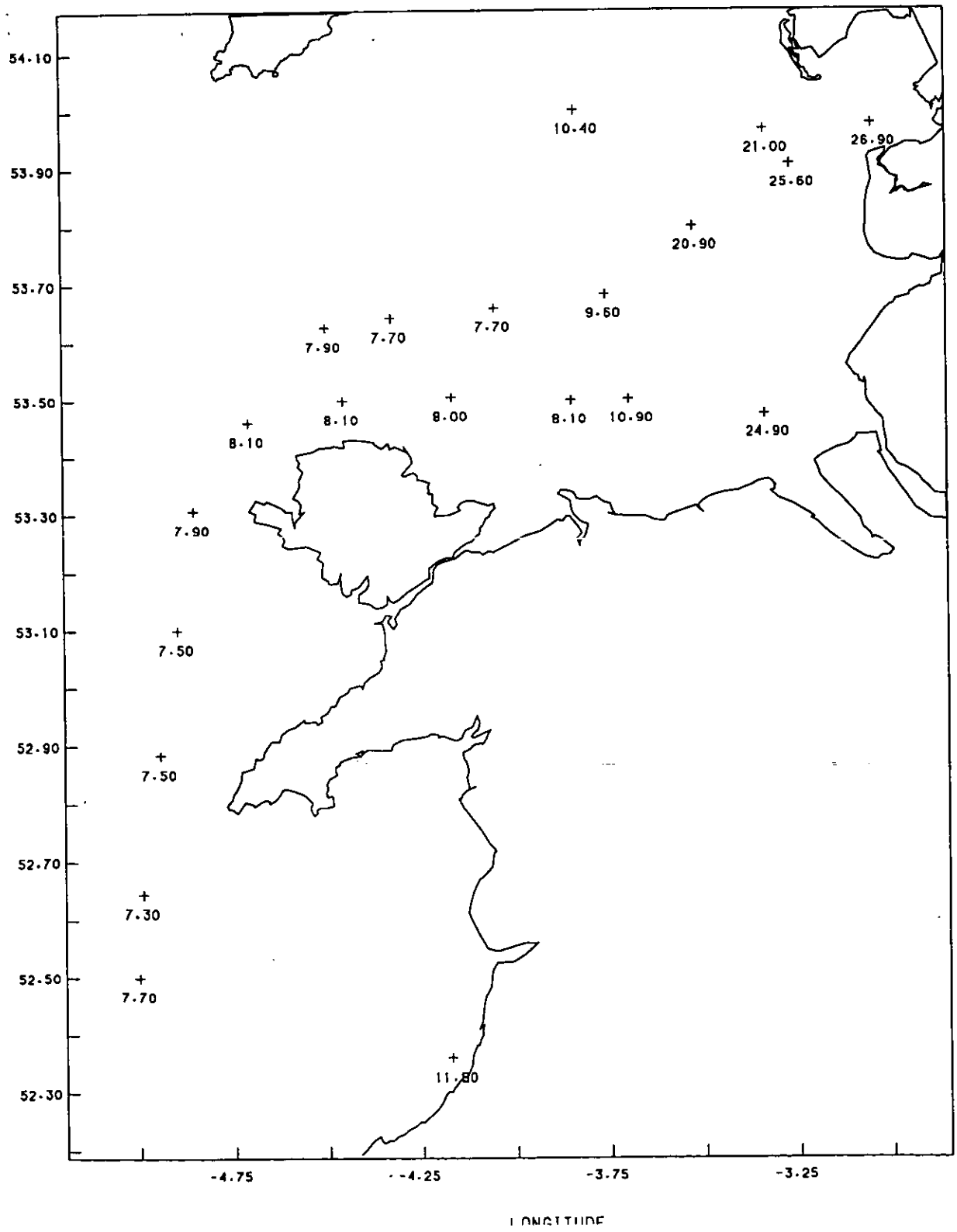


Figure 3

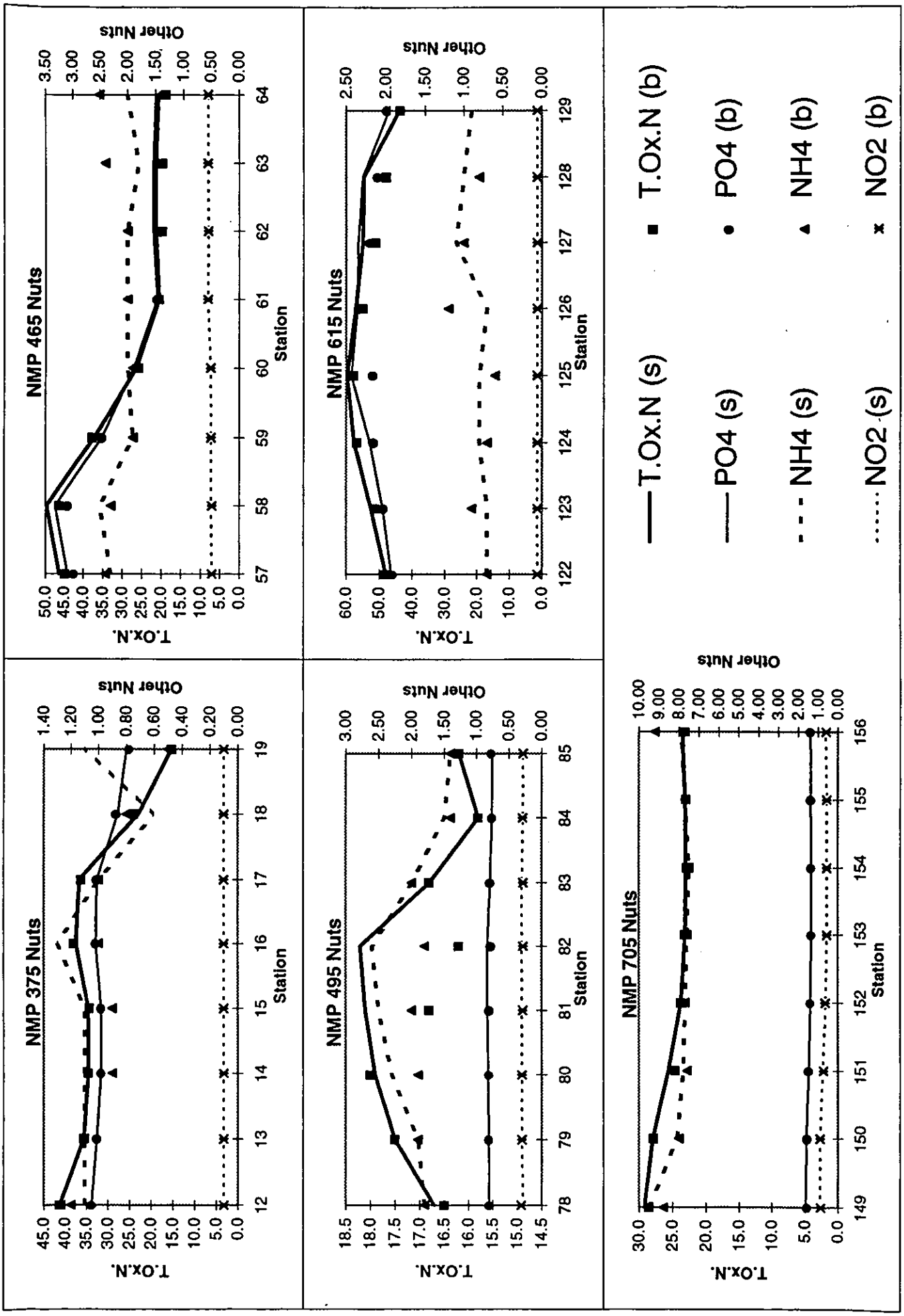

Variation in surface and bottom nutrient concentrations at anchor stations
NMP 465 Nuts
NMP 615 Nuts
NMP 375 Nuts
NMP 495 Nuts
NMP 705 Nuts
T.Ox.N.
Other Nuts
Station
T.Ox.N (s)
T.Ox.N (b)
PO4 (s)
PO4 (b)
NH4 (s)
NH4 (b)
NO2 (s)
NO2 (b)

