

Daily Current Series from the Deep Eastern Gotland Basin (1993 – 2008)

E. Hagen and G. Plüschke

1. Introduction

This report presents data of current measurements initiated by three research projects of the Institute for Baltic Sea Research Warnemuende (IOW) to study low-frequency fluctuations in deep currents of the Eastern Gotland Basin. The first of them was the interdisciplinary ‘Gotland Basin Experiment’ (GOBEX, 1993-1996), cf. Hagen (1996), Zülicke & Hagen (1997), and Emeis & Struck (1998). The second one focused on hydrographic phenomena expected on spatial scales with a diameter of several kilometres. It was denoted ‘Meso-Scale Dynamics’, (MESODYN, 1997-2000) and is described in more detail by Reißmann (1999), Hagen & Feistel (2001), and Reißmann (2005). Related field campaigns focused on spatiotemporal changes in thermohaline properties of the deep mass field and associated circulation patterns in the Arkona Basin, the Bornholm Basin, the Stolpe Furrow, and the Eastern Gotland Basin (EGB). Unfortunately, intense fishing activities prevented long-term records of currents in the three shallower basins. Consequently, such measurements were carried out preferentially in deep layers of the EGB although the existence of hydrogen sulphide required special mooring techniques. Logistic frame conditions limited all long-term current records at only one position located above the north-eastern topographic flank of the deep EGB denoted NE-1 and NE in Fig.1. These activities could be continued during the third project denoted ‘Deep Rim Currents in the Eastern Gotland Basin’ (RAGO, 2006 -2008) residing in its synthesis-stage. Other long-term records of deep currents came from biological studies carried out in the central EGB between 2004 and 2007. One Aanderaa recording current meter (RCM) was mounted few metres beneath a sediment trap moored in vicinity of the central HELCOM monitoring station 271 (57°20’N, 20°03’E) where the overall water depth is about 245 m, Reißmann (1999). Records from this position are labelled ‘CENTRAL’ in this report, Fig.1. Due to different recovering/ deployment episodes of related sediment traps and slight changes in the overall water depth around the target depth, the actual measuring horizon of this RCM fluctuated by few metres. However, such little discrepancies have been neglected and these measurements are considered to be 60 m above the bottom. All other sub-surface strings were equipped with 3-5 RCMs at positions echo-sounded to be in the range between 200 and 240 m, depth, Fig.1. The only exception was the string deployed at 70 m depth above the southern flank of the so-called ‘Klints Bank’ during four days in April 1998. For completeness, these series have been included on the base of hourly averages.

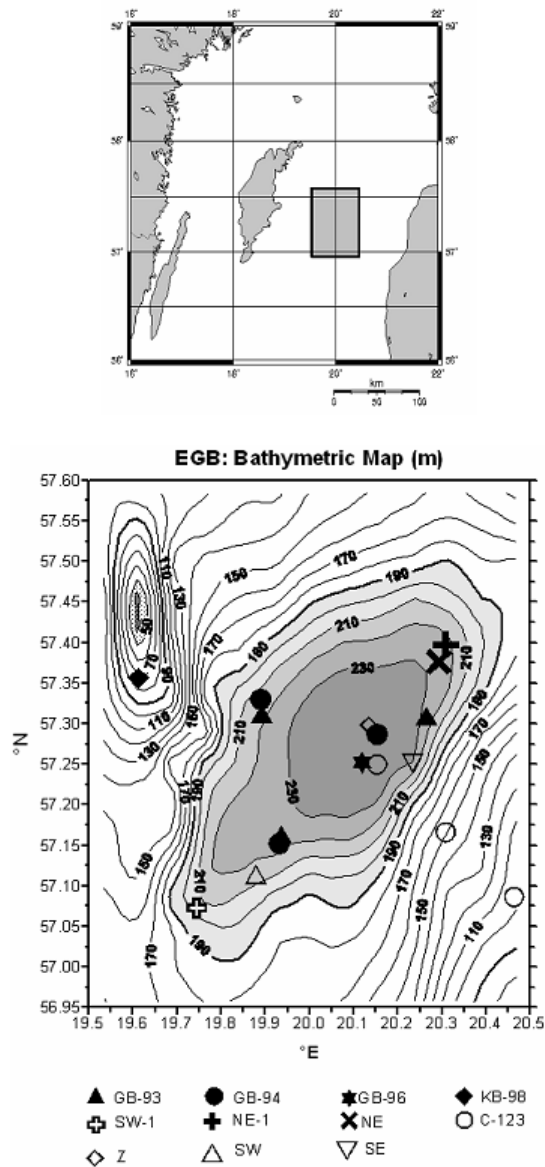


Fig.1
 Study area in the central Eastern Gotland Basin (upper panel) and its bathymetric contours (m) showing shallow water areas of the ‘Klints Bank’ as well as the so-called ‘Gotland Deep’ in the centre; positions of moored sub-surface strings were equipped with Aanderaa recording current meters during several field campaigns carried out between 1993 and 2008 whereby assigned projects and used string abbreviations are compiled in Table 1.

The schematic of exposed sub-surface strings, which were equipped with three RCMs at the mooring position denoted NE-1 and NE in Fig.1, is shown exemplary in Fig.2. Their position was seen to be suitable to study low-frequency changes in deep rim currents.

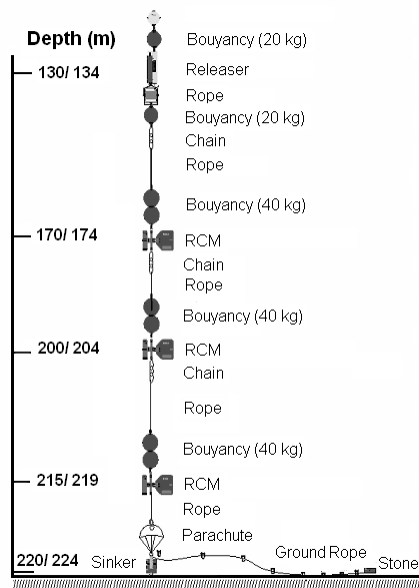


Fig.2
Schematic of sub-surface strings equipped with three recording current meters (RCM) deployed at the positions NE-1/ NE shown in Fig.1.

| Project | Identifier | Start | End | Days | Strings | Levels |
|-----------|--------------|------------|------------|--------|---------|---------|
| GOBEX | GB-93(1/2/3) | 30.11.1993 | 11.12.1993 | 12 | 3 | 3/ 2/ 3 |
| | GB-94(1/2/3) | 12.08.1994 | 25.09.1994 | 45 | 3 | 1/ 3/ 3 |
| | GB-96 | 07.03.1996 | 02.06.1996 | 88 | 1 | 1 |
| MESODYN | SW-1 | 30.08.1997 | 14.09.1998 | 381 | 1 | 1 |
| | NE-1 | 30.08.1997 | 20.07.1998 | 325 | 1 | 1 |
| | KB-98 | 26.04.1998 | 27.04.1998 | 2 | 1 | 5 |
| | C-00(1/2/3) | 20.04.2000 | 29.04.2000 | 9/9/10 | 3 | 1/ 2/ 4 |
| CENTRAL | Z1 | 16.11.2004 | 14.02.2005 | 101 | 1 | 1 |
| | Z2 | 02.11.2005 | 30.10.2007 | 729 | 1 | 1 |
| RAGO | SW | 08.05.2006 | 29.03.2007 | 326 | 1 | 3 |
| | SE | 08.05.2006 | 29.03.2007 | 326 | 1 | 3 |
| Long-Term | NE | 31.08.1999 | 30.03.2008 | | 1 | 3 |
| | NE-P1 | 01.05.2000 | 30.10.2005 | 2009 | 1 | 2 |
| | NE-P2 | 09.05.2002 | 19.10.2003 | 529 | 1 | 3 |
| | NE-P3 | 23.03.2004 | 30.10.2005 | 587 | 1 | 3 |
| | NE-P4 | 28.09.2006 | 21.12.2007 | 450 | 1 | 3 |
| | NE-L | 31.08.1999 | 30.10.2005 | 2253 | 1 | 1 |

Table1.
Project abbreviation, mooring identifier, starting and ending day of resulting series, overall length, the number of deployed strings, and the number of associated measuring levels at positions labelled in Fig.1.

2. Data Base

Mechanically operating current meter types RCM-7/8 exhibit a resolution of ± 1 cm/s while that of the electronic type RCM-9 is better by the factor of about three (± 0.3 cm/s). The used sampling interval (SI) resulted from particular project-tasks and varied between 1 minute (short-term records) and 1 hour (long-term records). Resulting time-series of current speed and current direction were decomposed into those of the zonal component (u, positive to the east) and the meridional component (v, positive to the north). All records, which were based on sampling rates shorter than an hour, were transformed into hourly series. These hourly series were used to compute the daily averages pointing to the UTC-noonday. Missing data were completed by linear interpolation between neighbouring values. Such gaps of 3-4 hours were caused by the time needed for recovering and deploying consecutive strings. Resulting recording lengths are shown in Fig.3.

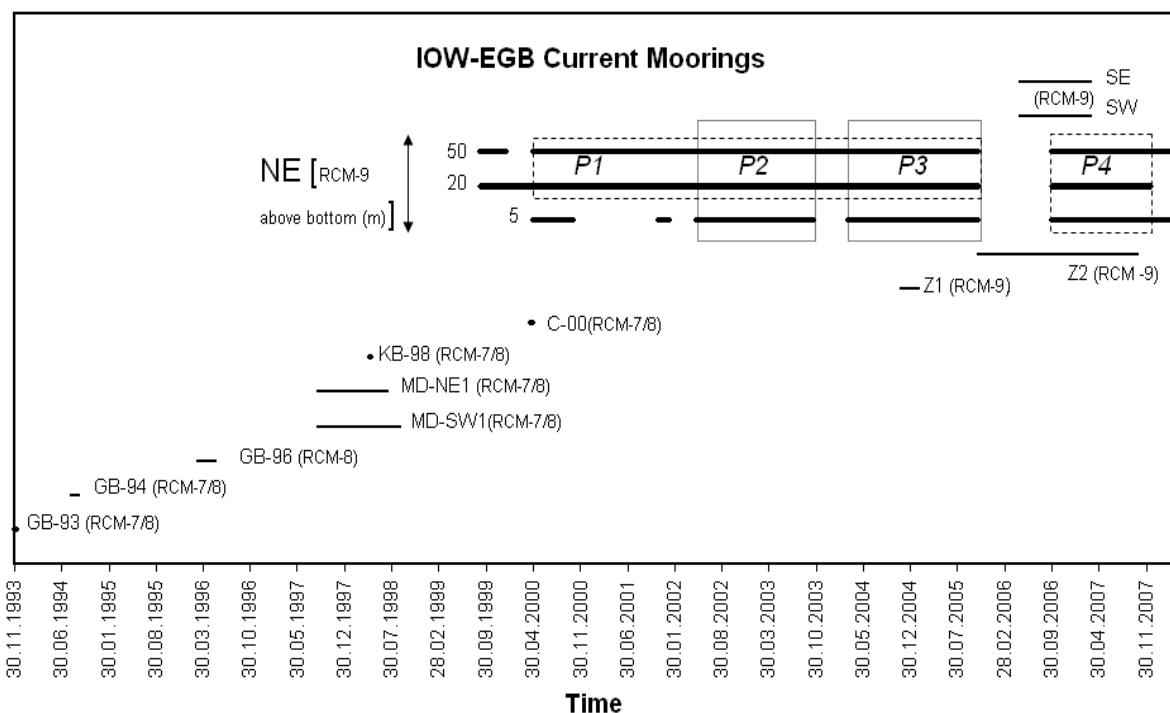


Fig.3

Lengths of daily current series recorded by Aanderaa recording current meters (RCM-7/8/9) within deep layers of the Eastern Gotland Basin at positions shown in Fig.1; long-term series only result from the position NE equipped with three RCMs mounted at 5, 20, and 50 m above the sea bed (220/ 224 m) as shown schematically in Fig.2; complete measuring periods for all three horizons are labelled P2, P3, and P4 while P1 reflects a somewhat longer series from two RCMs deployed 20 and 50 m above the bottom; the longest continuous time series (denoted NE-L in Table 1) covers 2253 days and results from the 20m-horizon.

