CNR IAMC – Institute for Coastal Marine Environment

CNR ISMAR – Marine Science Institute

MEDGOOS 11

- Cruise Report -

16th November 2005 – 3rd December 2005

ENEA - CRAM

University of Florence

CNR ISAC Institute for Atmospheric and Climatic Science Institute

University of Pisa

NURC Undersea Research Centre

University of Tuscia

Edited by M. Borghini

K. Schröder

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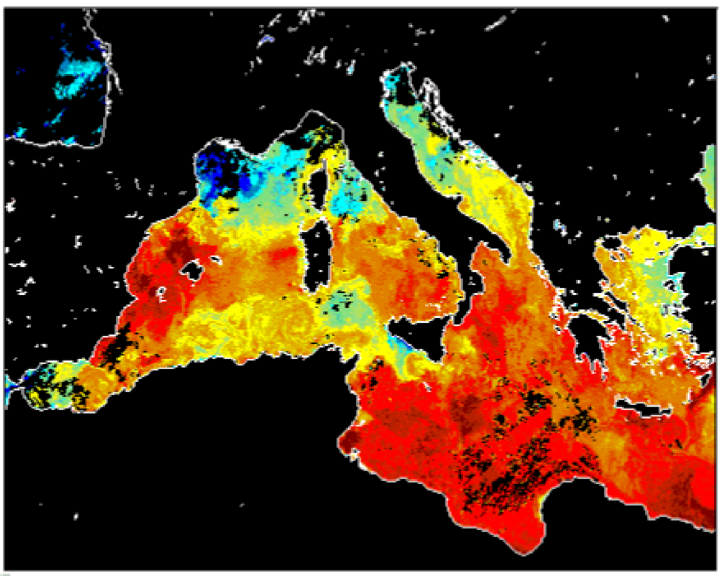
Cruise Particulars

NAME	*MEDGOOS 11*
DATES	*16TH NOVEMBER 2005 – 3RD DECEMBER 2005*
STUDY AREA	*CORSICA CHANNEL* *CENTRAL MEDITERRANEAN SEA* *TYRRHENIAN SEA*
HEAD PROJECT	*MASSIMILIANO DIBITETTO CNR-IAMC*
SCIENTIFIC HEAD	*ANGELO PERILLI CNR-IAMC*
HEAD OF MISSION	*MIRENO BORGHINI, CNR-ISMAR*
PARTICIPANT INSTITUTES	*CNR – IAMC* *CNR – ISMAR* *ENEA – CRAM* *CNR – ISAC* *UNIVERSITY OF FLORENCE* *UNIVERSITY OF TUSCIA* *UNIVERSITY OF PISA* *NURC – UNDERSEA RESEARCH CENTRE*
RESEARCH VESSEL	*URANIA*
DEPARTURE PORT	*CIVITAVECCHIA*
ARRIVAL PORT	*NAPOLI*



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Scientific objectives

This report presents the preliminary results obtained during the MEDGOOS 11 cruise, carried out from 16th November – 03rd December 2005, on board of the Italian R/V URANIA in the Western Mediterranean Sea.

The cruise was planned in order to achieve the following objectives:

1. **Water mass properties and biological features**

   to define the principal circulation paths and the physical-chemical-biological properties (temperature, salinity, oxygen, nutrients, chlorophyll, phytoplankton, primary production, bacteria, etc) of the surface, intermediate and deep water masses in the Western Mediterranean Sea, through measurements along key sections located in the interior and at the boundaries of the basin;

2. **Methodological development**

   - **to measure velocity profiles by using Lowered ADCPs;**
   - **to measure salinity and temperature in the surface layer with an oscillating vehicle, the Nv Shuttle;**
   - **to test the correct functioning of a Tflap probe (temperature, salinity and fluorescence);**
   - **to proceed with the periodical maintanance of the moorings;**
   - **to compare different chlorophyll quantification methods and to calibrate the fluorimeter coupled with the CTD-probe with different photochemical techniques.**

Scientific Background

General description

The **Central Mediterranean** is characterised by a very complicated bottom topography, which directly affects the water exchange between the two Mediterranean basins (western and eastern Mediterranean Sea). The most salient features are the unequal depths of the boundary sections (Astraldi et al., 2002). In the Sardinia Channel (section D13-D21 in Figure 1), the silldepth is at about 1900 m, allowing the free exchange of the deep waters with the WMED, but in the Sicily Strait (section 410-432), the deeper sill is at about 430 m, thus imposing strong constraints on the exchanges with the EMED. In between, a wide area of very shallow waters off Tunisia provides a further obstacle to a direct connection between the two basins. All water masses outflowing at depth, both from the WMED (Krivosheya and Ovchinnikov, 1973; Hopkins, 1988) and from the EMED (Astraldi et al., 1996), are conveyed into the **Tyrrhenian Sea**, an intermediate basin whose southern part strongly interacts with the central Mediterranean. Section 212-291 is substantially formed by two main channels with a wide plateau in between. The deeper one, in the central part, directly connects the Tyrrhenian Sea with the Sardinia Channel and the WMED, and the other, adjacent to the Sicilian slope, connects, with an increasing depth, the Sicily Strait with the Tyrrhenian Sea.

Hence, this study area is a very complex system, with even extreme climatic conditions in its northern part and an almost sub-tropical climate in its southern part. It sustains one of the most productive areas of the whole Mediterranean Sea, with the vastest marine mammals and large fishes community.

Further interesting aspects regard the hydrological properties (temperature and salinity) of the deep and intermediate layers, which have presented a positive trends for some decades. The reasons of this trend are not yet known. Furthermore, the water masses coming from this area constitute the principal source of the outflowing Mediterranean water at Gibraltar.

An increased knowledge about all these aspects will permit a more complete understanding of the role and the functioning of the Western Mediterranean Sea.

Cruise Plan

The following table summarizes the parameters that have been measured and the sampling group involved in the operation, while table 2 lists the sampling equipment and the methods of analysis.

Parameter/Instrument	Sampling Group
CTD/O2/rosette	CNR-ISMAR - ENEA
Salinity	CNR-ISMAR
XBT	CNR-ISMAR
Dissolved Oxygen	CNR-ISMAR
NO3, P04, SiO4	CNR-ISMAR – ENEA
Chlorophyll	IAMC, NURC, Universities of Florence and of Tuscia
Phytoplankton	UniversitIes of Florence and Pisa
Spectroradiometer	IAMC, University of Florence

Table 1 Measured Parameters

Small-Volume Sampling	General Oceanics 24-place rosette with 10-liter bottles
CTD System	CTD SBE 911 plus
XBT	T4, T5 and Deep Blue (Sippican Inc.)
Salinometer	AUTOSAL
Oxygen	Winkler titration
Nutrients	Samples only, no on board analyses
Chlorophyll	Filtration
Phytoplankton	Filtration
Solar spectra transmission	Spectroradiometer

Table 2 Sampling equipment and analysis methods

The planned track is shown in Figure 1. We planned to spend 17 days at sea. The geographic boundaries of the survey are 35.00 °N - 43.00 °N latitude and -8.00 °E – 14.00 °E longitude. Because of the meteorological and marine conditions, the effective cruise track is the one showed in fig. 2. The station list is shown in table 3.

Cruise Maps

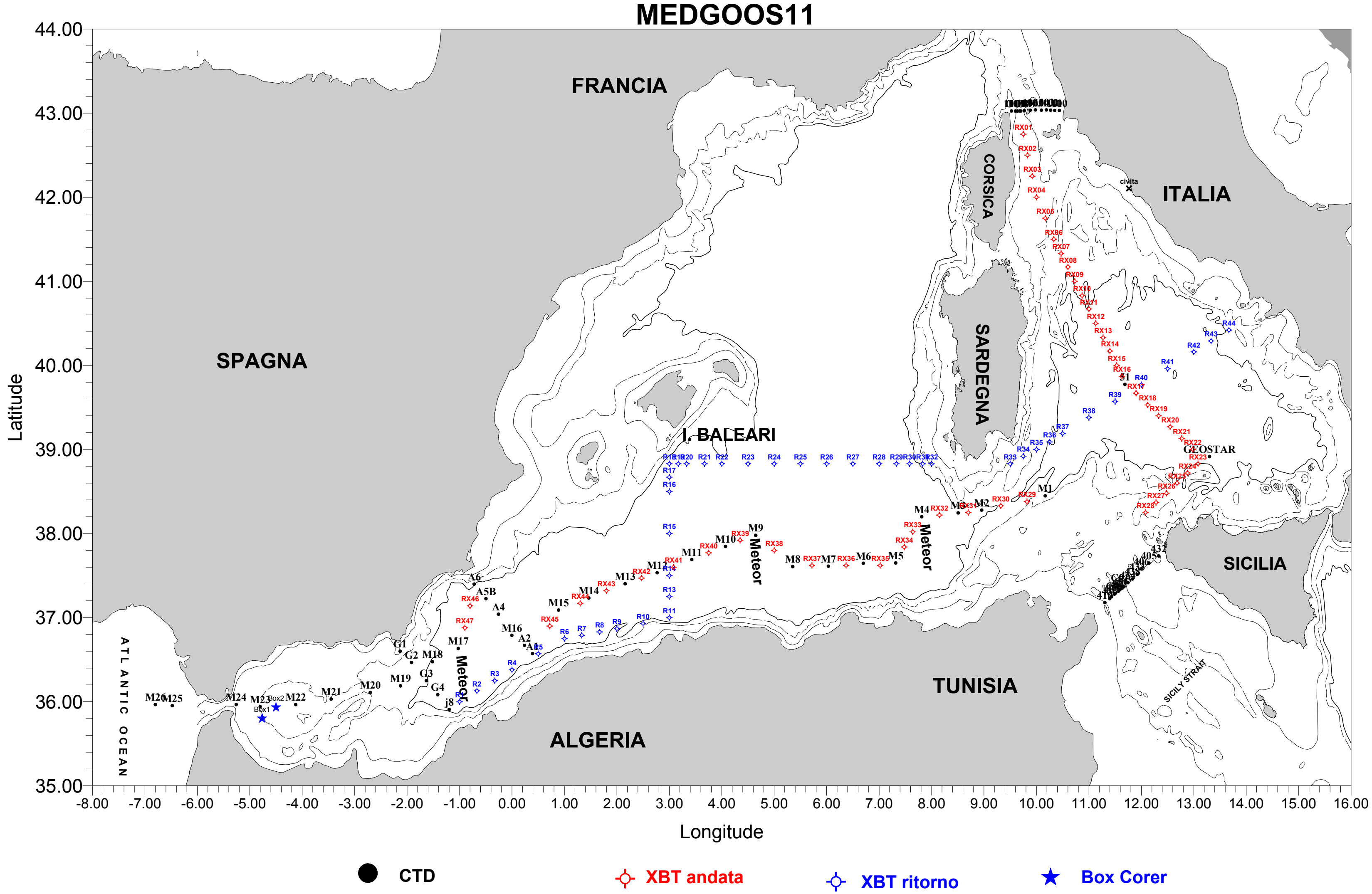


Figure 1 Planned cruise map

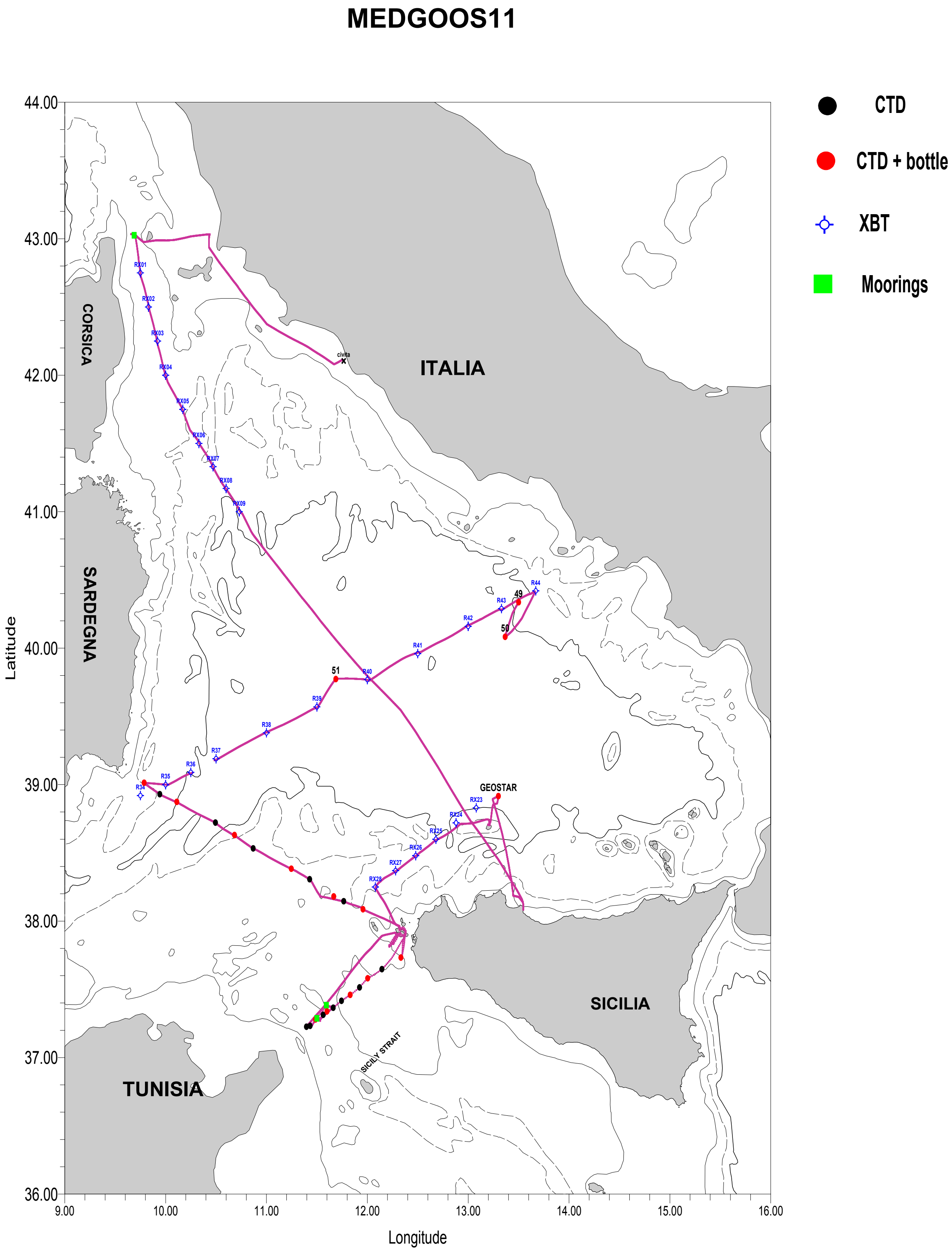


Figure 2 Effective cruise map

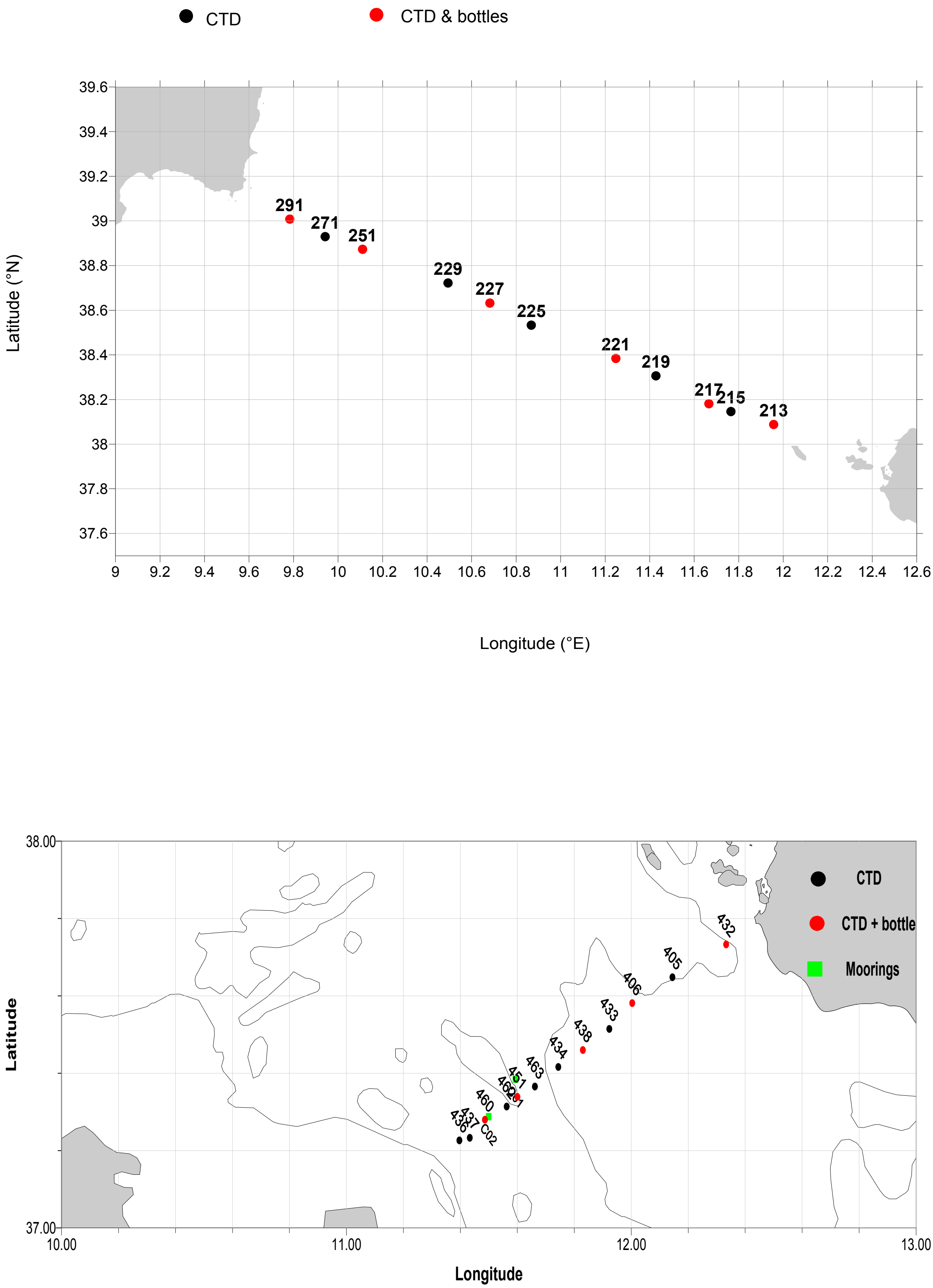


Figure 3 Zoomed maps

Cruise Stations

Station	Date	Long (°E)	Lat (°N)	Depth (m)	Type
GEOSTAR	19/11/2005	13° 17.96	38° 54.98	3445	CTD, rosette
Testflap	19/11/2005	13° 12.59	38° 42.99	238	CTD
Testflap1	20/11/2005	12° 17.54	37° 53.66	70	CTD
Testflap3	20/11/2005	12° 17.09	37° 53.88	70	CTD
Testflap4	20/11/2005	12° 17.54	37° 54.68	69	CTD
Testflap5	20/11/2005	12° 13.06	37° 49.44	156	CTD
Testflap6	20/11/2005	12° 13.10	37° 48.81	162	CTD
Testflap7	21/11/2005	12° 15.15	37° 50.04	139	CTD
Testflap8	21/11/2005	12° 15.51	37° 49.97	121	CTD
432	21/11/2005	12° 20.30	37° 43.62	170	CTD, LADCP, rosette
405	21/11/2005	12° 08.70	37° 38.86	93	CTD, LADCP
406	21/11/2005	12° 00.20	37° 34.83	148	CTD, LADCP, rosette
433	21/11/2005	11° 55.38	37° 30.09	106	CTD, LADCP
438	21/11/2005	11° 49.75	37° 07.63	74	CTD, LADCP, rosette
434	22/11/2005	11° 44.60	37° 24.98	86	CTD, LADCP
463	22/11/2005	11° 39.66	37° 21.92	94	CTD, LADCP
451	22/11/2005	11° 36.00	37° 20.35	541	CTD, LADCP, rosette
460	22/11/2005	11° 29.12	37° 16.76	545	CTD, LADCP, rosette
462	22/11/2005	11° 39.66	37° 21.94	94	CTD, LADCP
437	22/11/2005	11° 25.99	37° 13.95	445	CTD, LADCP
436	22/11/2005	11° 23.74	37° 13.60	416	CTD, LADCP
213	29/11/2005	11° 57.42	38° 05.23	410	CTD, LADCP, rosette
215	29/11/2005	11° 45.96	38° 08.75	1207	CTD, LADCP
217	29/11/2005	11° 31.94	38° 10.86	368	CTD, LADCP, rosette
219	29/11/2005	11° 25.68	38° 18.41	888	CTD, LADCP
221	29/11/2005	11° 14.75	38° 23.06	699	CTD, LADCP, rosette
225	29/11/2005	10° 52.09	38° 31.96	728	CTD, LADCP
227	29/11/2005	10° 40.96	38° 37.89	1523	CTD, LADCP, rosette
229	30/11/2005	10° 29.61	38° 43.34	2485	CTD, LADCP
251	30/11/2005	10° 06.64	38° 52.41	2191	CTD, LADCP, rosette

271	30/11/2005	09° 56.51	38° 55.80	1377	CTD, LADCP
291	30/11/2005	09° 47.20	39° 00.84	1026	CTD, LADCP, rosette
51	01/12/2005	11° 41.20	39° 46.40	3266	CTD, LADCP, rosette
50	01/12/2005	13° 22.05	40° 04.98	2778	CTD, LADCP, rosette
49	02/12/2005	13° 30.01	40° 20.18	1962	CTD, rosette
XBT	17/11/2005	009° 44.98’	42° 45.21’	-	T4
XBT	17/11/2005	009° 50.00’	42° 29.86’	-	T4
XBT	17/11/2005	009° 54.80’	42° 15.06’	-	T4
XBT	17/11/2005	010° 00.15’	41° 59.56’	-	T4
XBT	17/11/2005	010° 10.74’	41° 43.45’	-	T4
XBT	17/11/2005	010° 19.84’	41° 30.31’	-	T4
XBT	17/11/2005	010° 28.00’	41° 19.99’	-	T5
XBT	18/11/2005	012° 56.05’	38° 42.77’	-	DB
XBT	19/11/2005	012° 40.62’	38° 35.58’	-	DB
XBT	19/11/2005	012° 17.12’	38° 29.26’	-	DB
XBT	20/11/2005	012° 56.05’	38° 22.04’	-	DB
XBT	20/11/2005	012° 05.00’	38° 14.93’	-	DB
XBT	30/11/2005	009° 44.98’	38° 59.98’	-	T4
XBT	30/11/2005	010° 14.92’	39° 05.00’	-	T4
XBT	30/11/2005	010° 30.06’	39° 11.00’	-	T4
XBT	30/11/2005	010° 59.21’	39° 22.75’	-	T5
XBT	30/11/2005	011° 29.55’	39° 33.76’	-	T5
XBT	01/12/2005	012° 00.00’	39° 46.00’	-	T5
XBT	01/12/2005	012° 30.19’	39° 58.07’	-	T5
XBT	01/12/2005	012° 59.99’	40° 09.99’	-	T5
XBT	01/12/2005	013° 19.05’	40° 17.02’	-	T5
XBT	01/12/2005	013° 39.00’	40° 24.65’	-	T4

Table 3 Station list

Onboard Operations

CTD casts

At all the hydrological stations, pressure (P), salinity (S), potential temperature (θ) and dissolved oxygen concentration (DO) were measured with a CTD-rosette system consisting of a CTD SBE 911 plus, and a General Oceanics rosette with 24 12-l Niskin Bottles. Temperature measurements were performed with a SBE-3/F thermometer, with a resolution of 10^{-3} °C, and conductivity measurements were performed with a SBE-4 sensor, with a resolution of 3 x 10^{-4} S/m. In addition, salinities of water samples were analysed on board using a Guildline Autosal salinometer. Dissolved oxygen was measured with a SBE-13 sensor (resolution 4.3 μM), and data were checked against Winkler titration. The vertical profiles of all parameters were obtained by sampling the signals at 24 Hz, with the CTD/rosette going down at a speed of 1 m/s. The data were processed on board, and the coarse errors were corrected.

Nutrients

Seawater samples for nutrient measurements were collected at different depths, when the system CTD/rosette was going up, according to the vertical profiles of salinity, potential temperature and dissolved oxygen, recorded in real time. No filtration was employed, nutrient samples were stored at –20°C and nitrate, orthosilicate and ortophosphate concentrations will be determined later in the laboratory, using a hybrid Brän–Luebbe AutoAnalyzer following classical methods (Grasshoff et al., 1983) with slight modifications.

Laboratory: ENEA-CRAM, University of Florence

LADCP

Velocity profiles measurment were performed by means of two Lowered Acustic Doppler Current Profilers (LADCP), mounted on the rosette. We used RDI Workhorse 300 kHz ADCPs. For the data postprocessing we used the LDEO LADCP software, version 8.1.

Laboratory: CNR-ISMAR, ENEA-CRAM

Further On Board Operations:

Ship mounted ADCP (SADCP)

Laboratory: CNR-ISMAR

Mooring recovery and maintanance

Laboratory: CNR-ISMAR

Tflap – PrimProd

Laboratory: University of Tuscia

Chlorophyll

Laboratory: IAMC ,NURC, University of Florence, University of Tuscia

Phytoplankton

Laboratory: University of Florence, University of Pisa

Bacteria

Laboratory: IAMC

Yellow substances

Laboratory: University of Florence

Spectroradiometer

Laboratory: IAMC, University of Florence

Preliminary Results

Hydrology

In the following pages are presented the first graphic elaborations of the CTD data (salinity, psu, potential temperature, °C, and dissolved oxygen, ml/l).

From the plots we can note different characteristics of the superficial layers (MAW), the intermediate layers (LIW) and the deep ones (WMDW). The highly saline intermediate water in the Sicily Strait (figure 7) is very evident and probably denotes the presence of Cretan Intermediate Water (CIW).

The **MAW** enters in the Sardinian Channel, on the south. MAW also occupies the whole transect in the Sicily Channel, with lower salinities on the Tunisian side, where it enters in the Eastern Mediterranean Sea. MAW reaches the Tyrrhenian Sea with a higher salinity, through the Sardinia-Sicily transect.

LIW comes from the Eastern Mediterranean and is identified by a salinity and potential temperature maximum and, for his greater age, by an oxygen minimum. It enters in the Western Mediterranean Sea, through the Sicily Strait, where it is visible at 150-250 m depth. After entering the western basin, it turns toward the Tyrrhenian Sea, through the Sardinia-Sicily transect (S>38.65, figures 17 and 18).

The **WMDW** forms in the Gulf of Lions during winter. It moves on the Tunisian side towards the Tyrrhenian Sea.The Channel of Sardinia is a key place for the circulation of WMDW. The bottom water in the Sicily Strait, indeed, comes from the Eastern Mediterranean Sea (Eastern Mediterranean Deep Water, **EMDW**) and is directed to the Tyrrhenian Sea.

