SHIRSHOV INSTITUTE OF OCEANOLOGY

CRUISE REPORT No. 36

RV *AKADEMIK SERGEY VAVILOV* CRUISE 08 DEC 2012 – 26 MAR 2013

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2013

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DOCUMENT DATA SHEET

AUTHOR	***PUBLICATION DATE***
GLADYSHEV, S	2013

TITLE

RV ***Akademik Sergey Vavilov*** Cruise 36 , 08 Dec 2012 - 26 Mar 2013.

REFERENCE

Shirshov Institute of Oceanology, Akademik Sergey Vavilov Cruise Report, No. 36, 37pp. tables & figs.

ABSTRACT

RV ***Akademik SergeyVavilov*** Cruise 36 was a contribution to the Russian CLIVAR and World Ocean Research Programme. Underway measurements of the surface temperature, conductivity and currents in the upper 800 m were designed to enable the ocean circulation in Drake Passage and the Scotia Sea to be mapped and in particular the course and short-term variability of the Subantarctic, Polar and Southern Front of the Antarctic Circumpolar Current within the region to be determined. The main goal is austral summer monitoring of the Antarctic Circumpolar Current.

KEYWORDS

CRUISE 36 2012-2013, *AKADEMIK SERGEY VAVILOV,* **ANTARCTIC CIRCUMPOLAR CURRENT, POLAR FRONT, SUBANTARCTIC FRONT, BOTTOM RELEIF, SURFACE TEMPRATURE AND SALINITY, DRAKE PASSAGE, SCOTIA SEA, CLIVAR, VMADCP, THERMOSALINOGRAPH SBE21**

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Technical Personnel

BULYCHEV, V.V.	VMADCP OS-75, thermosalinograph SBE21	Shirshov Atlantic Branch

1. CRUISE NARRATIVE

1.1 Cruise Details

Expedition Designation: R/V ***Akademik Sergey Vavilov*** Cruise 36, RUSSIA CLIVAR

Principal Scientists: Dr Sergey V. Gladyshev (Shirshov Institute)

Ship: RV ***Akademik Sergey Vavilov***

Port of Call: Ushuaia (Argentina)

Cruise Dates: 08th Dec 2012 to 26th Mar 2013

1.2 Cruise Summary

1.2.1 Cruise Tracks

The cruise tracks are shown in Fig. 1, 2 where surface temperature and salinity are in color.

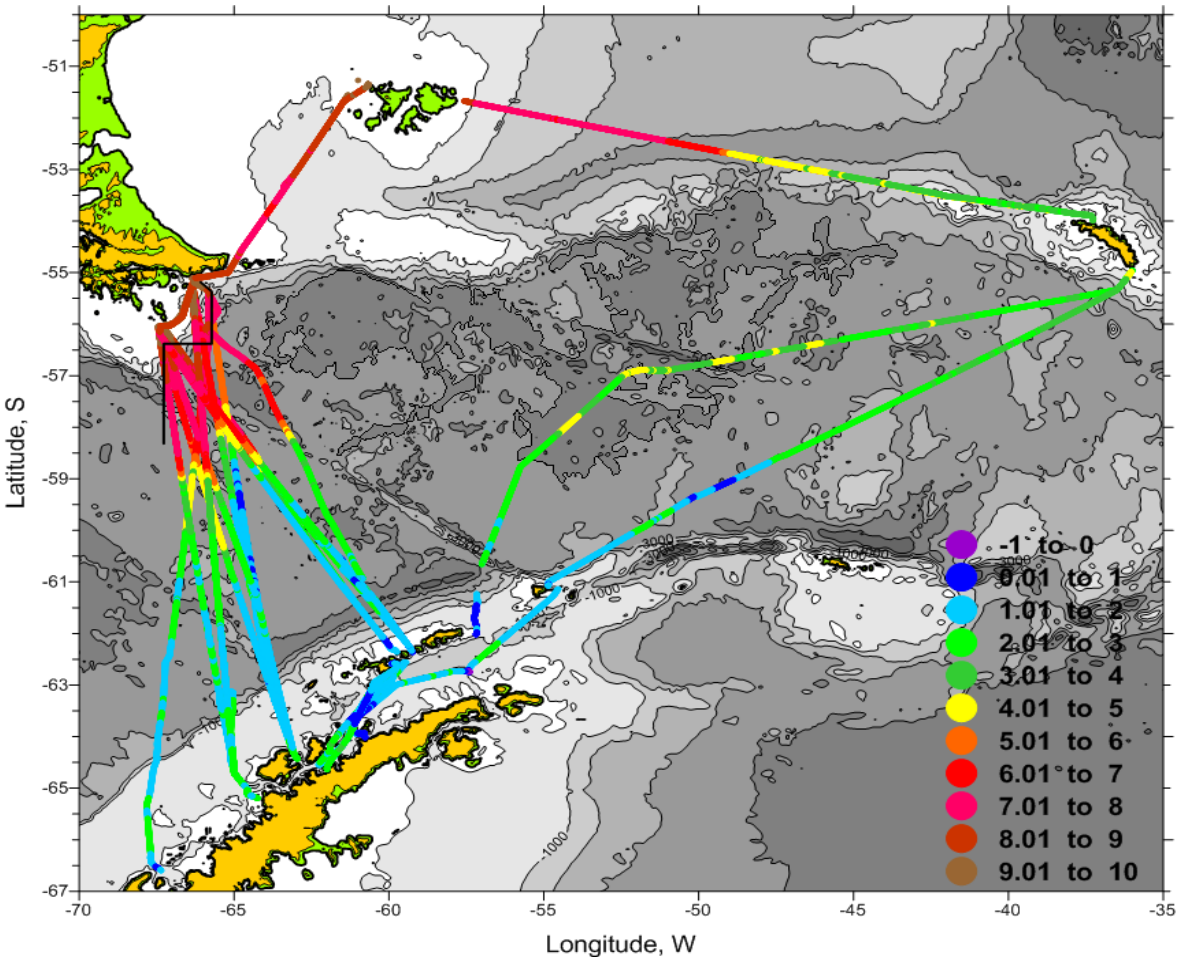

Figure 1. The chart showing *Akademik Sergey Vavilov* tracks from 1 to 33. Surface temperature along the tracks is given in different color. The Argentine-Chilean sea border is shown in black.

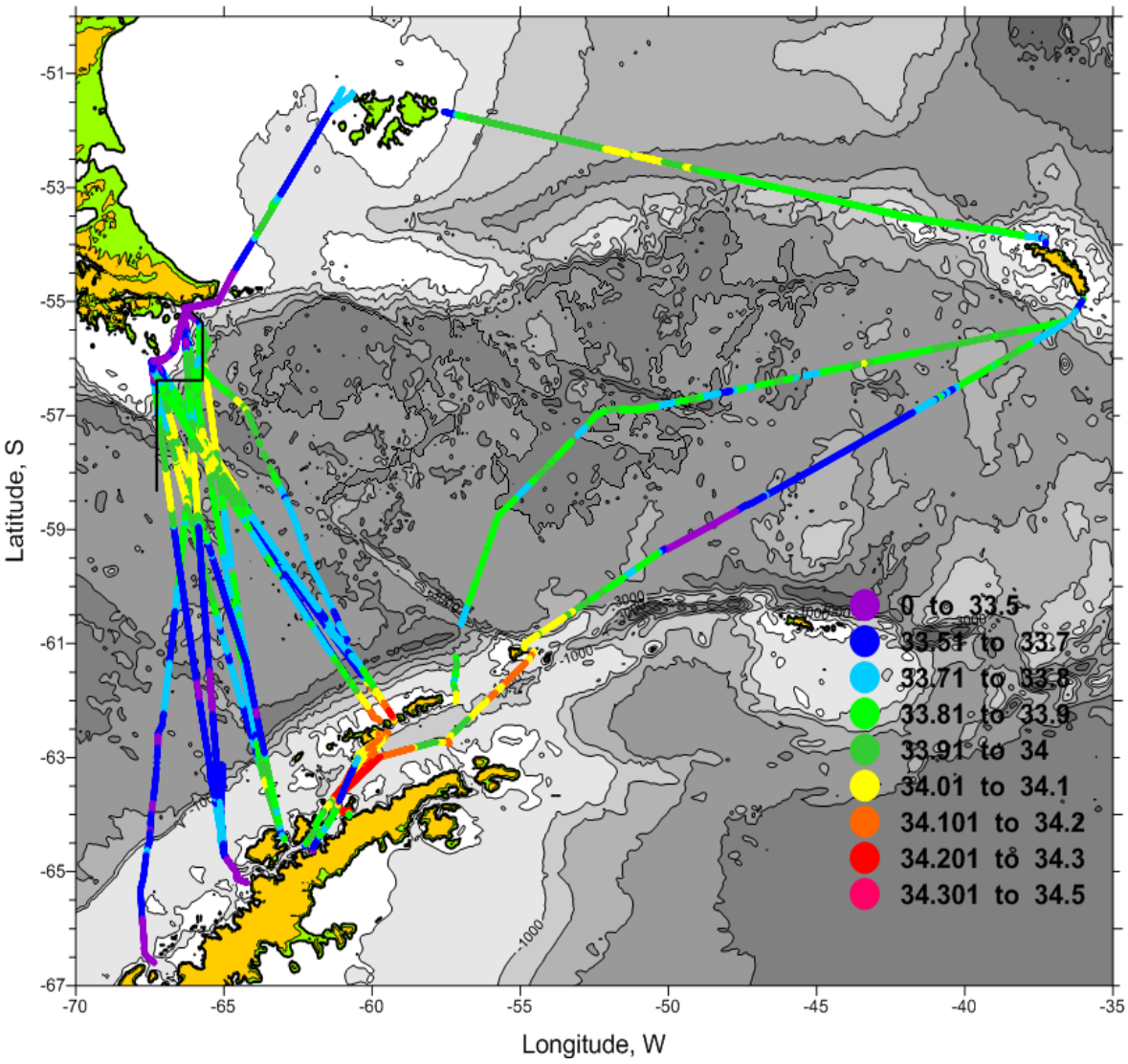

Figure 2. The chart showing *Akademik Sergey Vavilov* tracks from 1 to 33. Surface salinity along the tracks is color coded.