In the following, the presentation of each measuring campaign starts with a map showing bathymetric contours and the corresponding string position. The accompanying table explains the mooring identifier (project/ campaign/ string abbreviation), the position ($^{\circ}$ N, $^{\circ}$ E), the water depth (m), the sampling interval (SI, min=minute, h=hour), and the first and the last complete measuring day. Appropriate overall statistics include the recording length (N), the arithmetic mean, the standard deviation (STD), the skewness and the kurtosis (vanishing for a Gaussian frequency distribution), the maximum (Max.), the minimum (Min.), and the total range of fluctuations (Max.-Min.), cf. Wilks (1995).

Daily series of both current components are plotted versus the time to elucidate roughly the variability in zonal (u) and meridional currents (v) while progressive vector diagrams (PVD) characterize the time history of currents at different measuring horizons labelled by their distance above the sea bed. Different sub-series of the presented data sets were used in previously published studies, frequently in context to corresponding temperature records and snapshot surveys of quasi-synoptic hydrographic surveys, cf. Mittelstaedt (1996), Stips (1996), Zülicke et al (1998), Feistel et al (2003a), Feistel et al (2003b), Hagen & Feistel (2004), Feistel et al (2004), Hagen (2005), Reissmann (2006), Feistel et al (2006), Hagen & Feistel (2007), and Wieczorek et al (2008). Finally, the longest continuous record of deep currents (NE-L, 2253 days, 20 m above the sea bed) is presented by several supplementary graphs to give a certain impression about characteristic temporal scales at this position. All daily series of zonal/meridional current components, which are tabulated in Table 1, have been attached in the appendix by EXEL-spreadsheets.

Acknowledgements

We like to express our gratitude to all scientists in charge of the IOW-HELCOM-Baltic-Monitoring-Programme (COMBINE) conducted on behalf of the ‘Bundesamt für Seeschifffahrt und Hydrographie (BSH)’. They always supported the mooring activities carried out during many years at the NE-position. Dr. Falk Pollehne and U. Hehl kindly replenished data from the campaign ‘CENTRAL’. The project ‘GOBEX’ was partially funded by the ‘Kultusministerium Mecklenburg-Vorpommern’ (contract 0710, MG04, 68101-05) and records of the measuring campaign GB-93 were kindly provided by Dr. E. Mittelstaedt (BSH-Hamburg). Activities of the project ‘MESODYN’ were organizationally accompanied by the Federal Ministry of Education, Scientific Research and Technology of Germany (BMBF), while the still running project RAGO was broadly financed by the ‘Deutsche Forschungsgemeinschaft (DFG, No HA 1900/3-2)’.

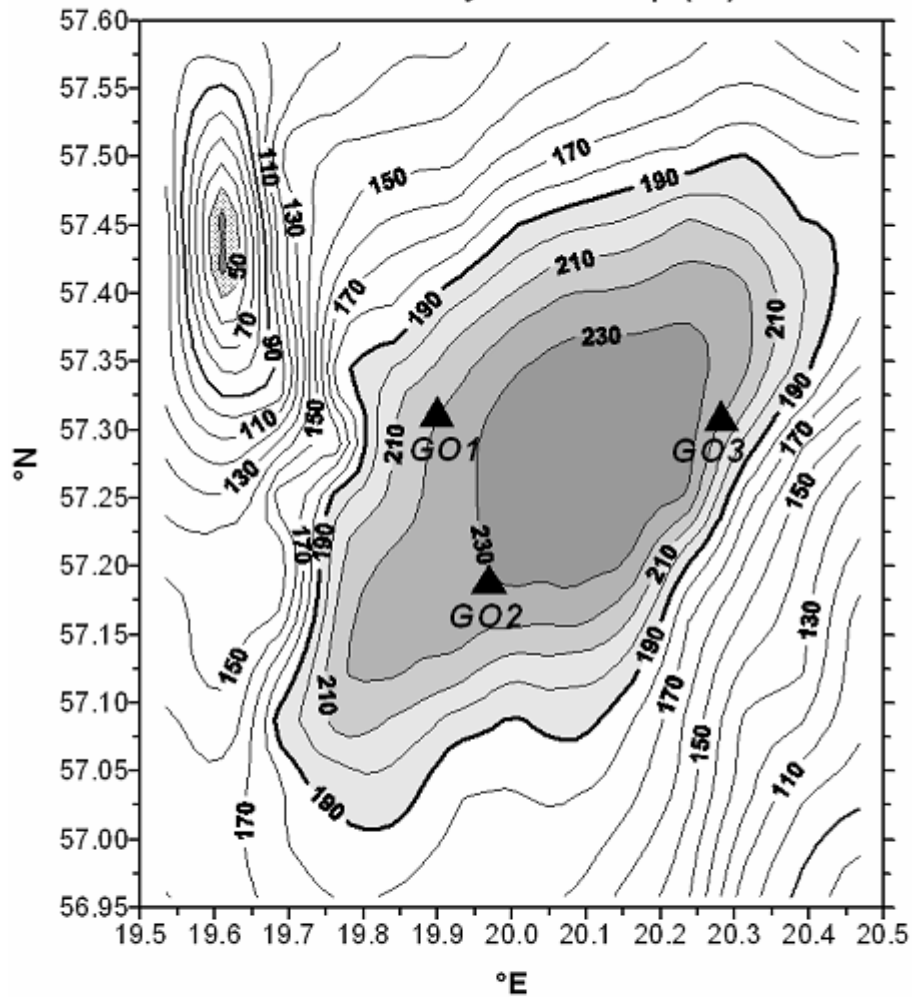
3. References

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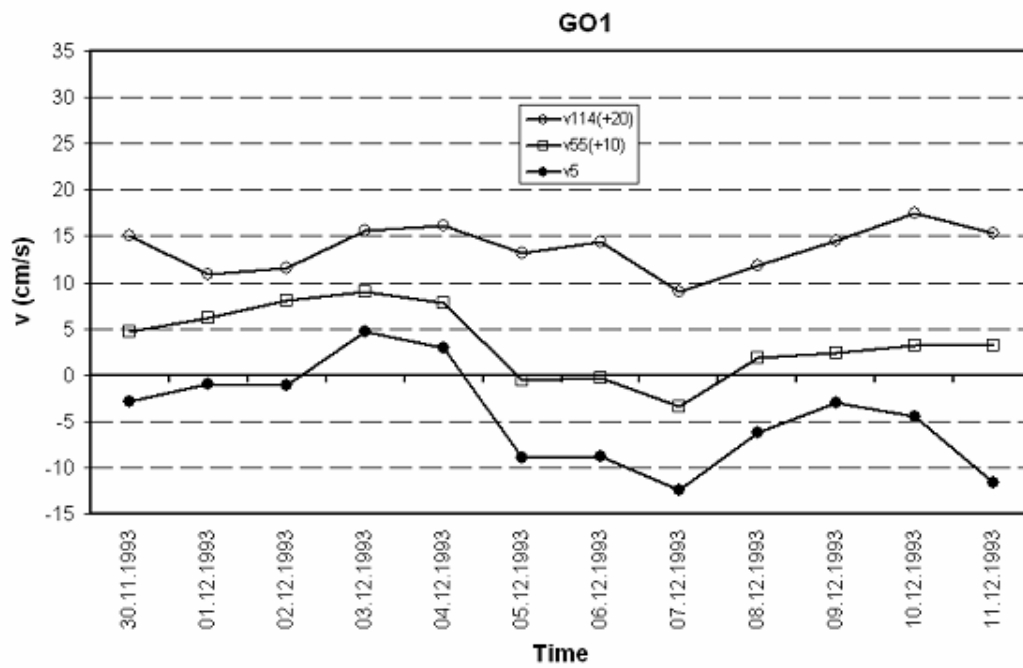
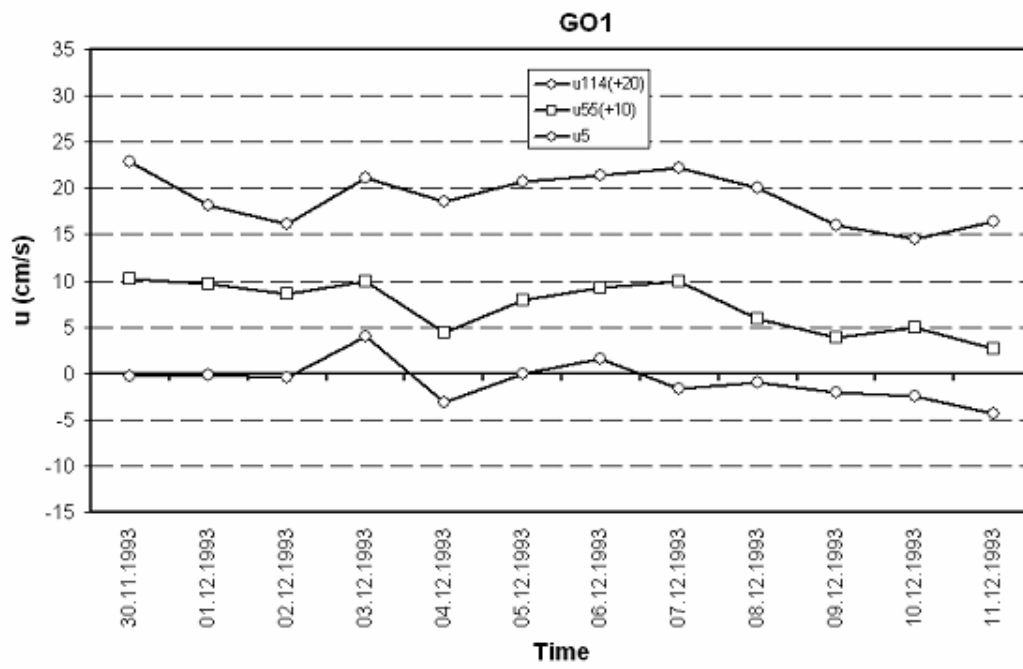
4. Graphics

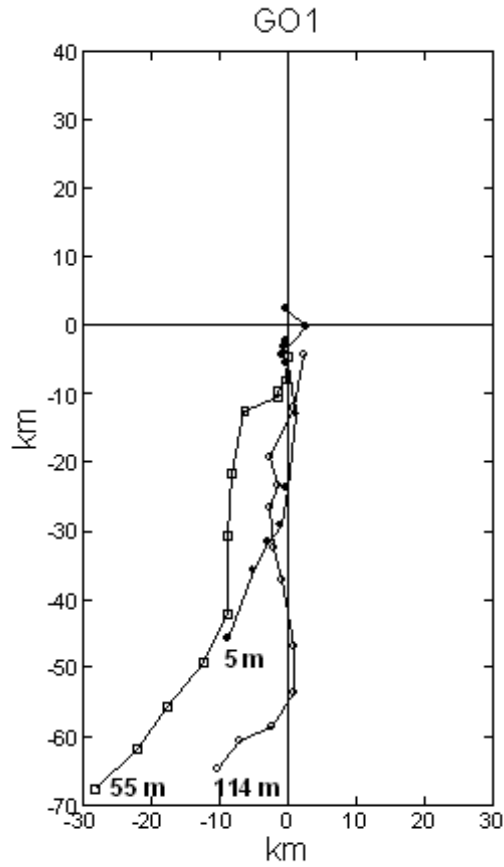
GB-93

EGB: Bathymetric Map (m)