Figure 4a

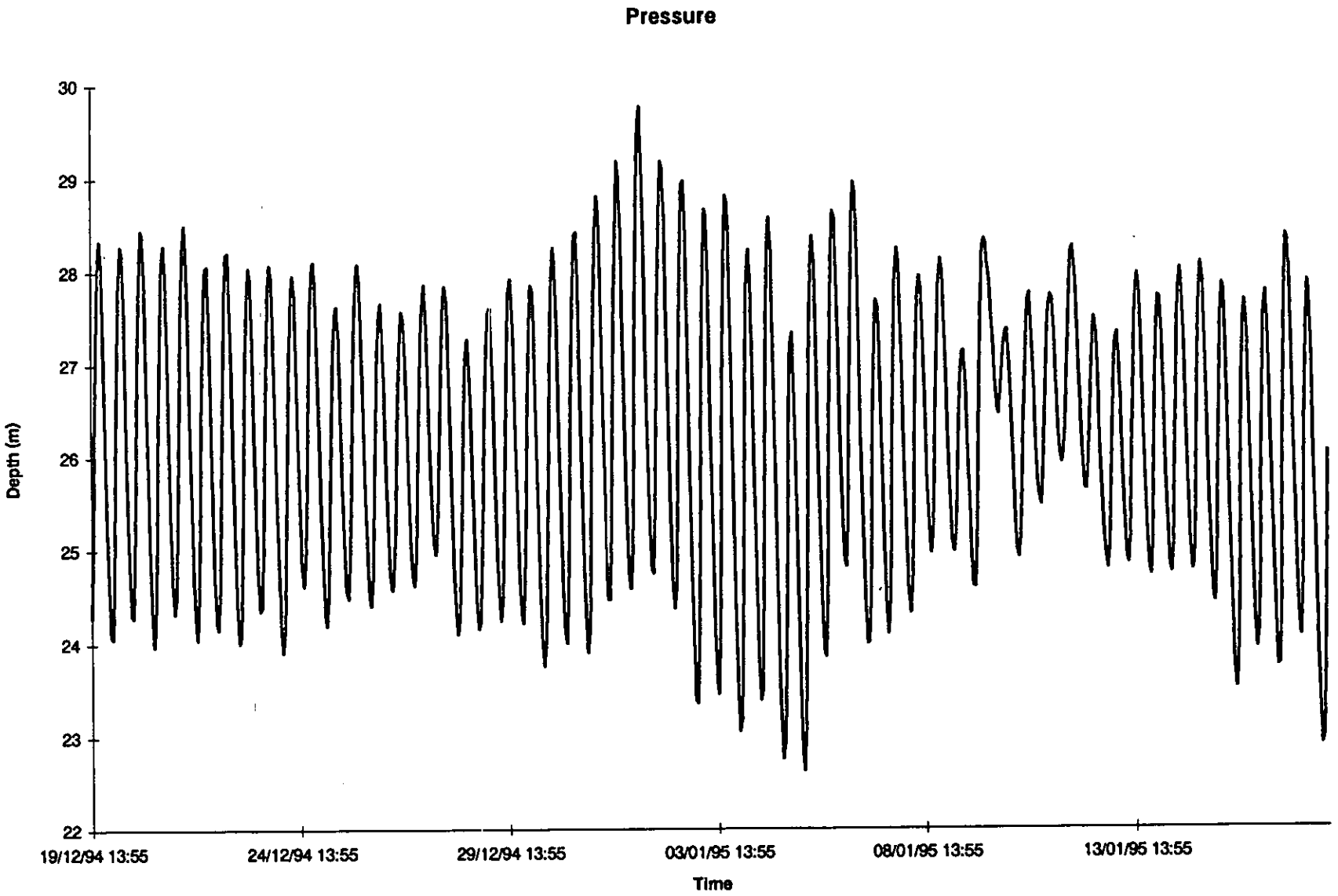

Pressure
Depth (m)
30
29
28
27
26
25
24
23
22
19/12/94 13:55
24/12/94 13:55
29/12/94 13:55
03/01/95 13:55
08/01/95 13:55
13/01/95 13:55
Time