Table 1

Track Num.	Description	Start Date Time (GMT)	End Date Time (GMT)	Start Latitude, S	Start Longitude, W	End Latitude, S	End Longitude, W
1	Nueva I. — Melchior I.	09.12.2012 04:19	11.12.2012 09:00	55 19.561	066 20.300	64 24.143	062 59.359
2	Trinity I – Halfmoon I.	14.12.12 22:15	15.12.2012 11:04	63 56.222	060 47.747	62 35.140	059 53.333
3	Nelson St. — Cape Horn — Nueva I.	15.12.12 22:19	18.12.2012 01:48	62 23.033	059 14.105	55 14.795	066 20.931
4	Nueva I. — Melchior I.	19.12.2012 03:06	20.12.2012 22:45	55 11.170	066 20.984	64 25.716	062 57.523
5	Wilhelmina Bay — Deception I.	24.12.2012 21:16	25.12.2012 11:15	64 33.672	062 15.510	63 00.103	060 29.040
6	Deception I — Halfmoon I.	25.12.2012 15:23	25.12.2012 17:40	62 59.327	060 28.654	62 34.892	059 46.788
7	English St. — Cape Horn —Nueva I.	25.12.2012 23:48	28.12.2012 01:55	62 22.287	059 44.110	55 14.052	066 20.860
8	Nueva I. — Falkland Is.	29.12.2012 02:21	30.12.2012 09:51	55 06.418	066 17.585	51 20.839	060 40.246
9	Falkland Is. – South Georgia	31.12.2012 20:51	03.01.2013 06:39	51 40.107	057 35.723	53 59.015	037 16.448
10	South Georgia — King George I.	05.01.2013 22:45	09.01.2013 03:13	54 56.391	035 58.903	62 01.074	057 11.337
11	King George I. – Trinity I.	09.01.2013 22:49	10.01.2013 10:21	62 31.031	059 23.314	63 56.083	060 47.780
12	Melchior I. – Cape Horn – Nueva I.	12.01.2013 22:46	15.01.2013 01:26	64 24.574	062 58.804	55 15.528	066 20.517

13	Nueva I. – Matha St. (polar circle)	16.01.2013 02:17	18.01.2013 09:21	55 11.039	066 18.941	66 35.412	067 21.823
14	Wilhelmina Bay – Deception I.	23.01.2013 21:12	24.01.2013 10:01	64 38.838	062 00.009	62 59.538	060 31.112
15	Deception I. – Halfmoon I.	24.01.2013 15:34	24.01.2013 17:51	62 59.230	060 28.073	62 34.707	059 48.560
16	Nelson St. – Cape Horn – Nueva I.	24.01.2013 23:17	27.01.2013 01:31	62 21.449	059 14.396	55 16.286	066 21.488
17	Nueva I. – Nelson St.	28.01.2013 02:30	30.01.2013 21:52	55 10.745	066 19.794	62 13.193	059 23.186
18	Deception I. – Liege I.	31.01.2013 23:39	01.02.2013 05:24	62 58.326	060 15.013	64 04.729	061 47.707
19	Argentine I. – Cape Horn –Nueva I.	03.02.2013 19:43	06.02.2013 00:39	65 12.081	064 12.074	55 16.637	066 21.842
20	Nueva I. – Falkland Is.	07.02.2013 03:44	08.02.2013 04:37	55 07.081	066 22.967	51 16.538	061 00.003
21	Falkland Is. – South Georgia	09.02.2013 20:51	12.02.2013 05:33	51 40.010	057 36.536	53 54.075	037 19.442
22	South Georgia – Elephant (Mordvinova) I.	15.02.2013 21:47	18.02.2013 09:46	54 57.793	036 00.809	61 04.182	054 51.573
23	Elephant (Mordvinova) I. – Trinity I.	18.02.2013 11:10	19.02.2013 10:54	61 06.984	054 31.902	64 00.765	060 46.381
24	Argentine I. – Cape Horn –Nueva I.	21.02.2013 19:28	24.02.2013 00:46	65 11.849	064 13.077	55 16.725	066 21.957
25	Nueva I. – Argentine I.	25.02.2013 02:58	27.02.2013 09:42	55 15.648	066 20.660	65 09.279	064 24.918
26	Enterprise I. – Deception I.	02.03.2013 20:50	03.03.2013 10:22	64 32.481	061 57.084	62 59.423	060 27.076
27	Nelson St. – Cape Horn – Nueva I.	03.03.2013 23:02	06.03.2013 01:31	62 21.386	059 14.456	55 16.573	066 23.191
28	Nueva I. – Argentine I.	07.03.2013 03:15	09.03.2013 09:53	55 14.582	066 21.664	65 10.411	064 19.947

29	Wilhelmina Bay – Deception I.	12.03.2013 20:46	13.03.2013 09:48	64 33.475	062 15.350	62 57.611	060 28.383
30	Deception I. – Half Moon I.	13.03.2013 13:07	13.03.2013 16:13	62 57.002	060 28.922	62 35.466	059 54.244
31	English St. - Cape Horn – Nueva I.	13.03.2013 21:30	16.03.2013 00:50	62 18.732	059 51.421	55 15.541	066 21.419
32	Nueva I. – Argentine I.	17.03.2013 02:34	19.03.2013 09:47	55 15.316	066 21.602	65 08.749	064 27.596
33	Melchior I. – Cape Horn – Nueva I.	23.03.2013 22:08	26.03.2013 00:38	64 13.981	063 06.175	55 16.437	066 22.770

1.2.2. Equipment

Upper-layer currents were measured using vessel mounted ADCP (VMADCP) TRDI OS75 kHz (S/N 2140) installed at the central point of the ship hall at depth 5.8 m. Surface temperature and conductivity were logged every 3 seconds. The equipment consisted of an SBE 21 (S/N 3251) temperature and conductivity sensors mounted in an SBE housing in the pump room located in the central part of the ship. A ship pump was used to provide a constant flow of non-toxic water.

Navigation information was provided by an Aquarius^2 Thales receiver and every second was recorded on the PC. Additional measurements were made with an ELAC 12 kHz and Aanderaa meteorological package.

1.3 Scientific Objectives

The cruise objectives were to:

1. To collect surface temperature and conductivity underway in Drake Passage and in the Scotia Sea.
2. To collect upper-layer currents underway in Drake Passage and in the Scotia Sea to estimate short-term variability of the Antarctic Circumpolar Current transport and relative contribution of its main jets.
3. To collect a depth to refine bottom releief features in the region.

1.4 Narrative

Beginning from January 2010 we started to collect a large data set related to the Antarctic Circumpolar Current (ACC) in Drake Passage, where a few main jets squeezed by continents and flowing over sills strongly meander and detach a number of mesoscale eddies. Our plan to continue these measurements each year when our ships carry out touristic trips crossing Drake Passage up to 30 times per austral summer. To date we have been carried out 103 crossings in Drake Passage.

The ACC is a main link of the global interocean circulation in the Southern Ocean. The absence of land barriers in the latitude band of Drake Passage has a profound influence on the dynamics of currents in the Southern Ocean and, more generally, on the earth's climate. Within this band, the strong eastward flow of the ACC connects each of the ocean basins. Sverdrup dynamics in their usual form cannot be applied to flows within a zonally unbounded ocean, and as a consequence the dynamics of the ACC have long been a topic of debate. Eddy fluxes are believed to play a more central role in both the dynamical and thermodynamical balances of the Southern Ocean than in other areas of the world ocean. The interbasin connection provided by the ACC permits a global overturning circulation to exist; the overturning circulation, in turn,

dominates the global transport of heat, fresh water and other properties that influence climate. The vigorous interbasin exchange accomplished by the ACC also admits the possibility of oceanic teleconnections, where anomalies formed in one basin may be carried around the globe to influence climate at remote locations. The fact that no net meridional geostrophic flow can exist across the unblocked latitudes isolates the Antarctic continent from the warmer waters at lower latitudes to some extent, contributing to the glacial climate of Antarctica; what heat does get carried poleward to balance the heat lost to the atmosphere must be carried by eddies.

Processes of air-sea interaction in this region cause the cooling and consequent sinking of surface waters and thus result in formation of the water masses. Complex of the South Atlantic deep waters formed spreads northward. According to the «global conveyor» concept [*Broecker*, 1991], cold deep waters formed in the South Atlantic, propagate throughout the entire Atlantic ocean and initiate the compensating return flow at shallow levels, which carries warmer water southward. The deep convection intensity variations cause the substantial interannual and long-term changes in properties of the deep and intermediate water masses and thus impact the global overturning circulation, which in turn influences the atmospheric circulation and the state of the climate system. For this reason, annual monitoring of the ACC in Drake Passage and in the Scotia Sea is essential.

RV ***Akademik Sergey Vavilov*** Cruise 36 was a contribution to the RUSSIA CLIVAR Community Research Programme. Underway measurements were designed to enable the ocean circulation in Drake Passage and in the Scotia Sea to be mapped and in particular the course of its main jets (Subantarctic, Polar and ACC Southern Front currents) within the region to be determined. The Drake Passage crossings aimed to provide estimates of the upper layer volume transport and its short-term variability including possible redistribution of mass between the main jets.

1.5 Preliminary Results

The first preliminary results will be received after completing analysis of the data set collected in 2010-2013.

1.6 Major Problems and Goals Not Achieved

Aquarius[2] Thales GPS periodically lost heading data. ADCP data partially missed because of absence of GPS heading data and due to weather conditions during Track No 17, Track No 33. TSG data did not collected for about 3 hours due to power problem during Track No 10. Echosounder data did not recorded for about 8.5 hours due to very heavy rough seas (Track No 10).

2. CONTINUOUS MEASUREMENTS (underway)

2.1 Navigation

Navigation data from Aquarius[2] Thales GPS was recorded every 1 second and was stored on the PC in binary format.

2.2 Meteorological Measurements

The standard mean meteorological measurements were stored in the separate files on the same PC with navigation data. Recording were running on the way to Ushuaia (Argentina) in December 2012 and worked reliably until 26th March 2013. Variability of the atmospheric pressure, air temperature and winds during this time is shown in Figures 3-5.

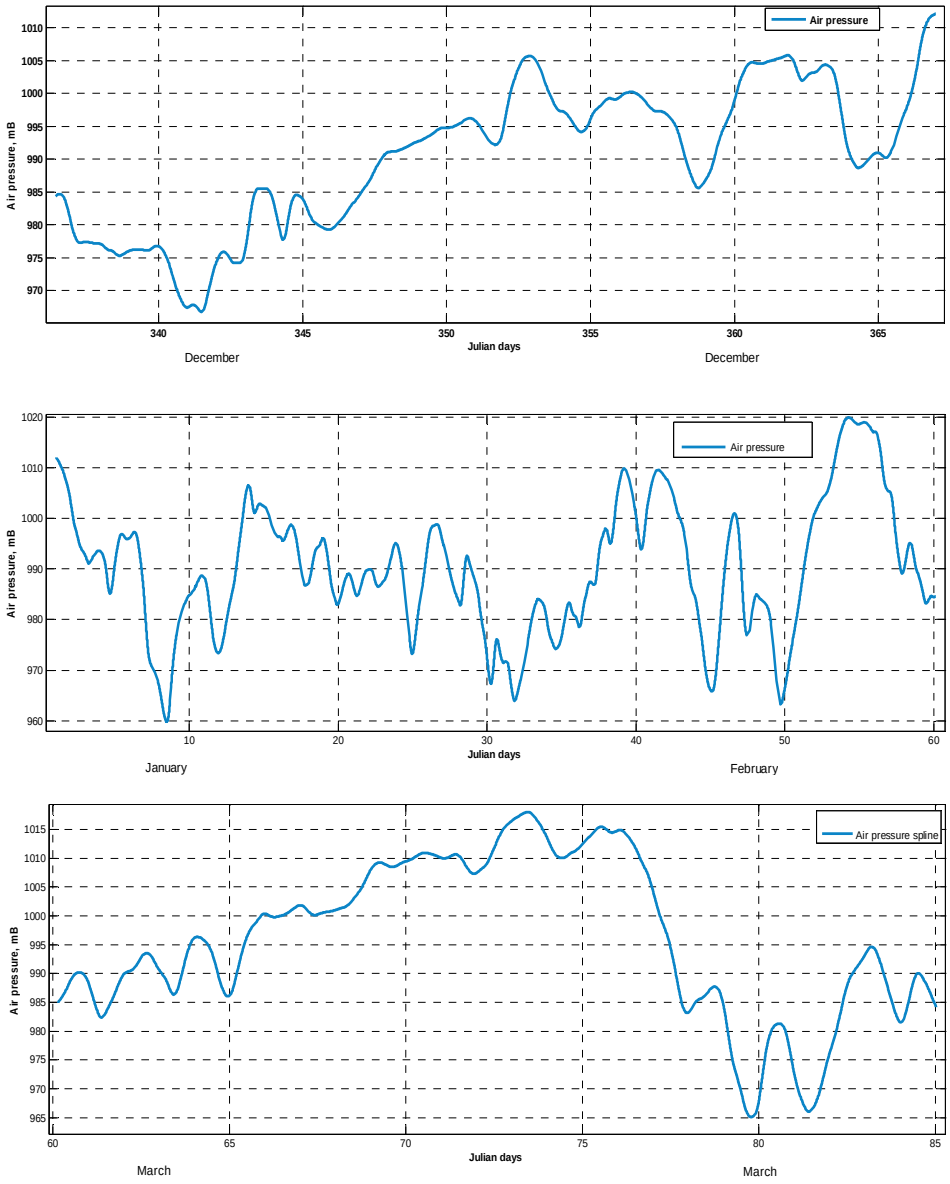

Figure 3. Spline smoothed atmospheric pressure (mbar) measured during *Akademik Sergey Vavilov* cruise.