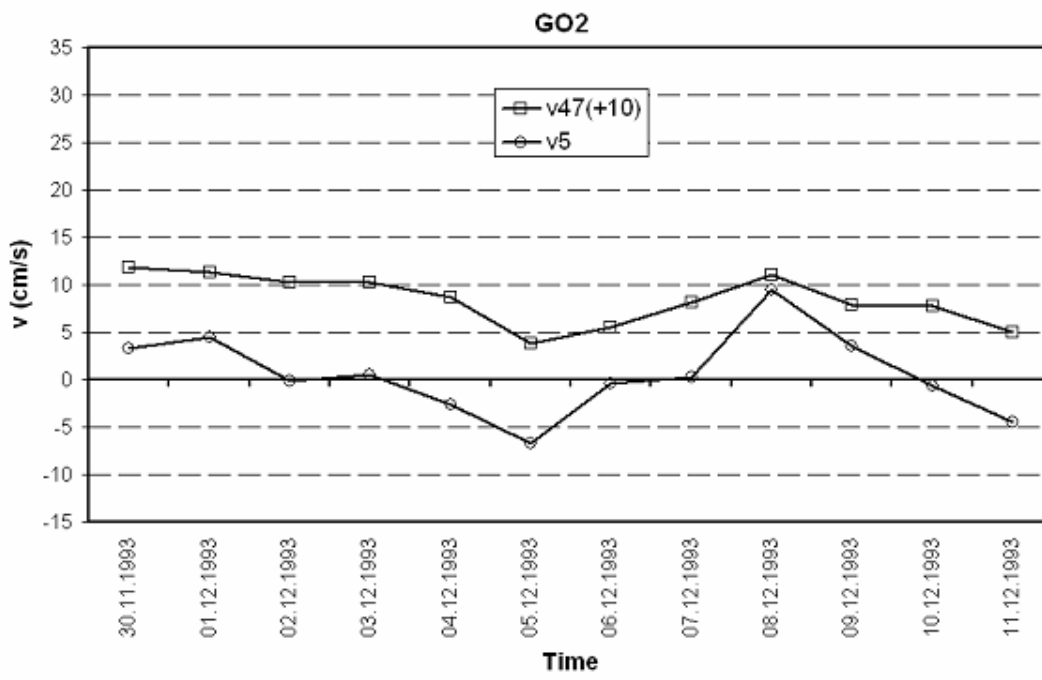
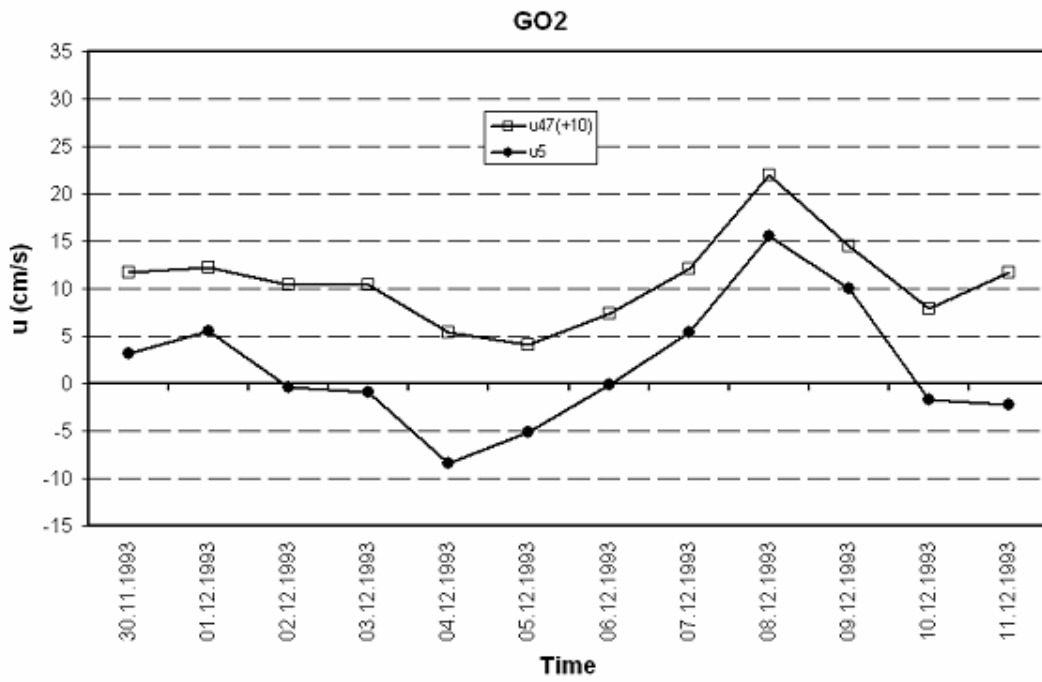


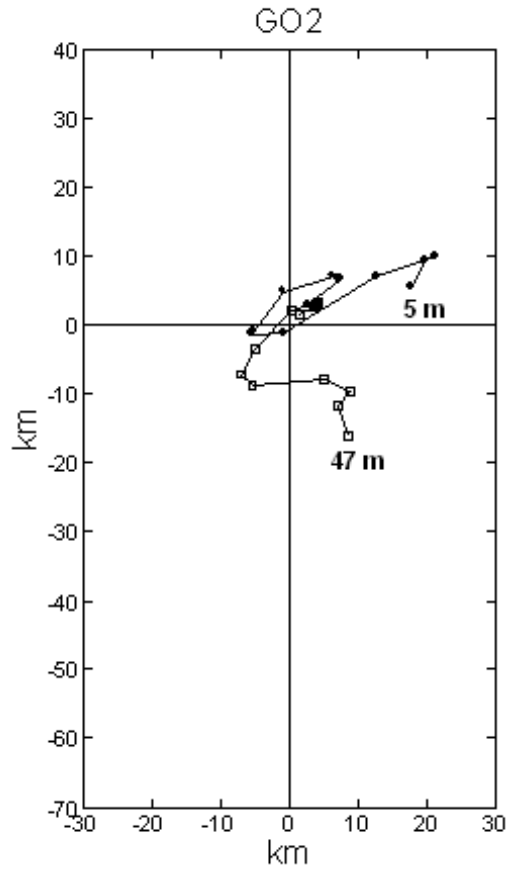
| | GO1 | GO2 | GO3 |
|-----------|------------|------------|------------|
| Lat.(°N) | 57°19' | 57°10' | 57°19' |
| Long.(°E) | 19°53' | 19°56' | 20°19' |
| Depth (m) | 220 | 230 | 220 |
| SI (min) | 10 | 10 | 10 |
| Start | 30.11.1993 | 30.11.1993 | 30.11.1993 |
| End | 11.12.1993 | 11.12.1993 | 11.12.1993 |





| GO1-93 | u114 | v114 | u55 | v55 | u5 | v5 |
|------------------|-------|--------|-------|--------|-------|--------|
| Above Bottom (m) | | | | | | |
| N (d) | 12,00 | 12,00 | 12,00 | 12,00 | 12,00 | 12,00 |
| Mean (cm/s) | -0,99 | -6,25 | -2,74 | -6,53 | -0,84 | -4,42 |
| STD (cm/s) | 2,77 | 2,48 | 2,75 | 3,81 | 2,22 | 5,42 |
| Skewness | -0,19 | -0,42 | -0,40 | -0,17 | 0,60 | 0,09 |
| Kurtosis | -1,31 | -0,74 | -1,44 | -0,91 | 0,27 | -0,96 |
| Min. (cm/s) | -5,53 | -10,99 | -7,28 | -13,41 | -4,38 | -12,50 |
| Max. (cm/s) | 2,86 | -2,48 | 0,15 | -1,06 | 4,05 | 4,69 |
| Range (cm/s) | 8,39 | 8,51 | 7,43 | 12,35 | 8,43 | 17,19 |

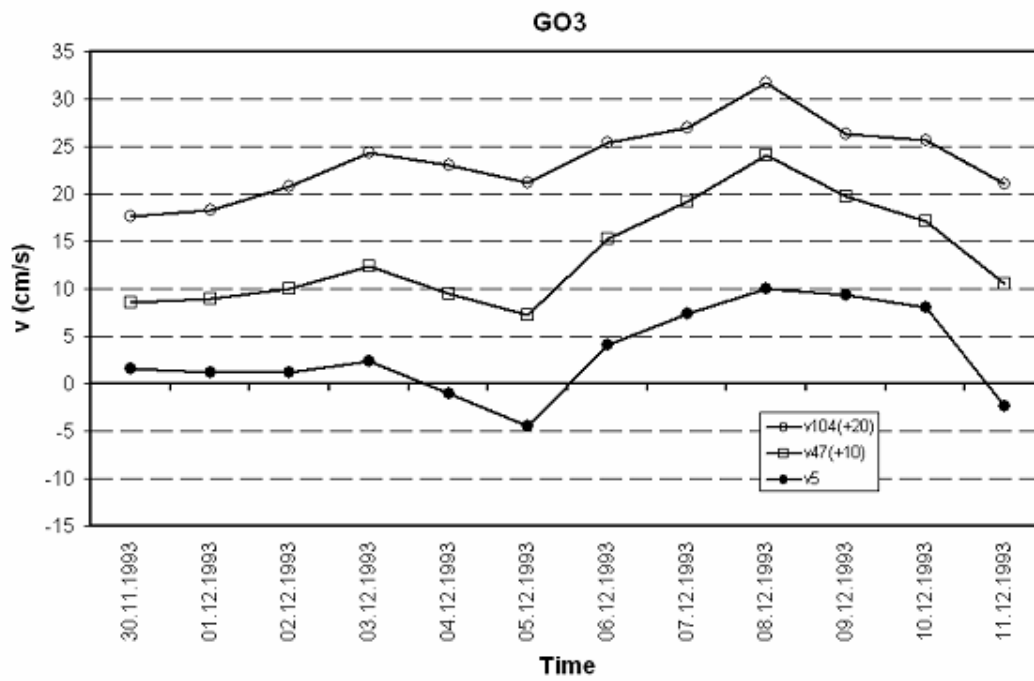
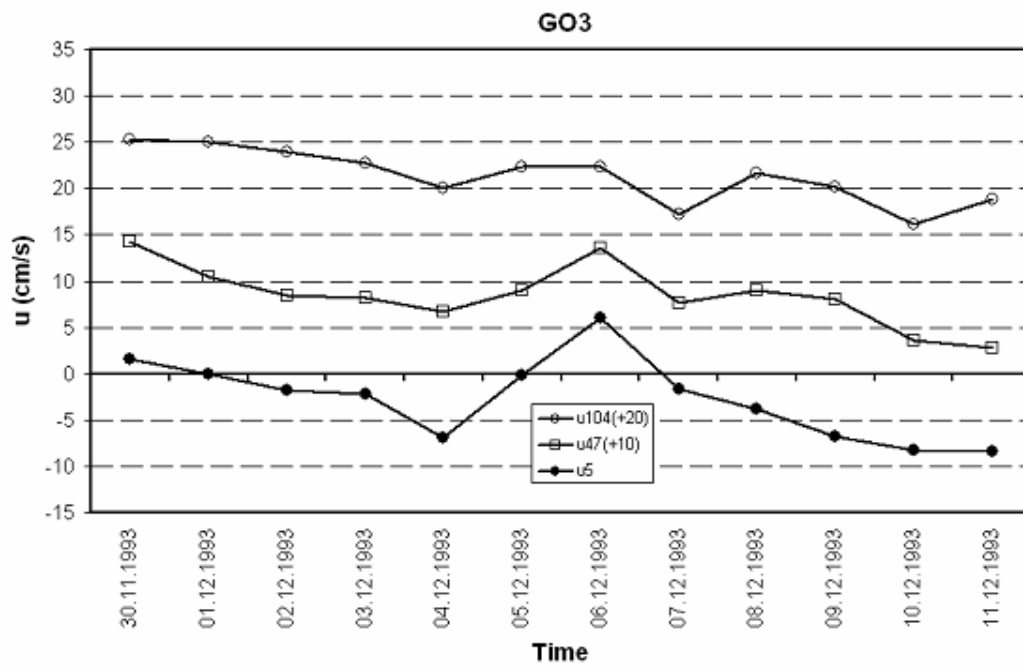