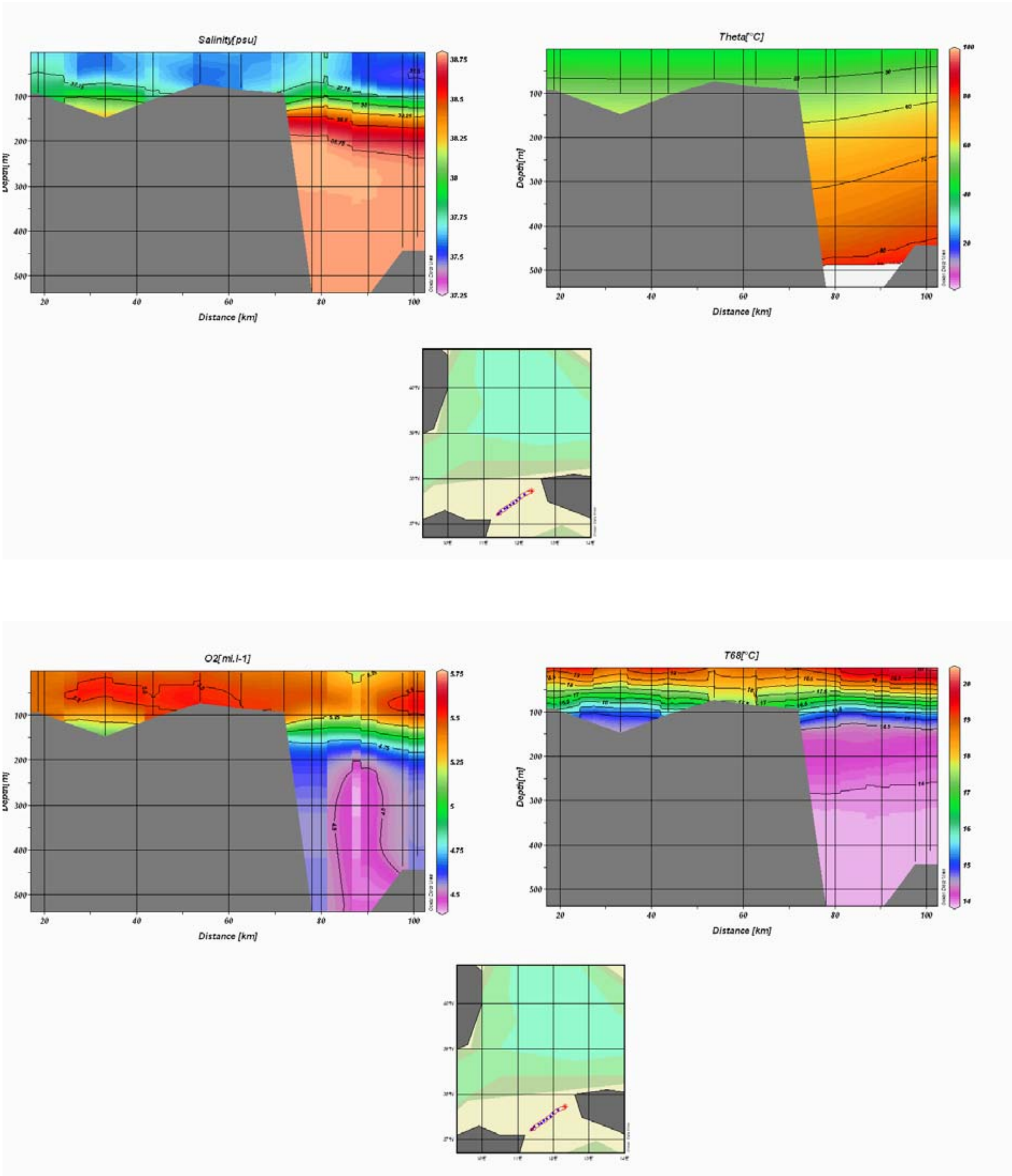


Figure 4a CTD Section (Strait of Sicily)

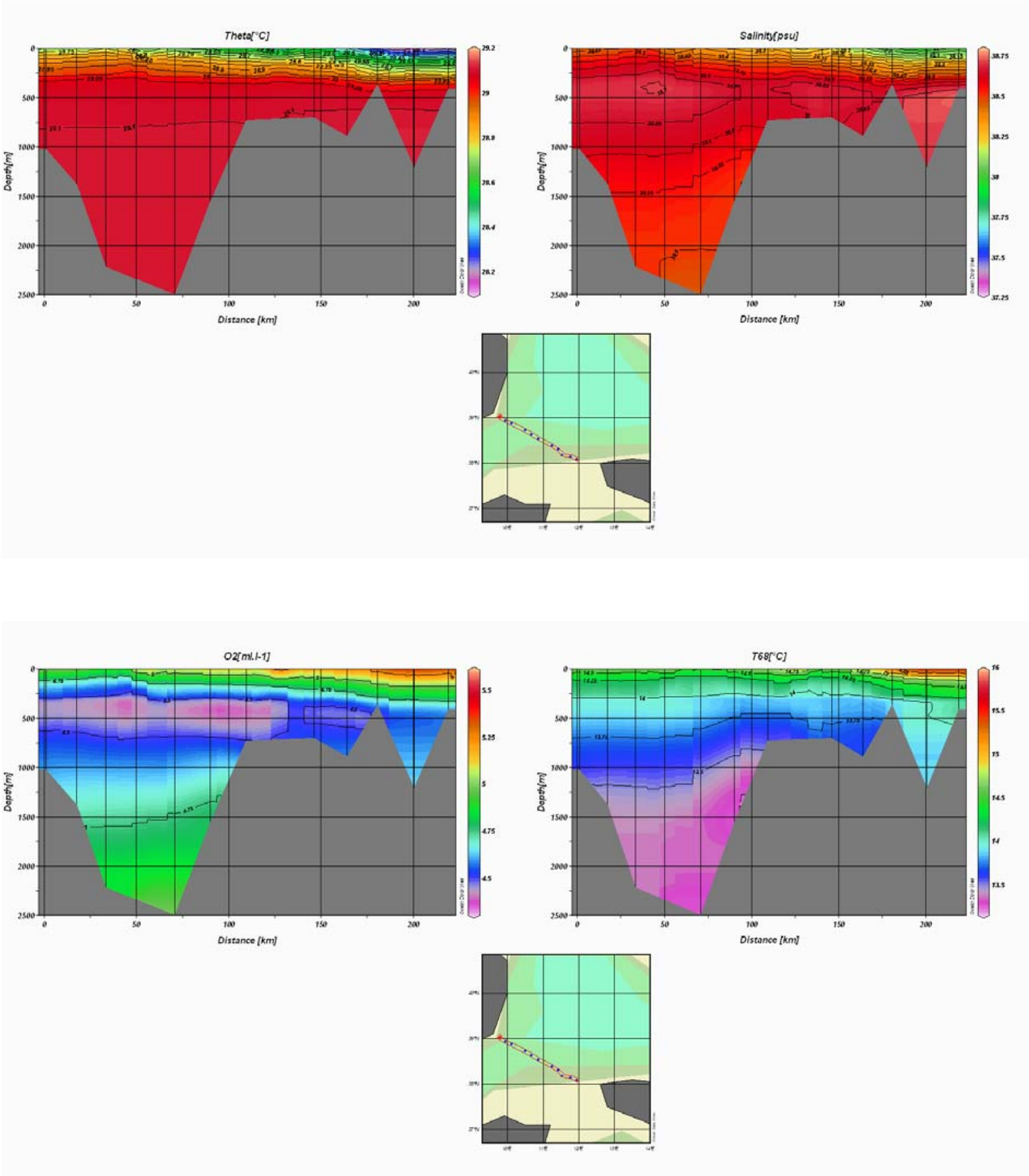


Figure 4b CTD Section (Sardinia – Sicily passage)

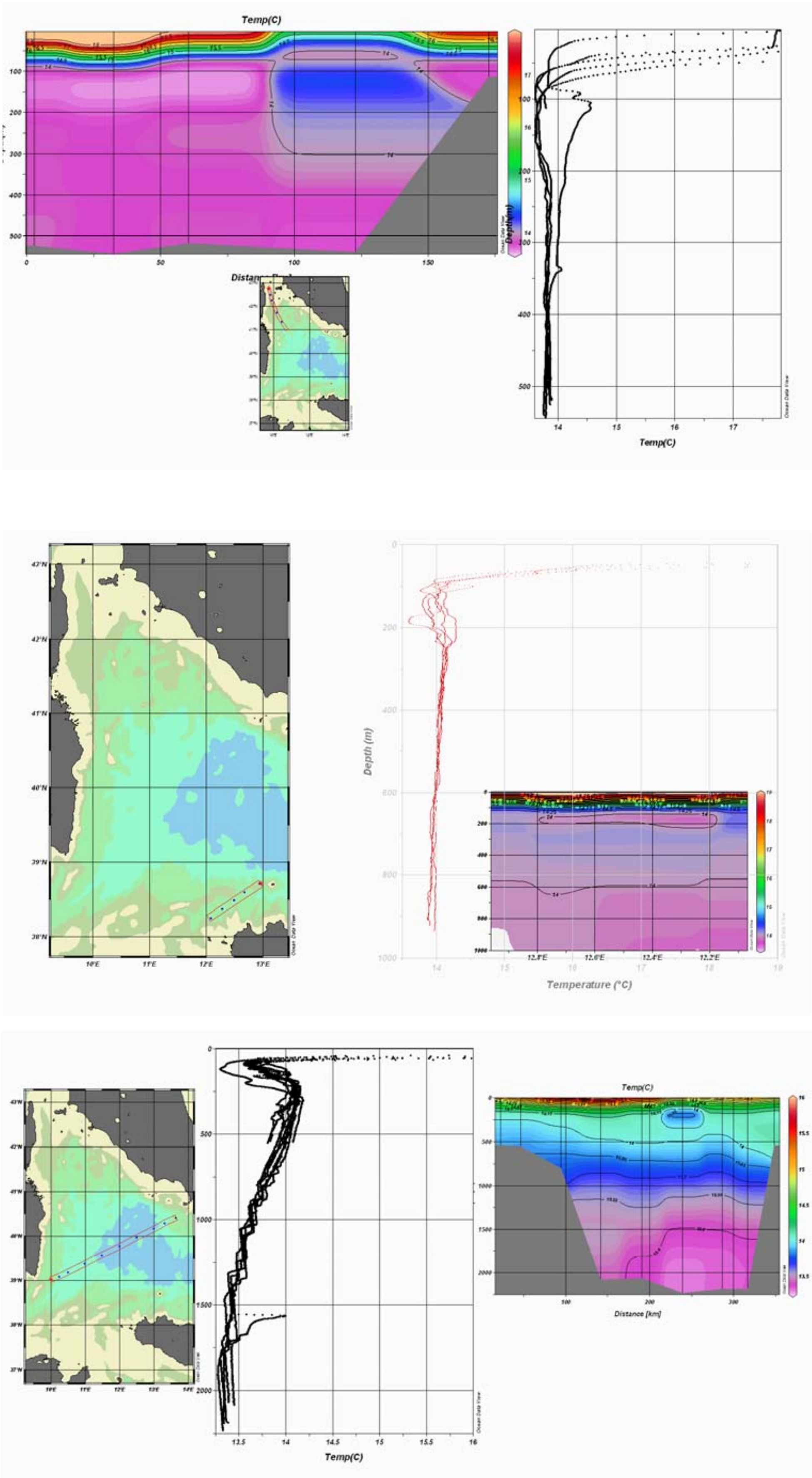


Figure 5 XBT Sections and profiles

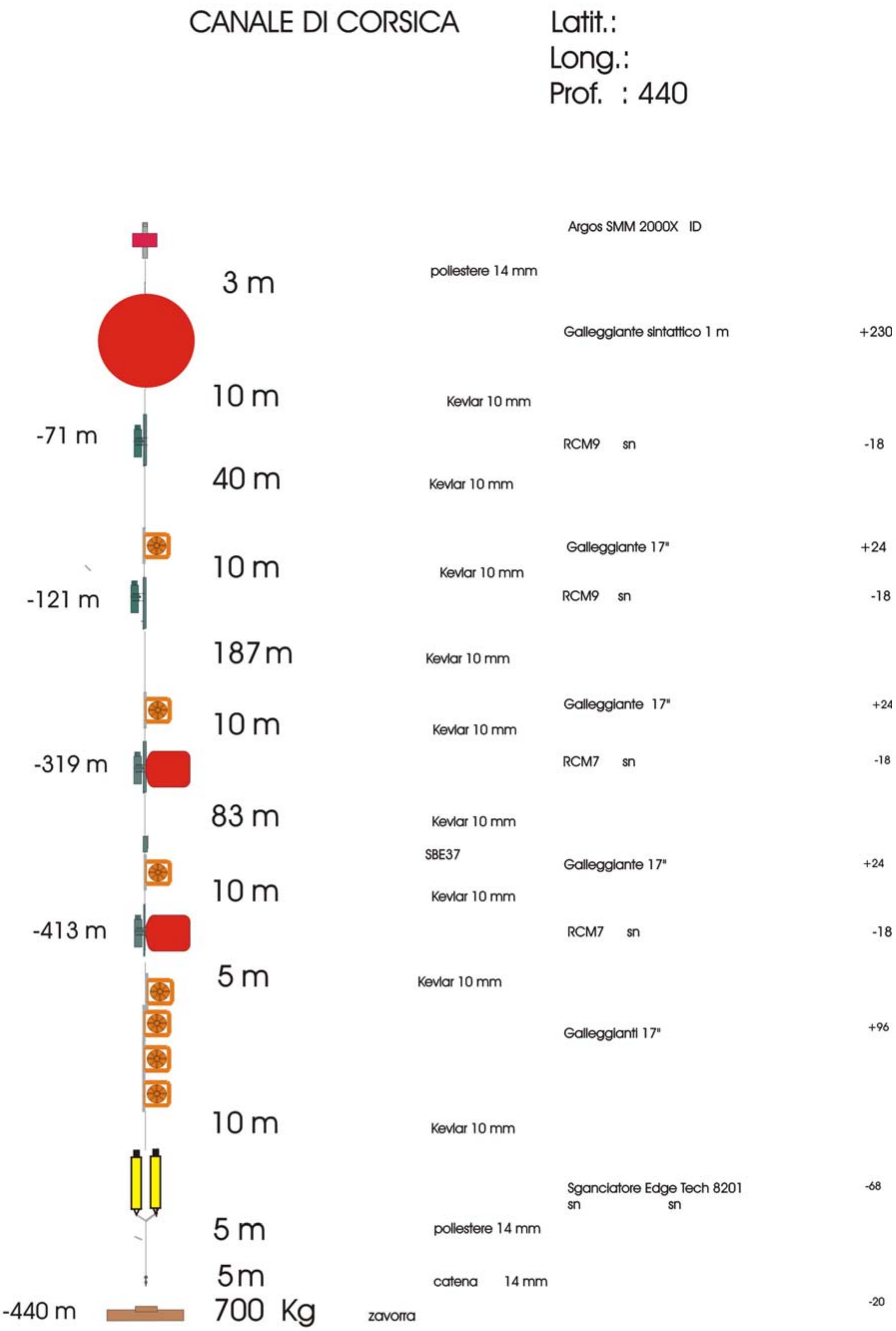


Figure 6 Mooring scheme (Corsica Channel)

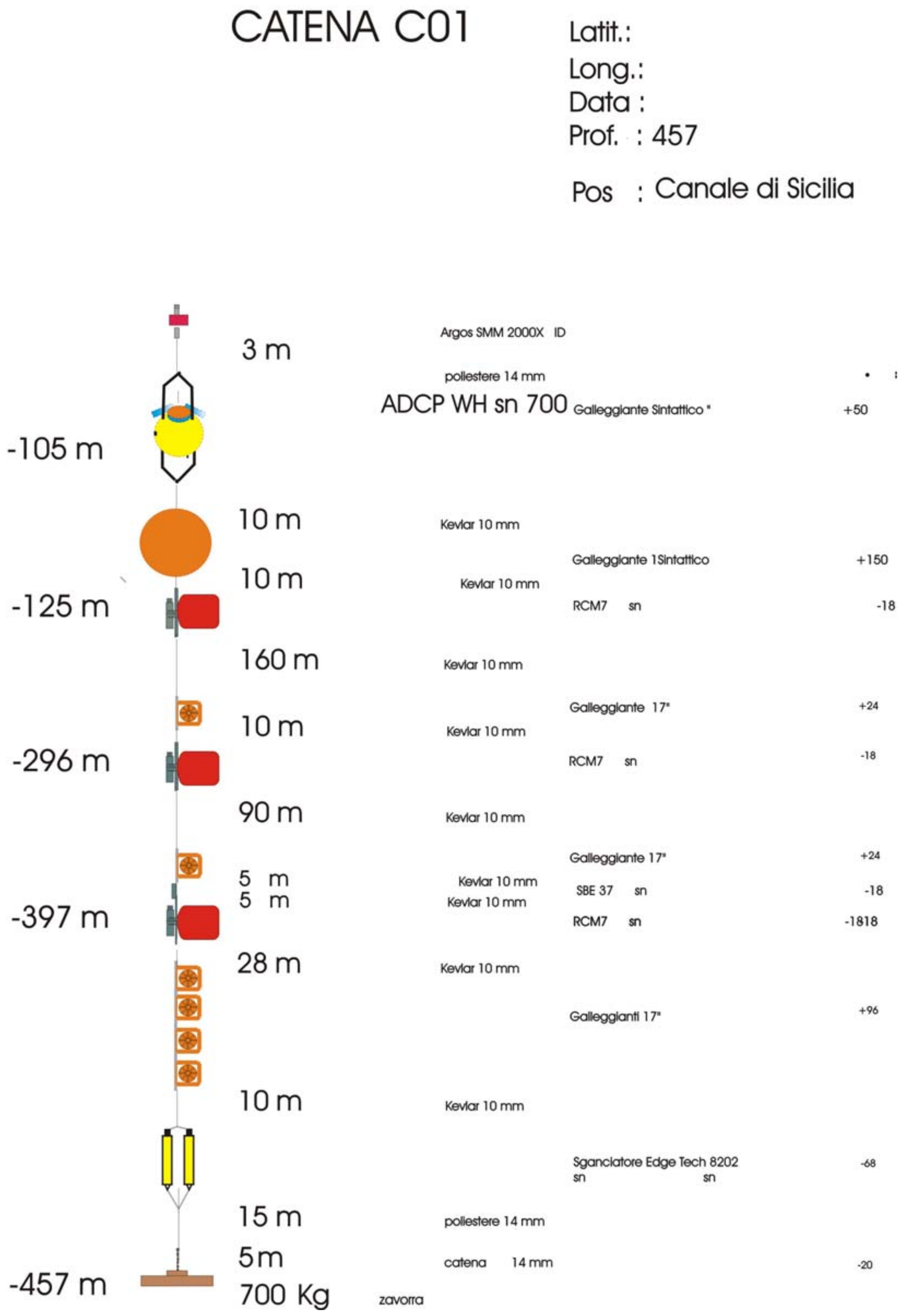


Figure 7 Mooring scheme C01 (Sicily Channel)

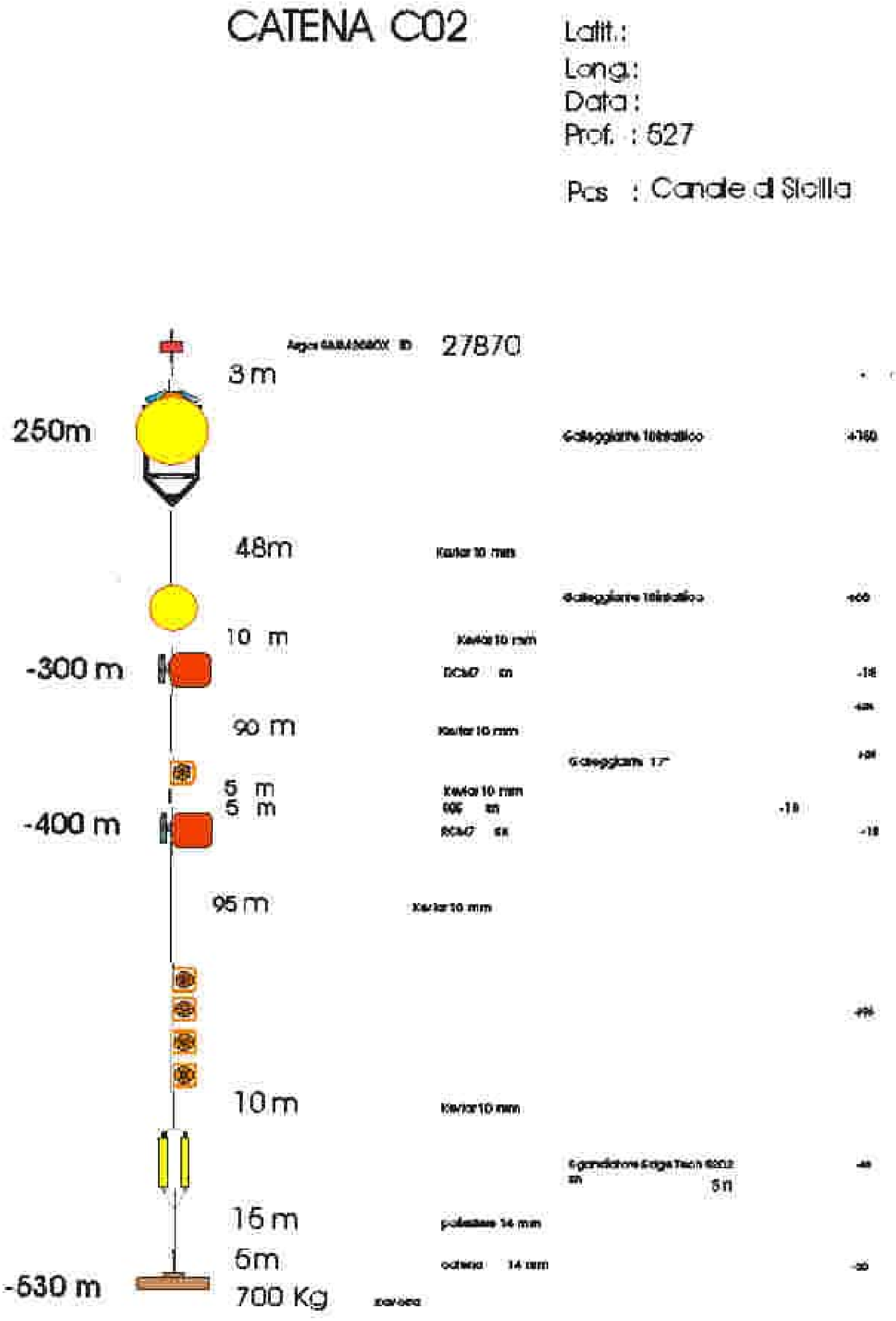


Figure 8 Mooring scheme C02 (Sicily Channel)

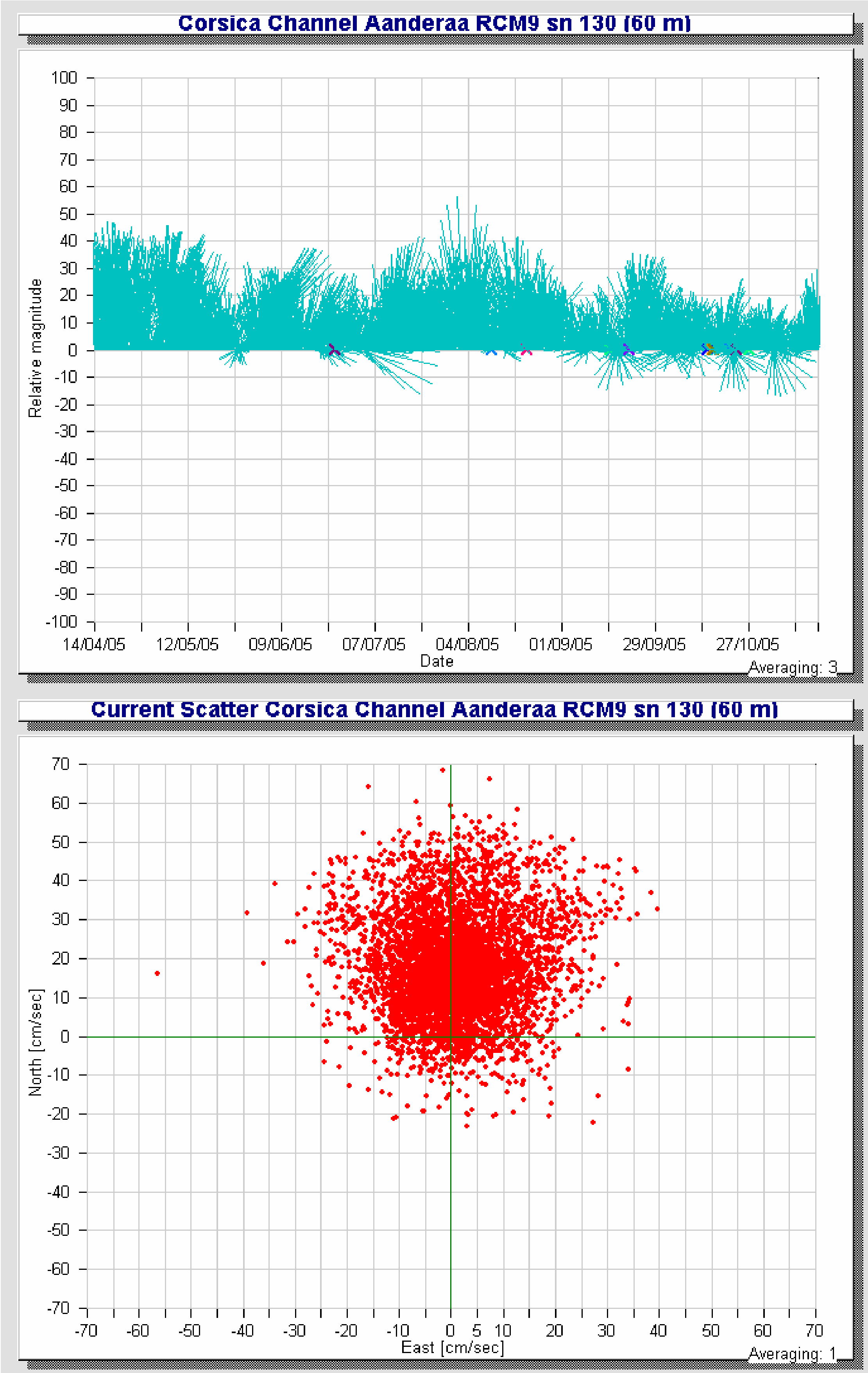


Figure 9 Stick plot and current scatter diagram (60 m, Corsica mooring)