Figure 4b

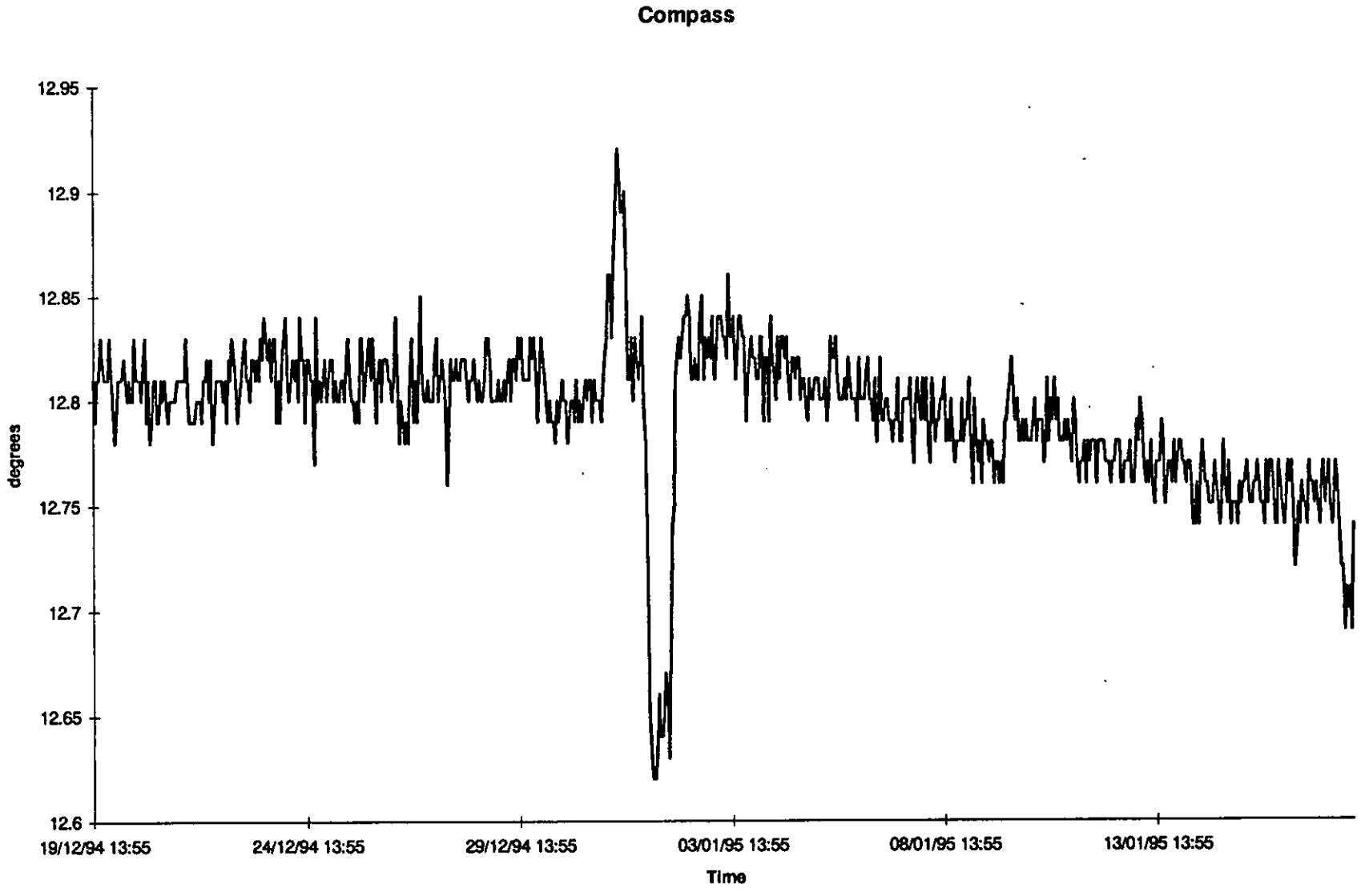

Compass
12.95
12.9
12.85
12.8
12.75
12.7
12.65
12.6
degrees
19/12/94 13:55
24/12/94 13:55
29/12/94 13:55
03/01/95 13:55
08/01/95 13:55
13/01/95 13:55
Time