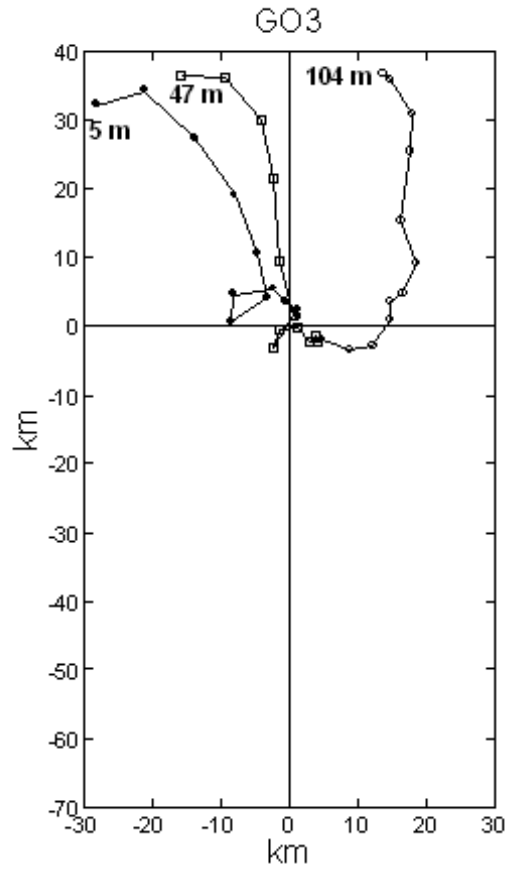


GO2-93

Above Bottom (m)

| | u47 | v47 | u5 | v5 |
|--------------|-------|-------|-------|-------|
| N (d) | 12,00 | 12,00 | 12,00 | 12,00 |
| Mean (cm/s) | 0,81 | -1,55 | 1,72 | 0,54 |
| STD (cm/s) | 4,66 | 2,64 | 6,62 | 4,29 |
| Skewness | 0,85 | -0,41 | 0,60 | 0,33 |
| Kurtosis | 0,94 | -1,02 | -0,17 | -0,04 |
| Min. (cm/s) | -5,97 | -6,24 | -8,38 | -6,67 |
| Max. (cm/s) | 11,95 | 1,80 | 15,57 | 9,43 |
| Range (cm/s) | 17,92 | 8,04 | 23,95 | 16,10 |

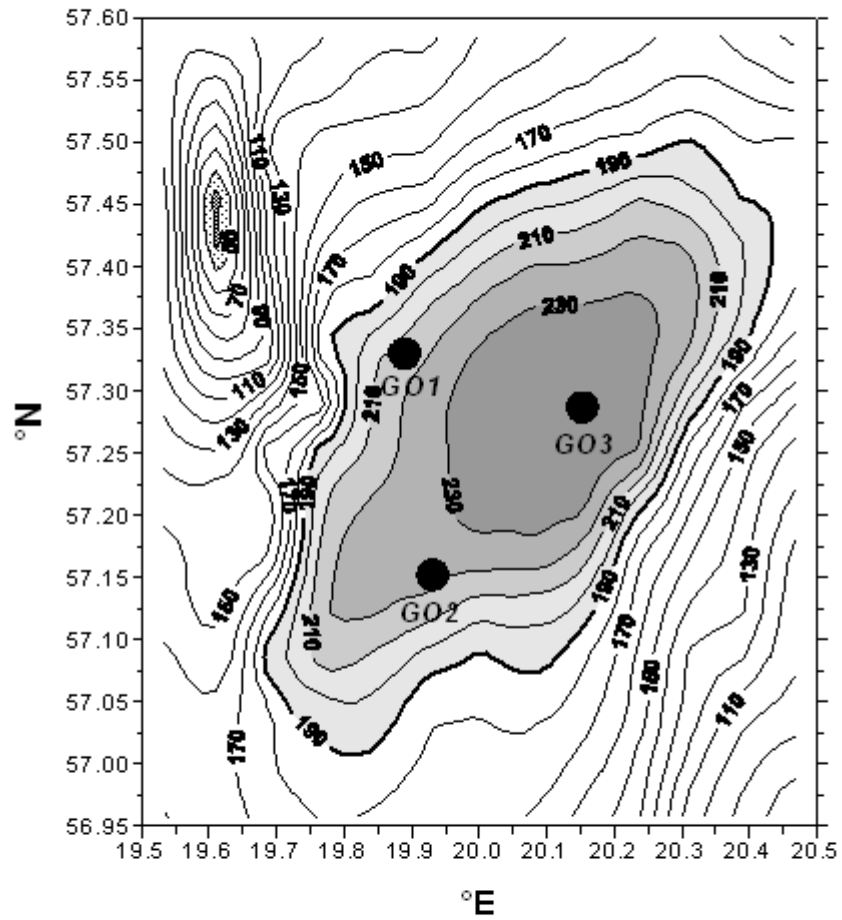




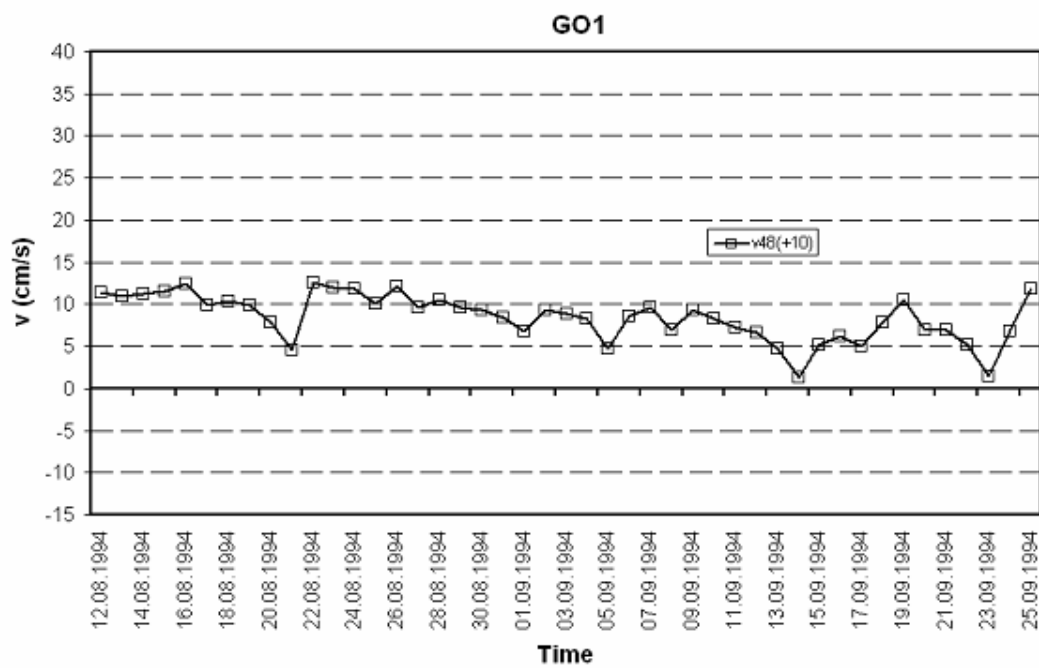
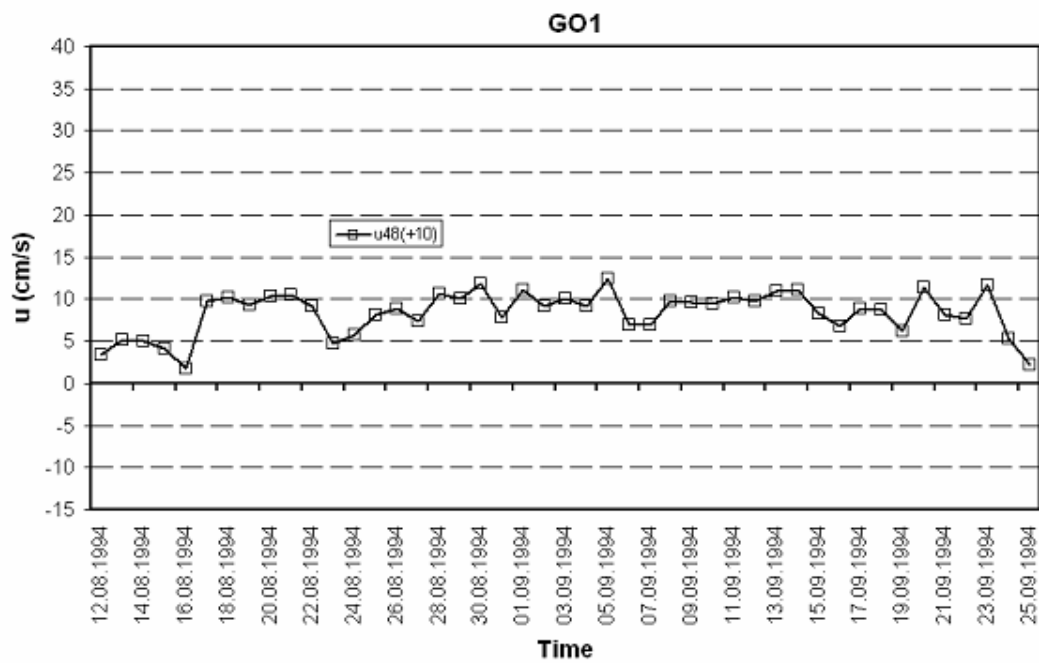
| G03-93 | u104 | v104 | u47 | v47 | u5 | v5 |
|------------------|-------|-------|-------|-------|-------|-------|
| Above Bottom (m) | | | | | | |
| N (d) | 12,00 | 12,00 | 12,00 | 12,00 | 12,00 | 12,00 |
| Mean (cm/s) | 1,31 | 3,54 | -1,53 | 3,53 | -2,72 | 3,10 |
| STD (cm/s) | 2,89 | 4,01 | 3,36 | 5,41 | 4,35 | 4,71 |
| Skewness | -0,34 | 0,34 | 0,06 | 0,62 | 0,34 | 0,07 |
| Kurtosis | -0,89 | -0,37 | -0,32 | -0,92 | -0,55 | -1,15 |
| Min. (cm/s) | -3,81 | -2,40 | -7,25 | -2,70 | -8,35 | -4,48 |
| Max. (cm/s) | 5,24 | 11,75 | 4,29 | 14,03 | 6,05 | 9,95 |
| Range (cm/s) | 9,05 | 14,15 | 11,54 | 16,73 | 14,40 | 14,43 |

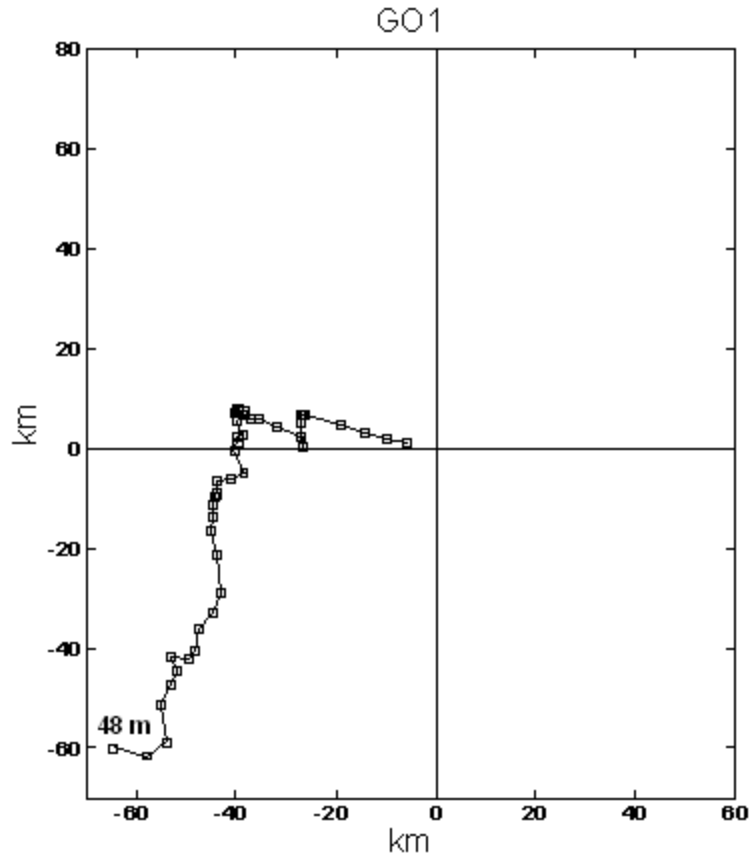
GB-94

EGB: Bathymetric Map (m)