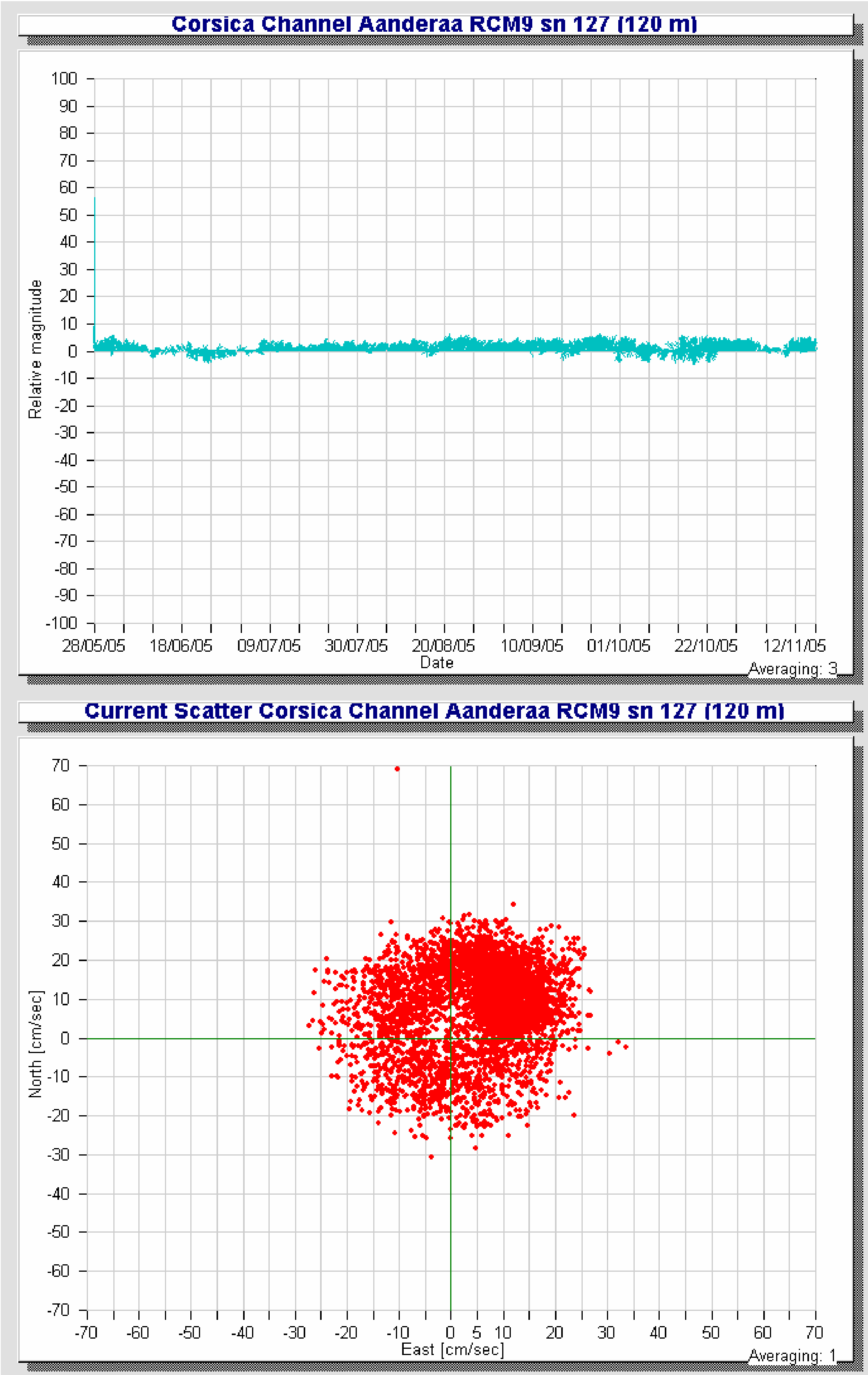


Figure 10 Stick plot and current scatter diagram (120 m, Corsica mooring)

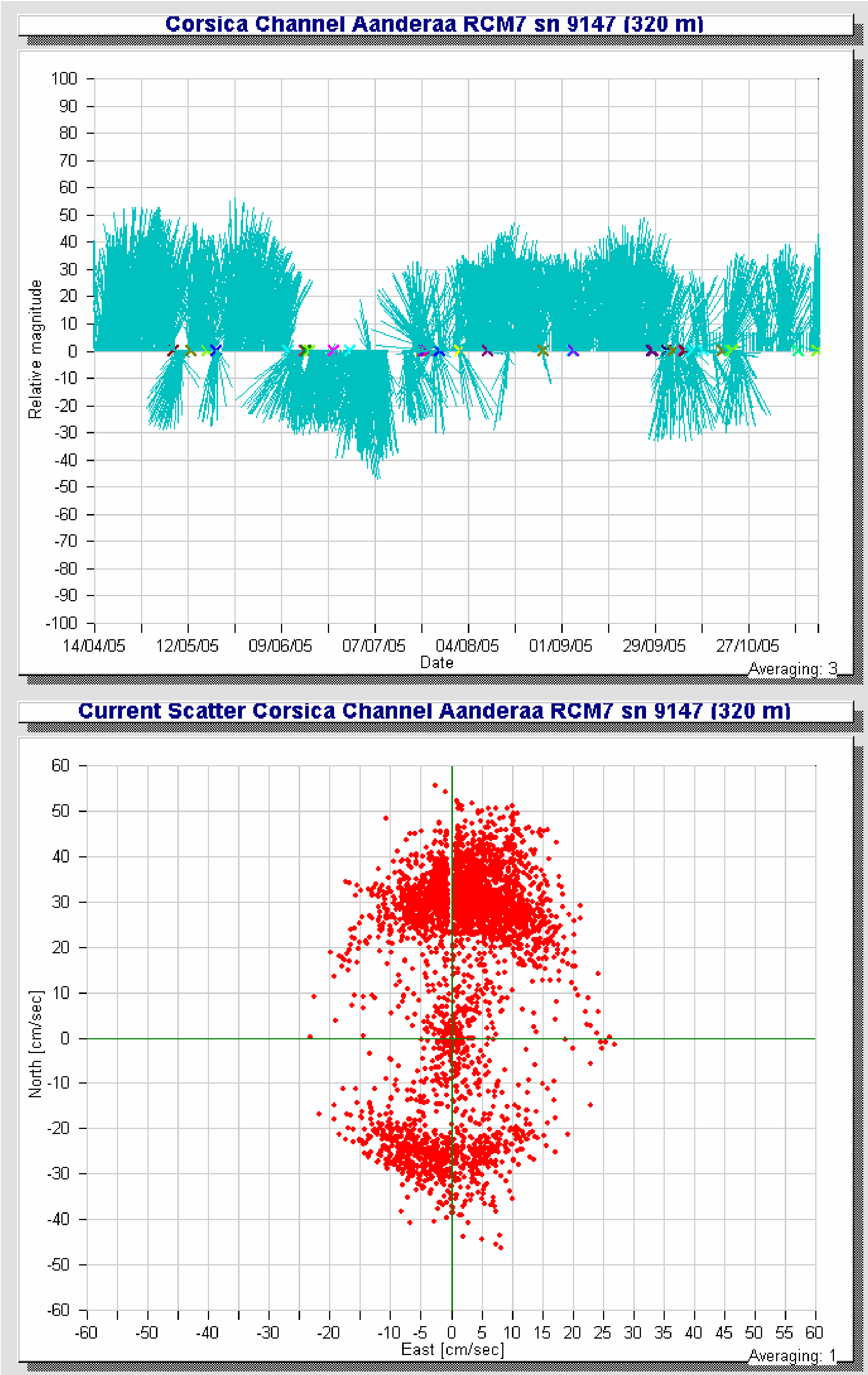


Figure 11 Stick plot and current scatter diagram (320 m, Corsica mooring)

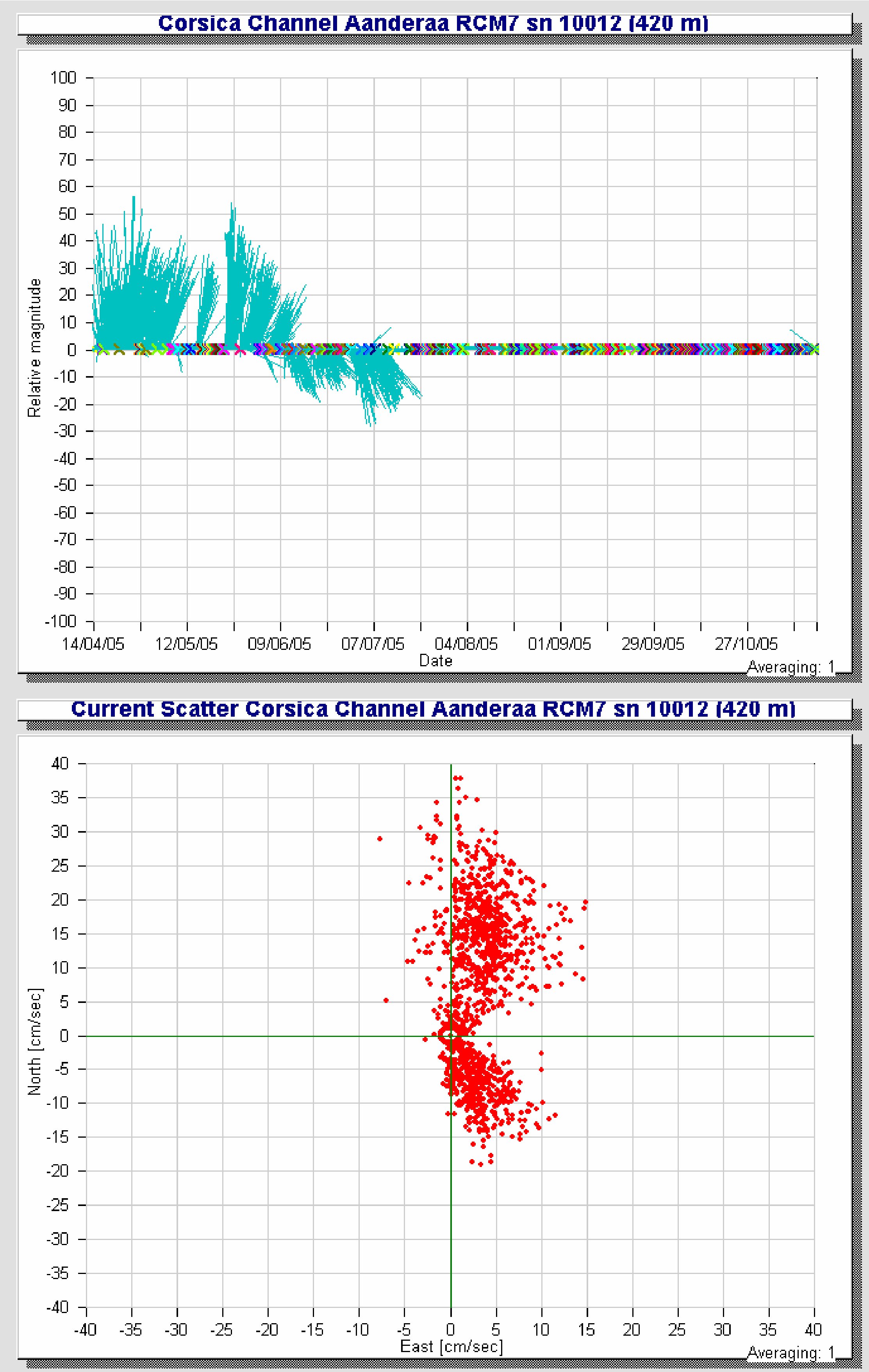


Figure 12 Stick plot and current scatter diagram (420 m, Corsica mooring)

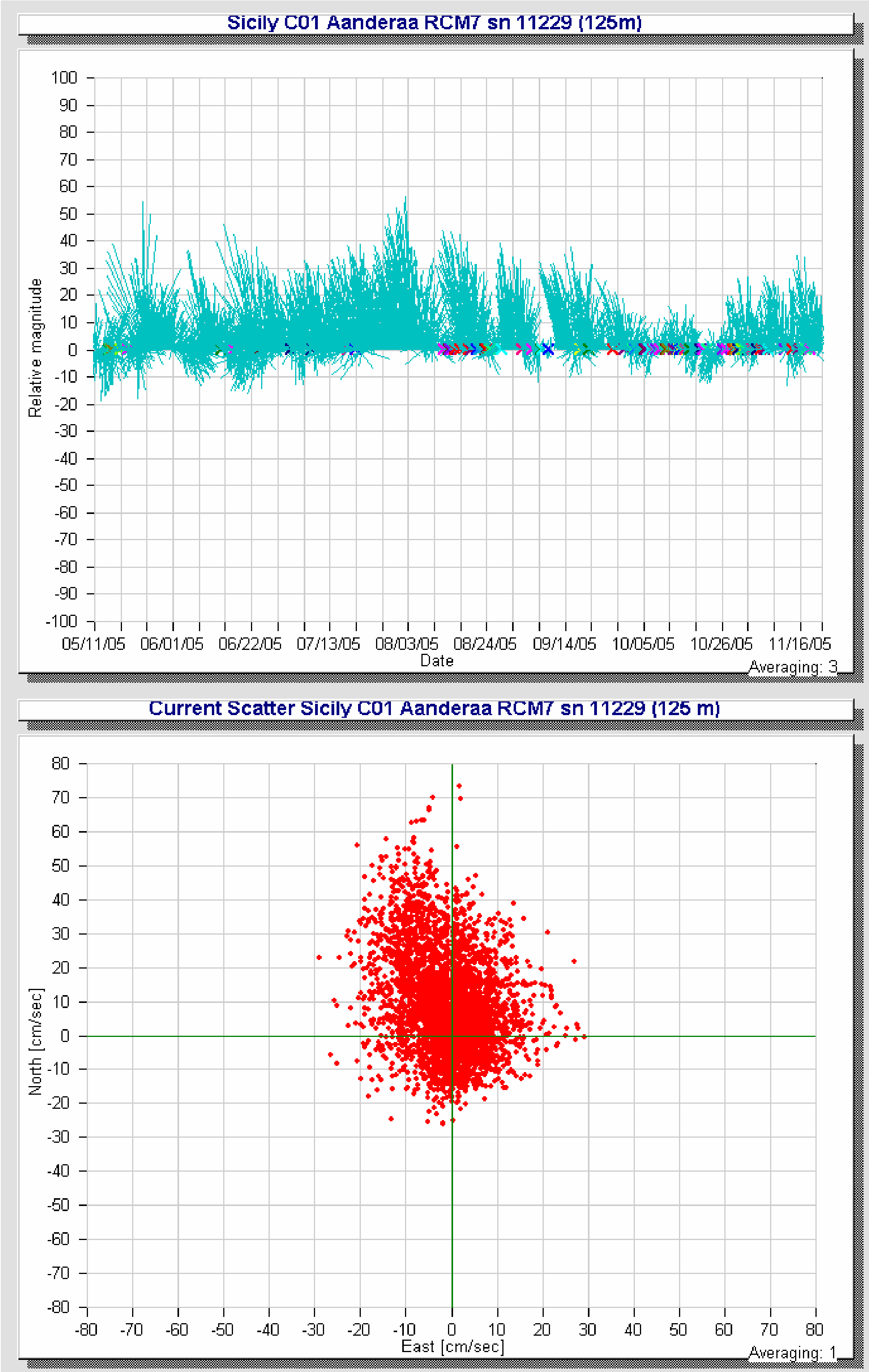


Figure 13 Stick plot and current scatter diagram (125 m, Sicily mooring C01)

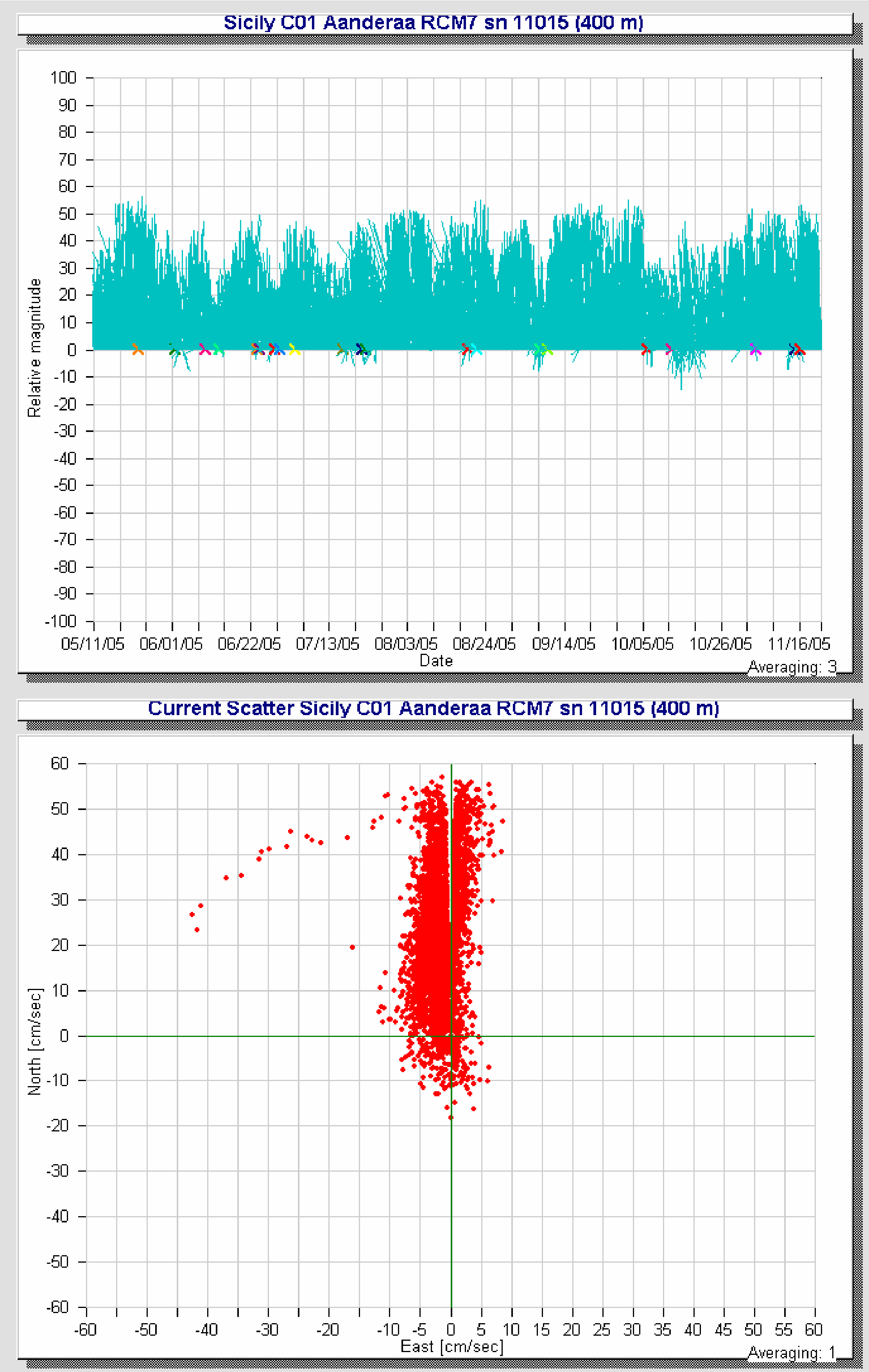


Figure 14 Stick plot and current scatter diagram (400 m, Sicily mooring C01)

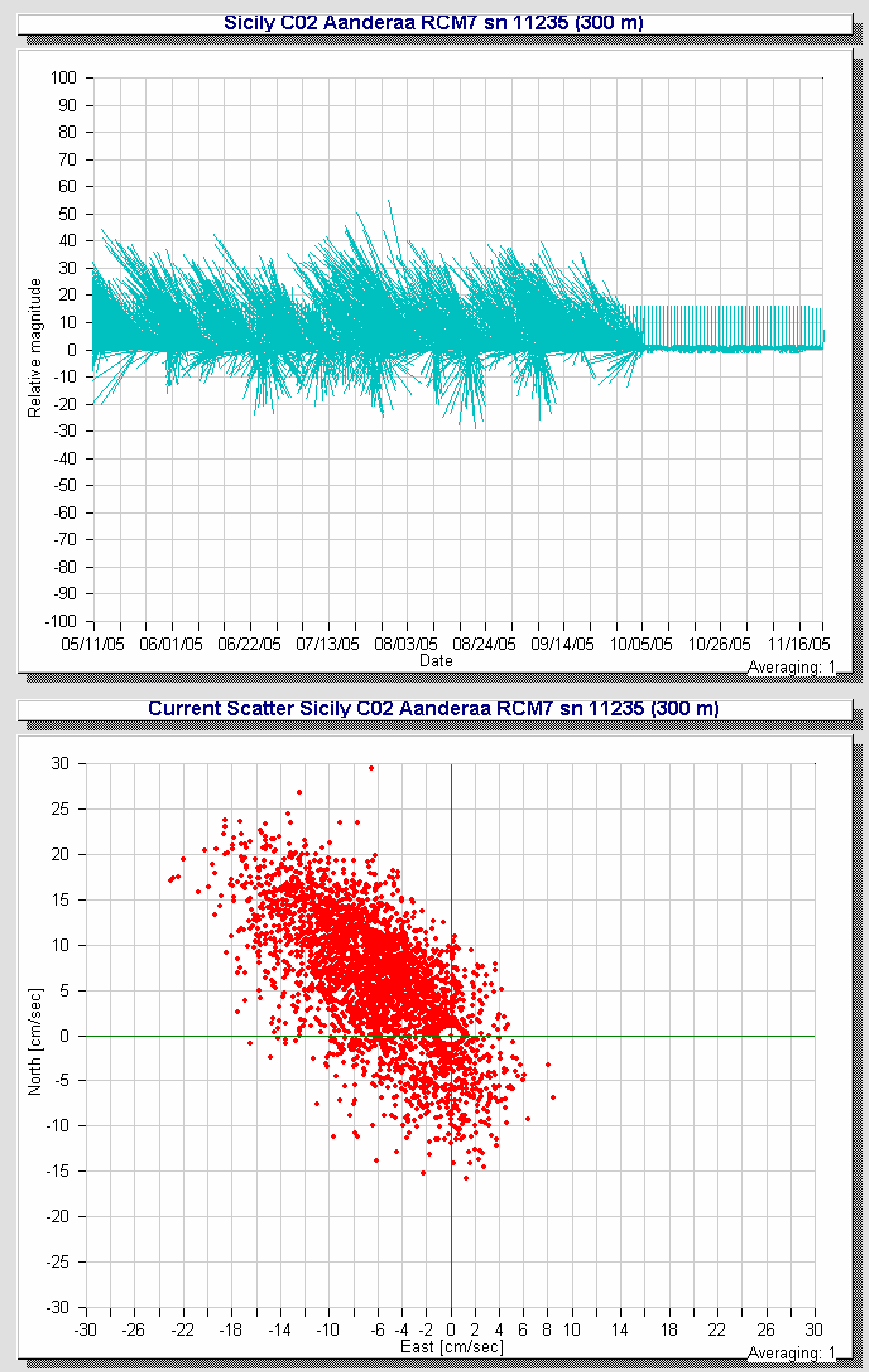


Figure 15 Stick plot and current scatter diagram (300 m, Sicily mooring C02)

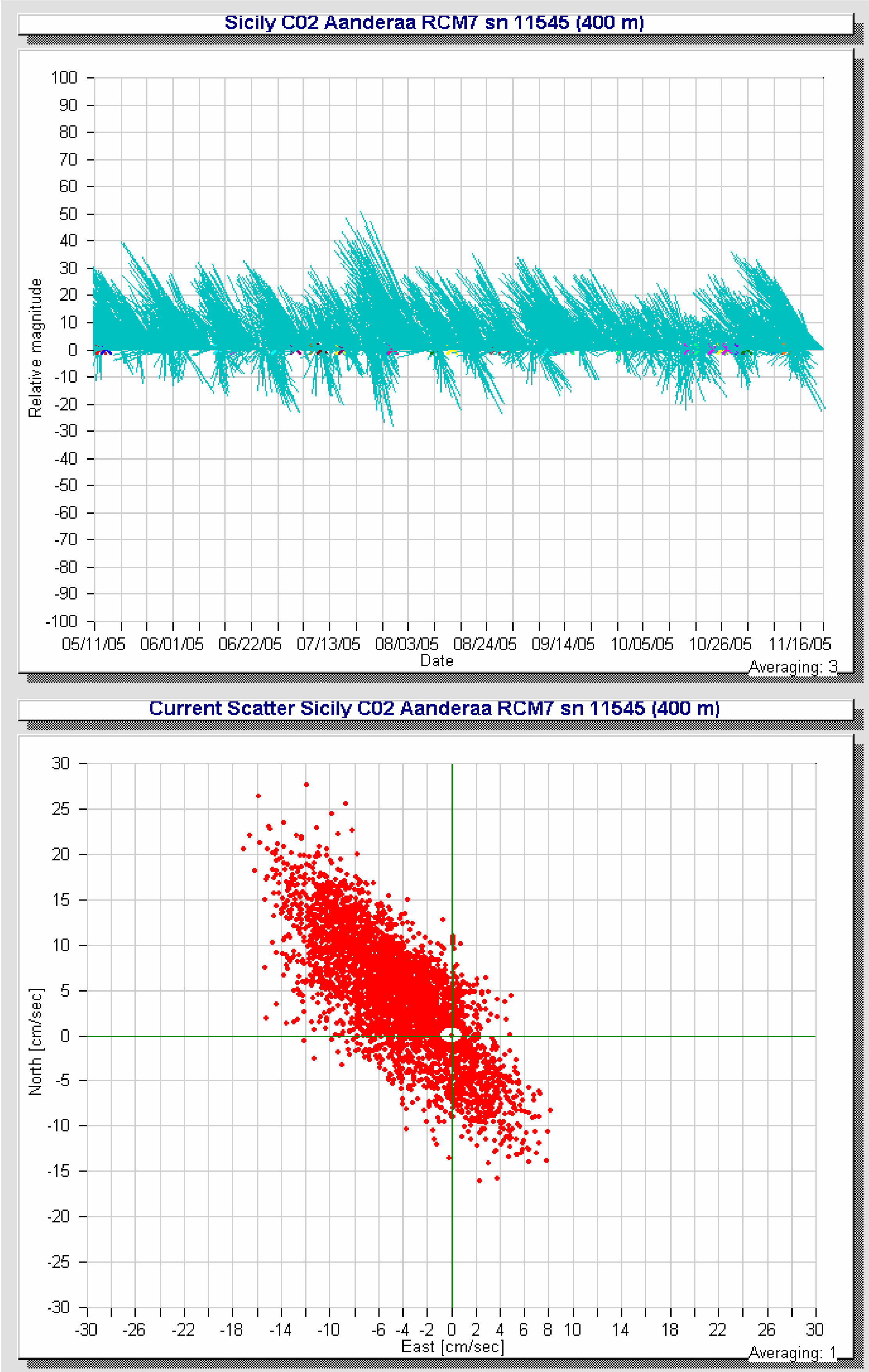


Figure 16 Stick plot and current scatter diagram (400 m, Sicily mooring C02)

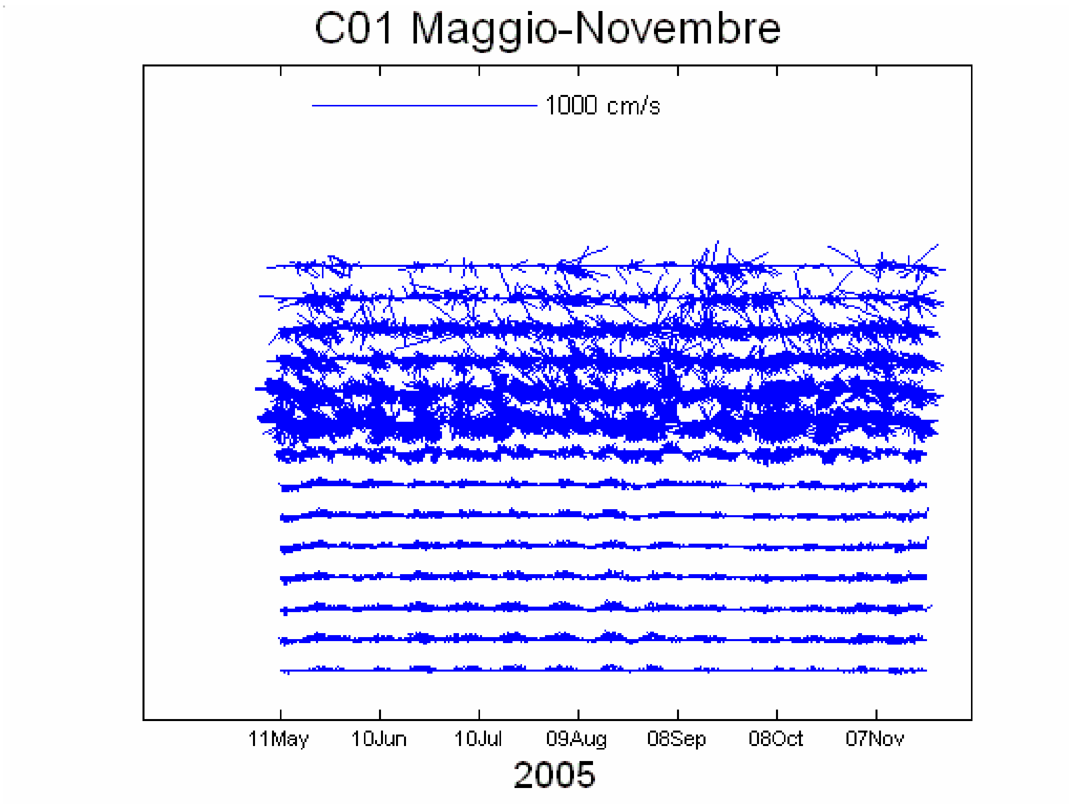


Figure 17 Stick plots of the moored RDI ADCP (mooring C01)