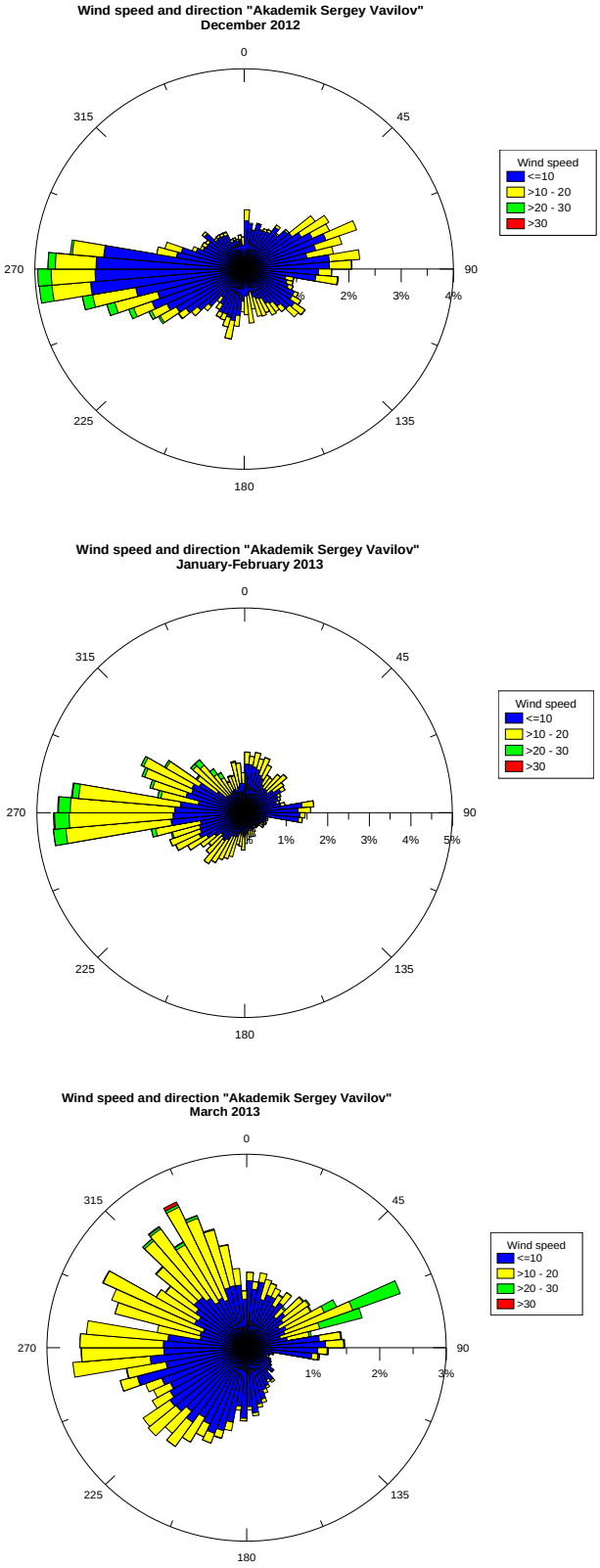

Figure 4. The rose diagrams for the wind speed and direction during the Antarctic season 2012-2013. The wind speed is showed in color.

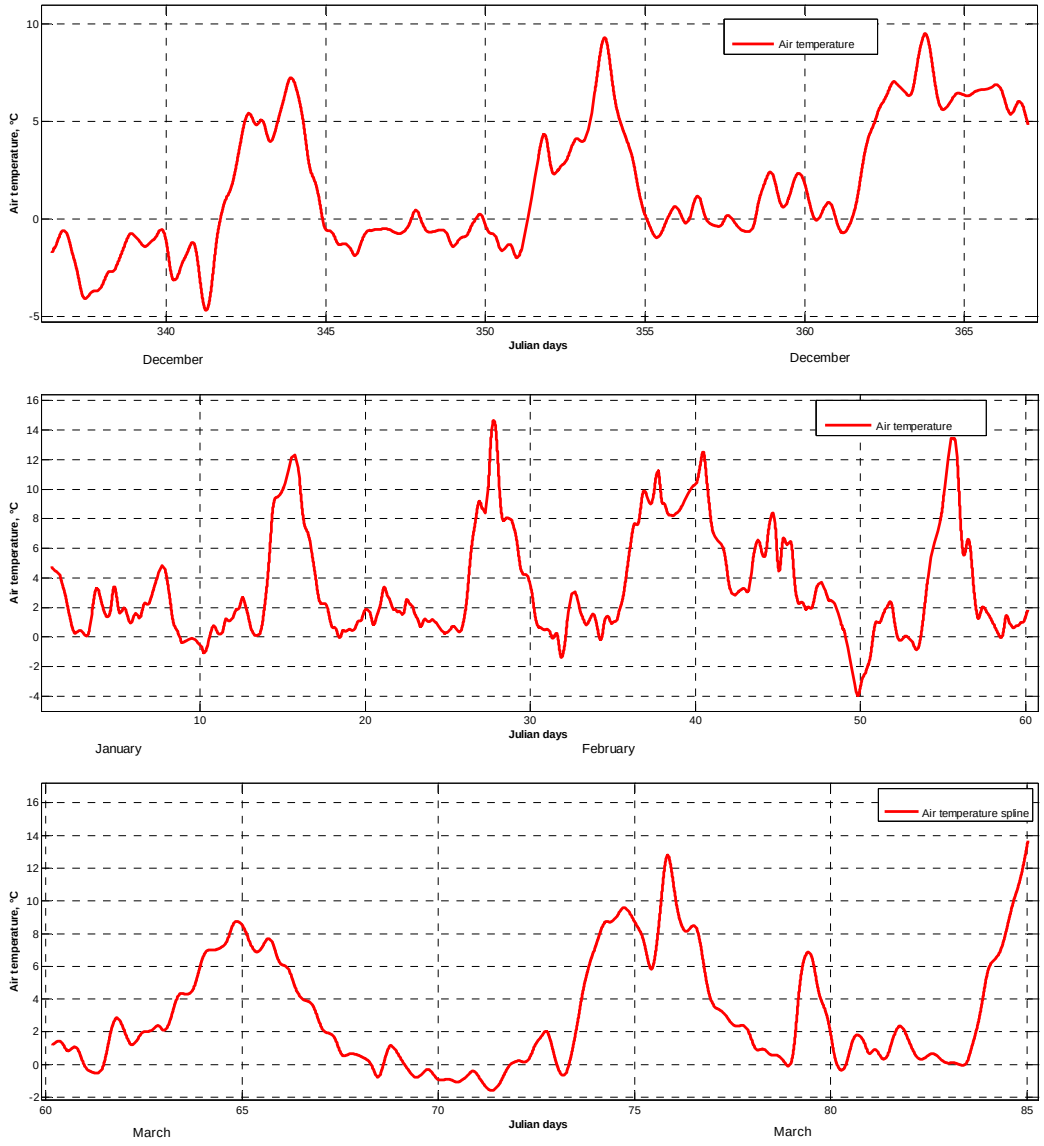

Figure 5. Spline smoothed air temperature (°C) measured during *Akademik Sergey Vavilov* cruise.

2.3 Thermosalinograph

Underway temperature and conductivity were continuously logged using the SBE acquisition program Seasave. The equipment consisted of an SBE 21 S/N 3251 temperature and conductivity sensors mounted in an SBE housing in the pump room. A ship pump with additional small pump was used to provide a constant flow of non-toxic water.

TSG salinity is usually calculated from the measured conductivity and temperature at the instrument housing. Surface bottle samples from CTD casts taking during previous cruise were used as true conductivity (salinity) from which to calculate an offset to be applied to the TSG salinities. CTD bottle samples were selected from a .btl sample files. We selected only CTD sample data from 0-10 dbars.

The CTD surface samples had their time added to the data file, and were then merged with the underway samples. The file was sorted on ascending time.

The new temperature and conductivity (salinity) were calculated and temperature, conductivity calibration was derived from the bottle samples. The data were merged on time and a linear regression used to derive A and B coefficients (TSG temperature against bottle temperature) and A1 and B1 coefficients (TSG conductivity against bottle conductivity). Prior to this, the difference between the bottle temperatures (salinities) and the TSG temperatures (salinities) was plotted to establish that there was no substantial drift with time or temperature. After calibration new residuals were calculated and the mean and standard deviation of the differences found. Based on the standard deviation of 103 data points accuracy of the TSG measurements is equaled 0.03 °C in temperature and 0.03 mSm/cm in conductivity.

Each time (during each trip) SBE 21 S/N 3251 data were collected along the ship track starting when the ship left Beagle three miles away from islands Isla Nueva and Islas Hermite. Data acquisition was stopped in Drake Passage on 26th March. Totally thirty three tracks were made and sixteen of them were crossing of the Drake Passage. Six tracks were made in the Scotia Sea along the track the Beagle – Falkland – South Georgia – South Orkneys – Antarctic Peninsula. Eleven trips were carried out in Bransfield Strait or south of the South Shetland Islands. The data acquisition was stopped each time when the ship arrived at Shetlands, Falkland, South Georgia or at the Antarctic Peninsula.

The data processing takes the following steps:

DATCNV Converts the raw data to physical parameters.

WILDEDIT For every block of 100-300 scans, flags all scans whose pressure, temperature, conductivity and oxygen values differ from the mean by more than 2 standard deviations. Recomputes mean from unflagged data then marks as bad all scans exceeding 20 standard deviations from these new values. When the data consists of too much spikes we repeat this procedure a few times.

WINDOW FILTER cosine and median filters temperature and conductivity with various window sizes are applied.

DERIVE Computes salinity, sigma-t.

BINAVG Averages into time bins taking into account window filter size applied.

2.4 Echosounding

The bathymetric equipment aboard during RV Akademik Sergey Vavilov Cruise 36 consists of an ELAC 12 kHz hydrographic echosounder. Data were collected for most of the cruise simultaneously with

TSG and VMADCP data. The hull mounted transducer is located 5.8 metres below the sea surface and this value was entered to estimate the depth.

Depth was indicated on the echosounder display and stored on the PC together with the navigation.

Two files with extension NAV and MET with maximum size 256032 b were created. File name corresponded to GMT time when the file was opened for records.

The data processing takes the following steps:

Removing repeated records with equaled coordinates and depth.

Excluding neighbor records with depth difference more than 300 - 500 m.

Comparison with existing bathymetry (GEBCO, ETOPO, Sandwell/Smith) to eliminate false peaks.

Correction due to sound speed changes across Drake Passage based on the comparison of historical CTD altimeter data and Echosounder records.

2.5 Vessel mounted Acoustic Doppler Current Profiler (VMADCP) OS 75 kHz

The Ocean Surveyor 75 kHz is designed for vessel-mount current profile measurement in the upper ocean water from depths greater than 30 meters. The system consists of a transducer and electronics chassis connected to PC.