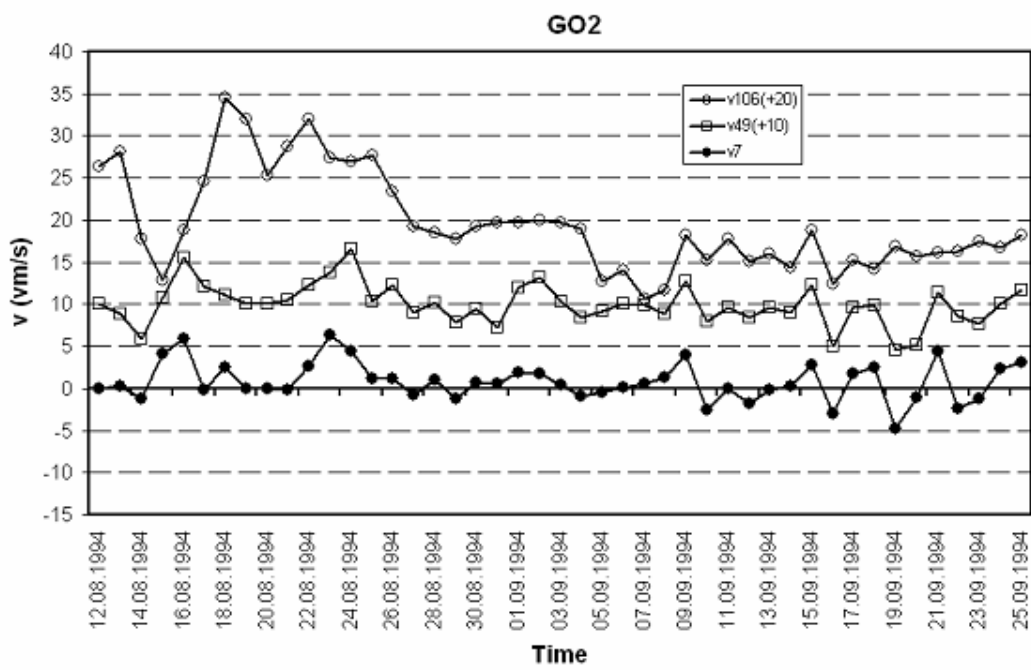
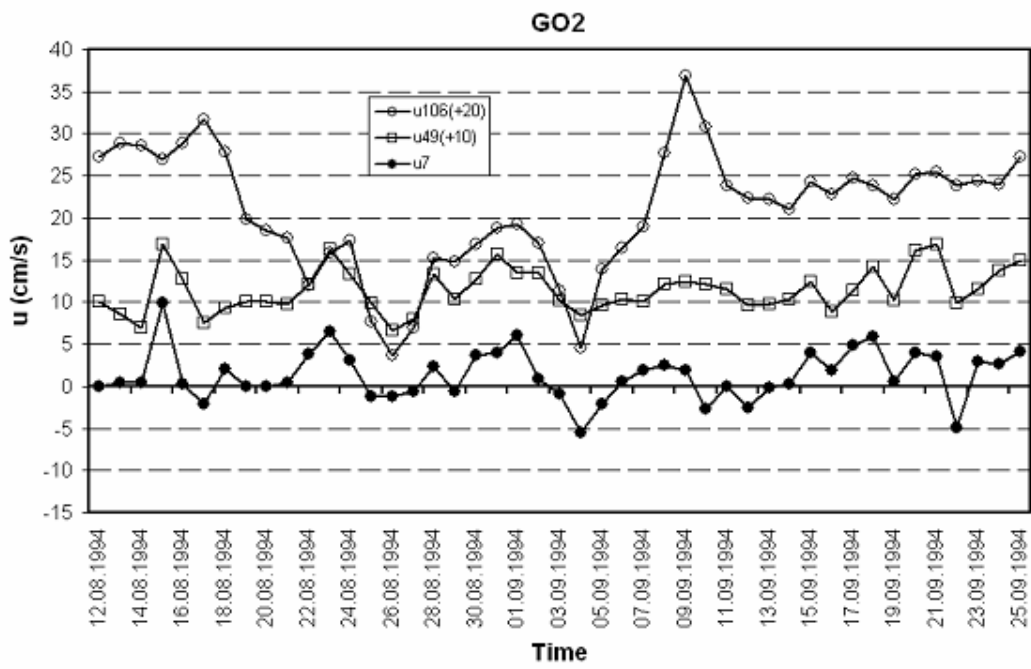


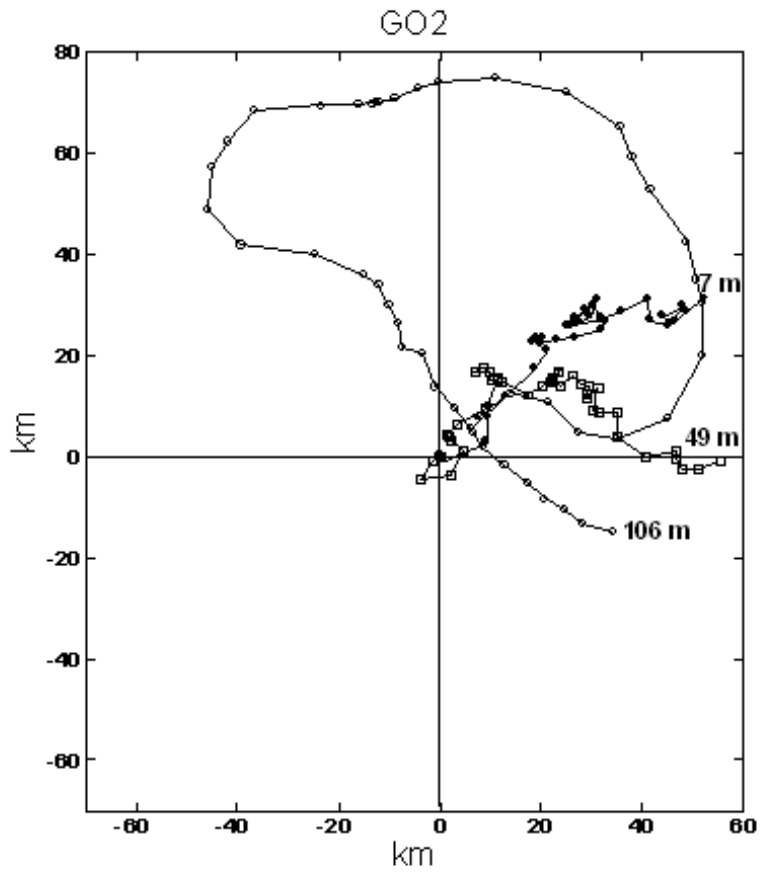
| | GO1 | GO2 | GO3 |
|-----------|------------|------------|------------|
| Lat.(°N) | 57°20' | 57°09' | 57°17' |
| Long.(°E) | 19°54' | 19°56' | 20°09' |
| Depth (m) | 217 | 225 | 243 |
| SI (min) | 10 | 10 | 10 |
| Start | 12.08.1994 | 12.08.1994 | 12.08.1994 |
| End | 25.09.1994 | 25.09.1994 | 25.09.1994 |





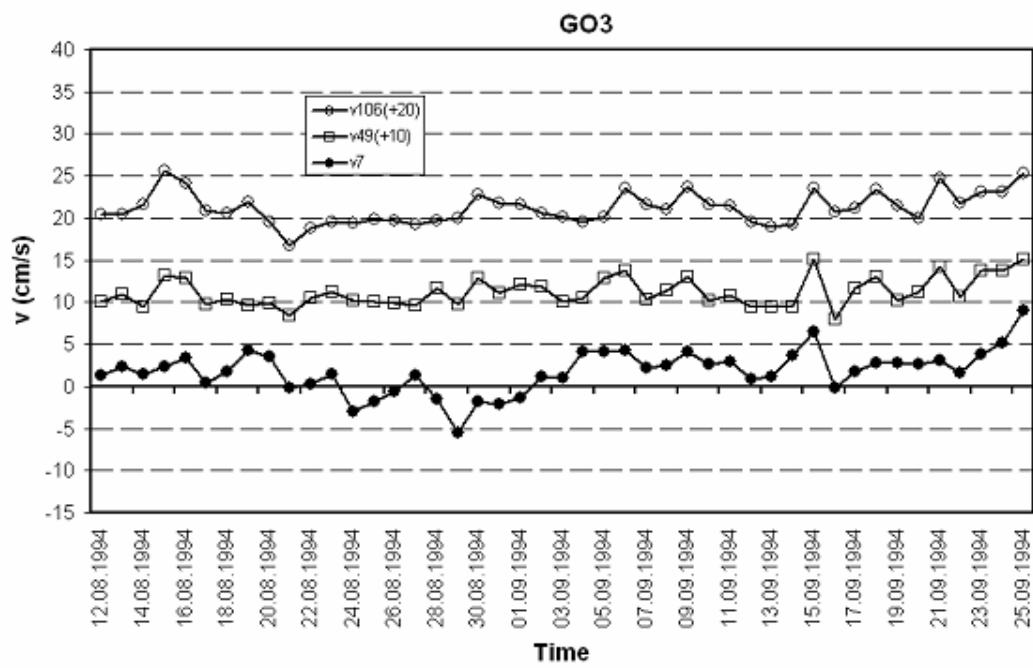
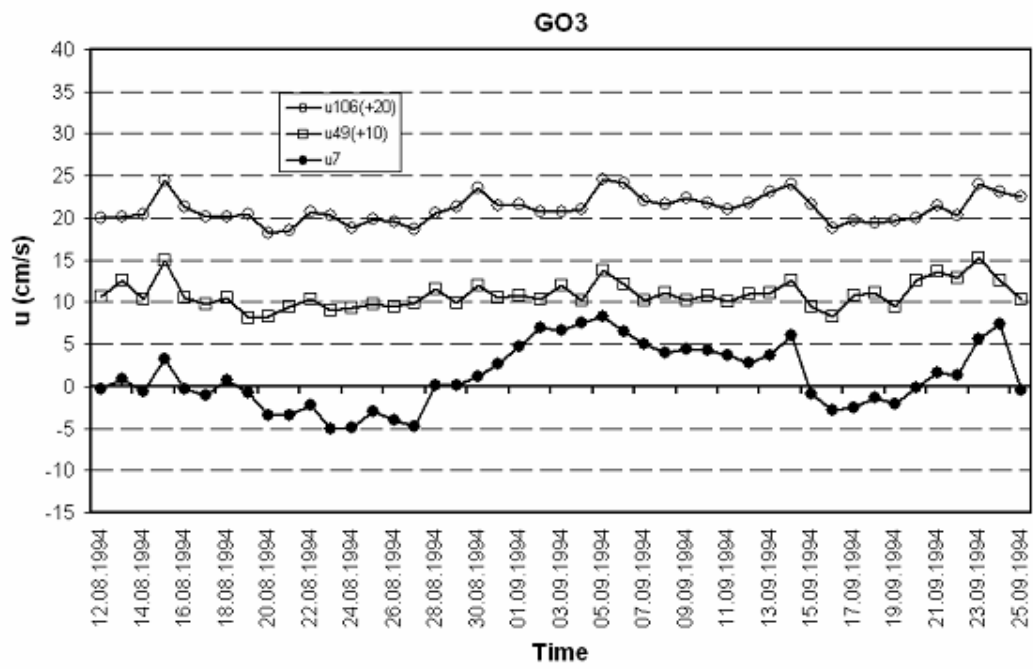
| | | |
|------------------|-------|-------|
| GO1-94 | | |
| Above Bottom (m) | u48 | v48 |
| N (d) | 45,00 | 45,00 |
| Mean (cm/s) | -1,66 | -1,54 |
| STD (cm/s) | 2,59 | 2,78 |
| Skewness | -0,78 | -0,62 |
| Kurtosis | -0,08 | -0,09 |
| Min. (cm/s) | -8,23 | -8,68 |
| Max. (cm/s) | 2,37 | 2,62 |
| Range (cm/s) | 10,60 | 11,30 |