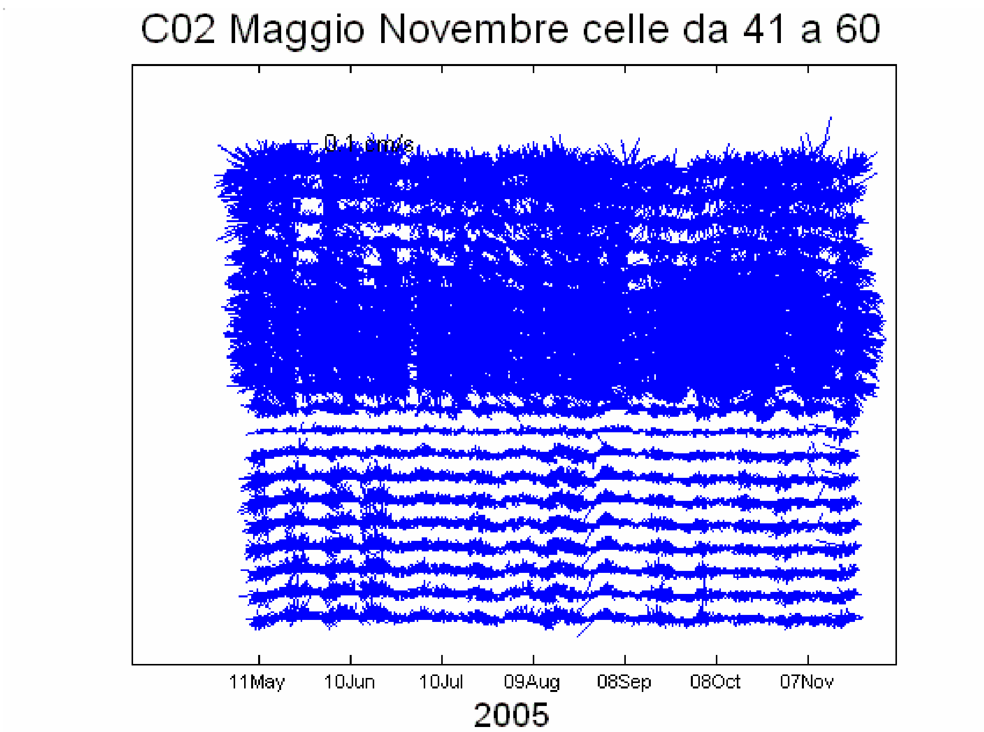
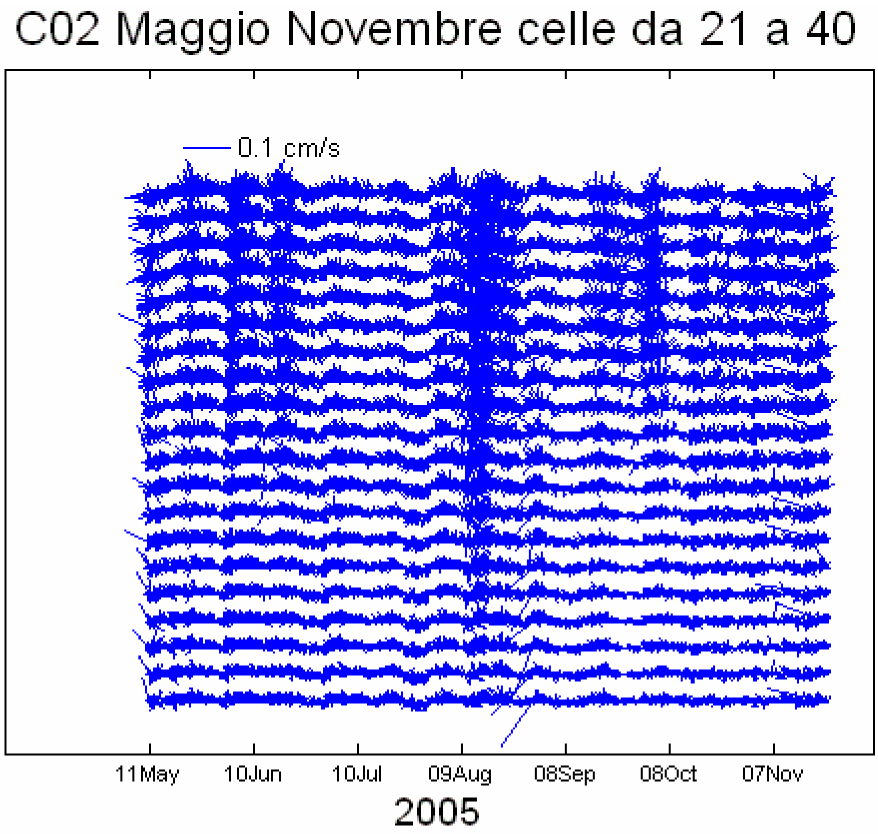
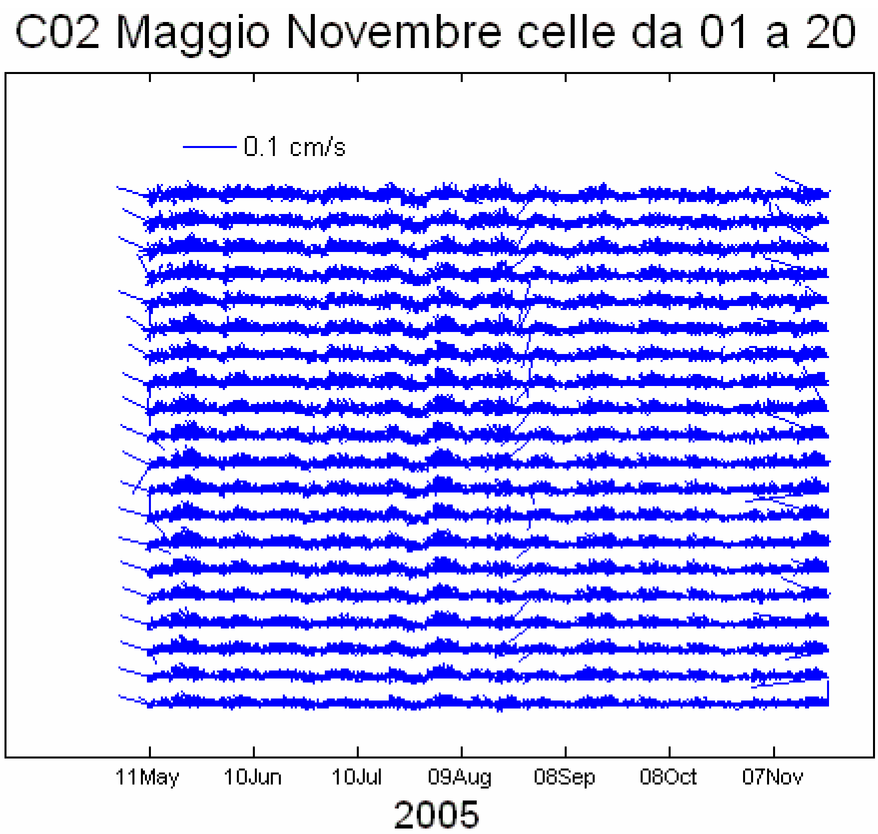


Figure 18 Stick plots of the moored NORTEK ADCP (mooring C02) (continues in the following page)


C02 Maggio Novembre celle da 21 a 40
0.1 cm/s
11May
10Jun
10Jul
09Aug
08Sep
08Oct
07Nov
2005


C02 Maggio Novembre celle da 01 a 20
0.1 cm/s
11May
10Jun
10Jul
09Aug
08Sep
08Oct
07Nov
2005

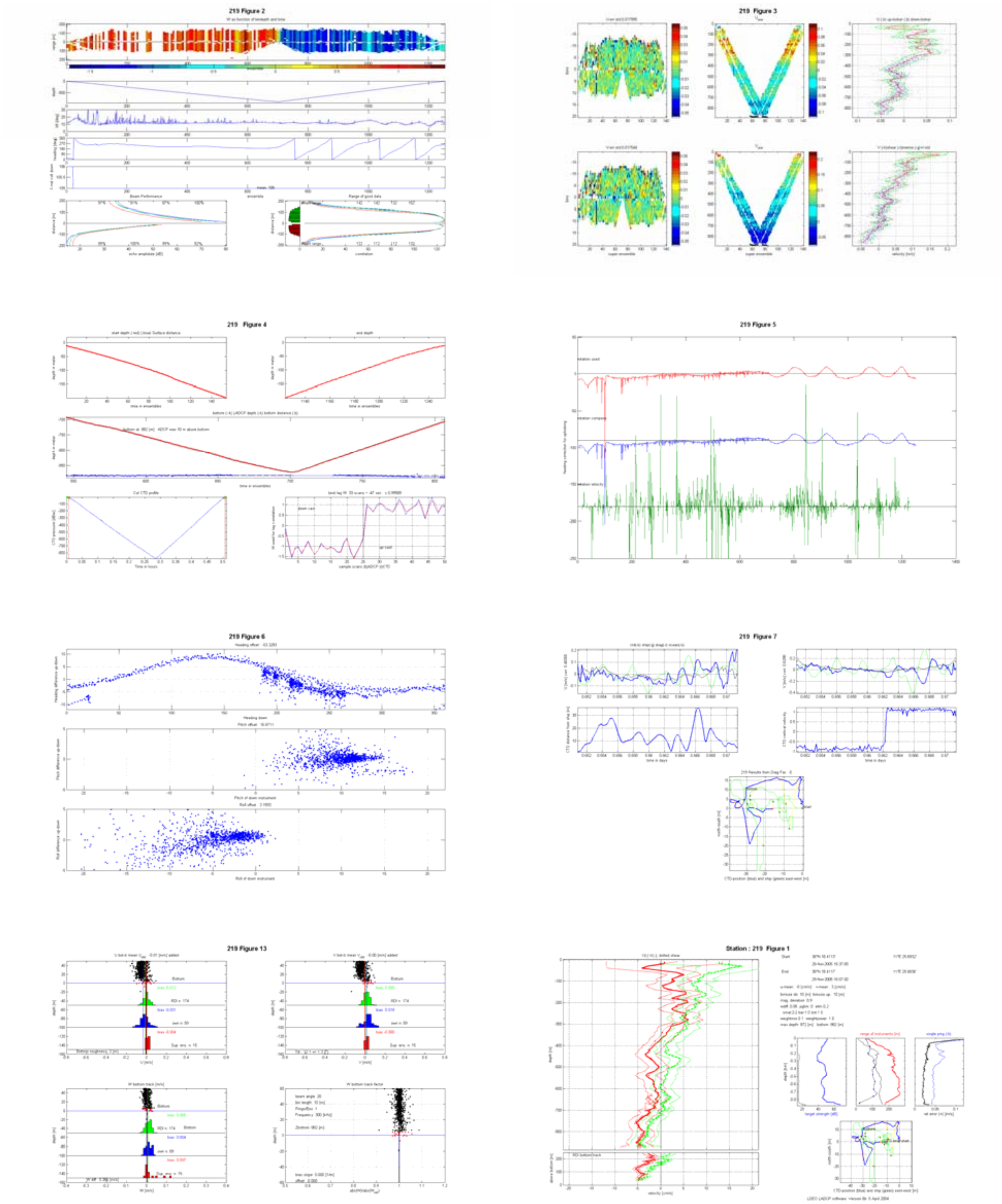
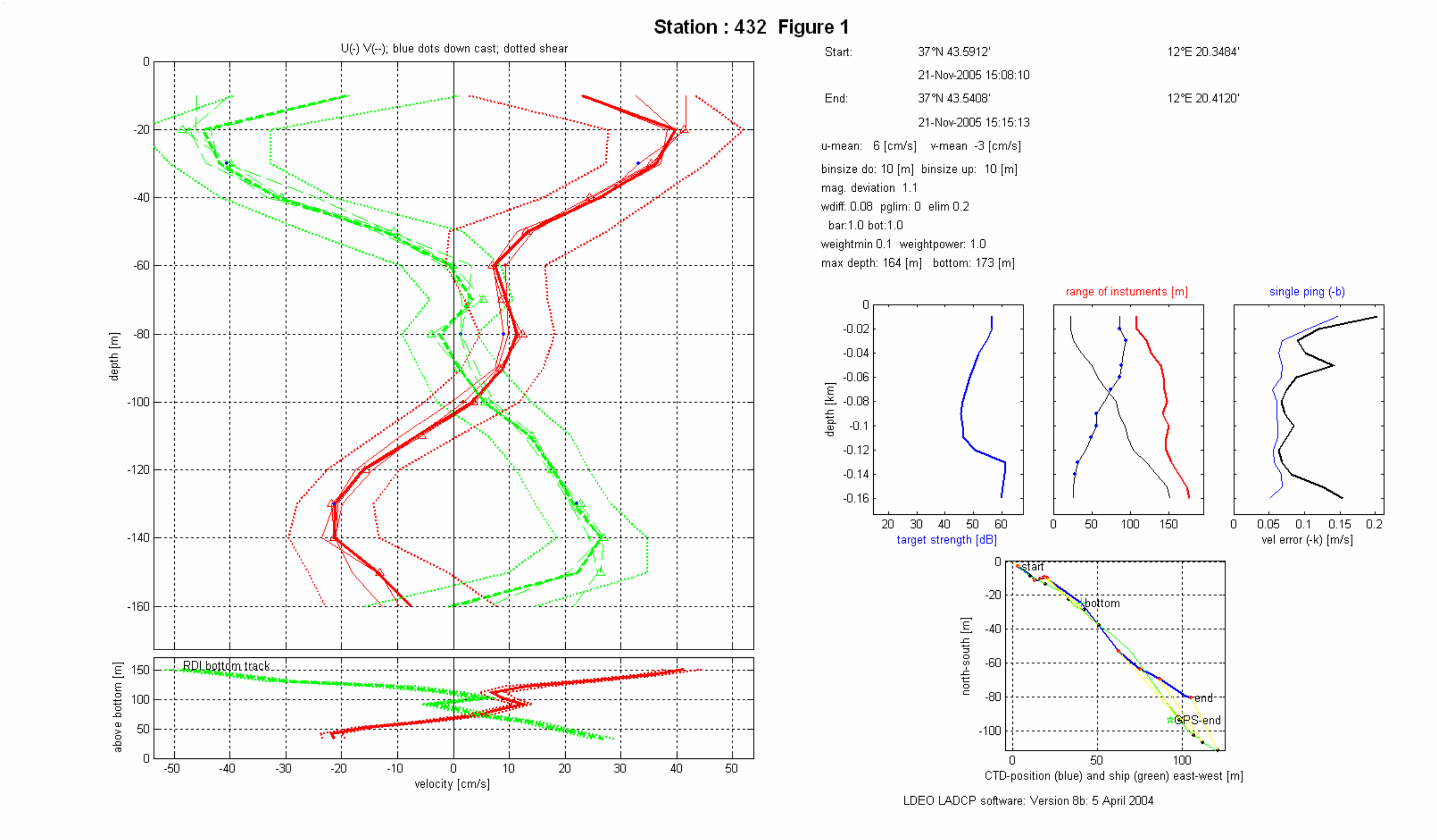
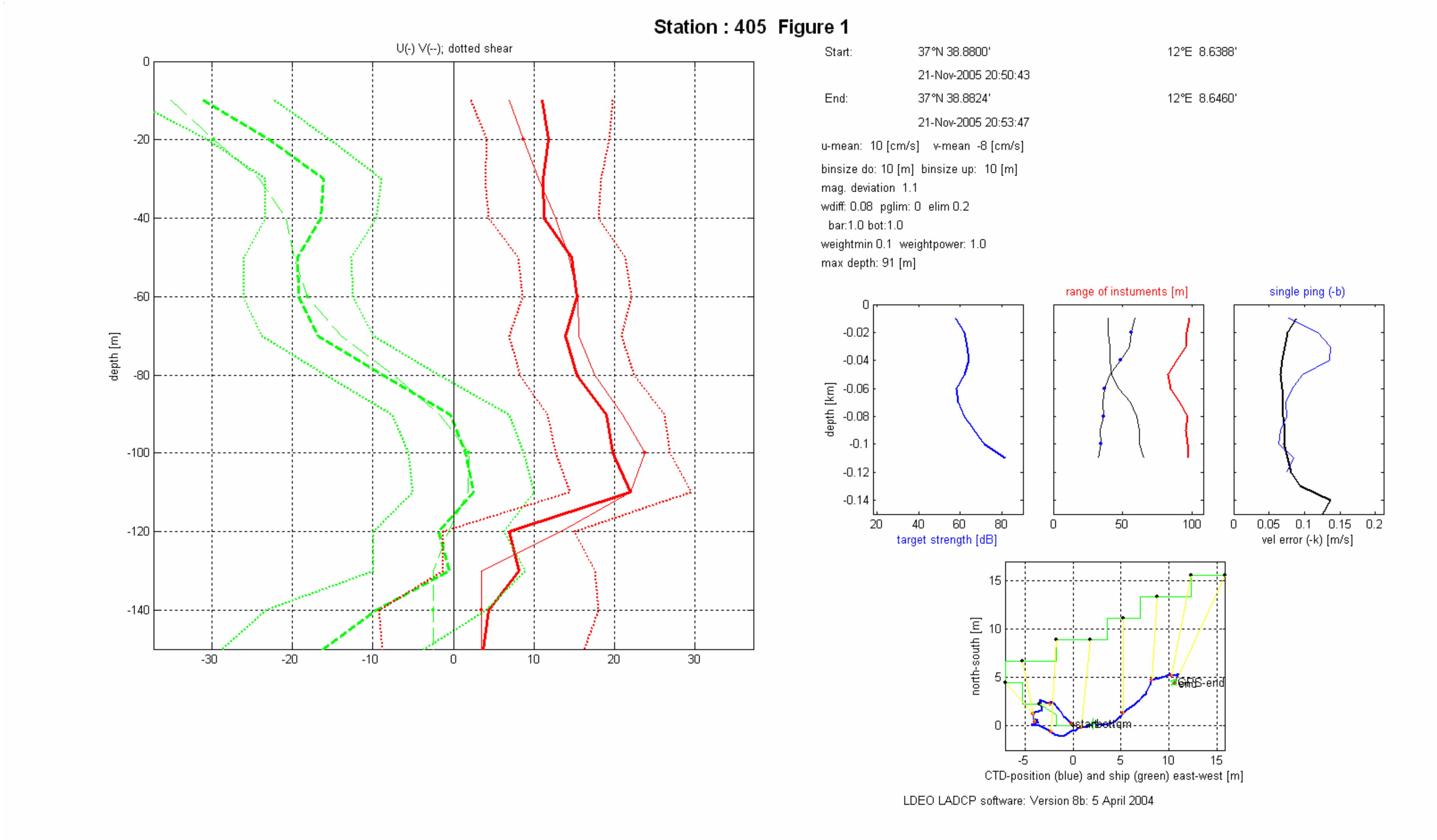
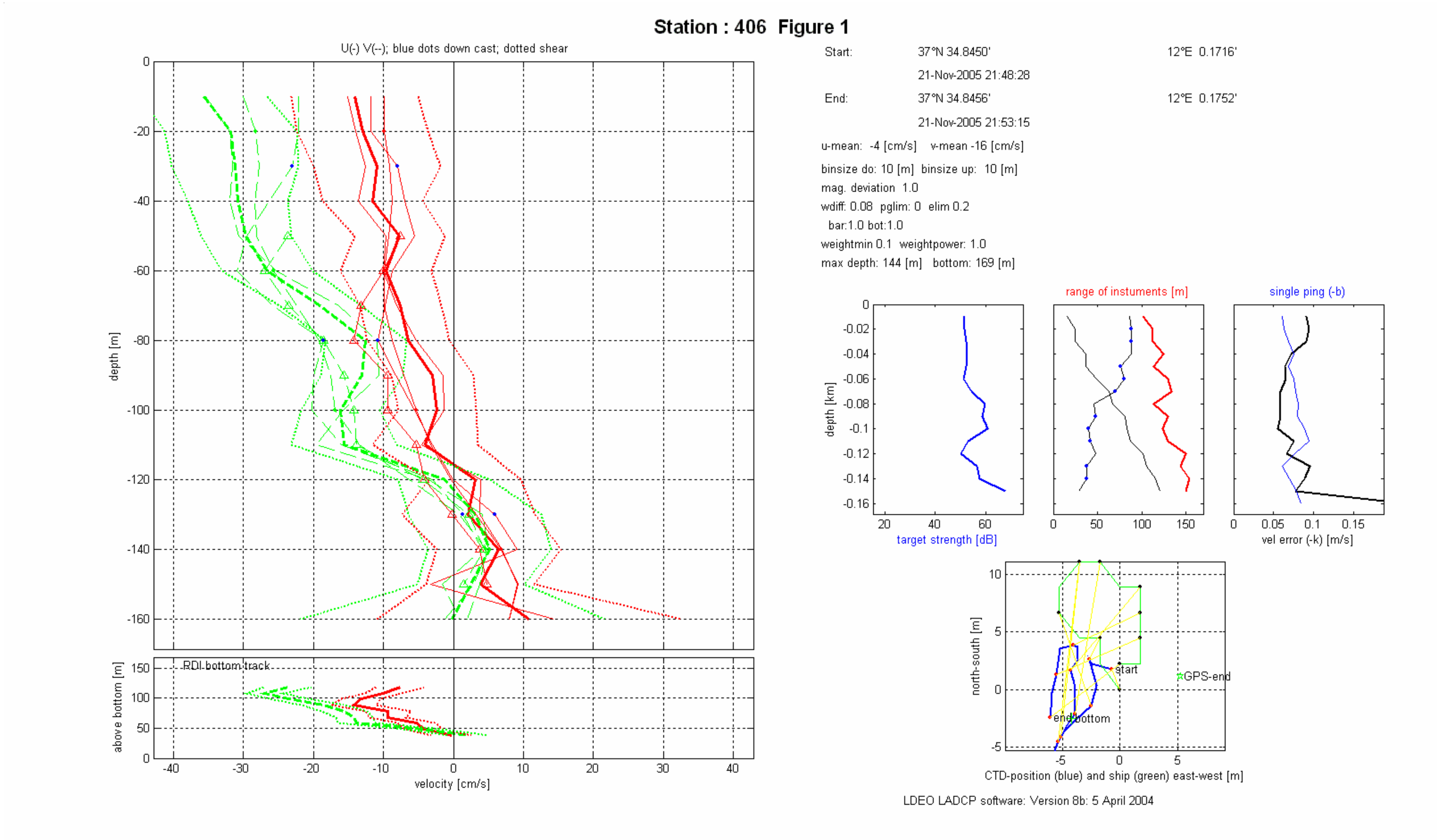


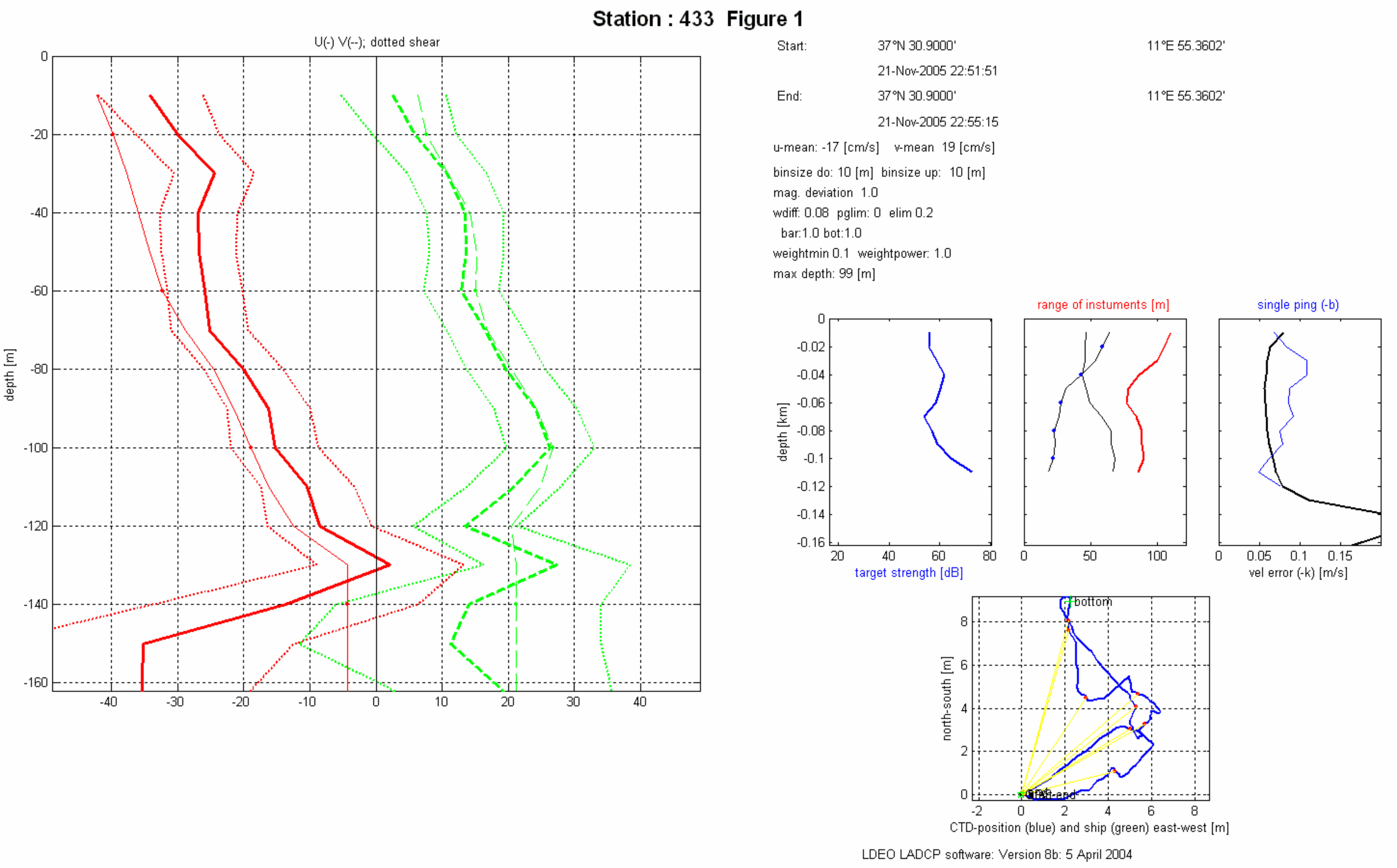
Figure 19 Graphic output of the LDEO LADCP software ver. 8b