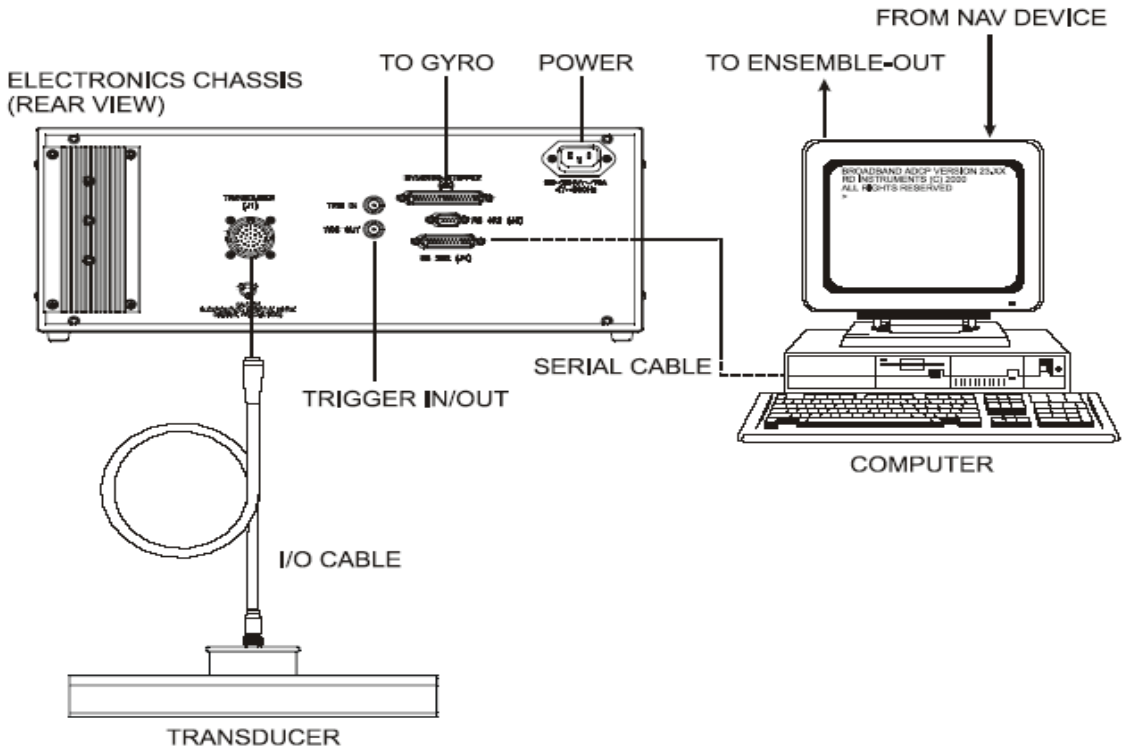

Figure 6 Ocean Surveyor 75 kHz Interface Cable Layout.

Data are transmitted in binary format through the I/O cable. GPS data in NMEA format are transmitted separately to another PC COM – port. The VMADCP can operate in two regimes (Narrow Bandwith and Broad Bandwith Profiling). Its main specifications are shown below.

To collect OS 75 kHz data we used *VmDas* software (version 1.46). The NMEA messages *VmDas* reads are standard GGA, HDG, HDT, VTG messages.

Table 1

	Bin size	Maximum range	Accuracy $(cm/s)^2$
NarrowBand (long-range mode)	16 m	750-800 m	17
BroadBand (high-precision mode)	8 m	310-430 m	12
	16 m	600 m	9

The following configuration file was mainly used to collect the data.

Deep water (>500 m):

NP00001 – Narrow Bandwidth profiling

NN060 – number of bins 60

NS1600 – cell size 16 m

NF0800 - blanking size 8 m

BP000 - disable single-ping bottom track (BP),

VmDas saves data in a few files with extension ENX, ENS, ENR (raw data with and without navigation), NR – NMEA messages, STA and LTA averaged data. Misalignment angle equaled 47.39° was introduced in configuration file and was used by VmDas for data correction.

Data processing performed STA files with 40-profile averaging. Taking into account that single ping takes about 3 seconds, one 40-profile ensemble lasts near 120 seconds in Narrow Bandwidth and slightly different time in Broad Bandwidth regime.

Data processing consists of data conversion in NetCDF format with extension NC and further cleaning, filtering, detiding (using barotropic tidal model TPXO 7.2) and averaging. The standard averaging is 1 km. IFREMER software was used to process OS 75 kHz data.

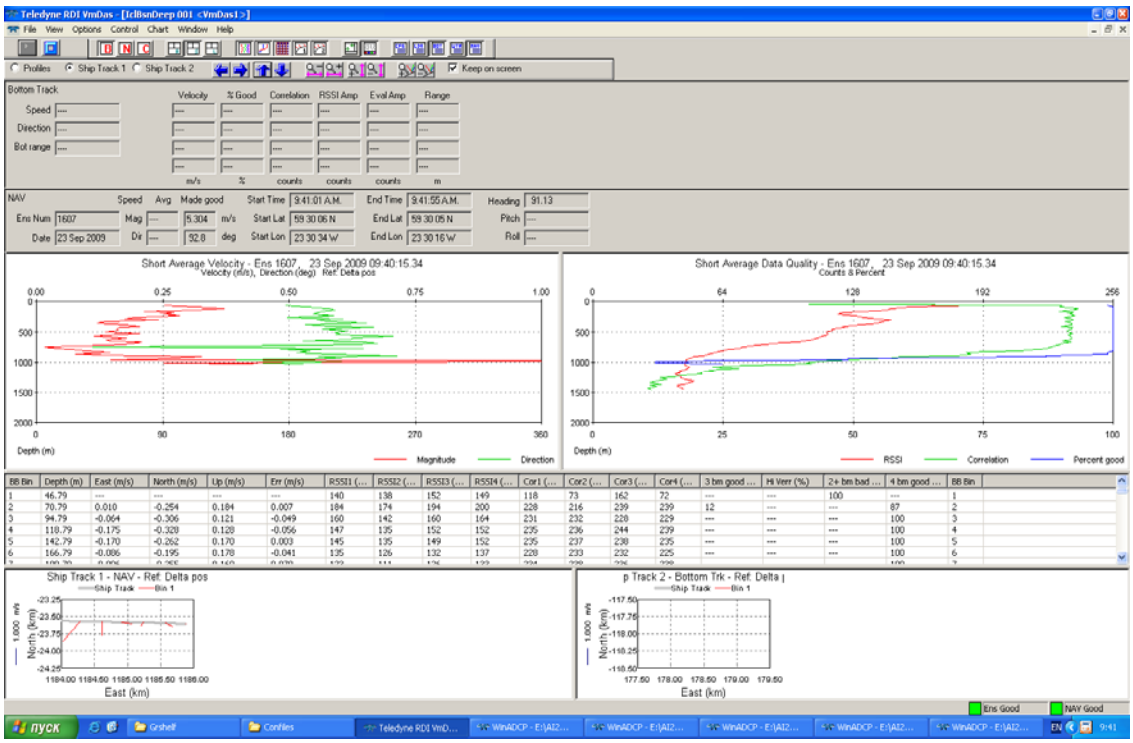

Figure 7. The VM DAS main window.

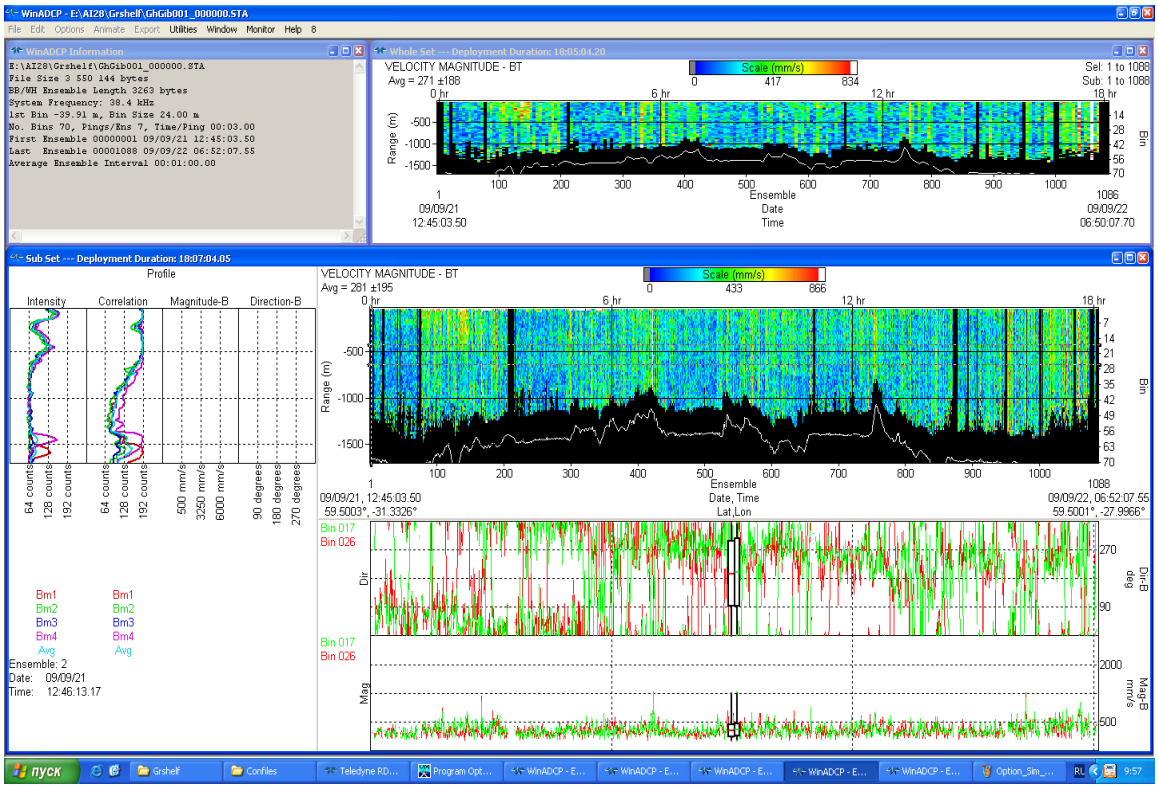

Figure 8. The WinADCP main window.

3. CRUISE LOGISTICS

Mobilization

Mobilization for the cruise took place when the vessel was in Ushuaia (Argentina). We had one day to complete all our preparations. When we finished the cruise one day was necessary to pack the equipment when the ship embarked Ushuaia.

4. Cruise Diary (GMT)

Sa 08.12.12
Depart Ushuaia

Su 09.12.12
0419 **Start the 1st track between Nueva I. to Melchior I,** H=53 m 55°19.6 S 66°20.3 W
Begin ADCP logging (NB regime)
0514 Start Echosounder logging
0712 Begin TSG logging

Tu 11.11.11
0000 Restart ADCP logging (BB8 regime)
0900-0904 Stop data logging, **end of the 1st track** 64°24.1 S 62°59.4 W, H=361 m

Fr 14.12.12
22215-2220 **Start the 2nd track in Bransfield St. (Trinity I. – Halfmoon I.),** H=141 m
63°56.2 S 60°47.7 W Begin data logging (BB16 regime)

Sa 15.12.12
1104-1107 Stop data logging, **end of the 2nd track** 62°35.1 S 59°53.3 W, H=74 m

2219-2224 **Start the 3rd track in Drake Ps. (Nelson St. – Cape Horn Nueva I.),** H=203 m
62°23.0 S 59°14.1 W Begin data logging (NB16 regime)

Su 16.12.12
1314-1325 No GPS data on the Data PC, reboot Data PC
2317-2319 No heading data

Mo 17.12.12
1247 Restart ADCP logging (BB8 regime, cell size 8m)

Tu 18.12.12
0148-0151 Stop data logging, **end of the 3rd track** 55°14.8 S 66°20.9 W, H=58 m

We 19.12.12
0306-0311 **Start the 4st track in Drake Ps. (Nueva I. – Melchior I.),** H=50 m
55°11.1 S 66°21.0 W Begin data logging (NB16 regime)

Th 20.12.11
2245-2248 Stop data logging, **end of the 4st track** 64°25.7 S 62°57.5 W, H=657 m

Mo 24.12.12
2116-2119 **Start the 5st track in Bransfield St. (Wilhelmina Bay – Deception I.),** H=672 m
64°33.7 S 62°15.5 W Begin data logging (BB16 regime, cell size 16 m)