Figure 4c

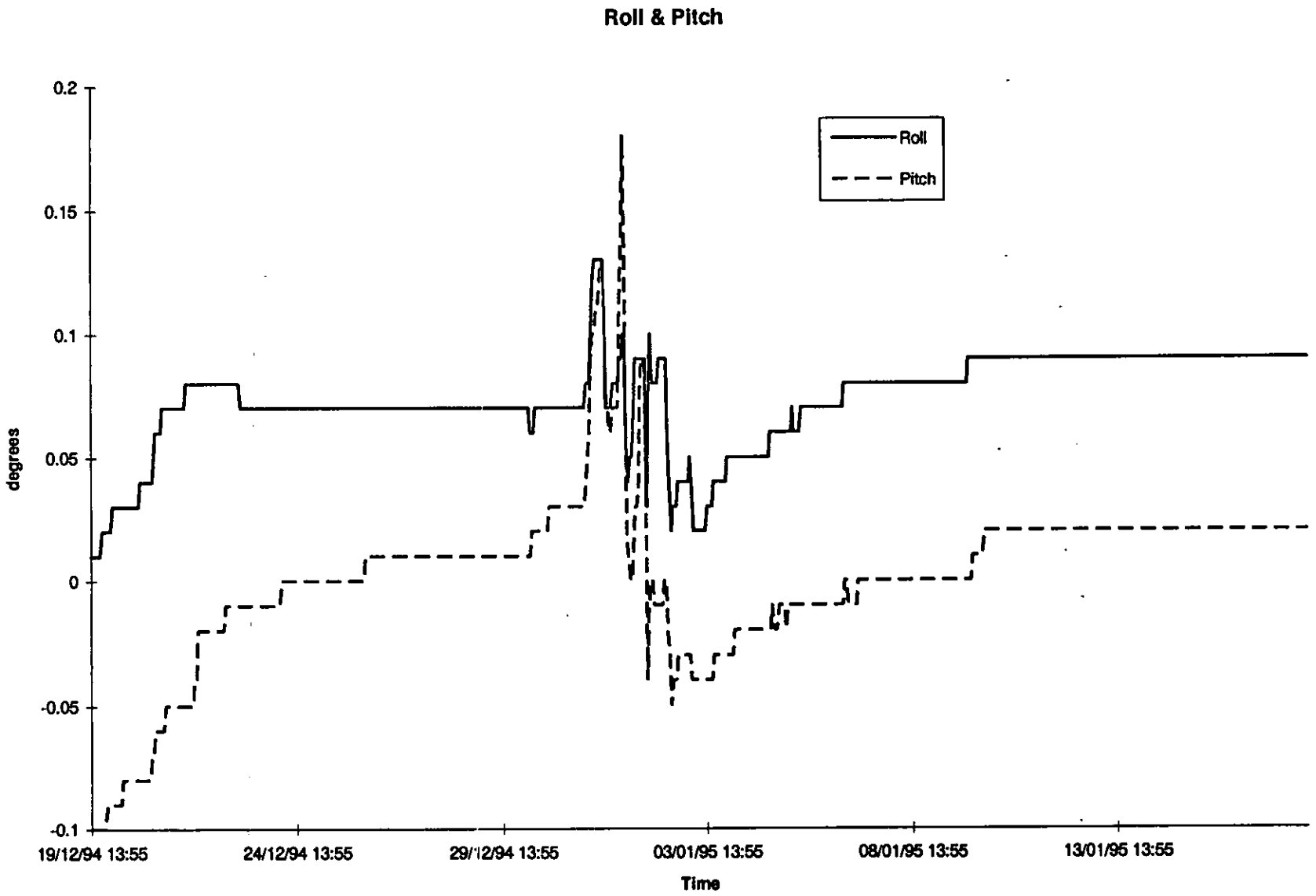

Roll & Pitch
Roll
Pitch
0.2
0.15
0.1
0.05
0
-0.05
-0.1
degrees
19/12/94 13:55
24/12/94 13:55
29/12/94 13:55
03/01/95 13:55
08/01/95 13:55
13/01/95 13:55
Time