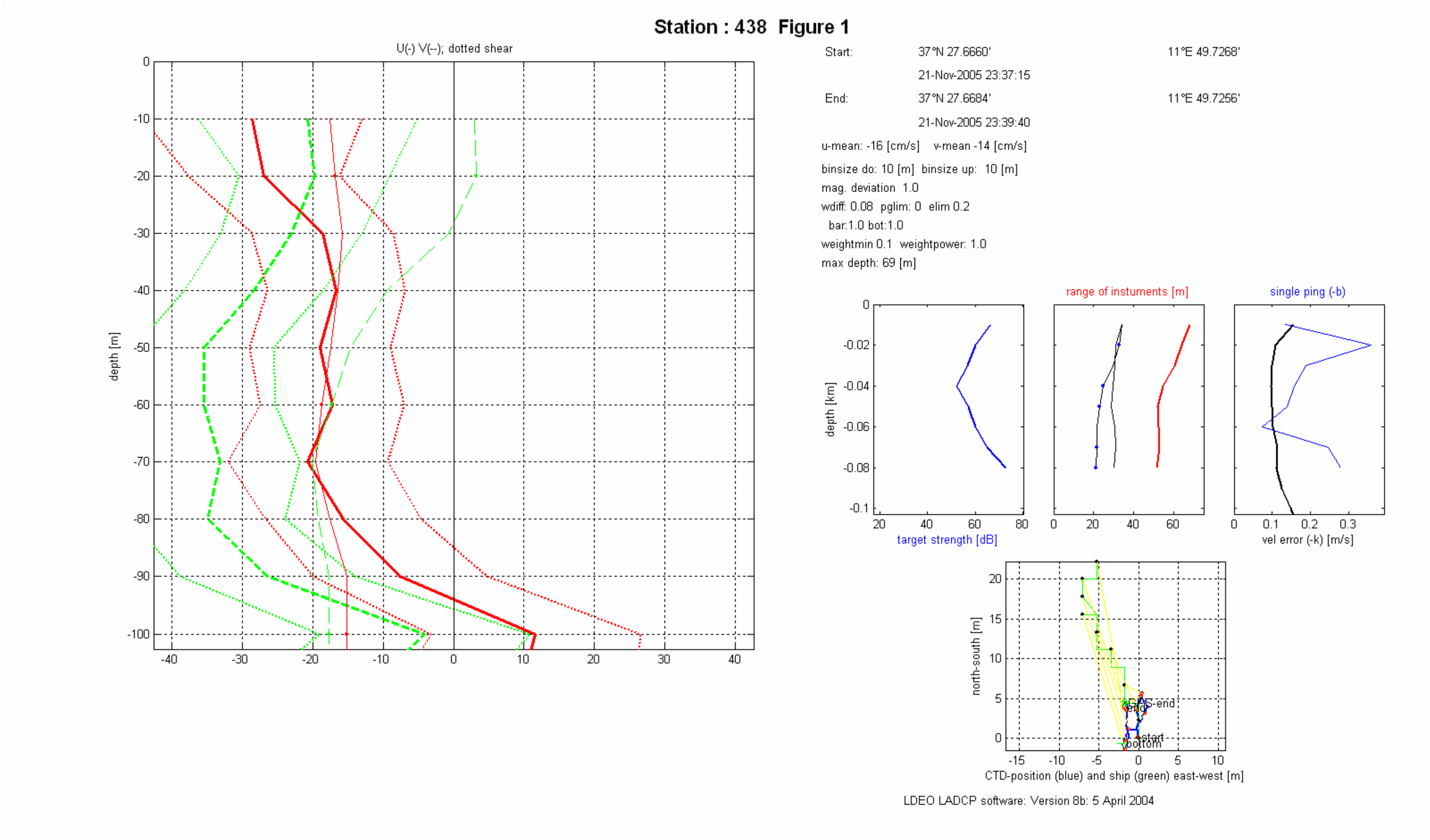
Figures 20-41 (following pages) Graphic results for each station


Station : 432 Figure 1
U(-) V(--); blue dots down cast; dotted shear
depth [m]
velocity [cm/s]
RDI bottom track
above bottom [m]
Start: 37°N 43.5912' 12°E 20.3484'
21-Nov-2005 15:08:10
End: 37°N 43.5408' 12°E 20.4120'
21-Nov-2005 15:15:13
u-mean: 6 [cm/s] v-mean -3 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.1
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 164 [m] bottom: 173 [m]
depth [km]
target strength [dB]
range of insturments [m]
single ping (-b)
vel error (-k) [m/s]
start
bottom
end
GPS-end
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

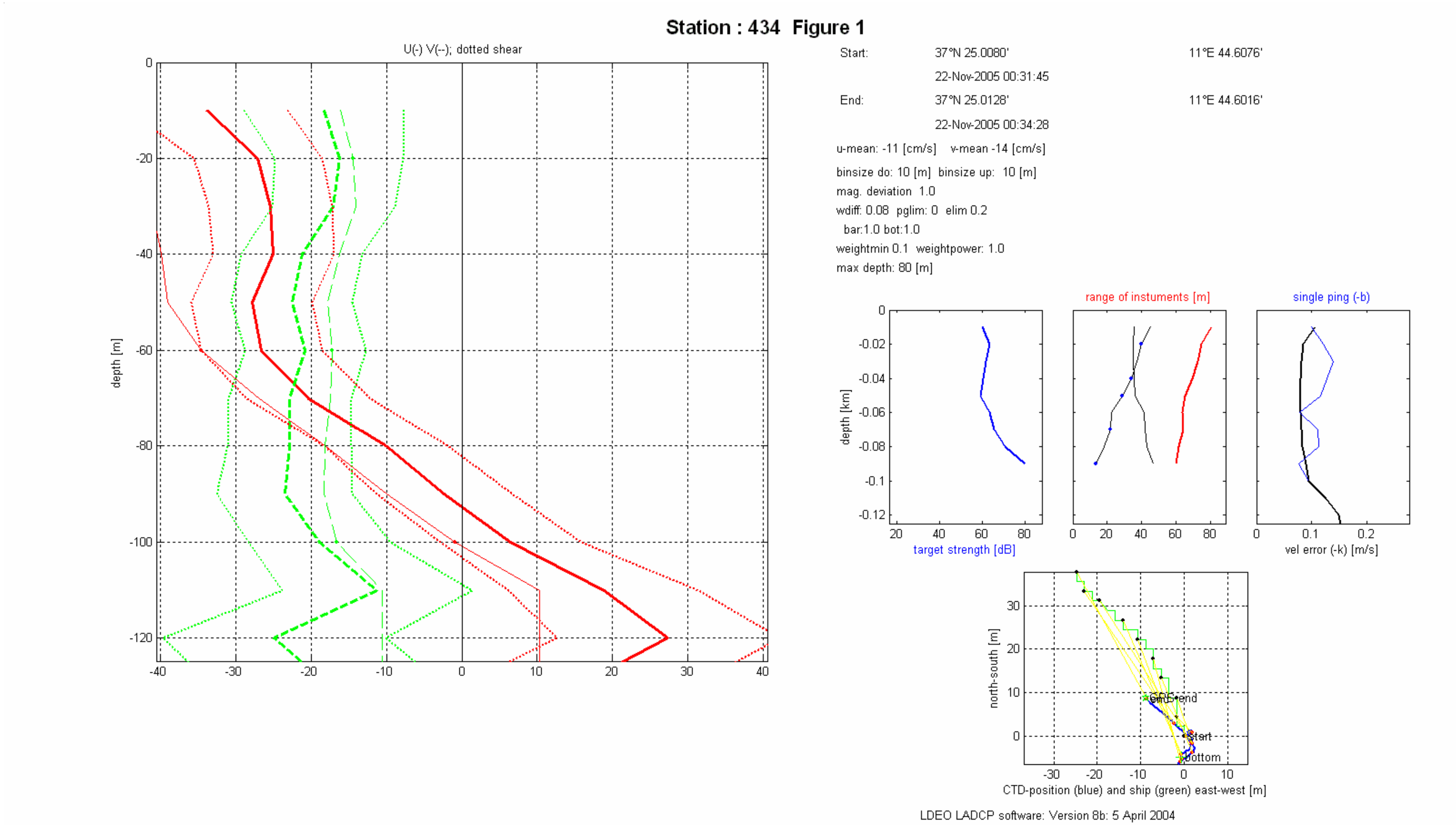

Station : 405 Figure 1
U(-) V(--); dotted shear
depth [m]
Start: 37°N 38.8800' 12°E 8.6388'
21-Nov-2005 20:50:43
End: 37°N 38.8824' 12°E 8.6460'
21-Nov-2005 20:53:47
u-mean: 10 [cm/s] v-mean -8 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.1
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 91 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

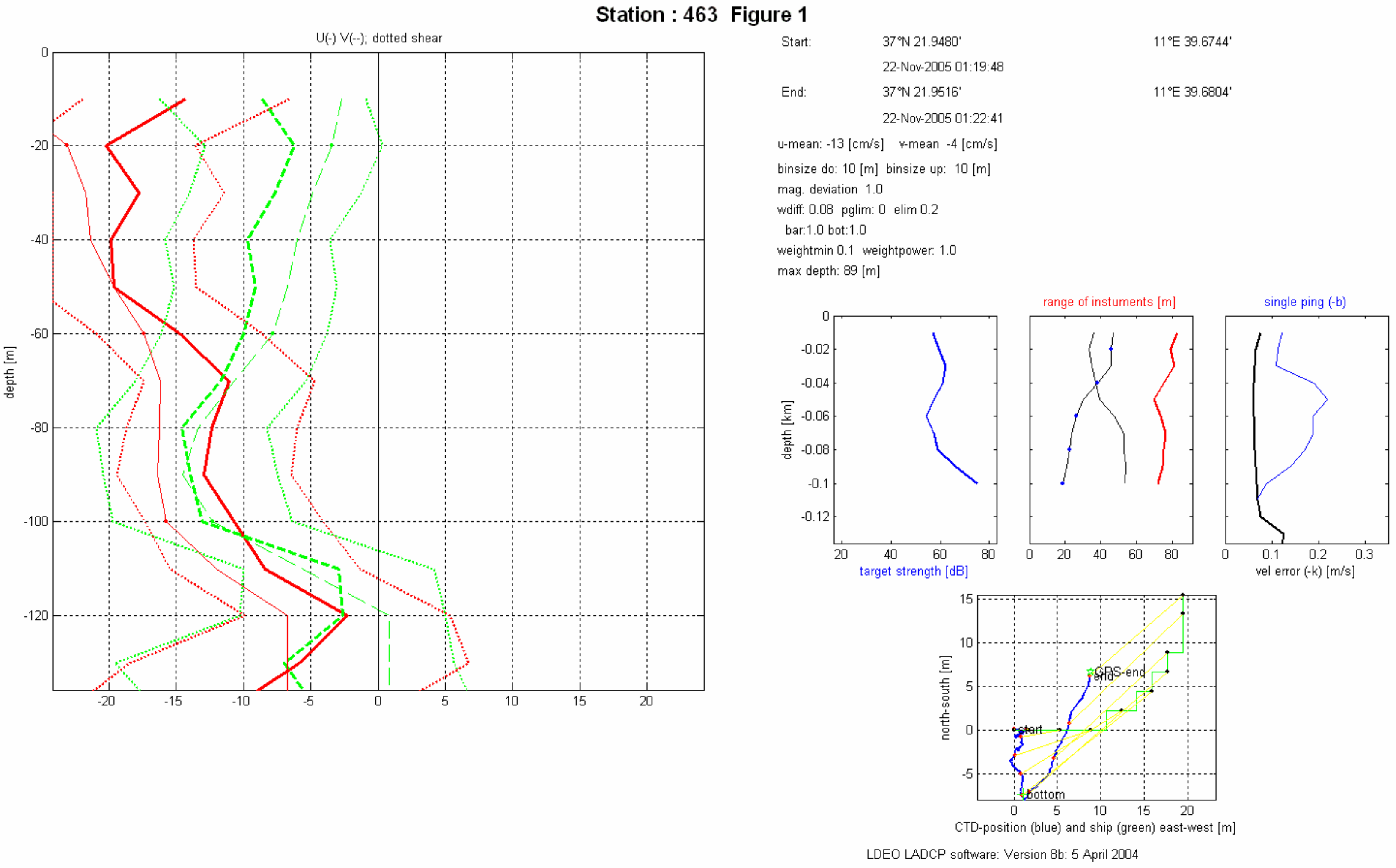

Station : 406 Figure 1
U(-) V(--); blue dots down cast; dotted shear
depth [m]
above bottom [m]
RDI bottom track
velocity [cm/s]
Start: 37°N 34.8450' 12°E 0.1716'
21-Nov-2005 21:48:28
End: 37°N 34.8456' 12°E 0.1752'
21-Nov-2005 21:53:15
u-mean: -4 [cm/s] v-mean -16 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 144 [m] bottom: 169 [m]
depth [km]
target strength [dB]
range of instuments [m]
single ping (-b)
vel error (-k) [m/s]
north-south [m]
start
GPS-end
end
bottom
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004


Station : 433 Figure 1
U(-) V(--); dotted shear
depth [m]
Start: 37°N 30.9000' 11°E 55.3602'
21-Nov-2005 22:51:51
End: 37°N 30.9000' 11°E 55.3602'
21-Nov-2005 22:55:15
u-mean: -17 [cm/s] v-mean 19 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 99 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
bottom
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

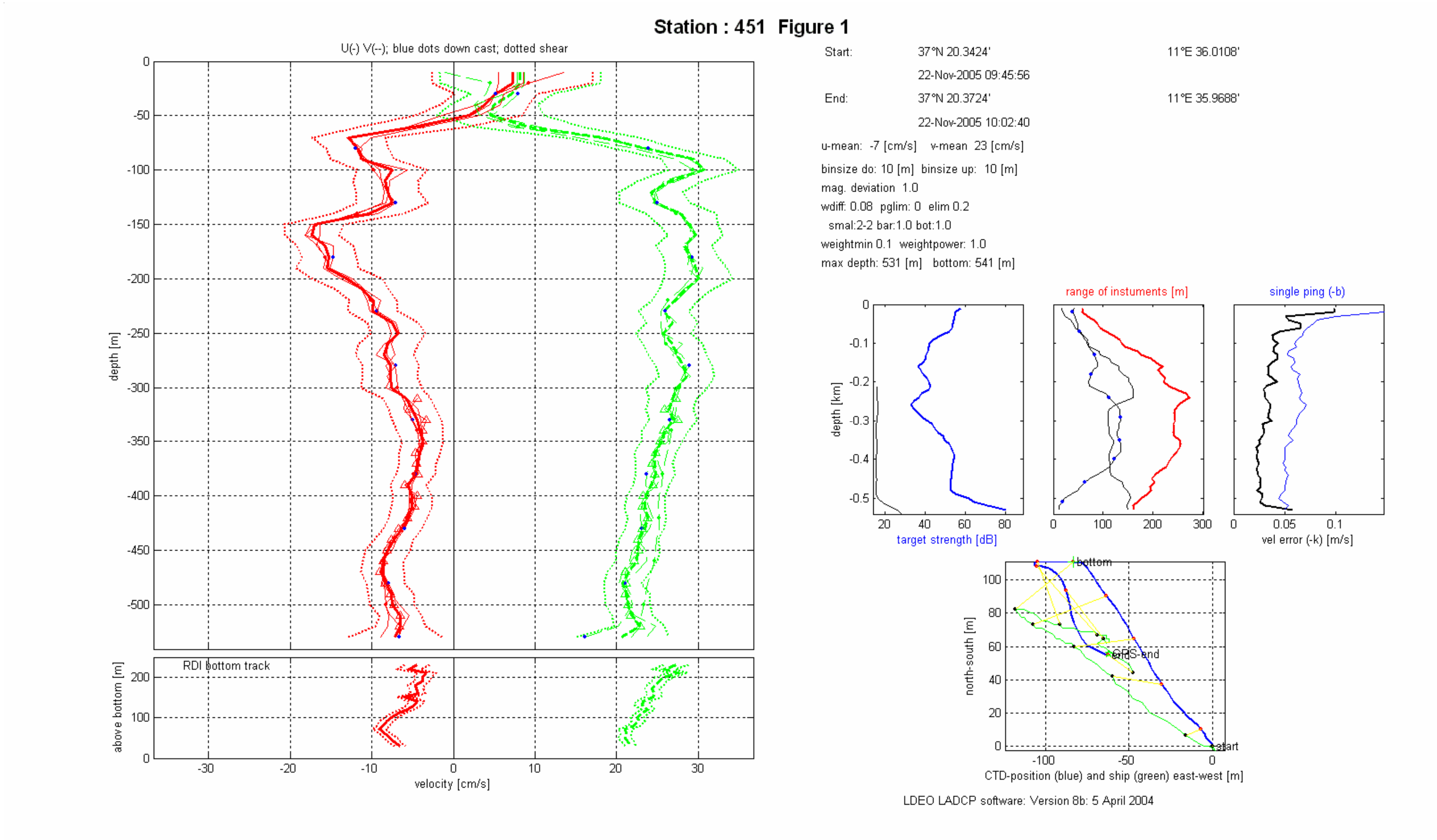


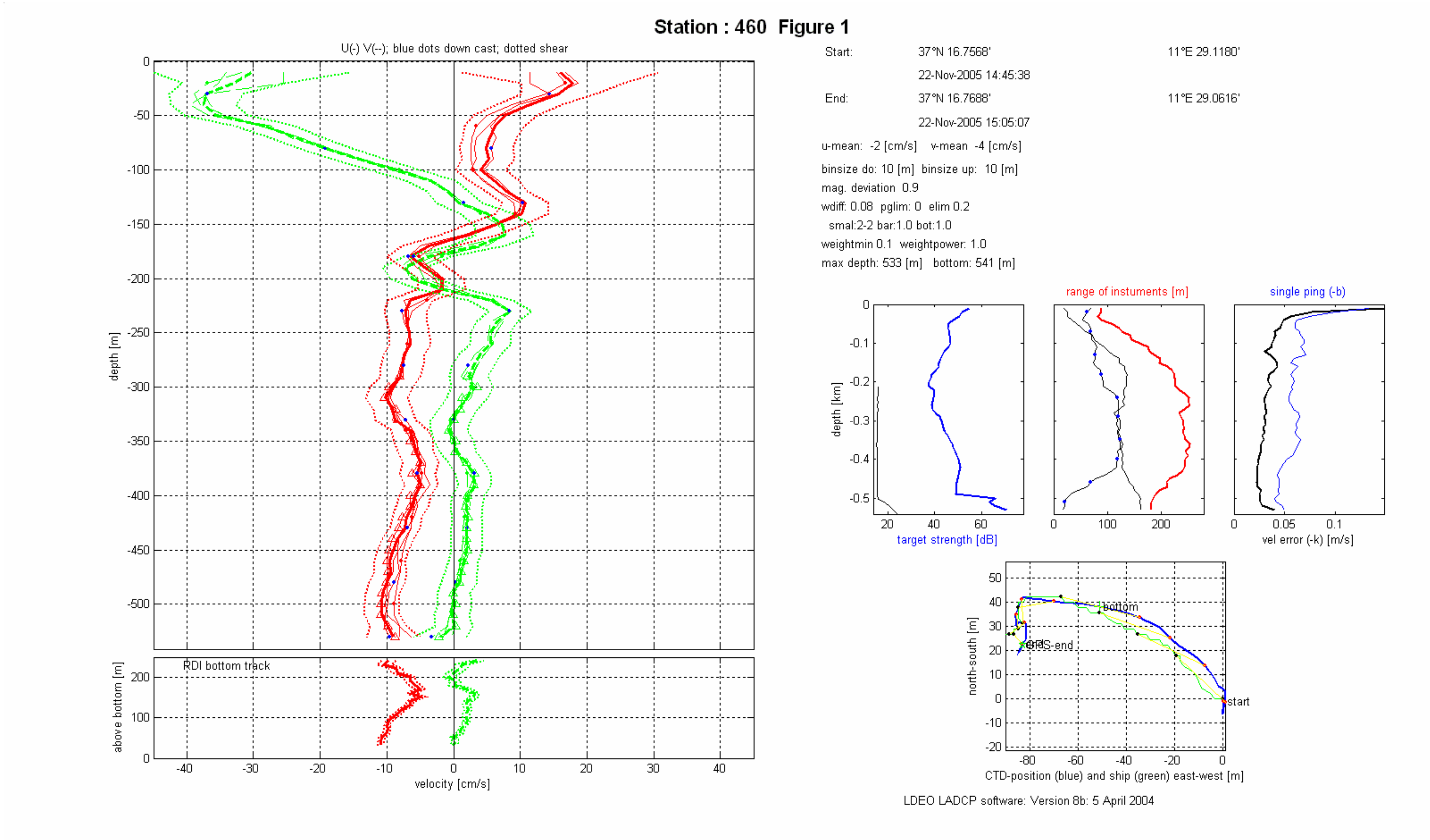
Station : 438 Figure 1
U(-) V(--); dotted shear
depth [m]
Start: 37°N 27.6660' 11°E 49.7268'
21-Nov-2005 23:37:15
End: 37°N 27.6684' 11°E 49.7256'
21-Nov-2005 23:39:40
u-mean: -16 [cm/s] v-mean -14 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 69 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
GPS-end
end
start
bottom
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

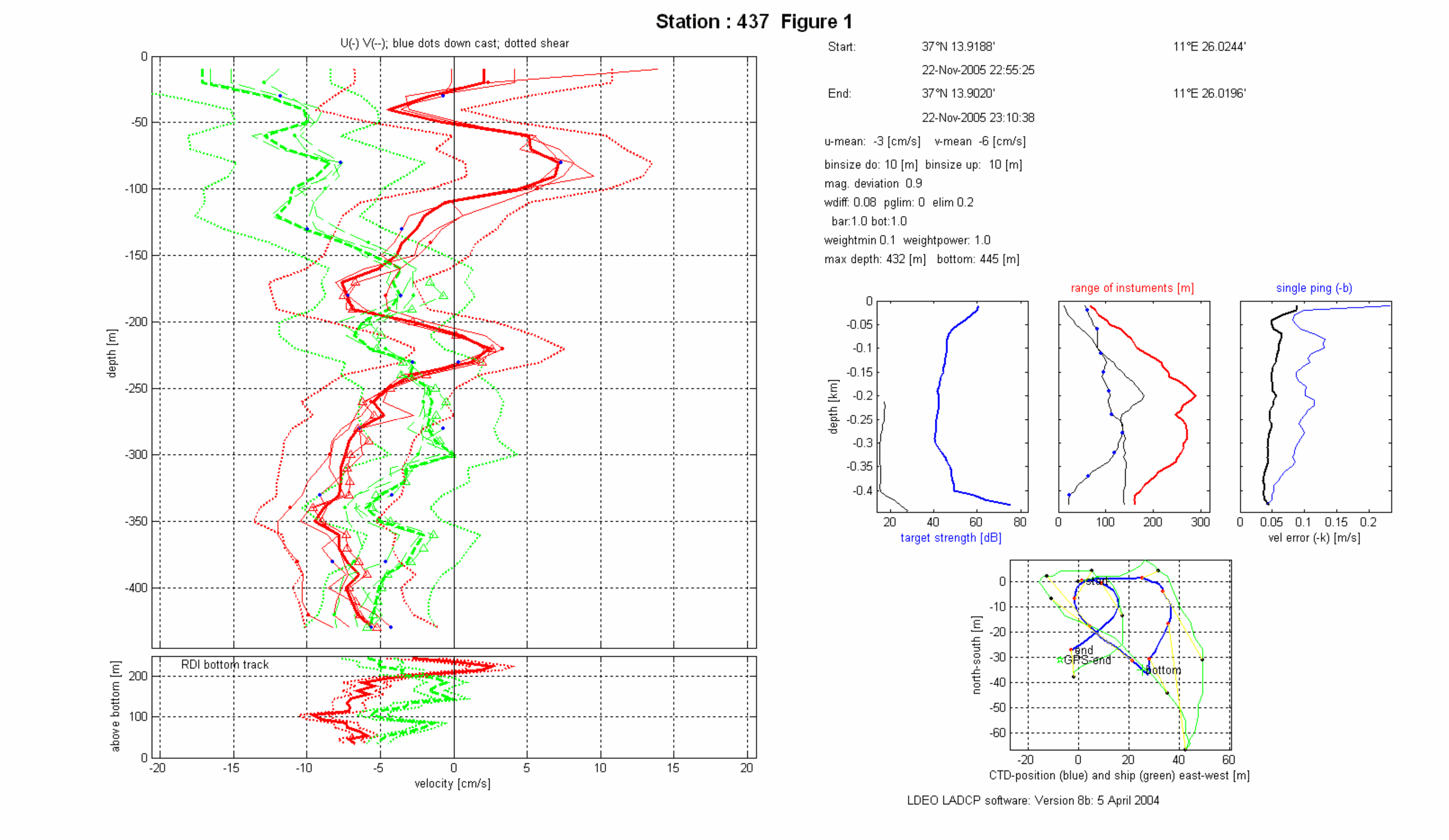

Station : 434 Figure 1
U(-) V(--); dotted shear
depth [m]
Start: 37°N 25.0080' 11°E 44.6076'
22-Nov-2005 00:31:45
End: 37°N 25.0128' 11°E 44.6016'
22-Nov-2005 00:34:28
u-mean: -11 [cm/s] v-mean -14 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 80 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