Tu 25.12.12
1115-1118 Stop data logging, **end of the 5st track** 63°00.1 S 60°29.0 W, H=237 m

1523-1527 **Start the 6st track in Bransfield St. (Deception I. – Halfmoon I.),** H=270 m
62°59.3 S 60°28.7 W Begin data logging (BB16 regime, cell size 16 m)

1740-1742 Stop data logging, **end of the 6st track** 62°34.9 S 59°46.8 W, H=416 m

2348-2351 **Start the 7st track in Drake Ps. (English St. – Cape Horn – Nueva I.),** H=75 m
62°22.3 S 59°44.1 W Begin data logging (NB16 regime)

Th 27.12.12
1205 Restart ADCP logging (BB8 regime, cell size 8 m)

Fr 28.12.12
0155-0158 Stop data logging, **end of the 7st track** 55°14.1 S 66°20.9 W, H=53 m

Sa 29.12.12
0221-0226 **Start the 8st track between Nueva I. - Falkland Is.,** H=60 m
55°06.4 S 66°17.6 W Begin data logging (NB16 regime)

Su 30.12.12
0950-0951 Stop data logging, **end of the 8st track** 51°20.8 S 60°40.2 W, H=36 m

Mo 31.12.12
2051-2055 **Start the 9st track between Falkland Is. and South Georgia,** H=73 m
51°40.1 S 57°35.7 W Begin data logging (BB16 regime, cell size 16 m)

Tu 01.01.13
1111-1122 No heading data, restart GPS

Th 03.01.13
0639-0642 Stop data logging, **end of the 9st track** 53°59.0 S 37°16.4 W, H=181 m

Sa 05.01.13
2245-2250 **Start the 10st track between South Georgia and King George,** H=275 m
54°56.4 S 35°58.9 W Begin data logging (NB16 regime)

Su 06.01.13
1052-1058 No heading data

Mo 07.01.13
1326-2200 No Echosounder data
1838 Noisy TSG data

Tu 08.01.13
2235 TSG UPS Back Up system out of range
2237 Restart TSG logging

We 09.01.13
0313-0316 Stop data logging, **end of the 10st track** 62°01.1 S 57°11.3 W, H=374 m

2249-2307 **Start the 11st track between King George I. and Trinity I.,** H=625 m
62°31.0 S 59°23.3 W Begin data logging (NB16 regime)

Th 10.01.13
1021-1028 Stop data logging, **end of the 11st track** 63°56.1 S 60°47.8 W, H=135 m

Sa 12.01.13
2246-2252 **Start the 12st track in Drake Ps. between Melchior I. and Cape Horn – Nueva I.,** H=656 m 64°24.6 S 62°58.8 W Begin data logging (NB16 regime)
UPS back Up (Cyber Power DX400E) is replaced with APC Back UPS CS 500

Su 13.01.13
1127-1128 No heading data

Mo 14.01.13
1226 Restart ADCP logging (BB8 regime)

Tu 15.01.13
0126-0129 Stop data logging, **end of the 12st track** 55°15.5 S 66°20.5 W, H=62 m

We 16.01.13
0217-0223 **Start the 13st track between Nueva I. and Matha St.** H=54 m
55°11.0 S 66°18.9 W Begin data logging (NB16 regime)

Fr 18.01.13
0921-0925 Stop data logging, **end of the 13st track** 66°35.4 S 67°21.8 W, H=501 m

We 23.01.13
2112-2116 **Start the 14st track between Wilhelmina Bay and Deception I.,** H=257 m
64°38.8 S 62°00.0 W Begin data logging (BB16 regime)

Th 24.01.13
0033-0034 No heading data
0520-0527 No heading data, restart GPS
1001-1004 Stop data logging, **end of the 14st track** 62°59.5 S 60°31.1 W, H=32 m

1534-1539 **Start the 15st track in Bransfield St. (Deception I. – Halfmoon I.)** H=252 m
62°59.2 S 60°28.1 W Begin data logging (BB16 regime)

1751-1754 Stop data logging, **end of the 15st track** 62°34.7 S 59°48.6 W, H=388 m

2317-2322 **Start the 16st track in Drake Ps. (Nelson St. – Cape Horn – Nueva I.)** H=282 m
62°21.4 S 59°14.4 W Begin data logging (NB16 regime)

Sa 26.01.13
1315 Restart ADCP logging (BB8 regime)

Su 27.01.13
0131-0134 Stop data logging, **end of the 16st track** 55°16.3 S 66°21.5 W, H=60 m

Mo 28.01.13
0230-0235 **Start the 17st track in Drake Ps. (Nueva I. – Nelson St.)** H=54 m 55°10.7 S
66°19.8 W Begin data logging (NB16 regime)
0551 Very heavy rough seas

Tu 29-30.01.13
2313-1200 The ship is drifting due to very bad weather conditions

We 30.01.13
2152-2157 Stop data logging, **end of the 17st track** 62°13.2 S 59°23.2 W, H=54 m

Th 31.01.13
2339-2345 **Start the 18st track between Deception I. and Liege I.)** H=999 m 62°58.3 S 60°15.0 W Begin data logging (BB16 regime)

Fr 01.02.13
0524-0527 Stop data logging, **end of the 18st track** 64°04.7 S 61°47.7 W, H=1236 m

Su 03.02.13
1943-1947 **Start the 19st track in Drake Ps. (Argentine I. – Cape Horn – Nueva I.)** H=232 m 65°12.1 S 64°12.1 W Begin data logging (NB16 regime)

Mo 04.02.13
1157-1213 No heading data

Tu 05.02.13
1446 Restart ADCP logging (BB8 regime)

We 06.02.13
0039-0042 Stop data logging, **end of the 19st track** 55°16.6 S 66°21.8 W, H=63 m

Th 07.02.13
0344-0348 **Start the 20st track between Nueva I. and Falkland Is.** H=55 m 55°07.1 S 66°23.0 W Begin data logging (NB16 regime)

Fr 08.02.13
0437-0440 Stop data logging, **end of the 20st track** 51°16.5 S 61°00.0 W, H=53 m

Sa 09.02.13
2051-2055 **Start the 21st track between Falkland Is. and South Georgia I.** H=71 m 51°40.0 S 57°36.5 W Begin data logging (NB16 regime)

Tu 12.02.13
0533-0537 Stop data logging, **end of the 21st track** 53°54.1 S 37°19.4 W, H=140 m

Fr 15.02.13
2147-2153 **Start the 22nd track between South Georgia I. and Elephant (Mordvinova) I.** H=196 m 54°57.8 S 36°00.8 W Begin data logging (NB16 regime)

Mo 18.02.13
0946-0948 Stop data logging, **end of the 22nd track** 61°04.2 S 54°51.6 W, H=140 m

1110-1115 **Start the 23rd track (Elephant (Mordvinova) I. – Trinity I.)** H=317 m 61°07.0 S 54°31.9 W Begin data logging (BB16 regime)

Tu 19.02.13
1054-1057 Stop data logging, **end of the 23rd track** 64°00.8 S 60°46.4 W, H=240 m

Th 21.02.13
1928-1931 **Start the 24st track in Drake Ps. (Argentine I. – Cape Horn - Nueva I.)** H=225 m 65°11.8 S 64°13.1 W Begin data logging (NB16 regime)

Fr 22.02.13
2200-2225 No GPS data, restart GPS

Sa 23.02.13
1029 Restart ADCP logging (BB8 regime)

Su 24.02.13
0046-0048 Stop data logging, **end of the 24st track** 55°16.7 S 66°22.0 W, H=62 m

Mo 25.02.13
0258-0306 **Start the 25st track in Drake Ps. (Nueva I. – Argentine I.)** 55°15.6 S 66°20.7 W H = 61 m, begin data logging (NB16 regime)

We 27.02.13
0942-0946 Stop data logging, **end of the 25st track** 65°09.3 S 64°24.9 W, H=205 m

Sa 02.03.13
2050-2053 **Start the 26st track between Enterprise I. and Deception I.** 64°32.5 S 61°57.1 W H=284 m Begin data logging (BB16 regime)

Su 03.03.13
1022-1026 Stop data logging, **end of the 26st track** 62°59.4 S 60°27.1 W, H=450 m

2302-2306 **Start the 27st track in Drake Ps. (Nelson St. – Cape Horn - Nueva I.)** 62°21.4 S 59°14.5 W H=296 m Begin data logging (NB16 regime)

Tu 05.03.13
1621 Restart ADCP logging

We 06.03.13
0131-0134 Stop data logging, **end of the 27st track** 55°16.6 S 66°23.2 W, H=61 m

Th 07.03.13
0315-0319 **Start the 28st track in Drake Pas. (Nueva I. – Argentine I.)** 55°14.6 S 66°21.7 W H=52 m Begin data logging (BB8 regime)
0539 Restart ADCP logging (NB16 regime)

Sa 09.03.13
0721-0736 No heading data

0953-0956 Stop data logging, **end of the 28st track** 65°10.4 S 64°20.0 W, H=370 m

Tu 12.03.13
2046-2049 **Start the 29st track between Wilhelmina Bay and Deception I.)** 64°33.5 S 62°15.4 W H=669 m Begin data logging (BB16 regime)

We 13.03.13
0948-0952 Stop data logging, **end of the 29st track** 62°57.6 S 60°28.4 W, H=187 m

1307-1310 **Start the 30st track in Bransfield St. (Deception I. – Halfmoon I.)** 62°57.0 S 60°28.9 W H=100 m Begin data logging (NB16 regime)

1613-1617 Stop data logging, **end of the 30st track** 62°35.5 S 59°54.2 W, H=56 m

2130-2134 **Start the 31st track in Drake Ps. (English St. – Cape Horn – Nueva I.)** 62°18.7 S 59°51.4 W H=53 m Begin data logging (NB16 regime)

Fr 15.03.13
1119 Restart ADCP logging (BB8 regime)

Sa 16.03.13
0050-0052 Stop data logging, **end of the 31st track** 55°15.5 S 66°21.4 W, H=57 m

Su 17.03.13
0234-0238 **Start the 32nd track in Drake Ps. (Nueva I. – Argentine I.)** 55°15.3 S 66°21.6 W H=55 m Begin data logging (NB16 regime)

Tu 19.03.13
0947-0955 Stop data logging, **end of the 32nd track** 65°08.7 S 64°27.6 W, H=208 m

Sa 23.03.13
2208-2211 **Start the 33rd track in Drake Ps. (Melchior I. – Cape Horn – Nueva I.)** 64°14.0 S 63°06.2 W H=343 m Begin data logging (NB16 regime)

Th 25.03.13
1332 Restart ADCP logging (BB8 regime)
1832 Finish TSG logging

Fr 26.03.13
0038 Stop data logging, **end of the 33rd track** 55°16.4 S 66°22.8 W, H=58 m

End of the season

5. ACKNOWLEDGEMENTS

The principal scientists would like to thank the Master, officers and crew of the RV Akademik Sergey Vavilov for making this such an enjoyable, as well as successful cruise.

FIGURES

Fig.21 Correlation, echo intensity and percent good of the processed VMADCP data during the thirty third track between Melchior I. and Cape Horn - Nueva I. in Drake Passage (23-26 March 2013). Noisy data in the middle are due to rough seas.

Fig.22 Processed U and V components of the ADCP during the thirty third track between Melchior I. and Cape Horn - Nueva I. in Drake Passage (23-26 March 2013). Noisy data in the middle are due to rough seas.