Figure 4d

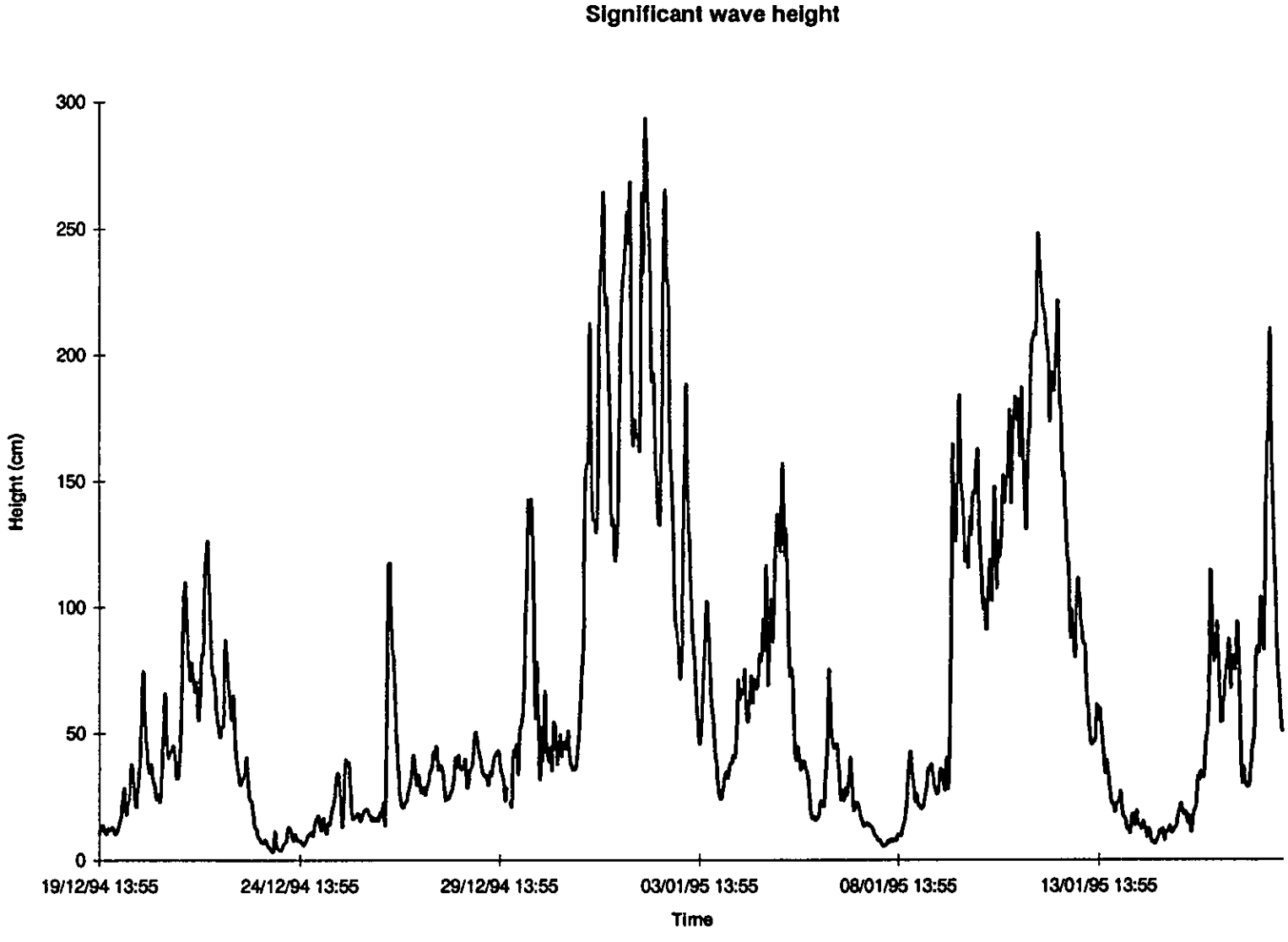
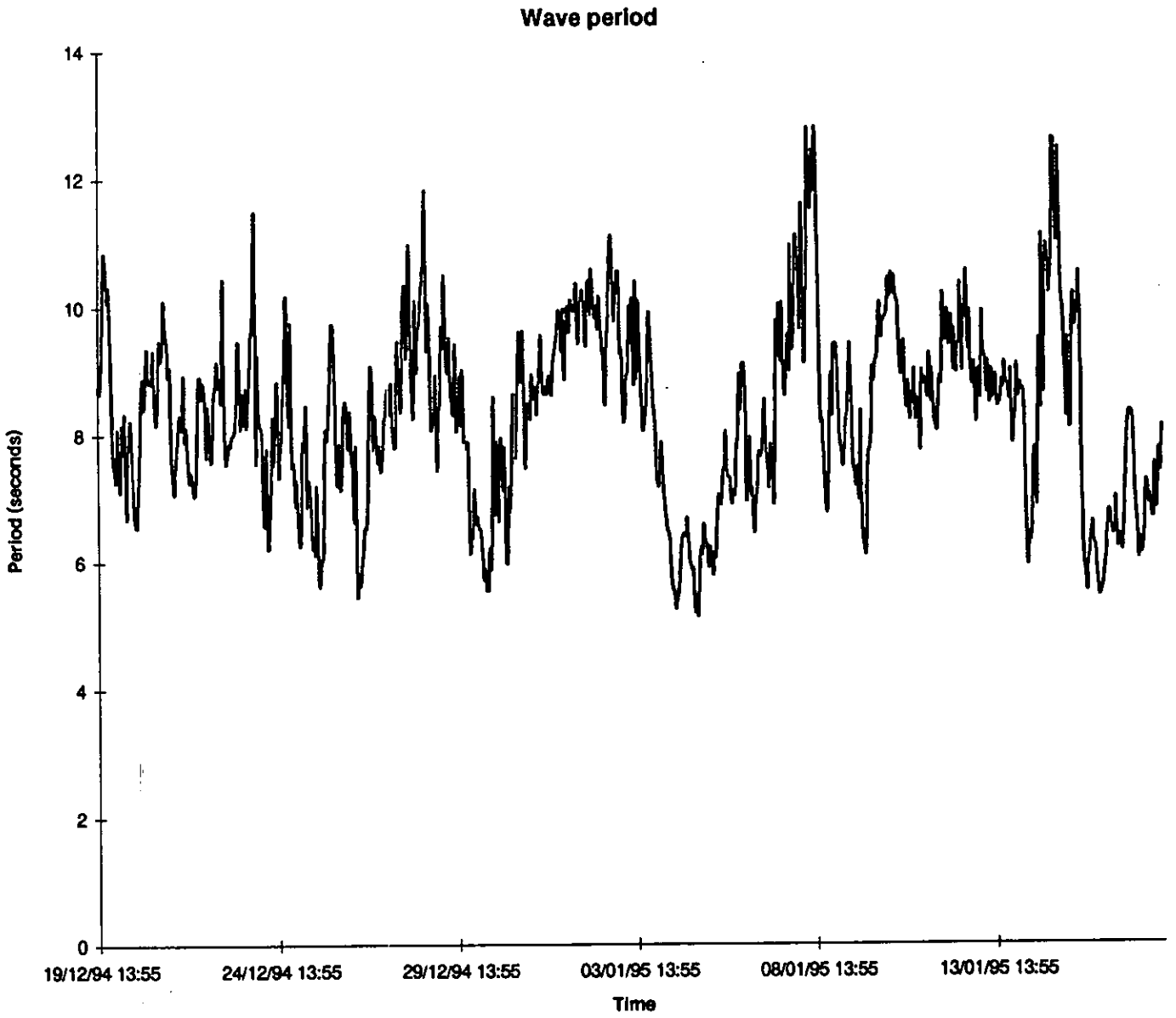

Significant wave height
300
250
200
150
100
50
0
Height (cm)
19/12/94 13:55
24/12/94 13:55
29/12/94 13:55
03/01/95 13:55
08/01/95 13:55
13/01/95 13:55
Time

Figure 4e


Wave period
Period (seconds)
14
12
10
8
6
4
2
0
19/12/94 13:55
24/12/94 13:55
29/12/94 13:55
03/01/95 13:55
08/01/95 13:55
13/01/95 13:55
Time