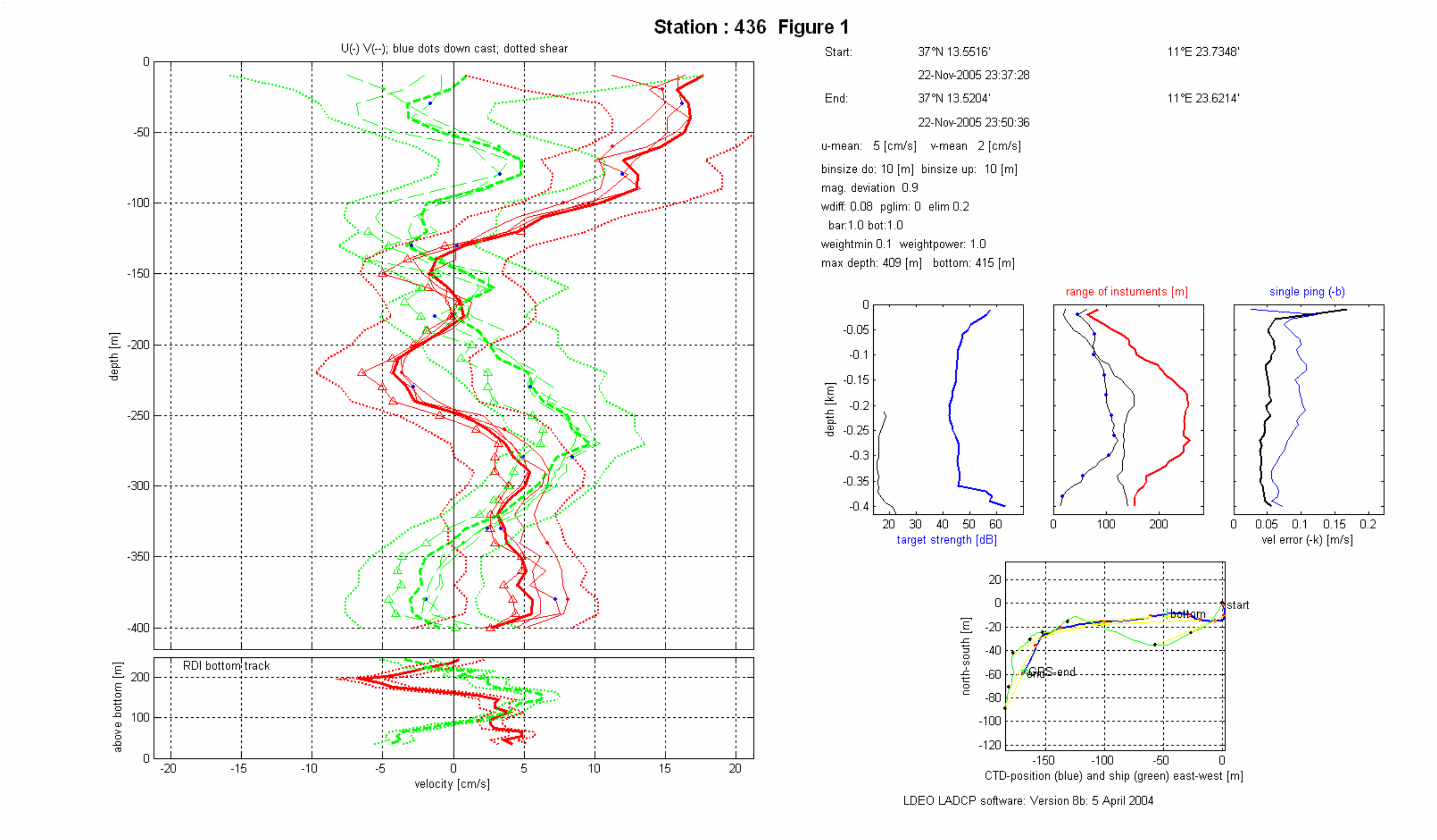


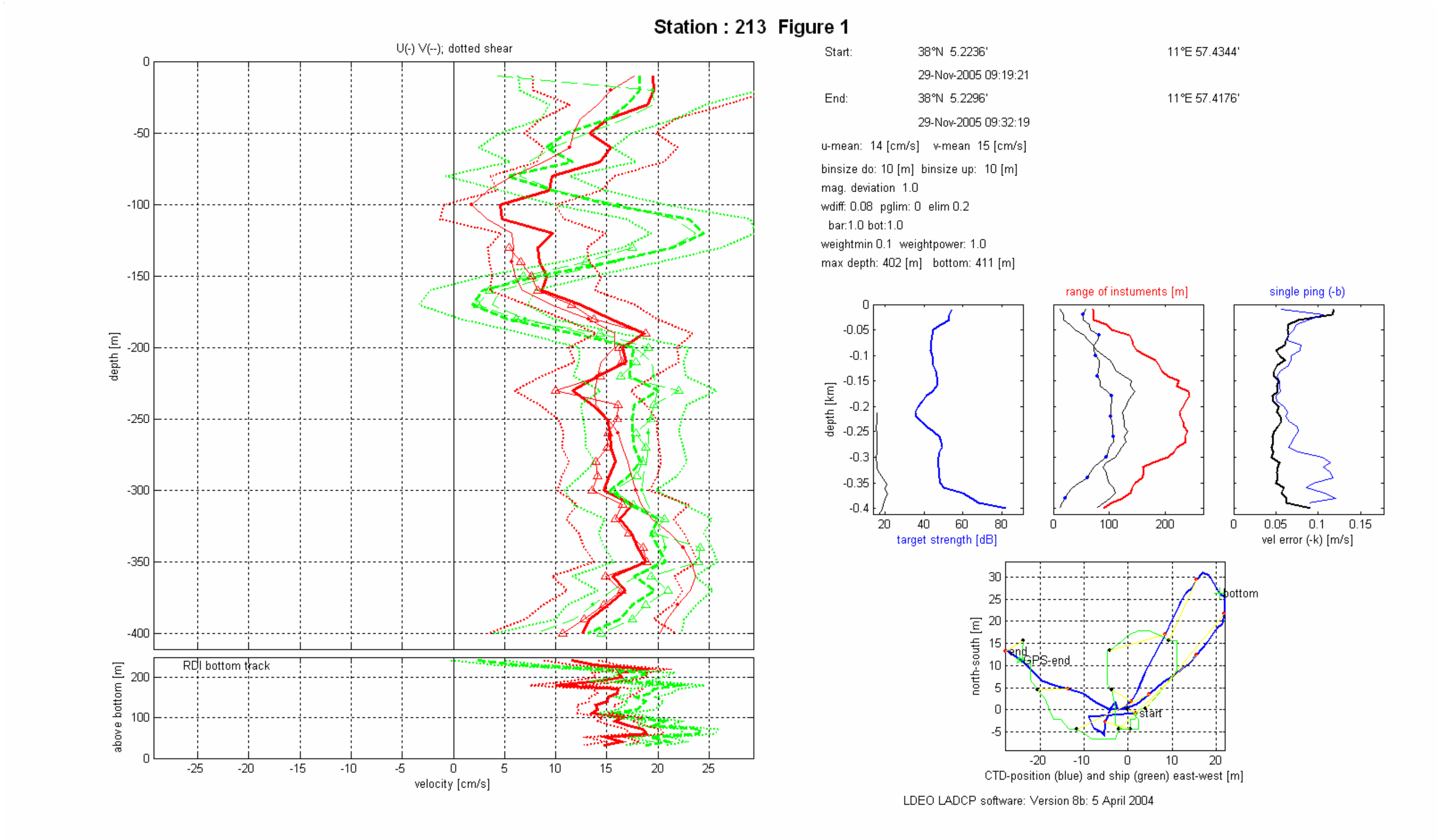
Station : 463 Figure 1
U(-) V(--); dotted shear
depth [m]
Start: 37°N 21.9480' 11°E 39.6744'
22-Nov-2005 01:19:48
End: 37°N 21.9516' 11°E 39.6804'
22-Nov-2005 01:22:41
u-mean: -13 [cm/s] v-mean -4 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 89 [m]
range of insturments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
GPS-end
start
bottom
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

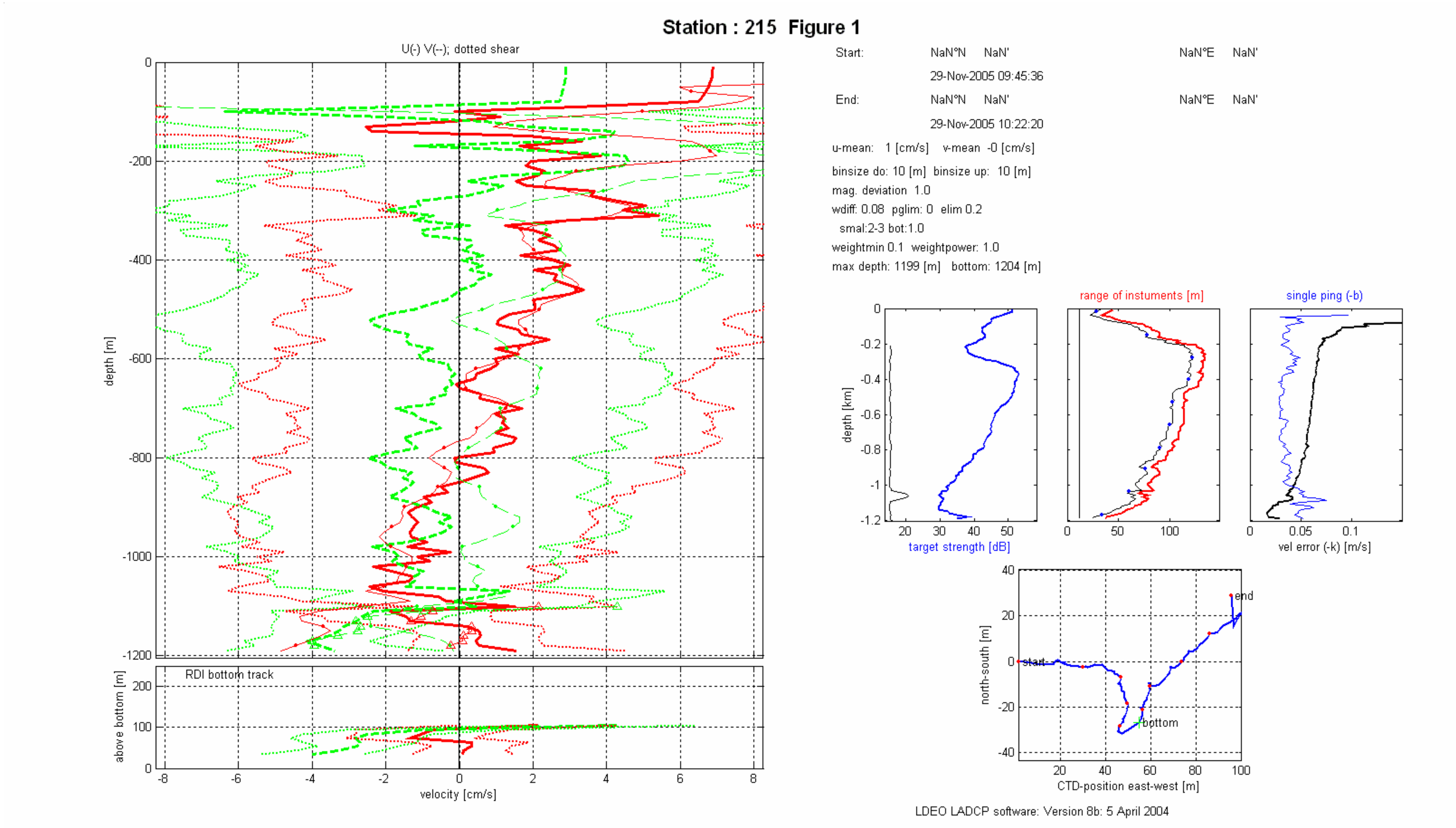

Station : 451 Figure 1
U(-) V(--); blue dots down cast; dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: 37°N 20.3424' 11°E 36.0108'
22-Nov-2005 09:45:56
End: 37°N 20.3724' 11°E 35.9688'
22-Nov-2005 10:02:40
u-mean: -7 [cm/s] v-mean 23 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-2 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 531 [m] bottom: 541 [m]
range of insturments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
bottom
end
GPS-end
start
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

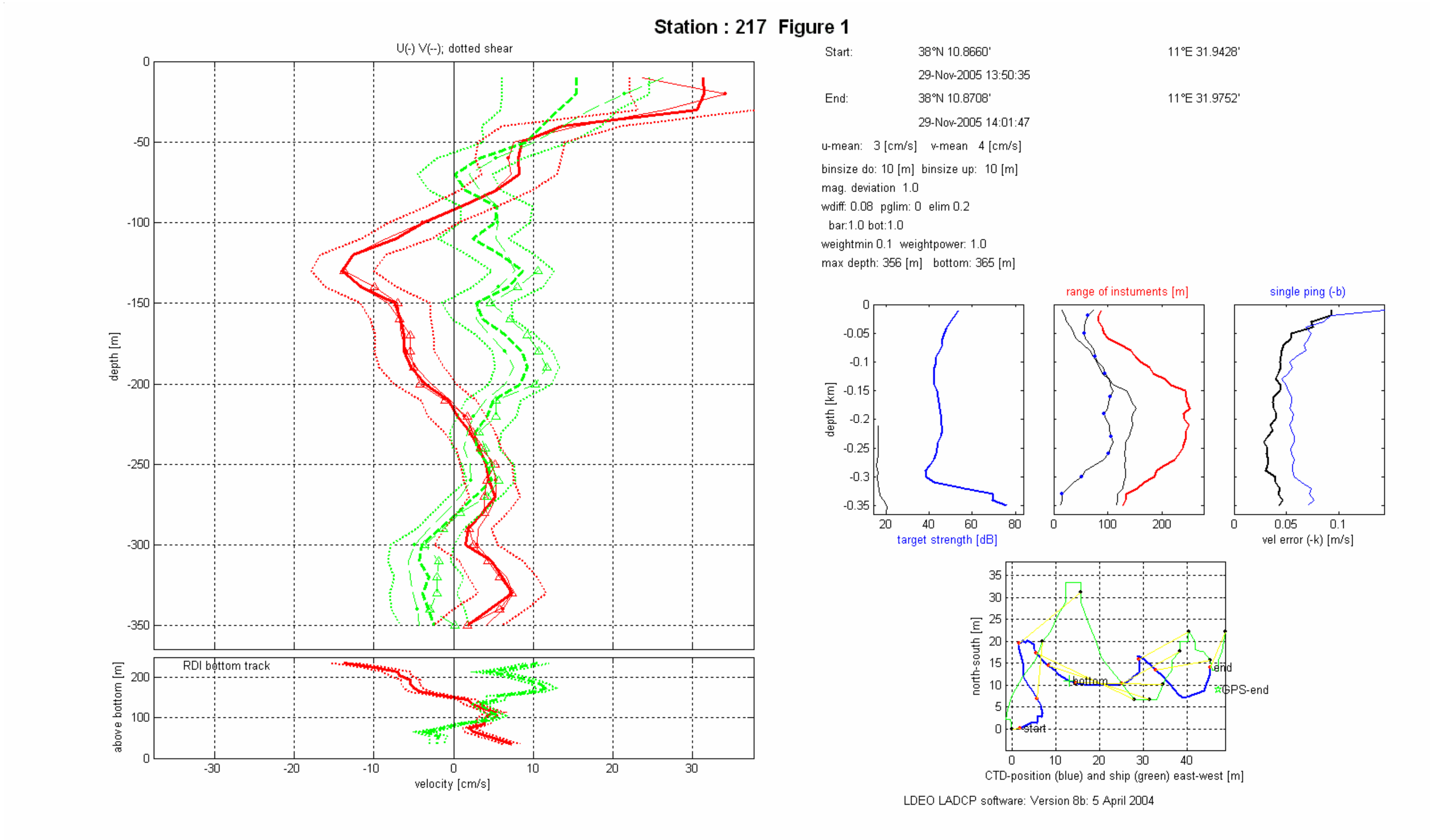

Station : 460 Figure 1
U(-) V(--); blue dots down cast; dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: 37°N 16.7568' 11°E 29.1180'
22-Nov-2005 14:45:38
End: 37°N 16.7688' 11°E 29.0616'
22-Nov-2005 15:05:07
u-mean: -2 [cm/s] v-mean -4 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.9
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-2 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 533 [m] bottom: 541 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
bottom
start
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004


Station : 437 Figure 1
U(-) V(--); blue dots down cast; dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: 37°N 13.9188' 11°E 26.0244'
22-Nov-2005 22:55:25
End: 37°N 13.9020' 11°E 26.0196'
22-Nov-2005 23:10:38
u-mean: -3 [cm/s] v-mean -6 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.9
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 432 [m] bottom: 445 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
start
end
GPS-end
bottom
LDEO LADCP software: Version 8b: 5 April 2004

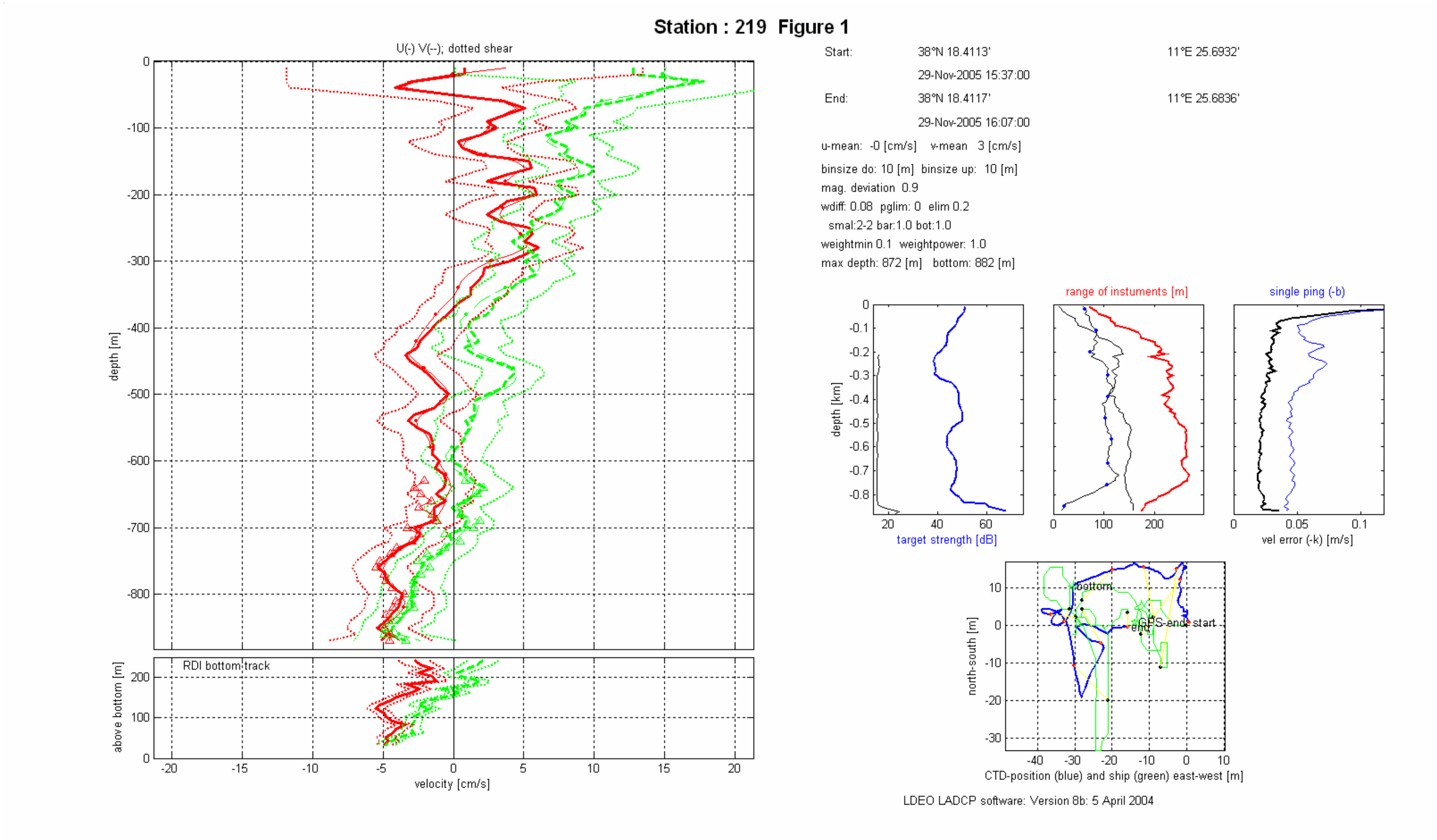

Station : 436 Figure 1
U(-) V(--); blue dots down cast; dotted shear
depth [m]
above bottom [m]
RDI bottom track
velocity [cm/s]
Start: 37°N 13.5516' 11°E 23.7348'
22-Nov-2005 23:37:28
End: 37°N 13.5204' 11°E 23.6214'
22-Nov-2005 23:50:36
u-mean: 5 [cm/s] v-mean 2 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.9
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 409 [m] bottom: 415 [m]
depth [km]
target strength [dB]
range of insturnents [m]
single ping (-b)
vel error (-k) [m/s]
north-south [m]
start
bottom
GPS-end
end
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

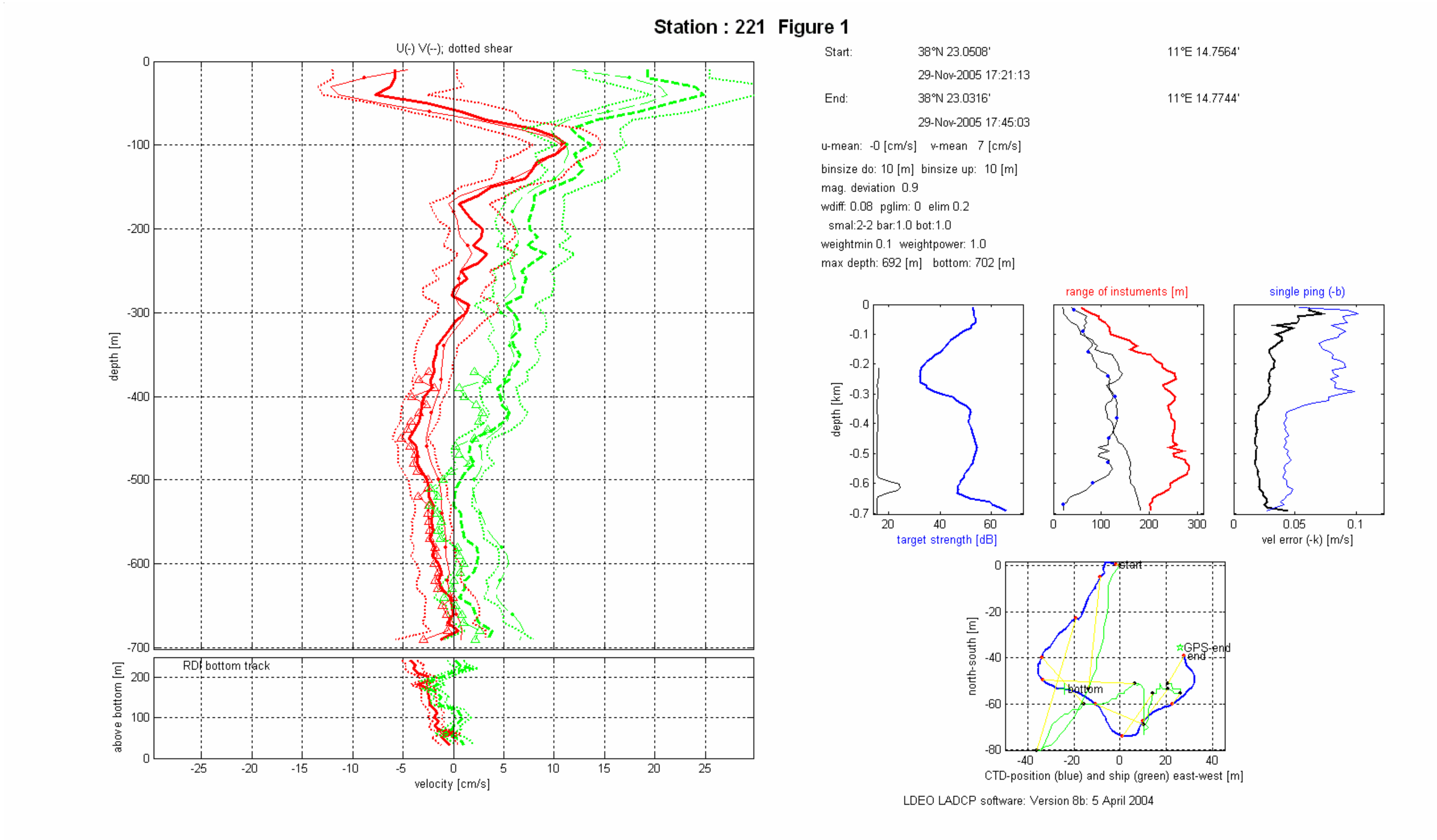

Station : 213 Figure 1
U(-) V(--); dotted shear
depth [m]
above bottom [m]
RDI bottom track
velocity [cm/s]
Start: 38°N 5.2236' 11°E 57.4344'
29-Nov-2005 09:19:21
End: 38°N 5.2296' 11°E 57.4176'
29-Nov-2005 09:32:19
u-mean: 14 [cm/s] v-mean 15 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 402 [m] bottom: 411 [m]
depth [km]
target strength [dB]
range of instuments [m]
single ping (-b)
vel error (-k) [m/s]
north-south [m]
bottom
end
GPS-end
start
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

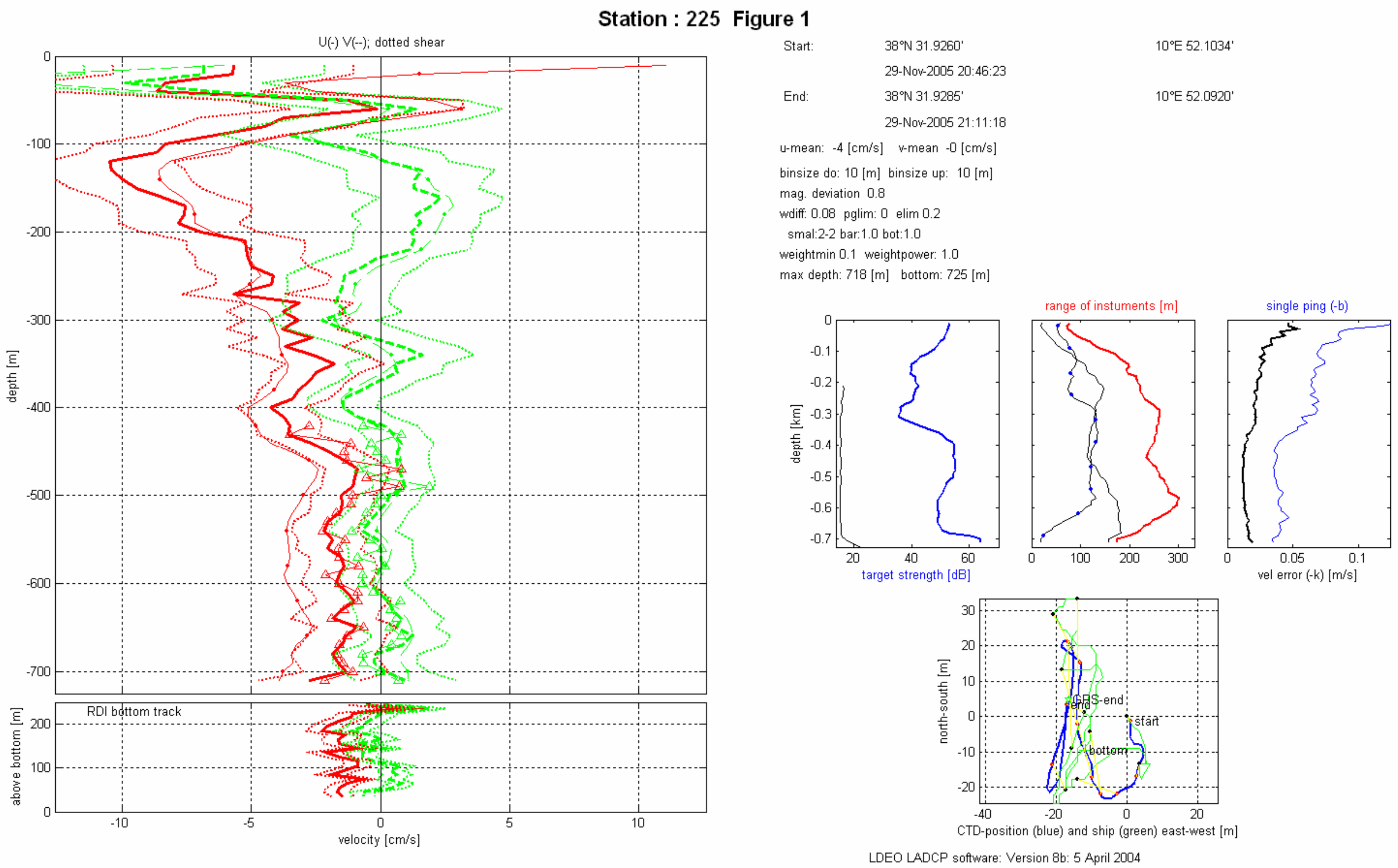

Station : 215 Figure 1
U(-) V(--); dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: NaN°N NaN' NaN°E NaN'
29-Nov-2005 09:45:36
End: NaN°N NaN' NaN°E NaN'
29-Nov-2005 10:22:20
u-mean: 1 [cm/s] v-mean -0 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-3 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 1199 [m] bottom: 1204 [m]
range of insturments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
CTD-position east-west [m]
start
end
bottom
LDEO LADCP software: Version 8b: 5 April 2004