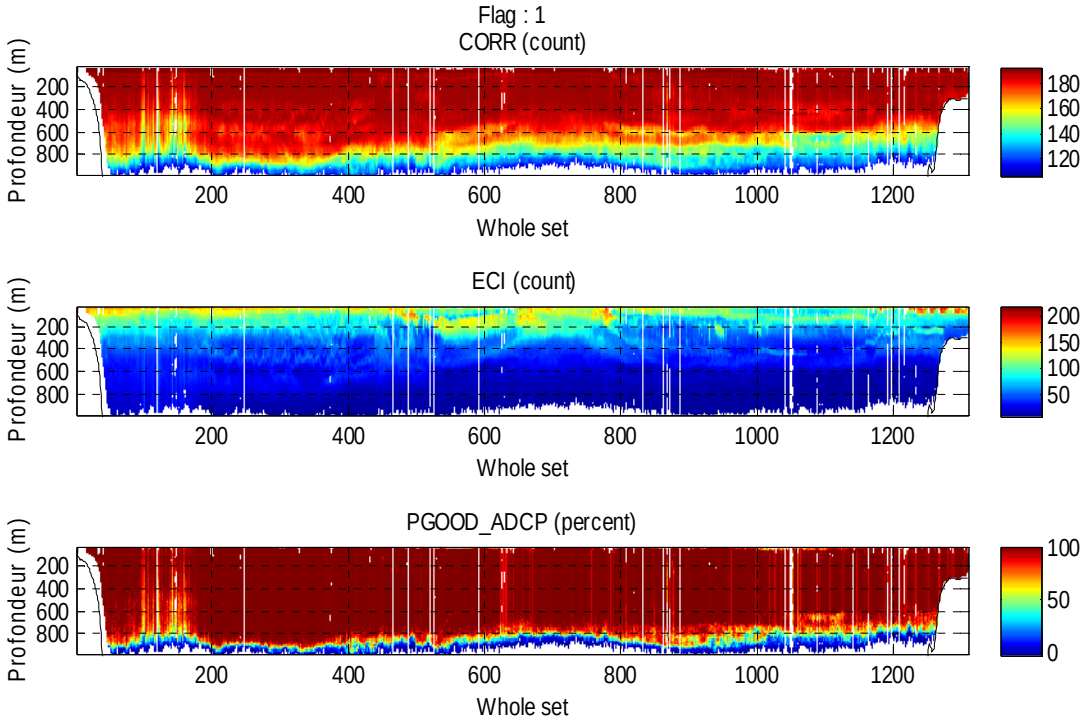

Fig. 9 Correlation, echo intensity and percent good of the processed VMADCP data during the first track between Nueva I. and Melchior I. in Drake Passage (9-11 December 2012).

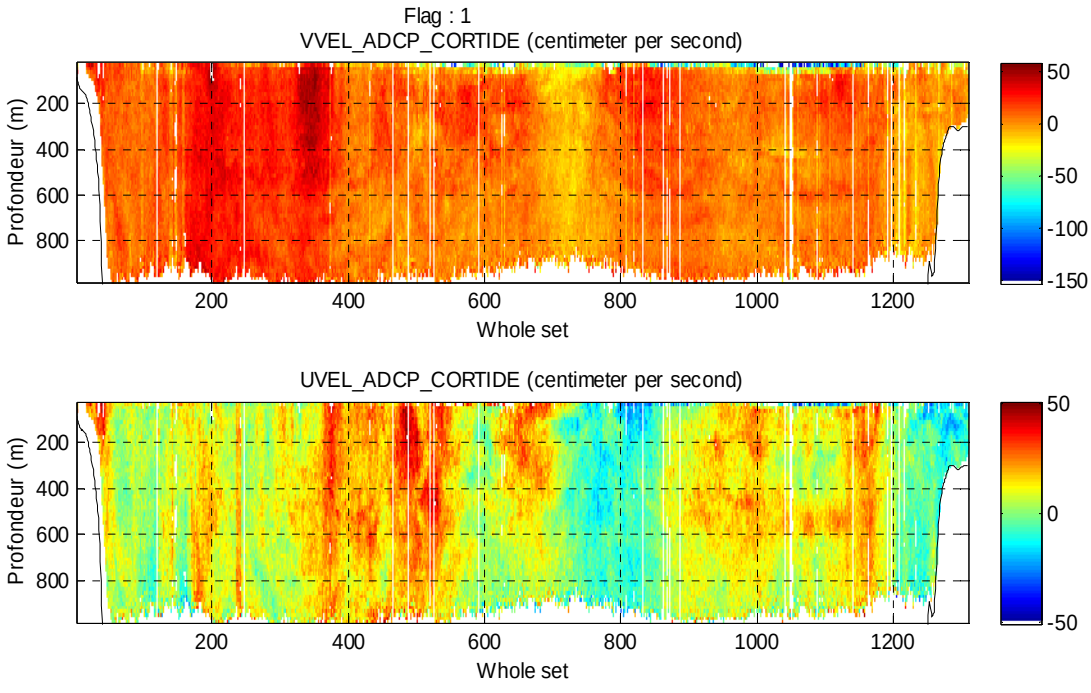

Fig. 10 Processed U and V components of the ADCP during the first track between Nueva I. and Melchior I. in Drake Passage (9-11 December 2012).

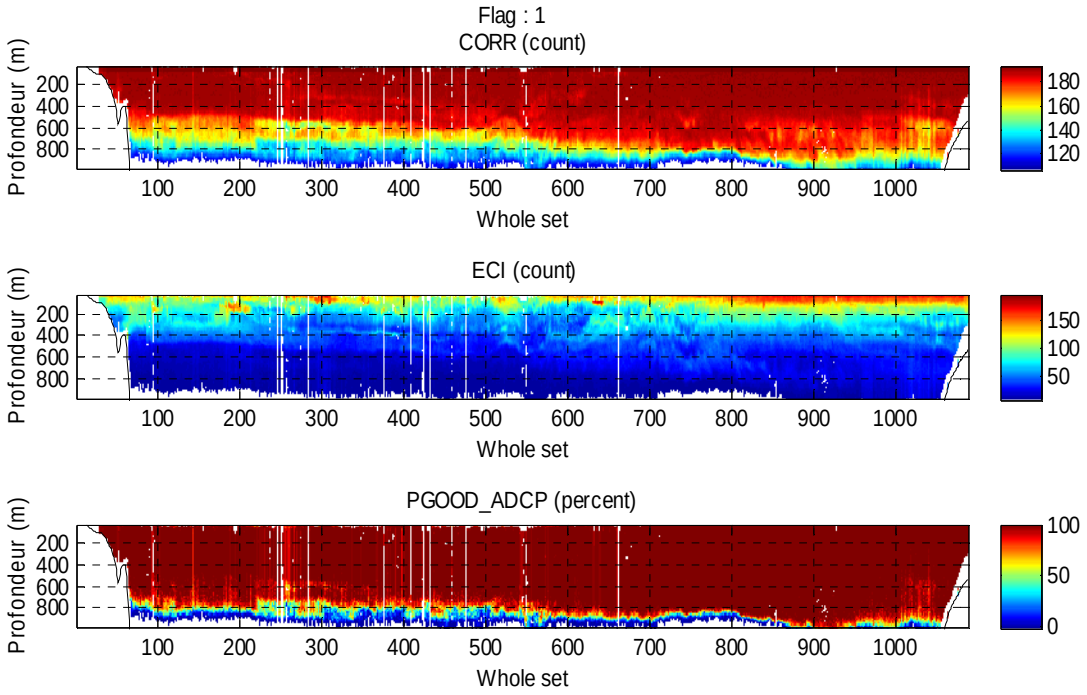

Fig. 11 Correlation, echo intensity and percent good of the processed VMADCP data during the seventh track between English St. and Cape Horn - Nueva I. in Drake Passage (25-28 December 2012).

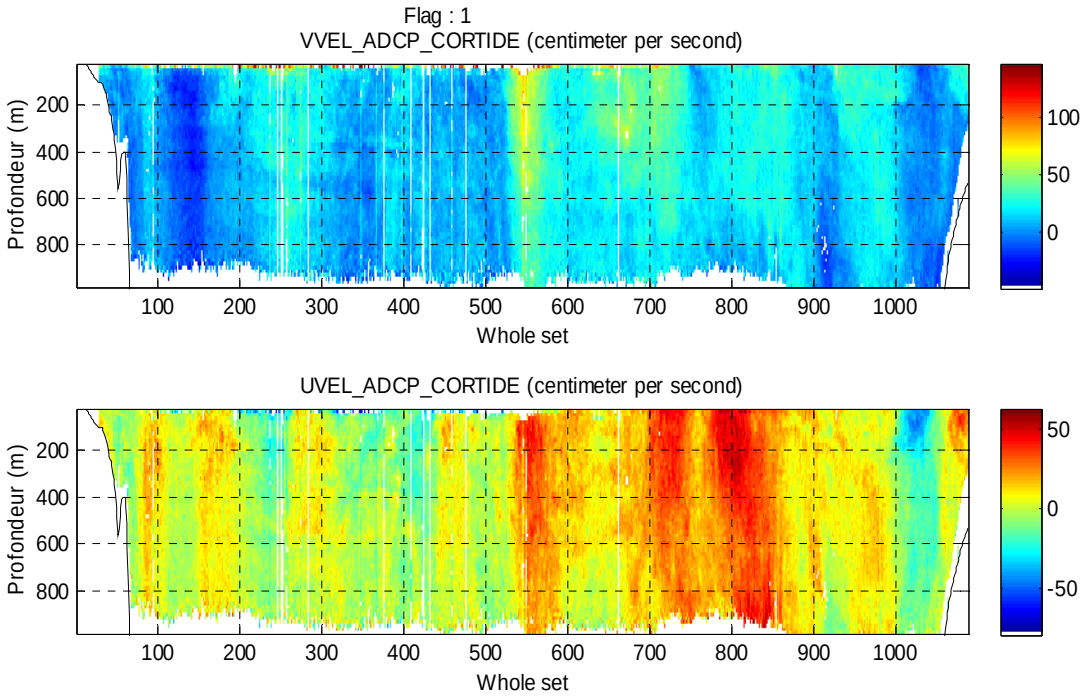

Fig. 12 Processed U and V components of the ADCP during the seventh track between English St. and Cape Horn - Nueva I. in Drake Passage (25-28 December 2012).

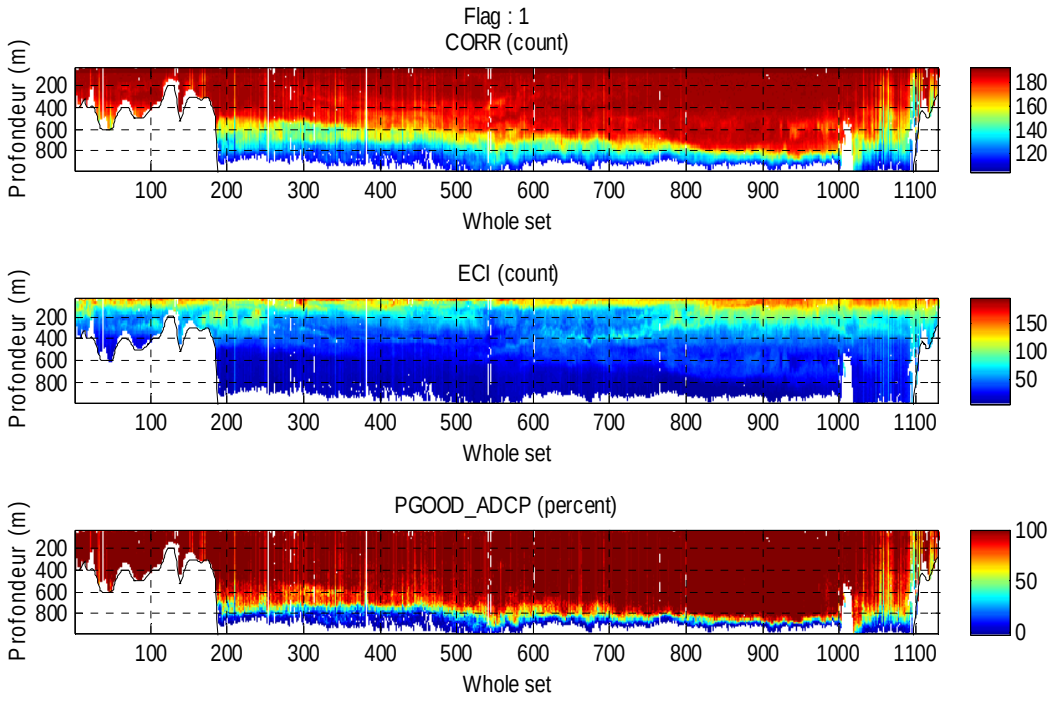

Fig. 13 Correlation, echo intensity and percent good of the processed VMADCP data during the twelfth track between Melchior Is. and Cape Horn - Nueva Is. in Drake Passage (12-15 January 2013).