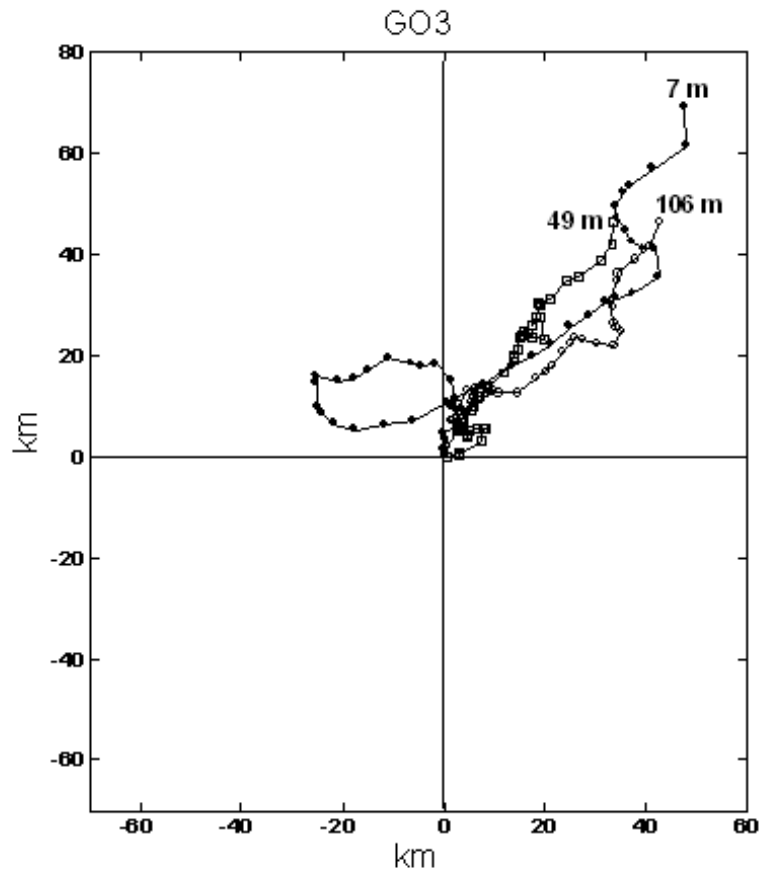




GO2-94

| Above Bottom (m) | u106 | v106 | u49 | v49 | u7 | v7 |
|------------------|--------|-------|-------|-------|-------|-------|
| N (d) | 45,00 | 45,00 | 45,00 | 45,00 | 45,00 | 45,00 |
| Mean (cm/s) | 0,88 | -0,38 | 1,42 | -0,02 | 1,35 | 0,80 |
| STD (cm/s) | 7,28 | 5,85 | 2,62 | 2,46 | 2,99 | 2,28 |
| Skewness | -0,44 | 0,83 | 0,40 | 0,19 | 0,23 | 0,29 |
| Kurtosis | -0,03 | -0,12 | -0,49 | 0,71 | 0,47 | 0,21 |
| Min. (cm/s) | -16,25 | -9,39 | -3,43 | -5,49 | -5,44 | -4,73 |
| Max. (cm/s) | 16,92 | 14,51 | 6,91 | 6,65 | 9,84 | 6,39 |
| Range (cm/s) | 33,17 | 23,90 | 10,34 | 12,14 | 15,28 | 11,12 |

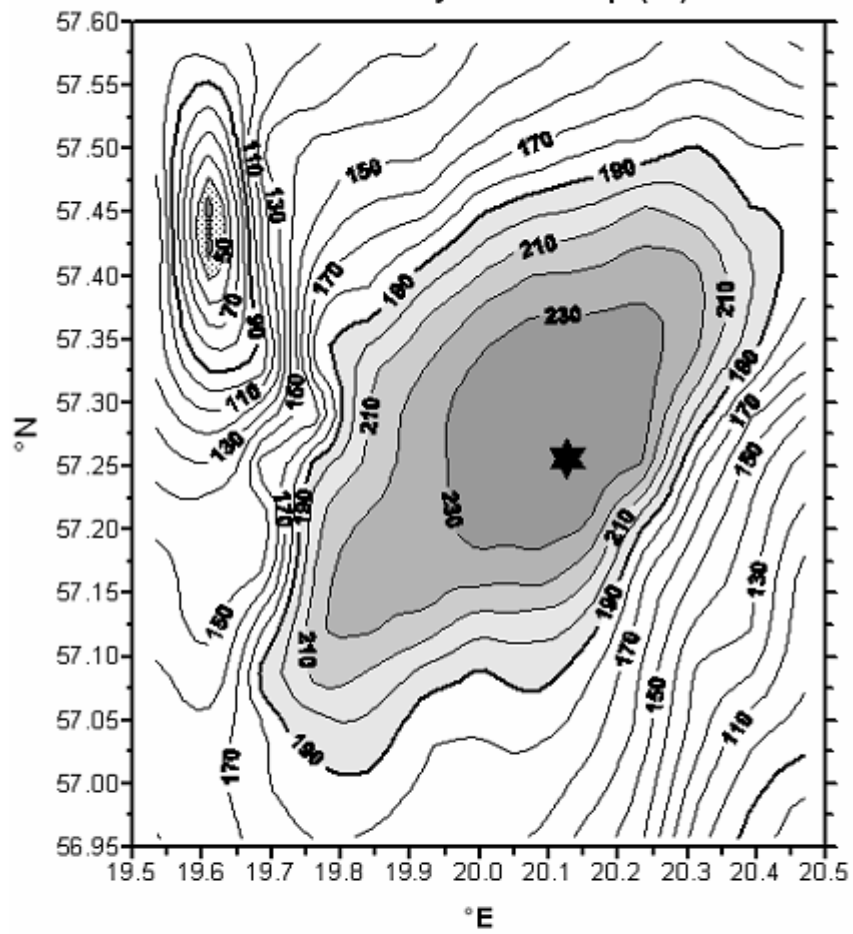




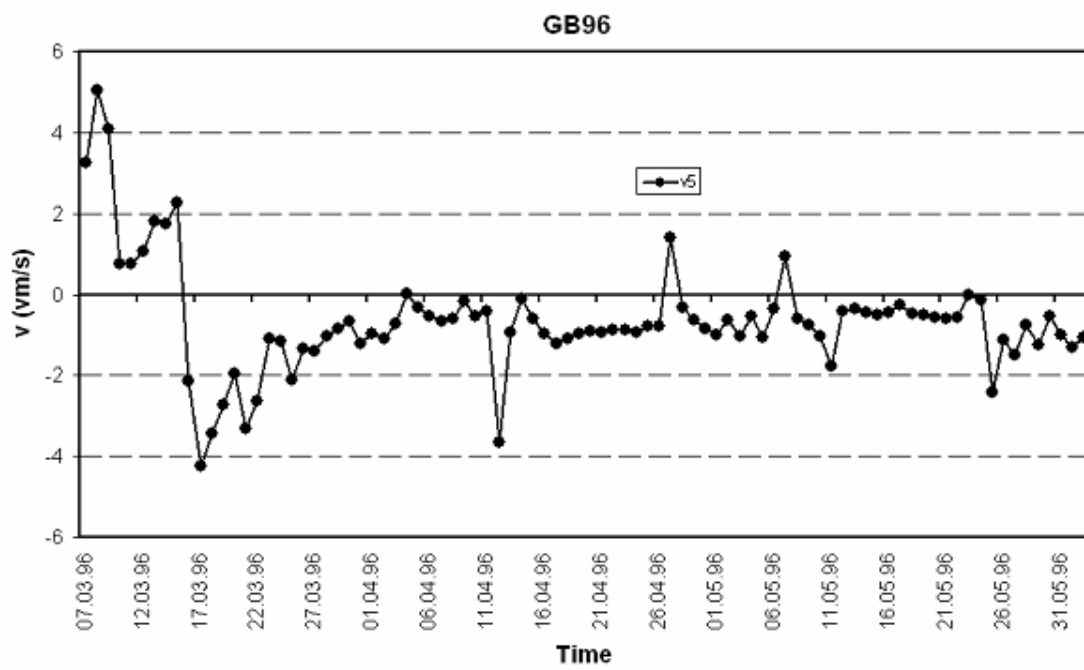
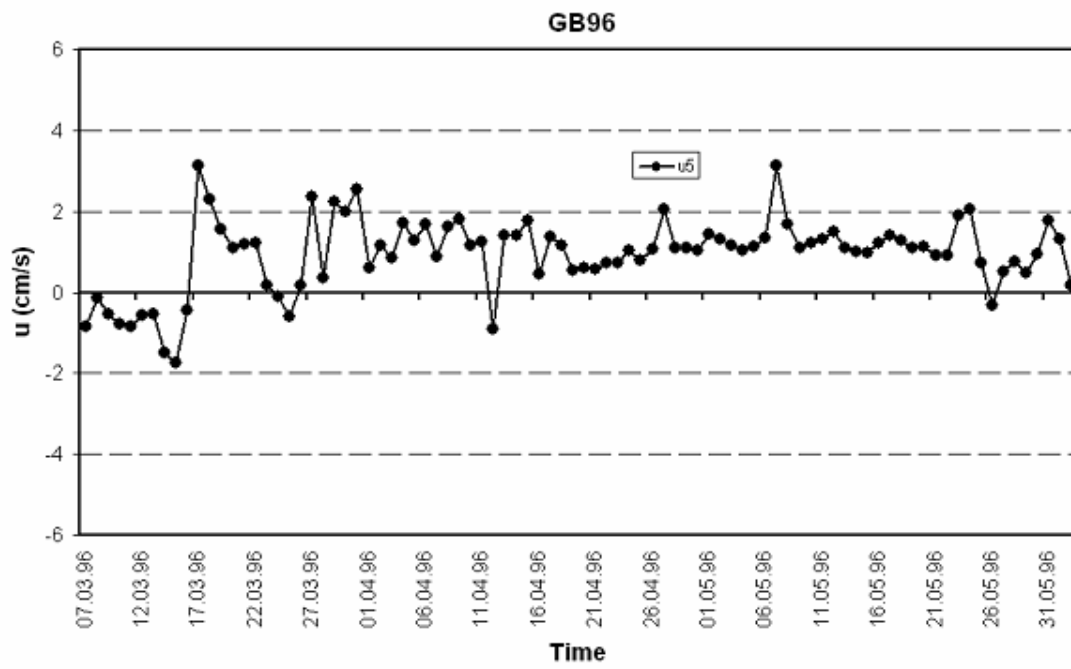
| GO3-94 | u106 | v106 | u49 | v49 | u7 | v7 |
|------------------|-------|-------|-------|-------|-------|-------|
| Above Bottom (m) | 45,00 | 45,00 | 45,00 | 45,00 | 45,00 | 45,00 |
| N (d) | 45,00 | 45,00 | 45,00 | 45,00 | 45,00 | 45,00 |
| Mean (cm/s) | 1,10 | 1,19 | 0,86 | 1,19 | 1,22 | 1,77 |
| STD (cm/s) | 1,66 | 1,90 | 1,60 | 1,73 | 3,77 | 2,59 |
| Skewness | 0,44 | 0,46 | 0,79 | 0,59 | 0,17 | -0,16 |
| Kurtosis | -0,48 | -0,06 | 0,53 | -0,50 | -1,04 | 0,99 |
| Min. (cm/s) | -1,84 | -3,28 | -1,88 | -1,98 | -5,02 | -5,48 |
| Max. (cm/s) | 4,63 | 5,68 | 5,20 | 5,13 | 8,26 | 8,96 |
| Range (cm/s) | 6,47 | 8,96 | 7,08 | 7,11 | 13,28 | 14,44 |