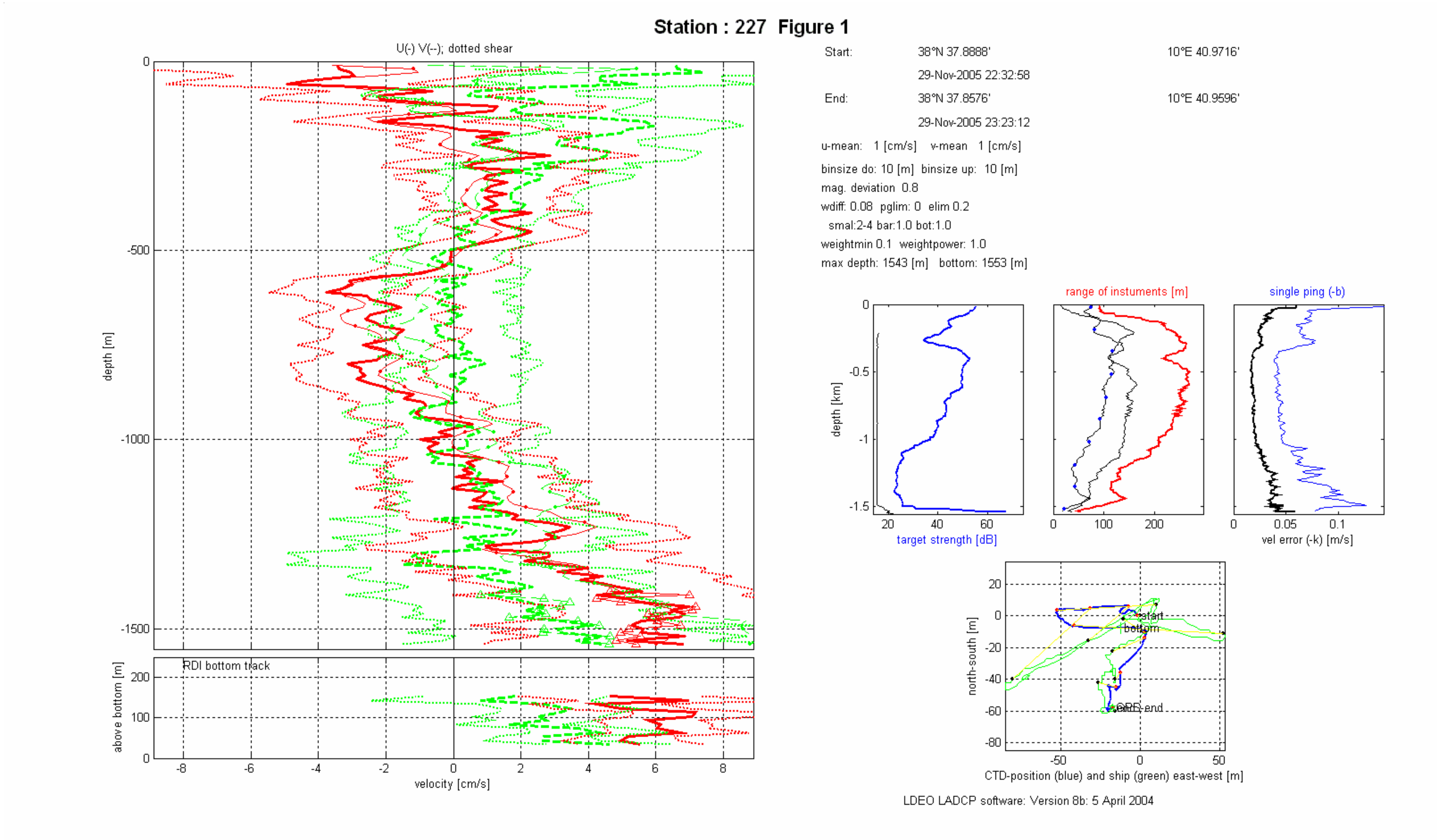


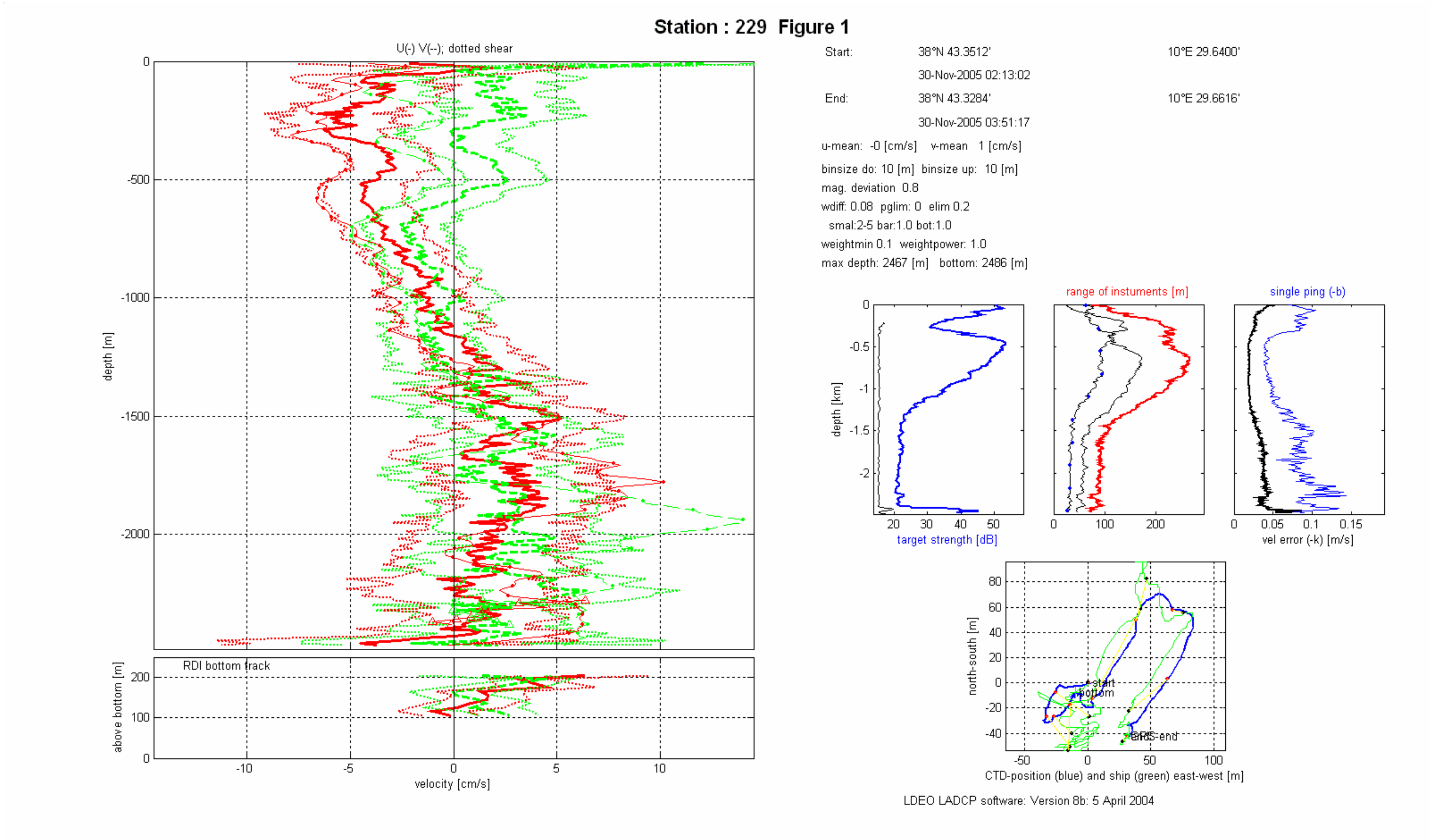
Station : 217 Figure 1
U(-) V(--); dotted shear
depth [m]
above bottom [m]
RDI bottom track
velocity [cm/s]
Start: 38°N 10.8660' 11°E 31.9428'
29-Nov-2005 13:50:35
End: 38°N 10.8708' 11°E 31.9752'
29-Nov-2005 14:01:47
u-mean: 3 [cm/s] v-mean 4 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 1.0
wdiff: 0.08 pglim: 0 elim 0.2
bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 356 [m] bottom: 365 [m]
range of insturments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
start
bottom
end
GPS-end
LDEO LADCP software: Version 8b: 5 April 2004

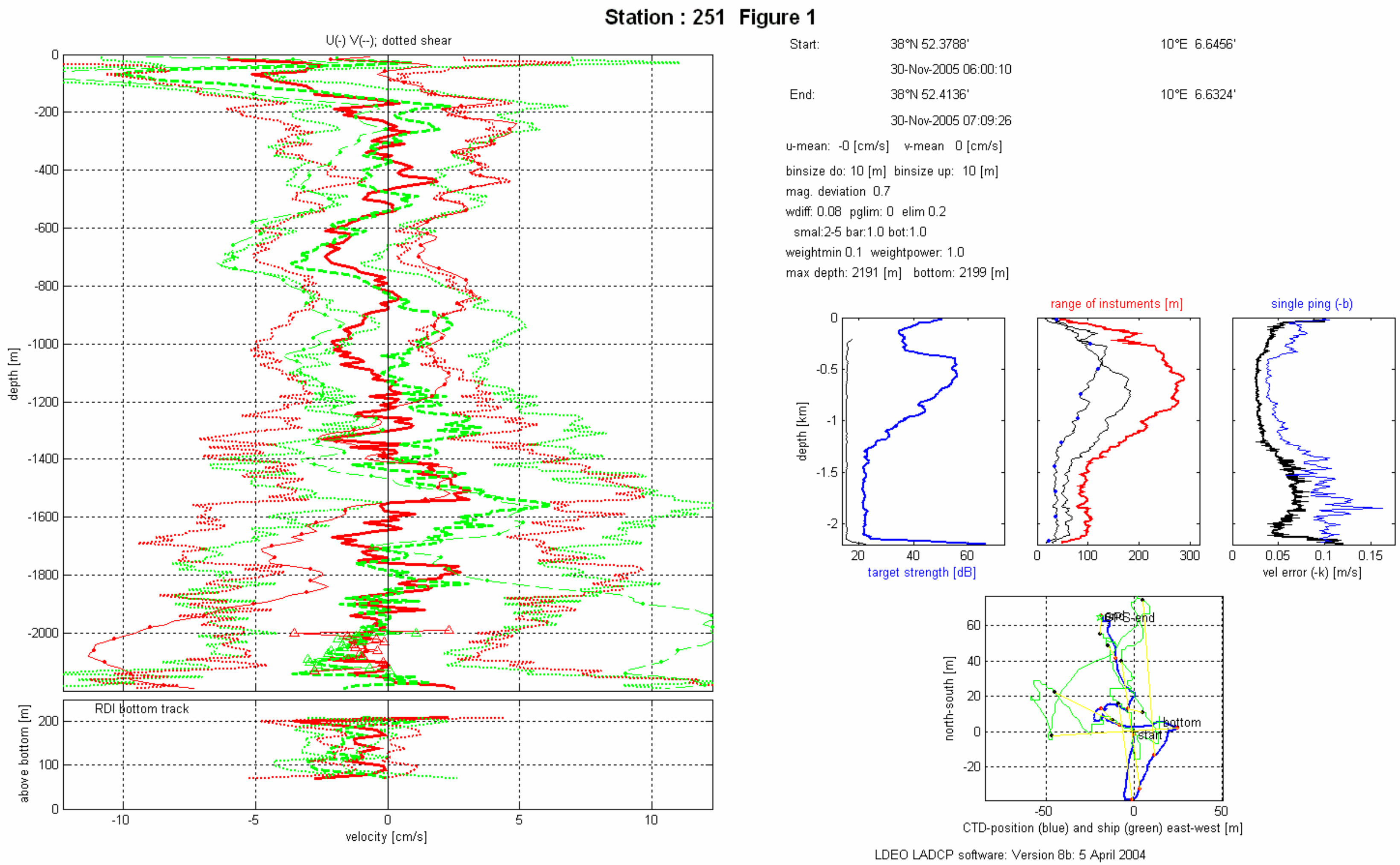

Station : 219 Figure 1
U(-) V(--); dotted shear
depth [m]
above bottom [m]
RDI bottom track
velocity [cm/s]
Start: 38°N 18.4113' 11°E 25.6932'
29-Nov-2005 15:37:00
End: 38°N 18.4117' 11°E 25.6836'
29-Nov-2005 16:07:00
u-mean: -0 [cm/s] v-mean 3 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.9
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-2 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 872 [m] bottom: 882 [m]
range of insturnents [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
bottom
GPS-end
start
end
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

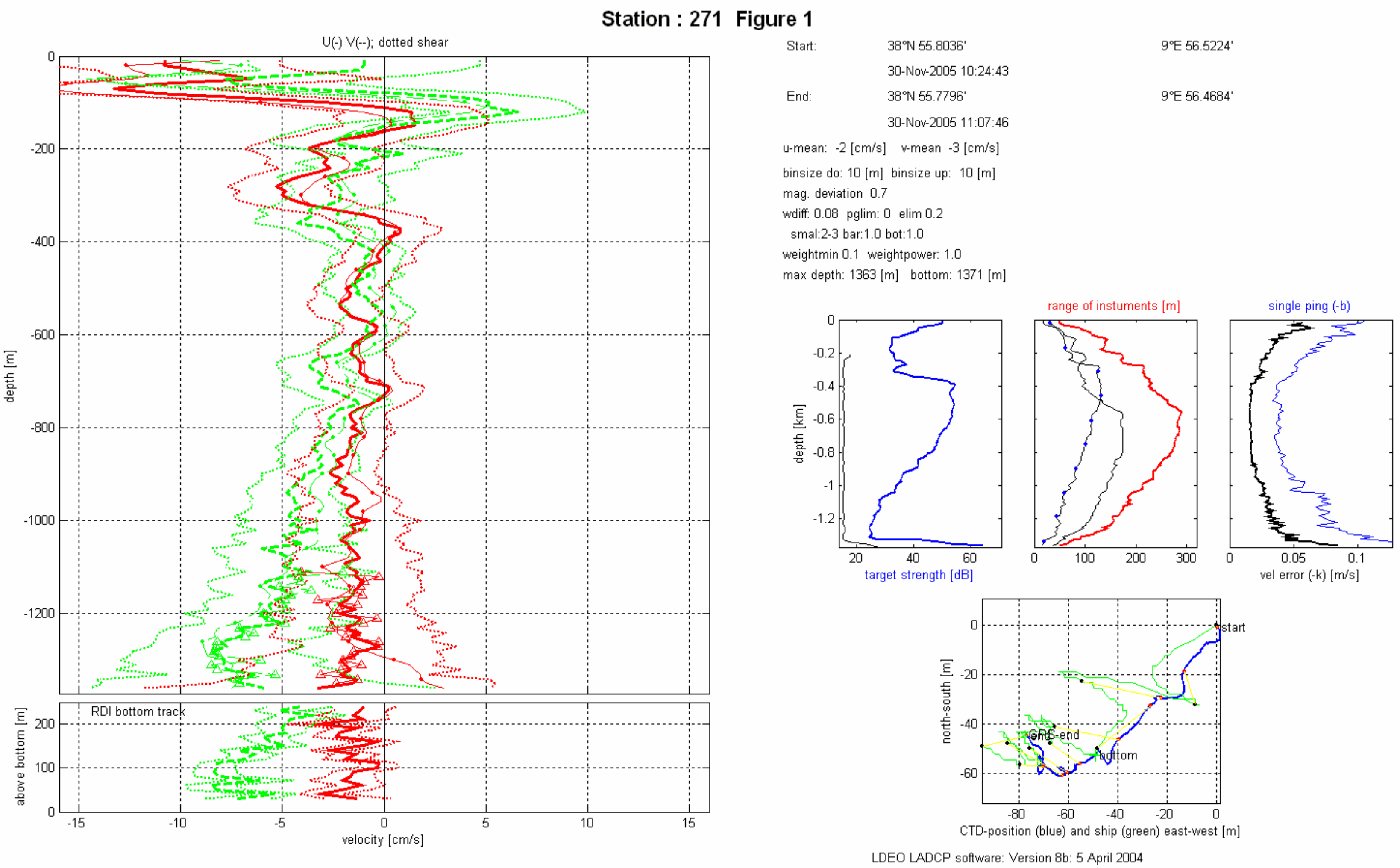

Station : 221 Figure 1
U(-) V(--); dotted shear
depth [m]
above bottom [m]
RDI bottom track
velocity [cm/s]
Start: 38°N 23.0508' 11°E 14.7564'
29-Nov-2005 17:21:13
End: 38°N 23.0316' 11°E 14.7744'
29-Nov-2005 17:45:03
u-mean: -0 [cm/s] v-mean 7 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.9
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-2 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 692 [m] bottom: 702 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
start
GPS-end
end
bottom
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

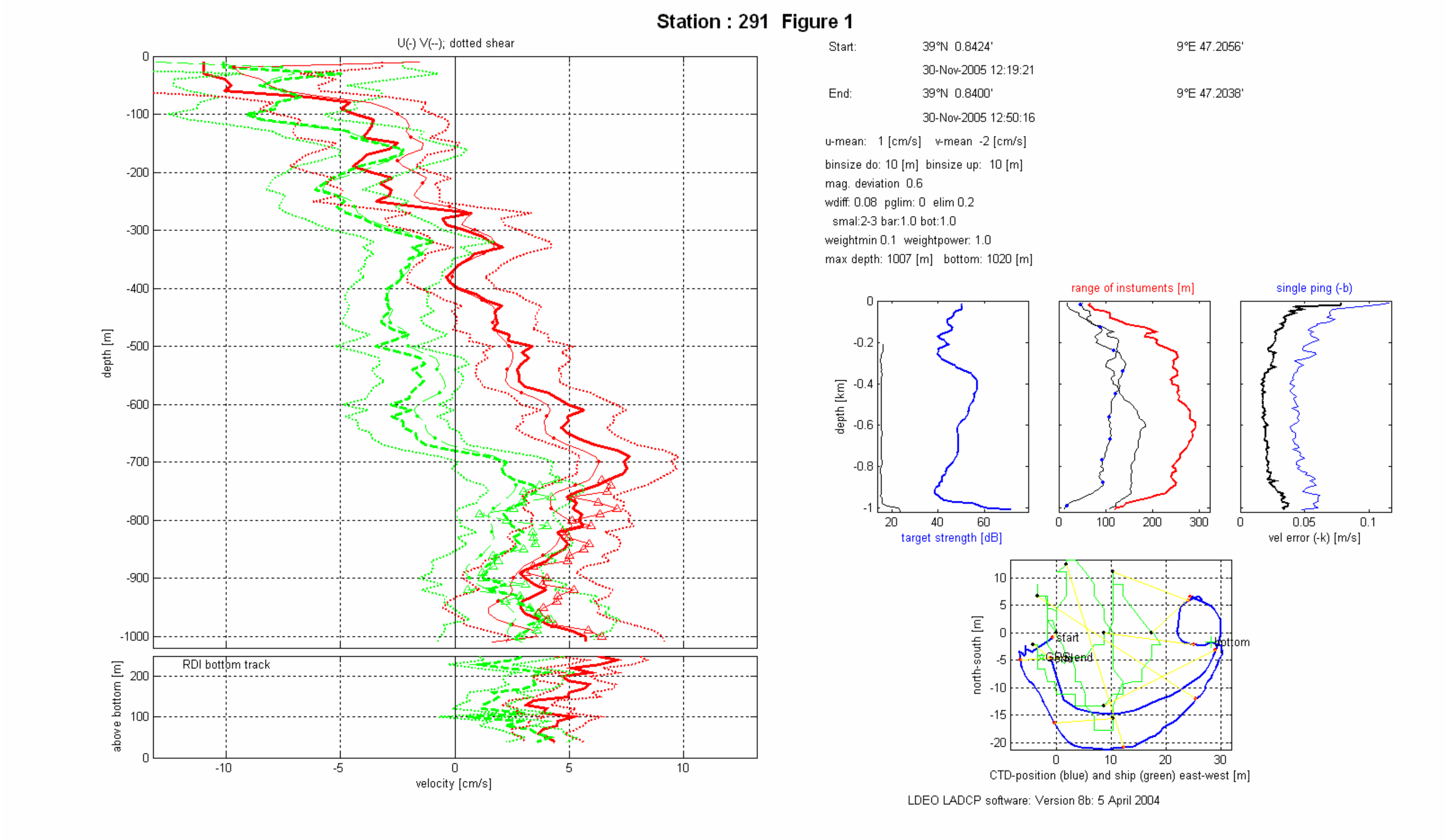

Station : 225 Figure 1
U(-) V(--); dotted shear
Start: 38°N 31.9260' 10°E 52.1034'
29-Nov-2005 20:46:23
End: 38°N 31.9285' 10°E 52.0920'
29-Nov-2005 21:11:18
u-mean: -4 [cm/s] v-mean -0 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.8
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-2 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 718 [m] bottom: 725 [m]
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
GPS-end
end
start
bottom
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004


Station : 227 Figure 1
U(-) V(--); dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: 38°N 37.8888' 10°E 40.9716'
29-Nov-2005 22:32:58
End: 38°N 37.8576' 10°E 40.9596'
29-Nov-2005 23:23:12
u-mean: 1 [cm/s] v-mean 1 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.8
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-4 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 1543 [m] bottom: 1553 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
start
bottom
end
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004


Station : 229 Figure 1
U(-) V(--); dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: 38°N 43.3512' 10°E 29.6400'
30-Nov-2005 02:13:02
End: 38°N 43.3284' 10°E 29.6616'
30-Nov-2005 03:51:17
u-mean: -0 [cm/s] v-mean 1 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.8
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-5 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 2467 [m] bottom: 2486 [m]
depth [km]
target strength [dB]
range of instuments [m]
single ping (-b)
vel error (-k) [m/s]
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004


Station : 251 Figure 1
U(-) V(--); dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: 38°N 52.3788' 10°E 6.6456'
30-Nov-2005 06:00:10
End: 38°N 52.4136' 10°E 6.6324'
30-Nov-2005 07:09:26
u-mean: -0 [cm/s] v-mean 0 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.7
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-5 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 2191 [m] bottom: 2199 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
GPS-end
bottom
start
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004


Station : 271 Figure 1
U(-) V(--); dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: 38°N 55.8036' 9°E 56.5224'
30-Nov-2005 10:24:43
End: 38°N 55.7796' 9°E 56.4684'
30-Nov-2005 11:07:46
u-mean: -2 [cm/s] v-mean -3 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.7
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-3 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 1363 [m] bottom: 1371 [m]
range of instuments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
start
GPS-end
bottom
north-south [m]
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004


Station : 291 Figure 1
U(-) V(--); dotted shear
depth [m]
RDI bottom track
above bottom [m]
velocity [cm/s]
Start: 39°N 0.8424' 9°E 47.2056'
30-Nov-2005 12:19:21
End: 39°N 0.8400' 9°E 47.2038'
30-Nov-2005 12:50:16
u-mean: 1 [cm/s] v-mean -2 [cm/s]
binsize do: 10 [m] binsize up: 10 [m]
mag. deviation 0.6
wdiff: 0.08 pglim: 0 elim 0.2
smal:2-3 bar:1.0 bot:1.0
weightmin 0.1 weightpower: 1.0
max depth: 1007 [m] bottom: 1020 [m]
range of insturments [m]
single ping (-b)
depth [km]
target strength [dB]
vel error (-k) [m/s]
north-south [m]
start
end
bottom
CTD-position (blue) and ship (green) east-west [m]
LDEO LADCP software: Version 8b: 5 April 2004

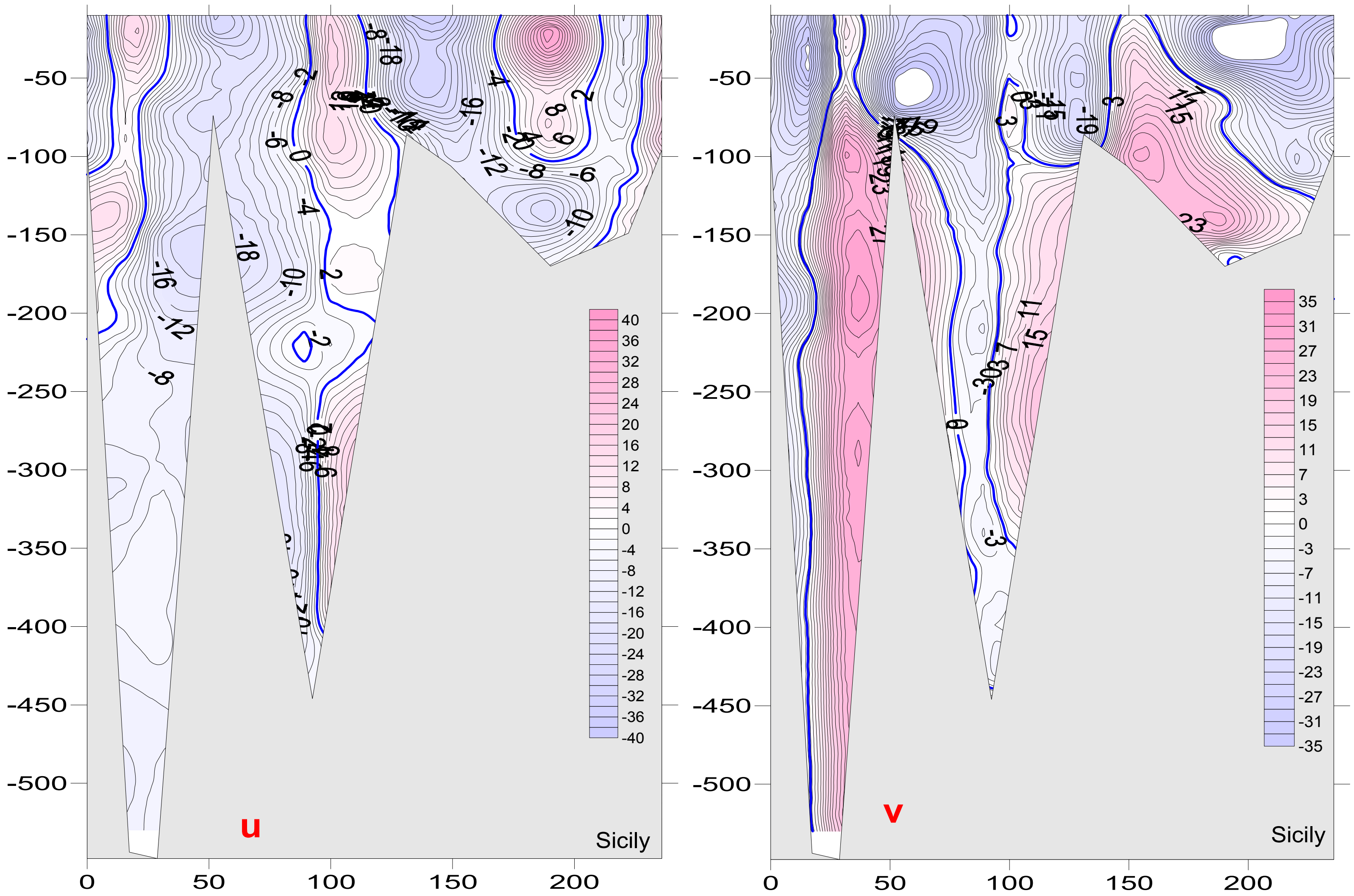


Figure 42 Velocity sections of the north and the east components, respectively u and v, in the Sicily Strait