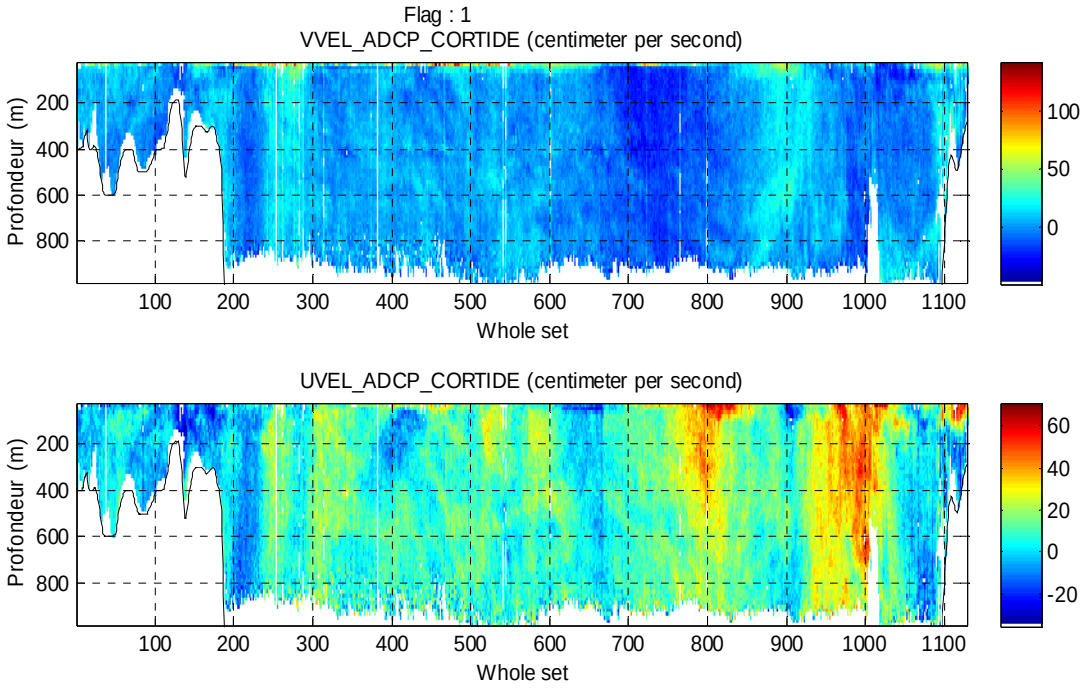

Fig. 14 Processed U and V components of the ADCP during the twelfth track between Melchior Is. and Cape Horn - Nueva Is. in Drake Passage (12-15 January 2013).

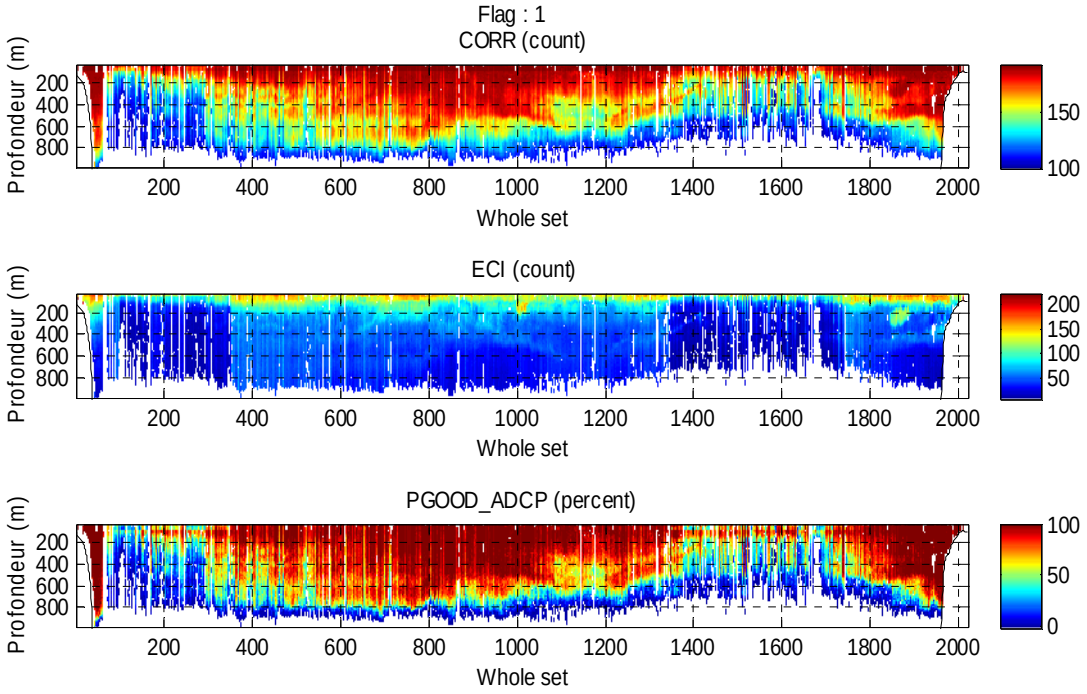

Fig. 15 Correlation, echo intensity and percent good of the processed VMADCP data during the seventeenth track between Nueva I. and Nelson St. in Drake Passage (28-30 January 2013). Noisy and shorter range data are due to rough seas.

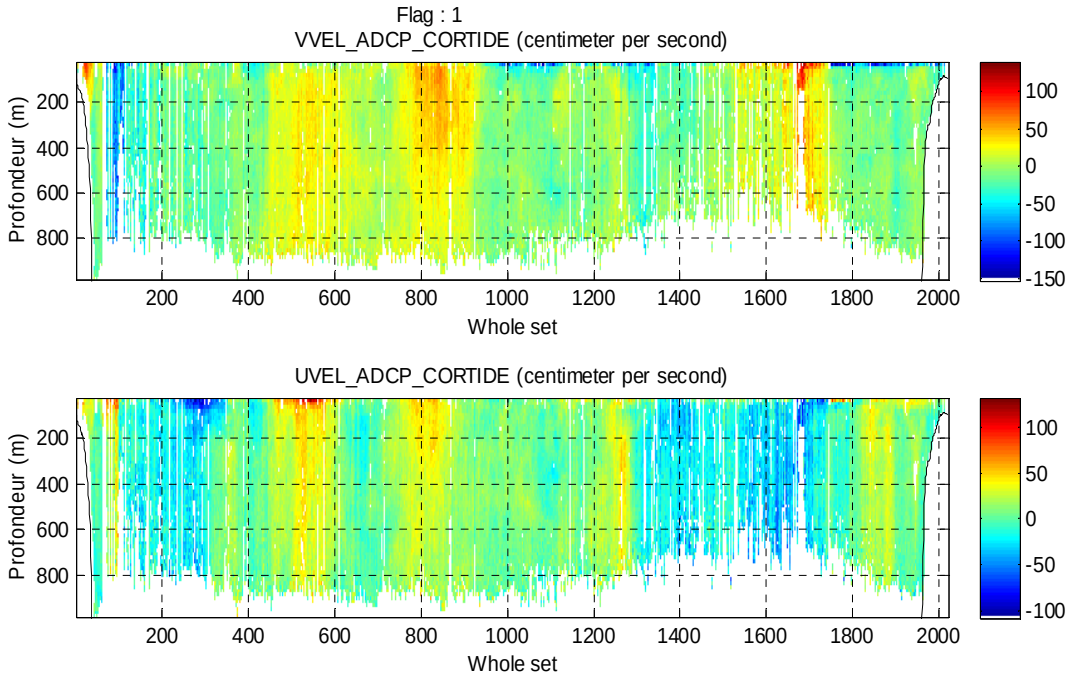

Fig. 16 Processed U and V components of the ADCP during the seventeenth track between Nueva I. and Nelson St. in Drake Passage (28-30 January 2013). Noisy and shorter range data are due to rough seas.

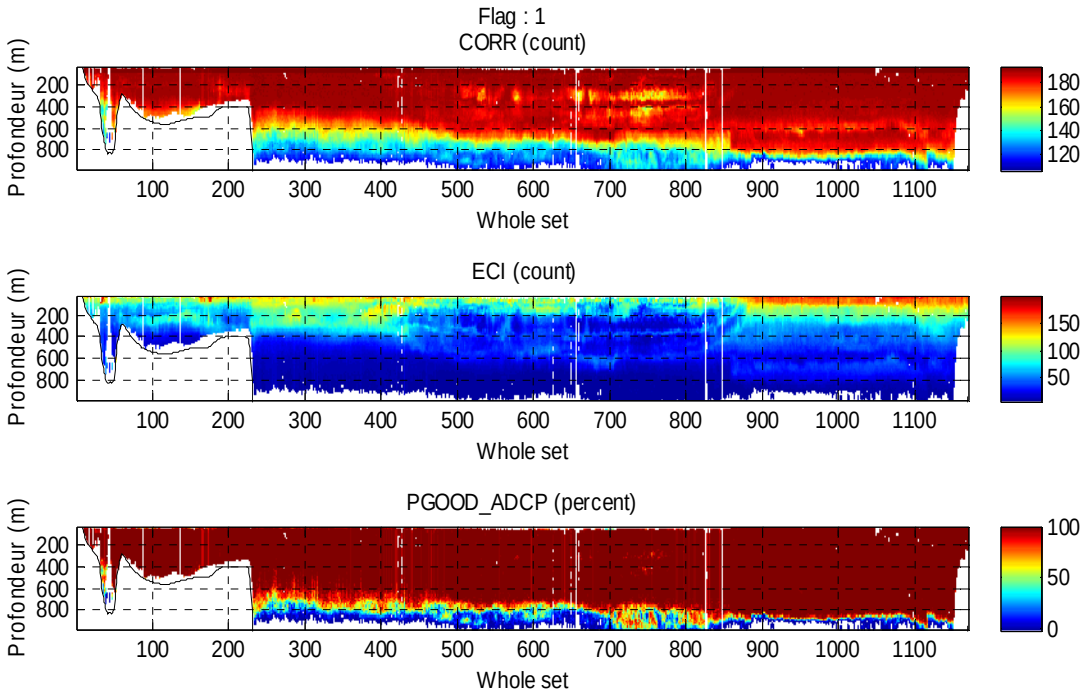

Fig. 17 Correlation, echo intensity and percent good of the processed VMADCP data during the twenty forth track between Argentine I. and Cape Horn - Nueva I. in Drake Passage (21-24 February 2013).