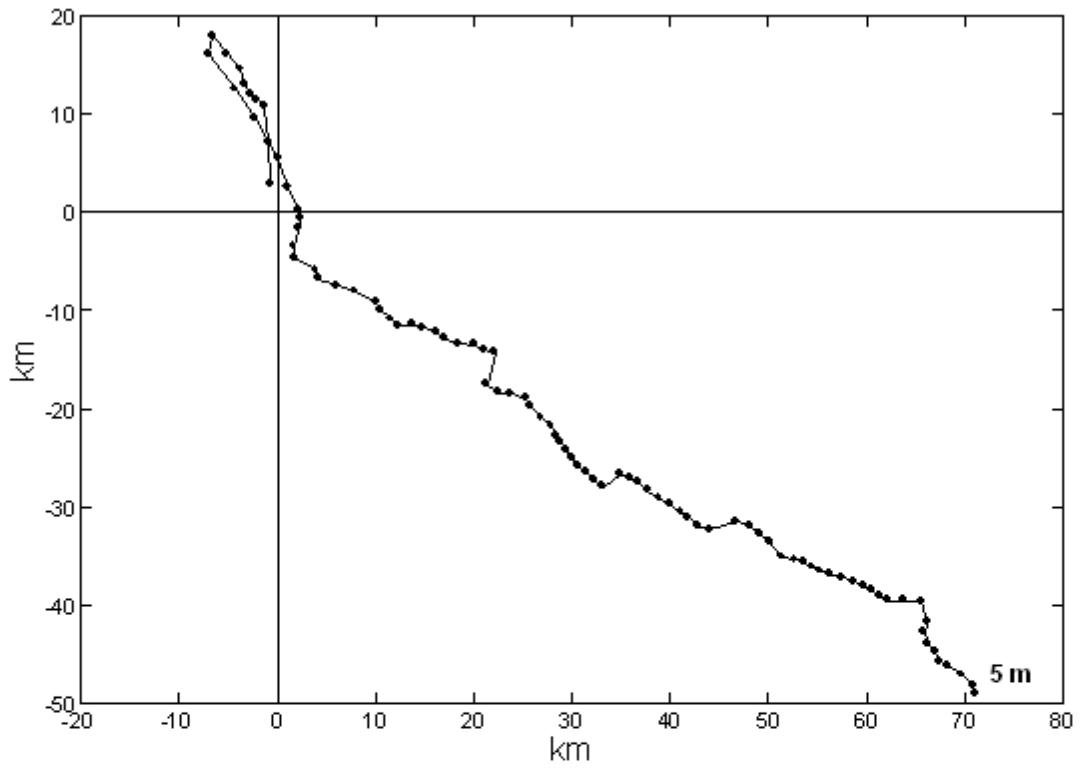
GB-96

EGB: Bathymetric Map (m)



| | |
|-----------|------------|
| GO-96 | |
| Lat.(°N) | 57°15' |
| Long.(°E) | 20°08' |
| Depth (m) | 240 |
| SI (min) | 20 |
| Start | 07.03.1996 |
| End | 02.06.1996 |

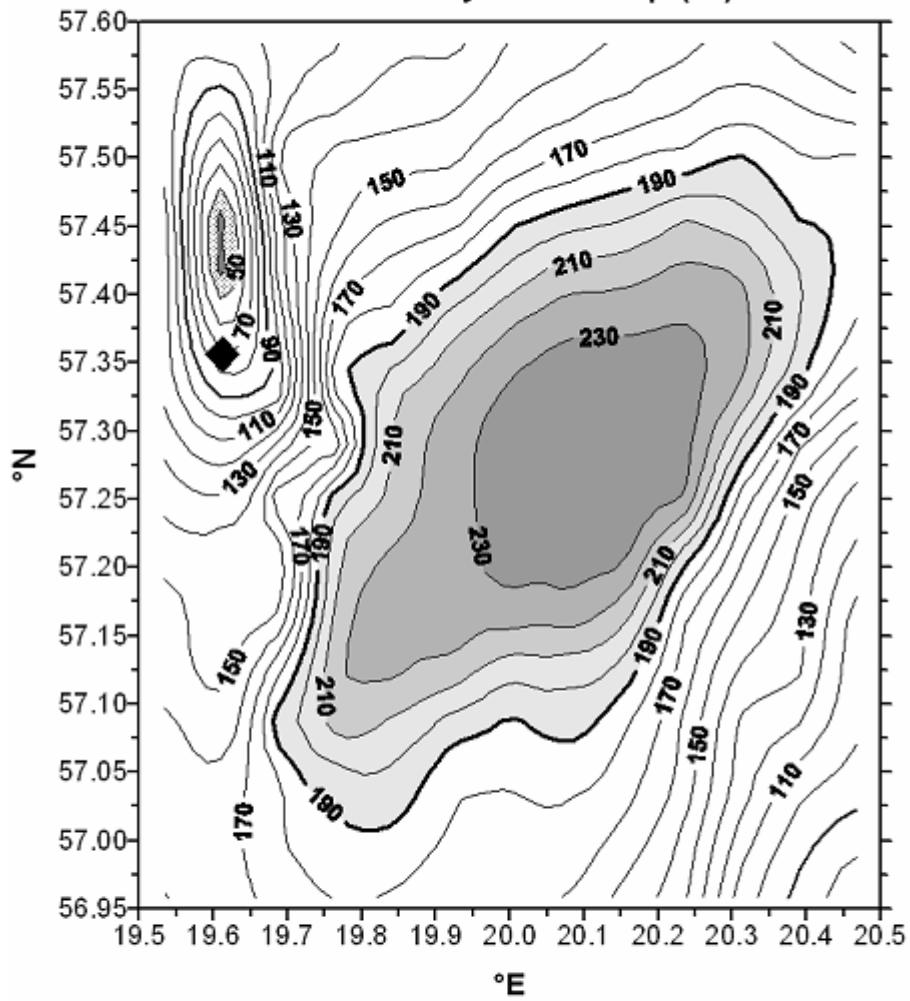




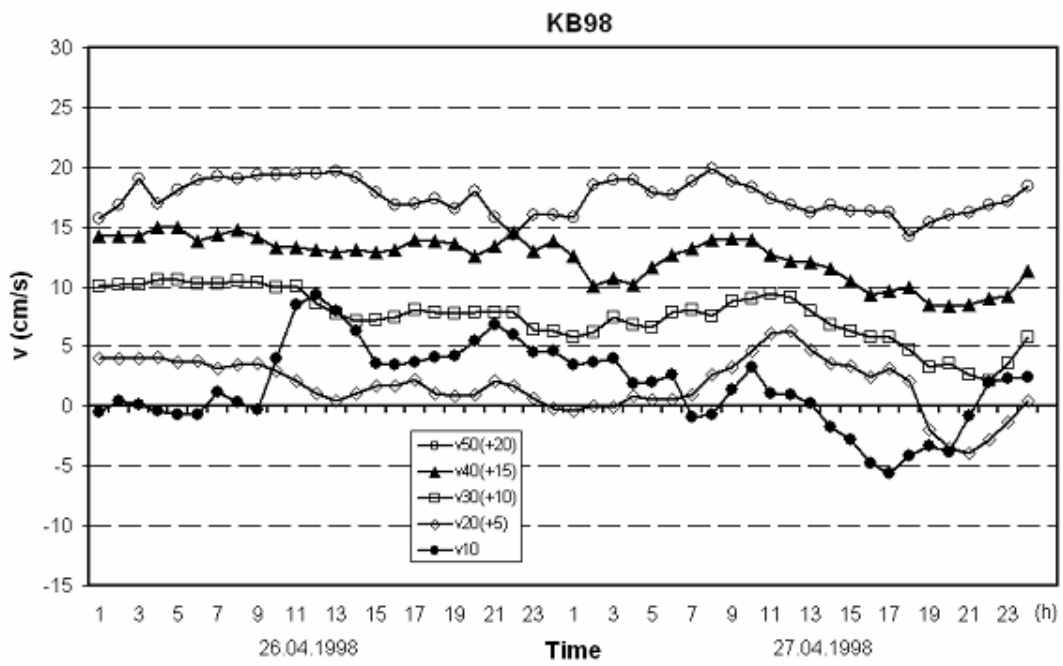
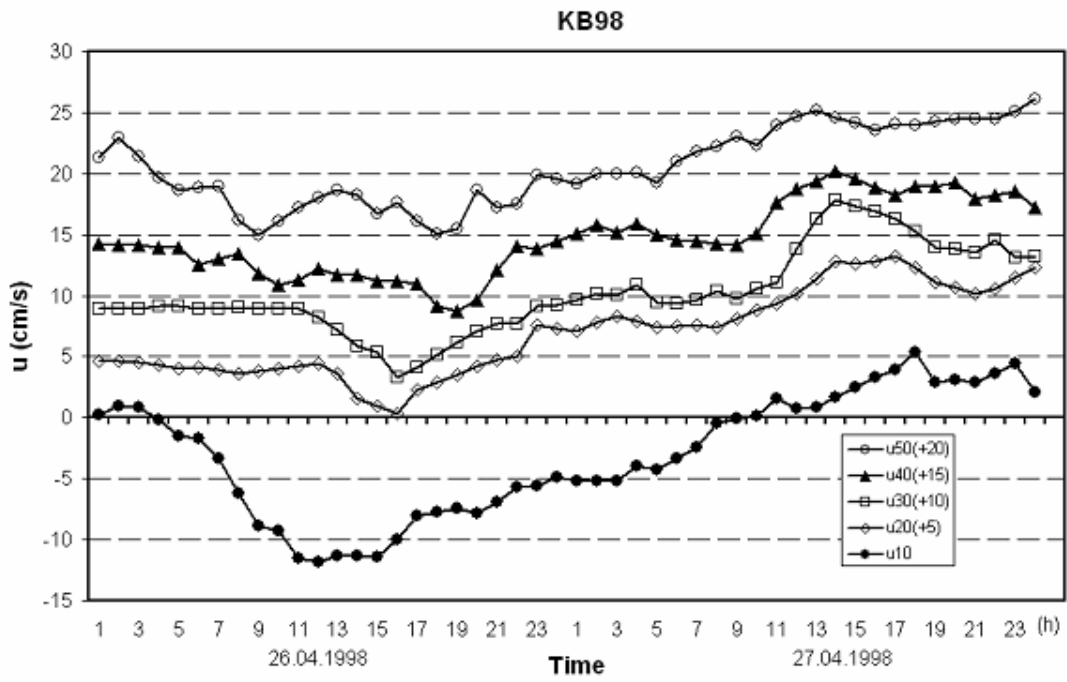
| GO-96 | | |
|------------------|-------|-------|
| Above Bottom (m) | u5 | v5 |
| N (d) | 88,00 | 88,00 |
| Mean (cm/s) | 0,93 | -0,65 |
| STD (cm/s) | 0,92 | 1,39 |
| Skewness | -0,53 | 1,18 |
| Kurtosis | 0,66 | 4,40 |
| Min. (cm/s) | -1,74 | -4,25 |
| Max. (cm/s) | 3,13 | 5,05 |
| Range (cm/s) | 4,87 | 9,30 |

KB-98

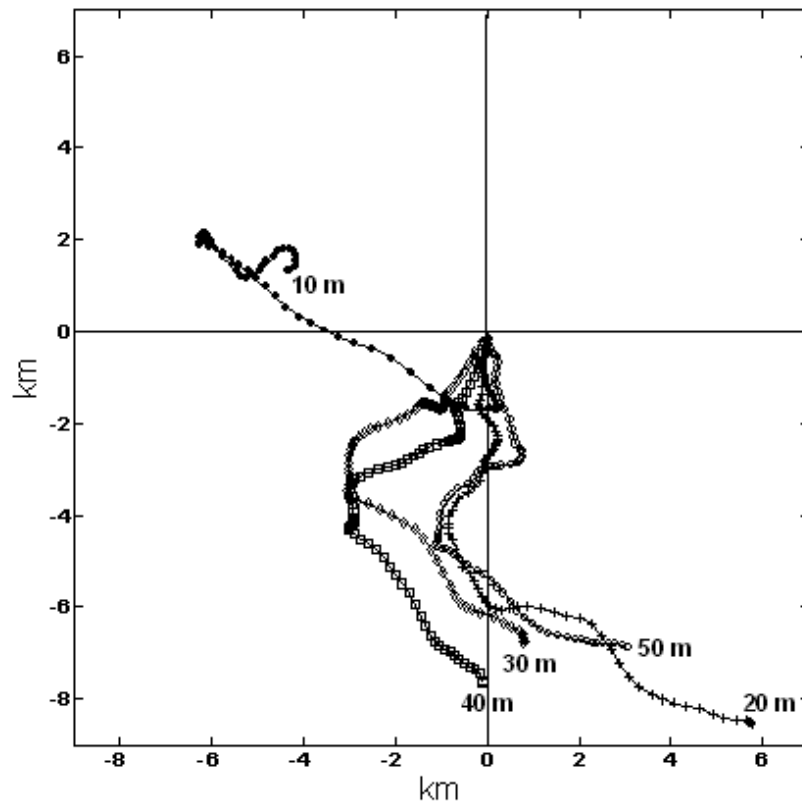
EGB: Bathymetric Map (m)



| | |
|------------|------------|
| | KB-98 |
| Lat. (°N) | 57°21' |
| Long. (°E) | 19°37' |
| Depth (m) | 70 |
| SI (min) | 1 |
| Start | 26.04.1998 |
| End | 27.04.1998 |