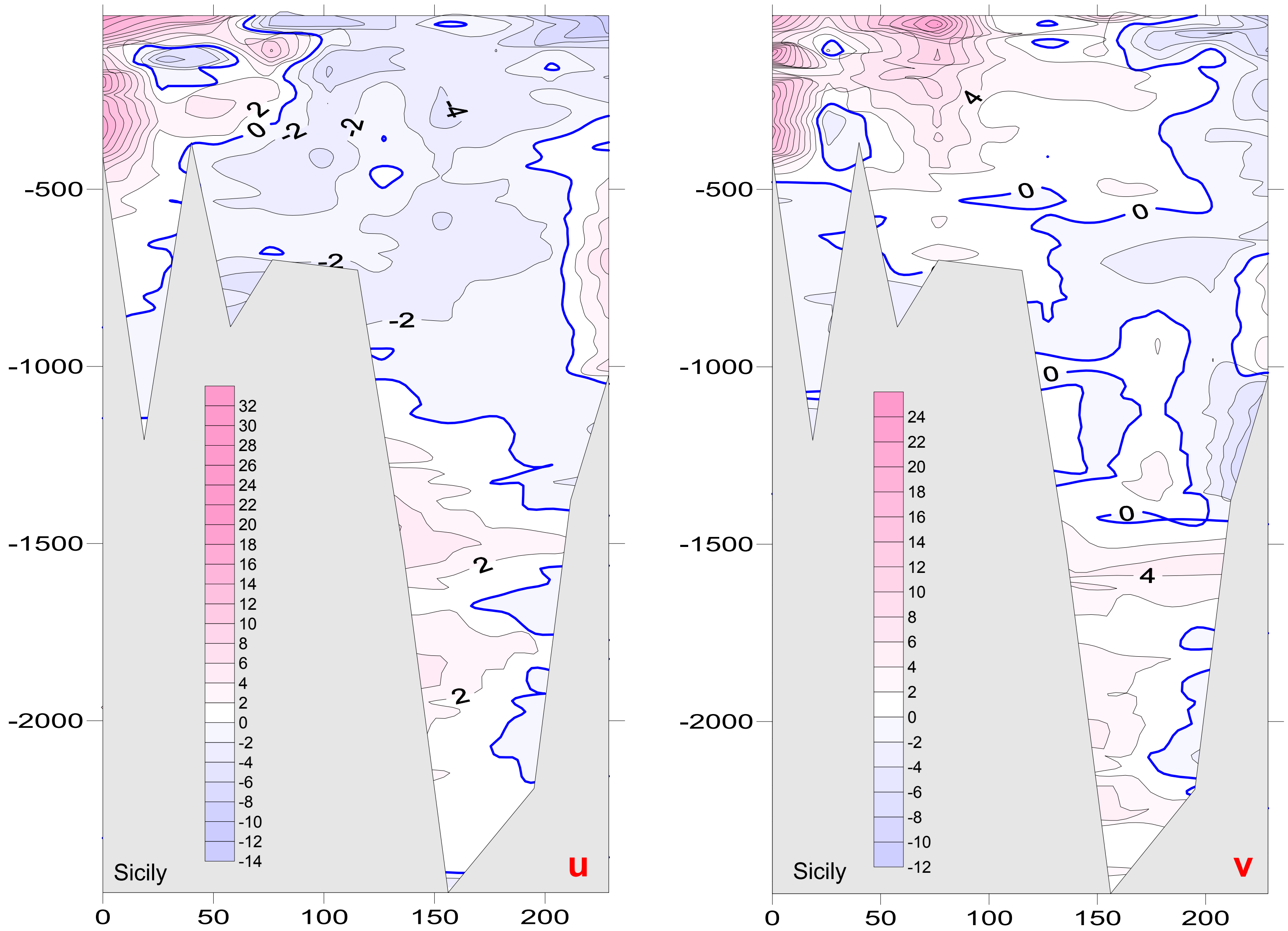


Figure 43 Velocity sections of the north and the east components, respectively u and v, in the Sardinia - Sicily passage

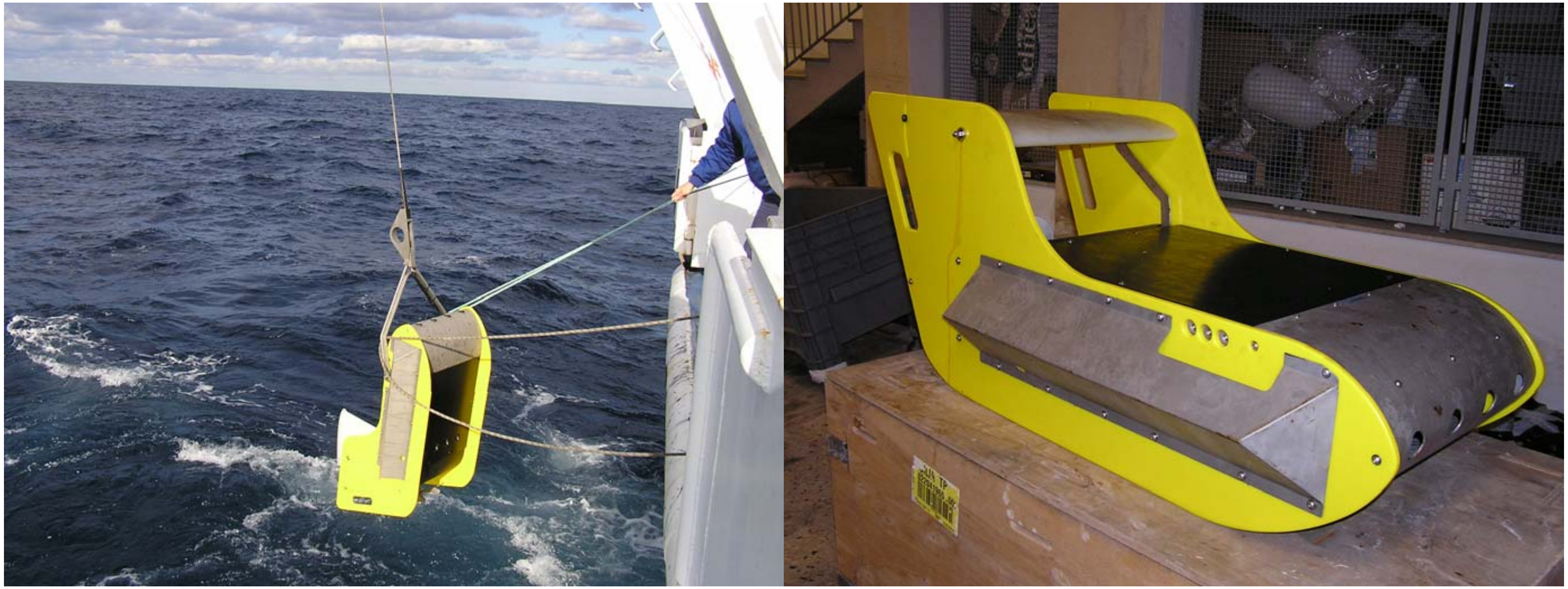


Figure 43 Nv Shuttle

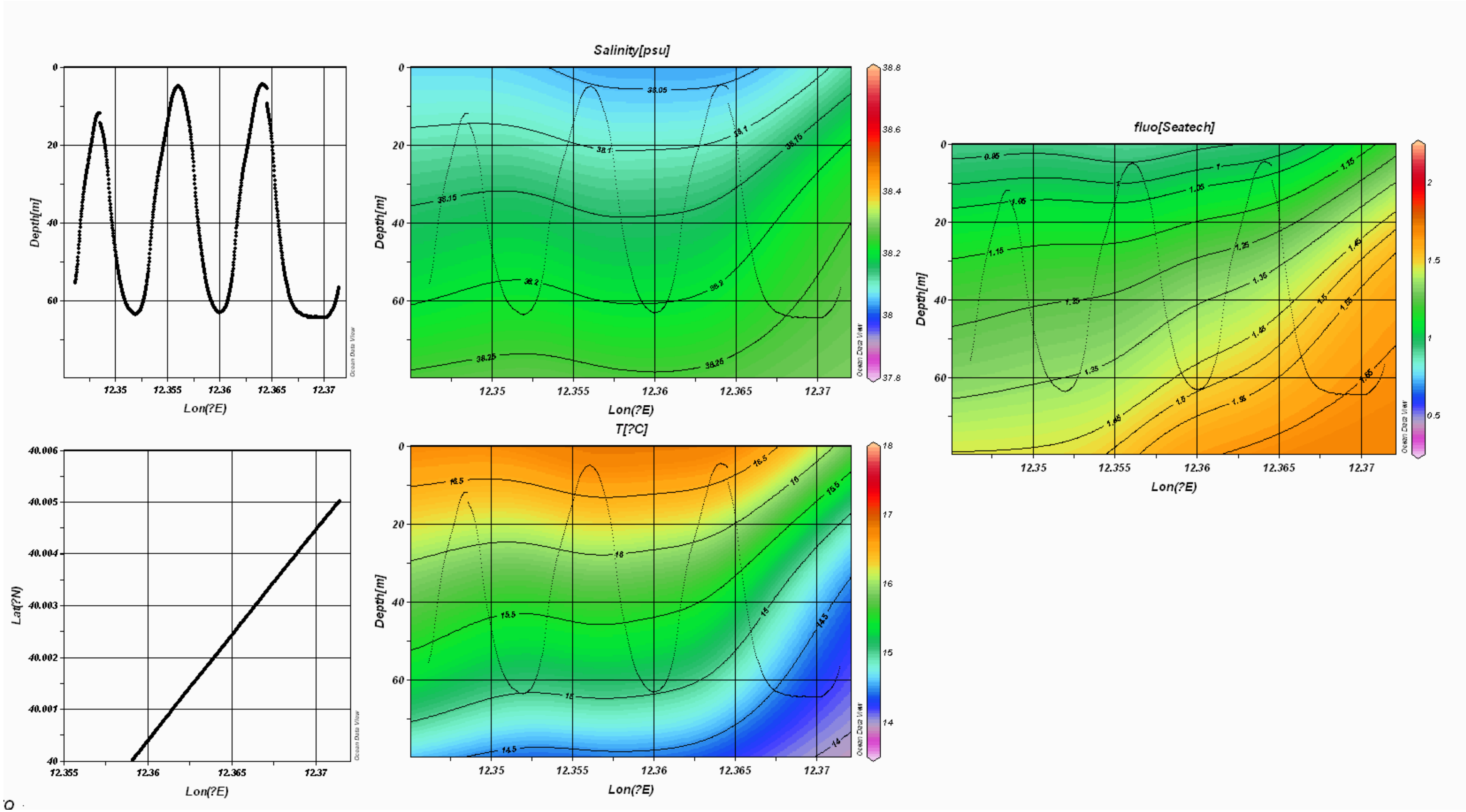


Figure 44 Nv Shuttle temperature, salinity and fluorescence profiles

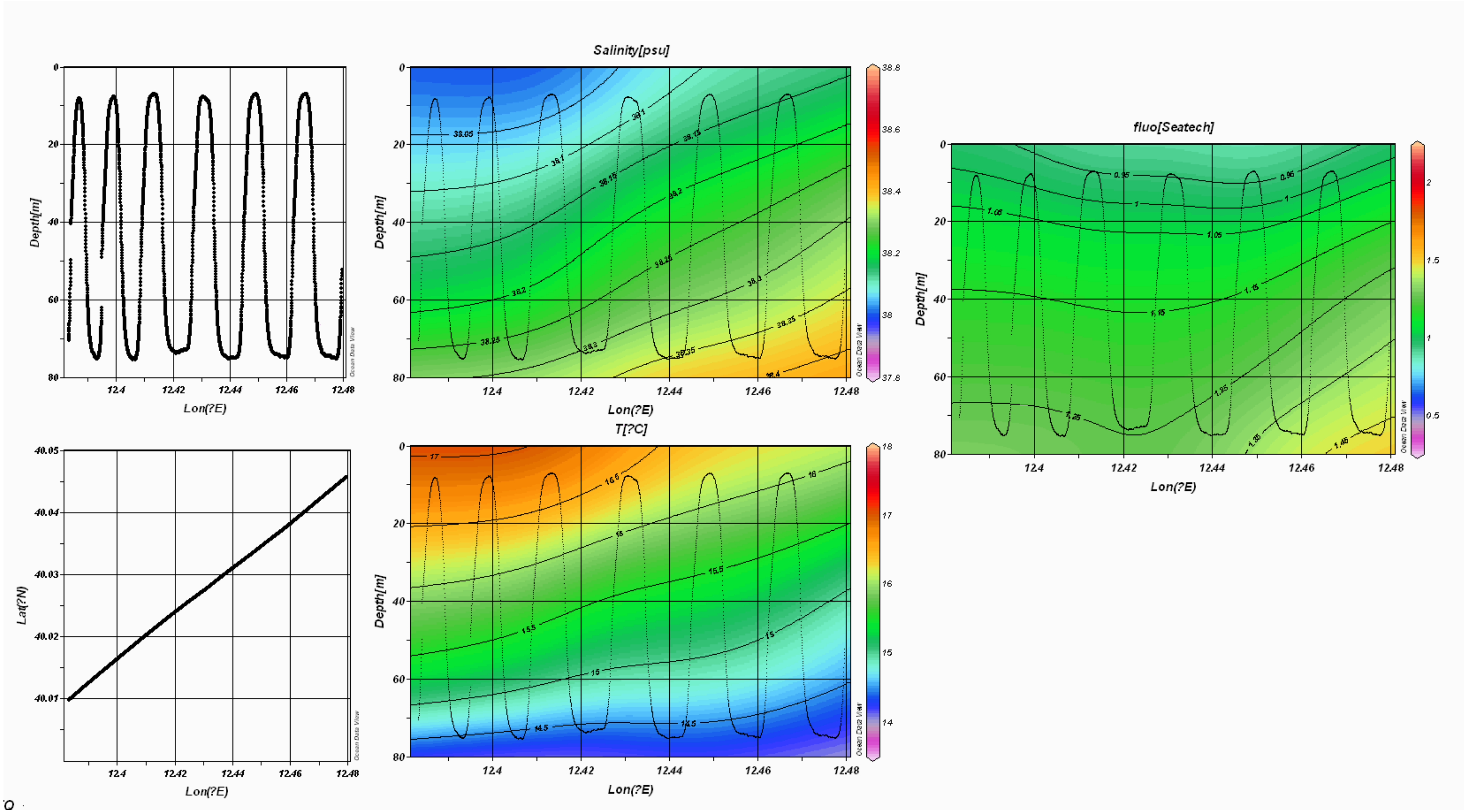
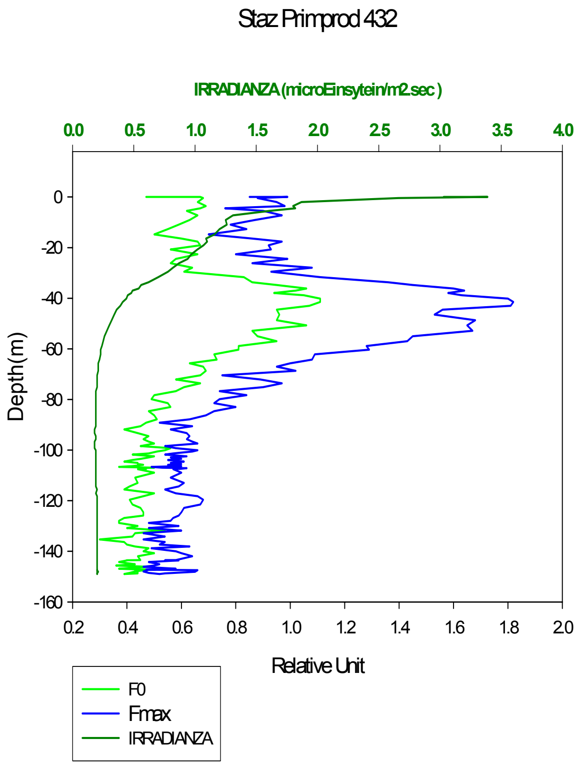
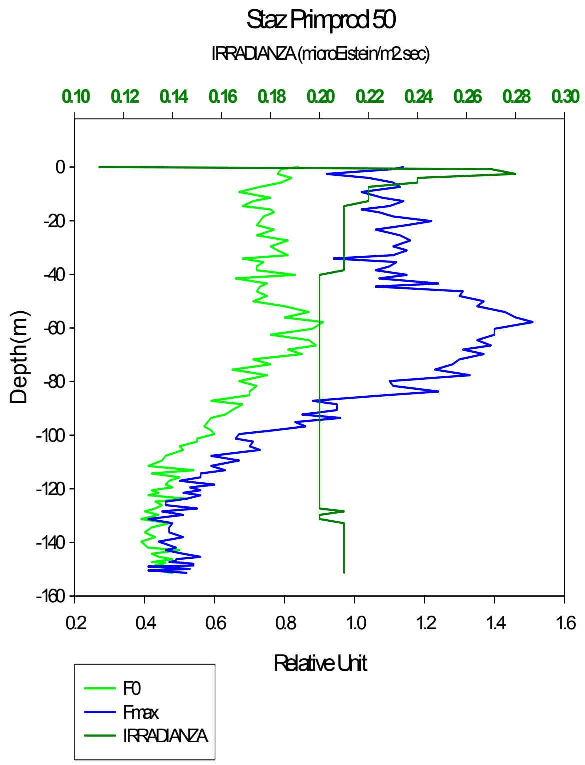
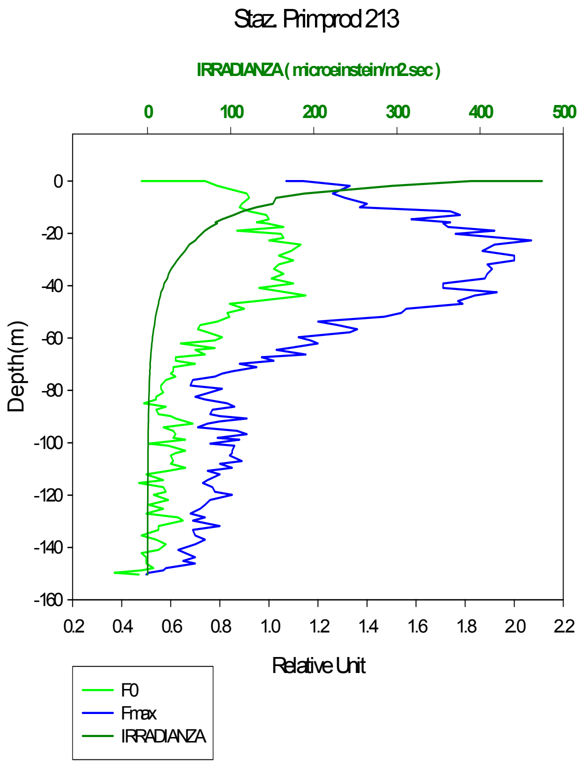


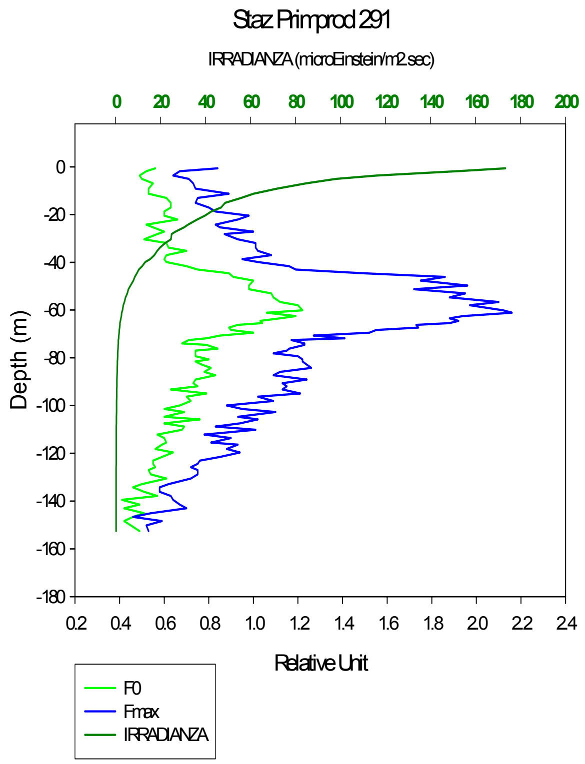
Figure 45 Nv Shuttle temperature, salinity and fluorescence profiles

Prim Prod Station









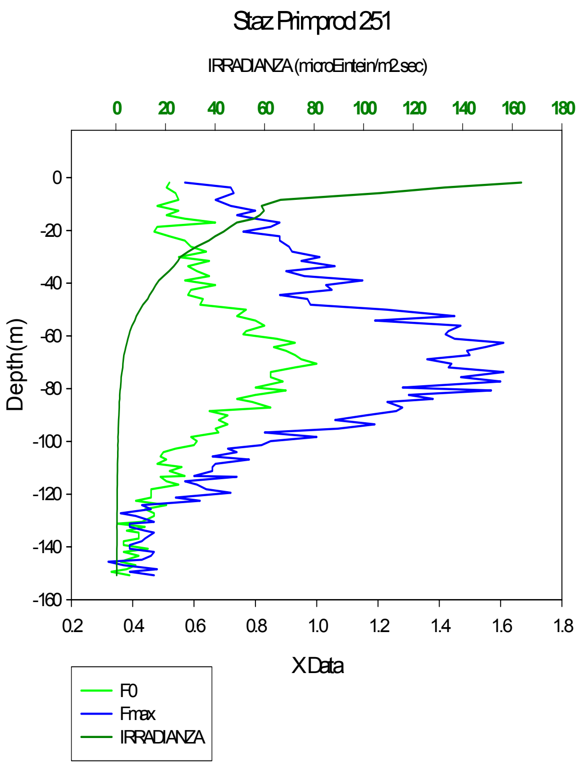


Figure 46 PrimProd fluorescence and irradiance profiles

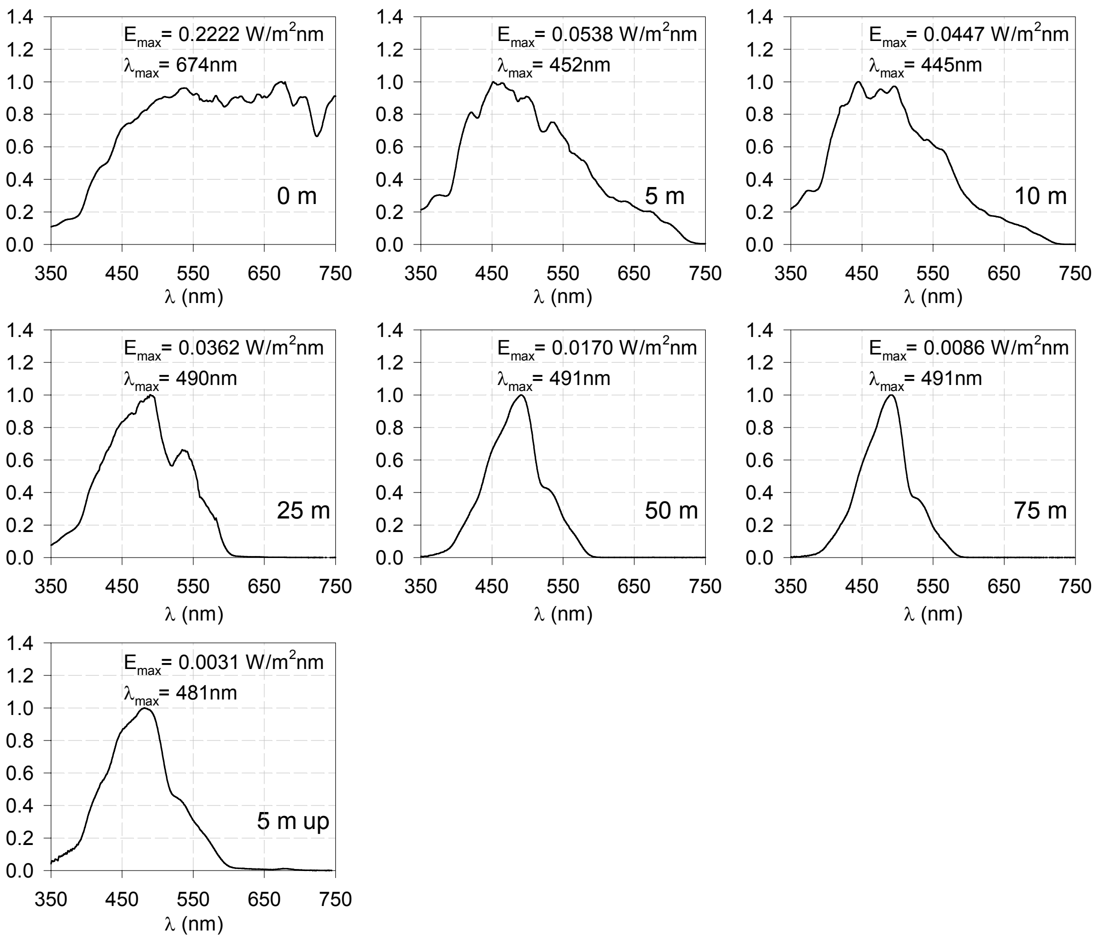


Figure 47 PAR irradiance measured at station 432

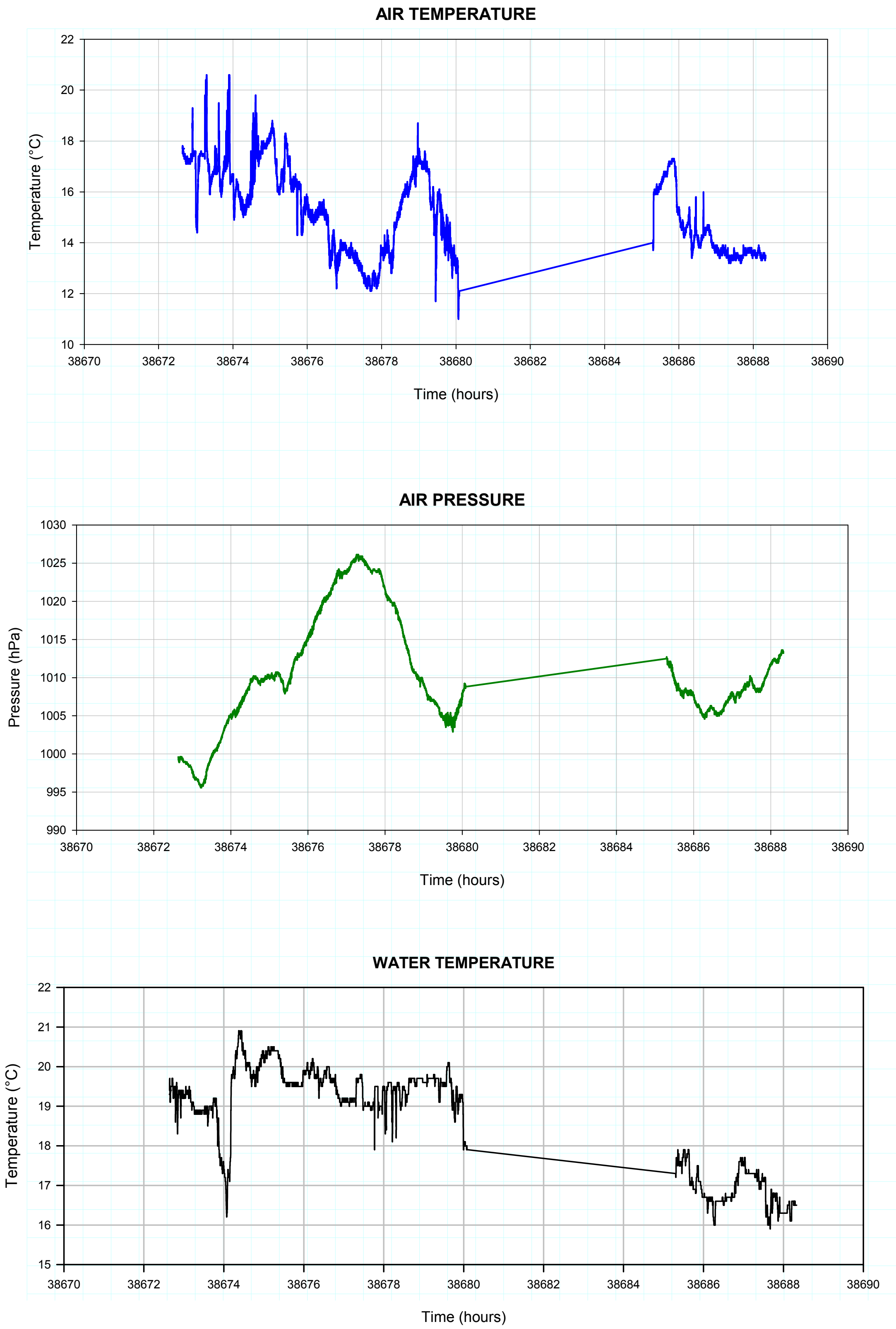


Figure 48 Meteorological data during cruise Medgoos11

Figure Caption

Acknowledgements

The scientific staff of MEDGOOS11 wishes to thank the Italian National Research Council (CNR), which made the R/V URANIA available for the cruise.
We also owe thanks to the Captain, the Officers and the Crew of the URANIA, without whose cooperation this work could not have been carried out.