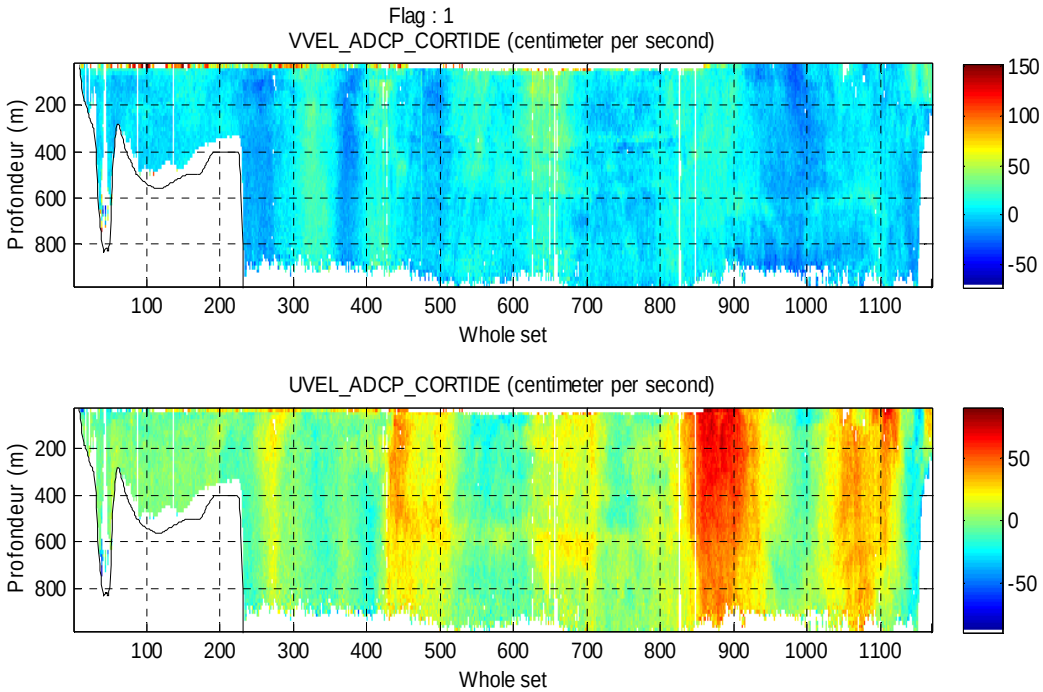

Fig. 18 Processed U and V components of the ADCP during the twenty forth track between Argentine I. and Cape Horn - Nueva I. in Drake Passage (21-24 February 2013).

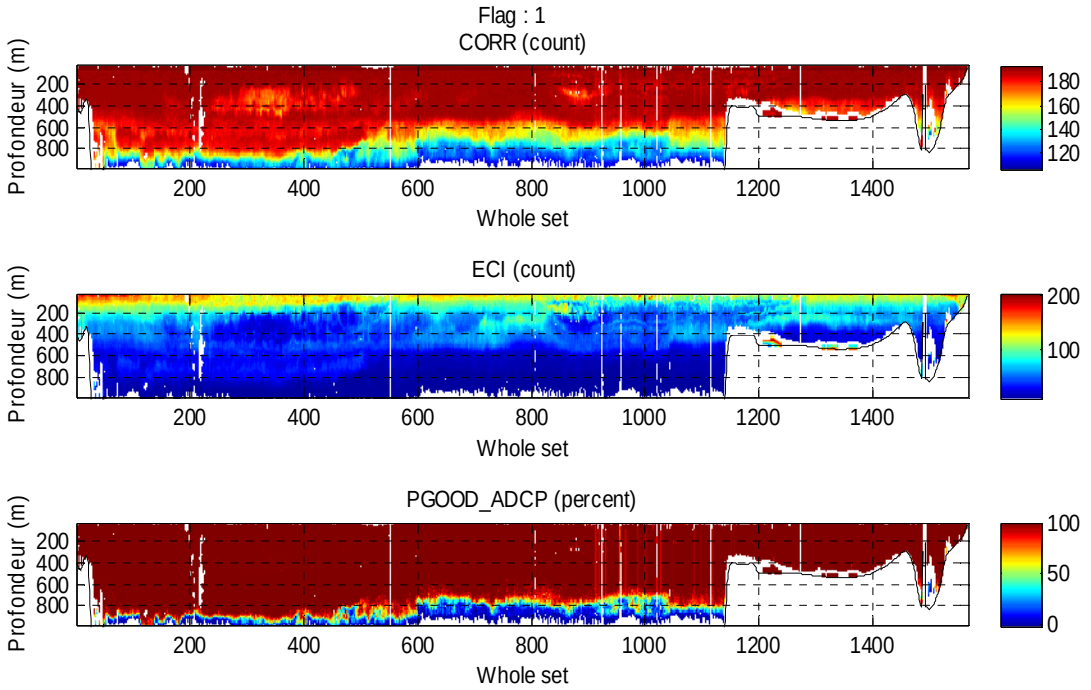

Fig. 19 Correlation, echo intensity and percent good of the processed VMADCP data during the twenty eighth track between Nueva I. and Argentine I. in Drake Passage (07-09 March 2013).

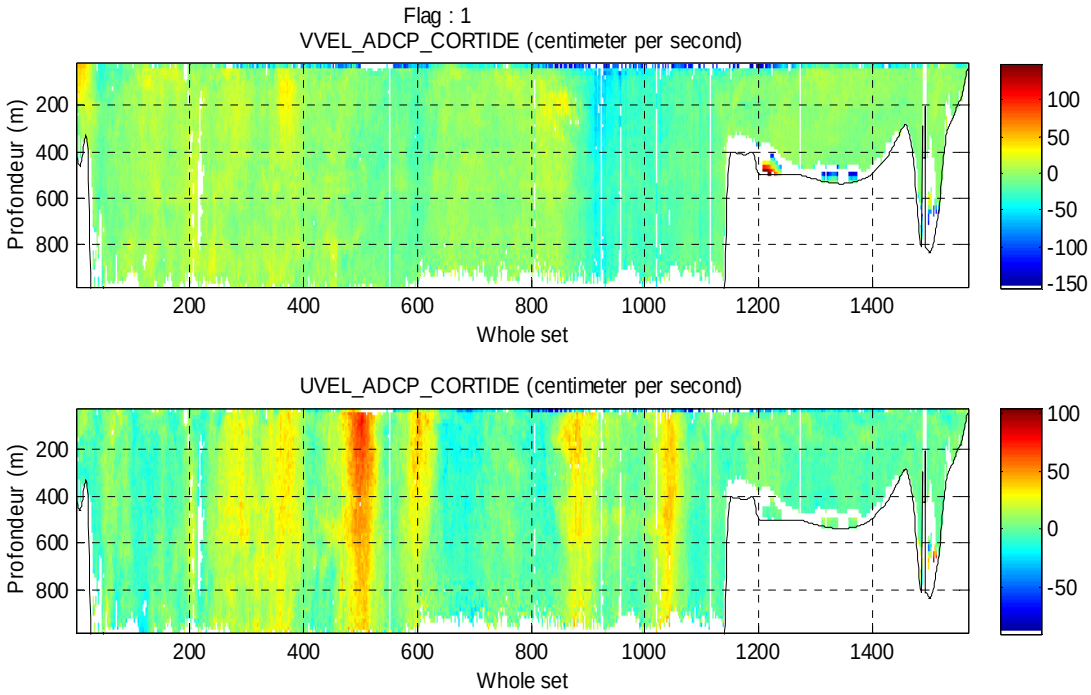

Fig. 20 Processed U and V components of the ADCP during the twenty eighth track between Nueva I. and Argentine I. in Drake Passage (07-09 March 2013).

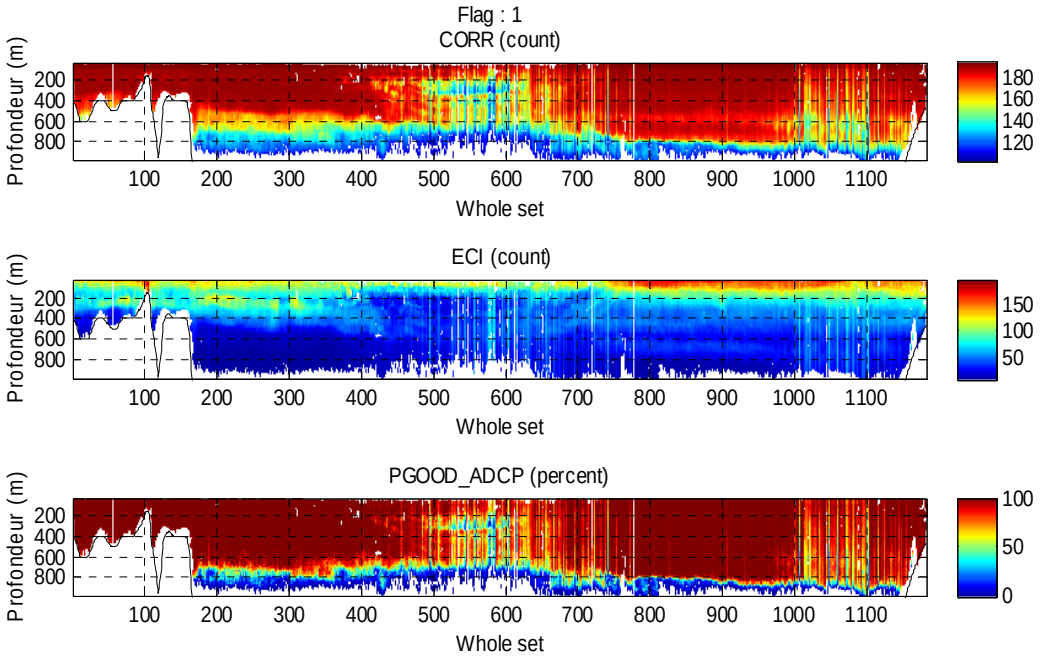

Fig. 21 Correlation, echo intensity and percent good of the processed VMADCP data during the thirty third track between Melchior I. and Cape Horn - Nueva I. in Drake Passage (23-26 March 2013). Noisy data in the middle are due to rough seas.

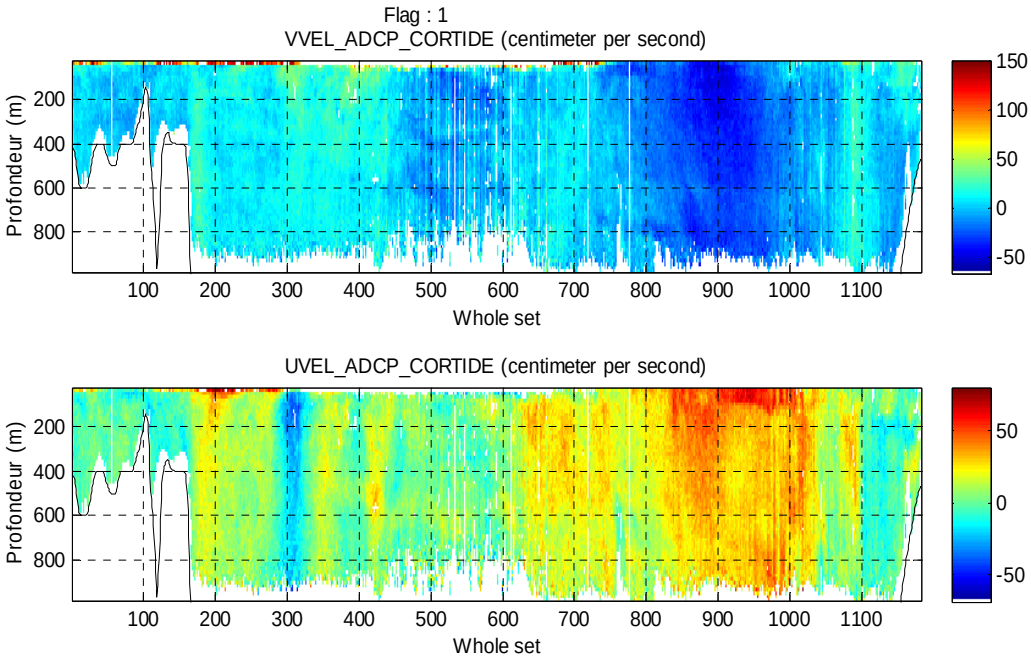

Fig. 22 Processed U and V components of the ADCP during the thirty third track between Melchior I. and Cape Horn - Nueva I. in Drake Passage (23-26 March 2013). Noisy data in the middle are due to rough seas.