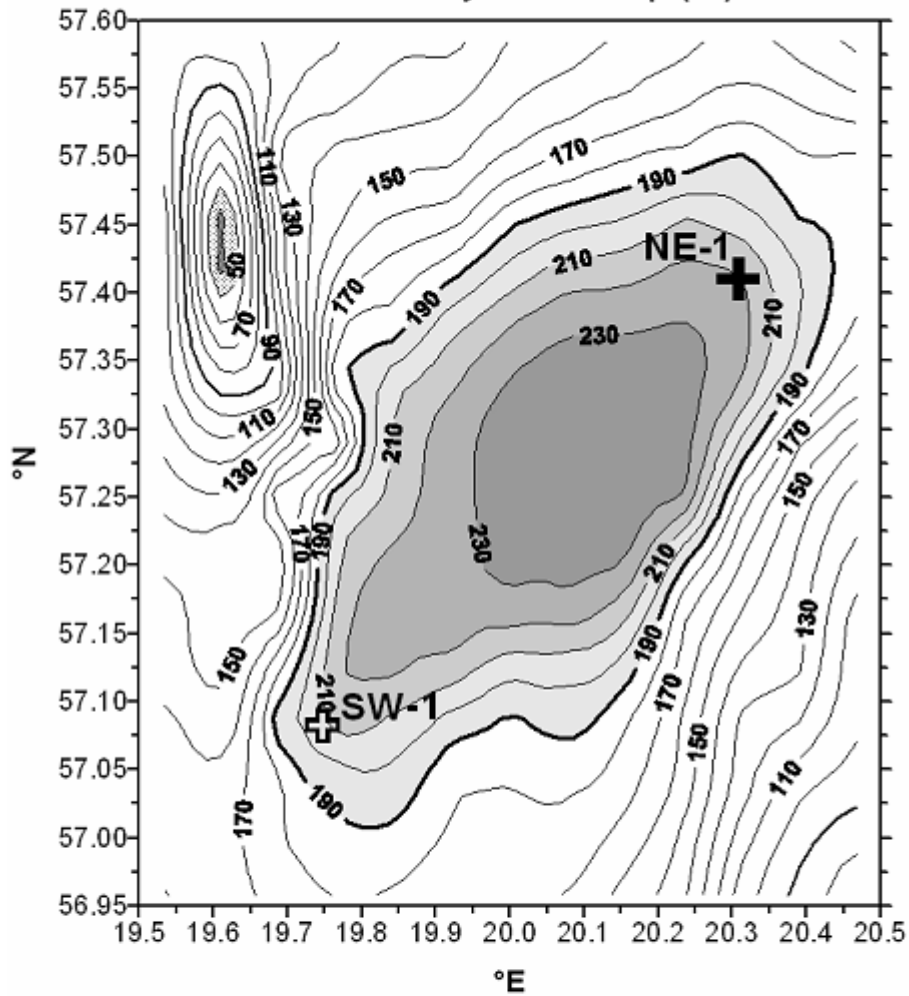
KB-98



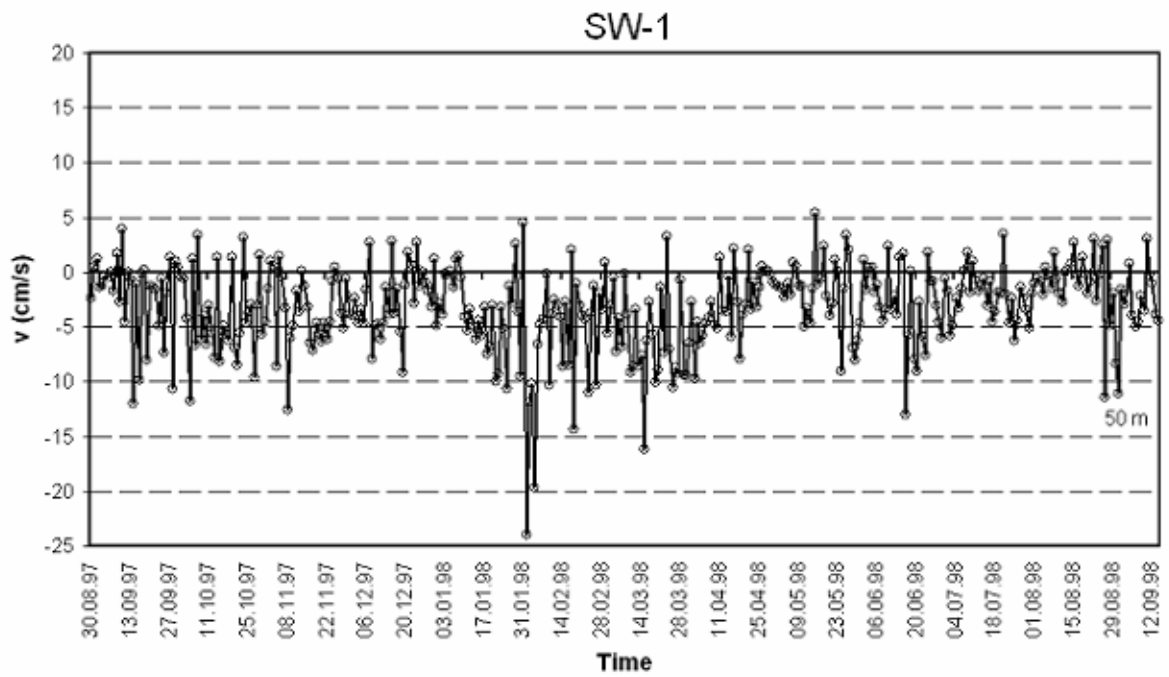
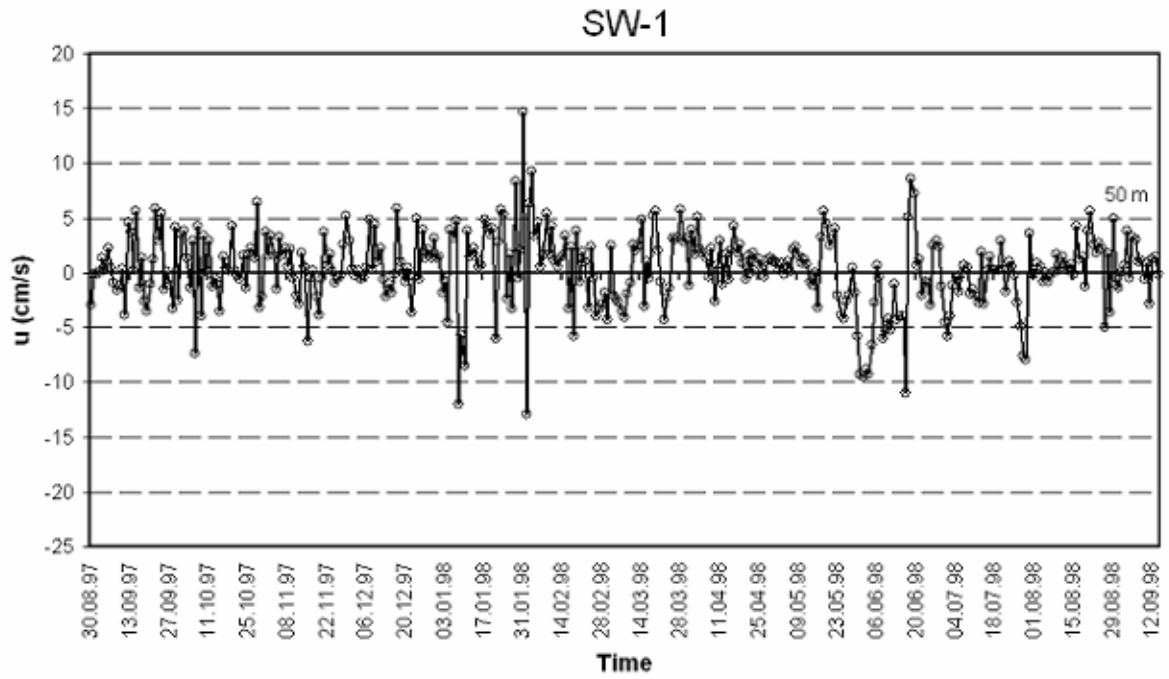
| Above Bottom (m) | u50 | v50 | u40 | v40 | u30 | v30 | u20 | v20 | u10 | v10 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| N (h) | 48,00 | 48,00 | 48,00 | 48,00 | 48,00 | 48,00 | 48,00 | 48,00 | 48,00 | 48,00 |
| Mean (cm/s) | 0,56 | -2,50 | -0,30 | -2,59 | 0,25 | -2,45 | 1,94 | -3,20 | -2,95 | 1,77 |
| STD (cm/s) | 3,20 | 1,47 | 3,08 | 1,93 | 3,48 | 2,20 | 3,56 | 2,25 | 5,05 | 3,44 |
| Skewness | -0,01 | -0,22 | 0,09 | -0,73 | 0,44 | -0,58 | 0,19 | -0,49 | -0,22 | 0,00 |
| Kurtosis | -1,23 | -0,87 | -0,95 | -0,69 | -0,31 | -0,17 | -1,09 | 0,21 | -1,16 | -0,33 |
| Min. (cm/s) | -4,98 | -5,80 | -6,25 | -6,62 | -6,71 | -7,88 | -4,64 | -8,93 | -11,85 | -5,59 |
| Max. (cm/s) | 6,13 | -0,15 | 5,20 | 0,01 | 7,82 | 0,62 | 8,19 | 1,29 | 5,37 | 9,31 |
| Range (cm/s) | 11,11 | 5,65 | 11,45 | 6,63 | 14,53 | 8,50 | 12,83 | 10,22 | 17,22 | 14,90 |

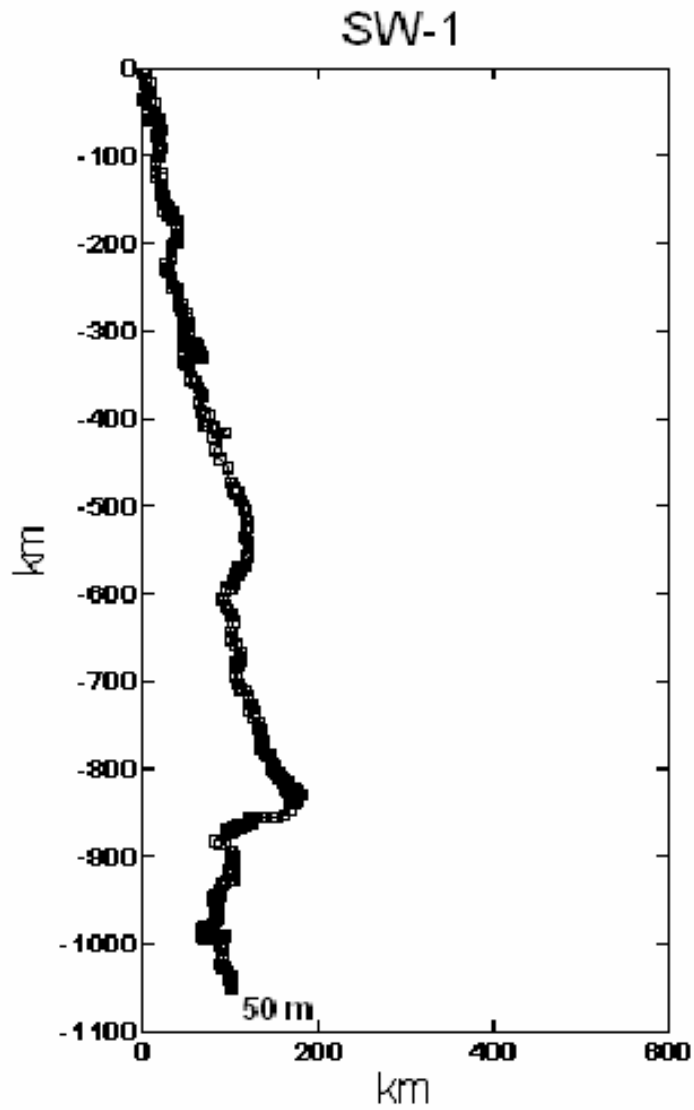
SW/NE-1

EGB: Bathymetric Map (m)

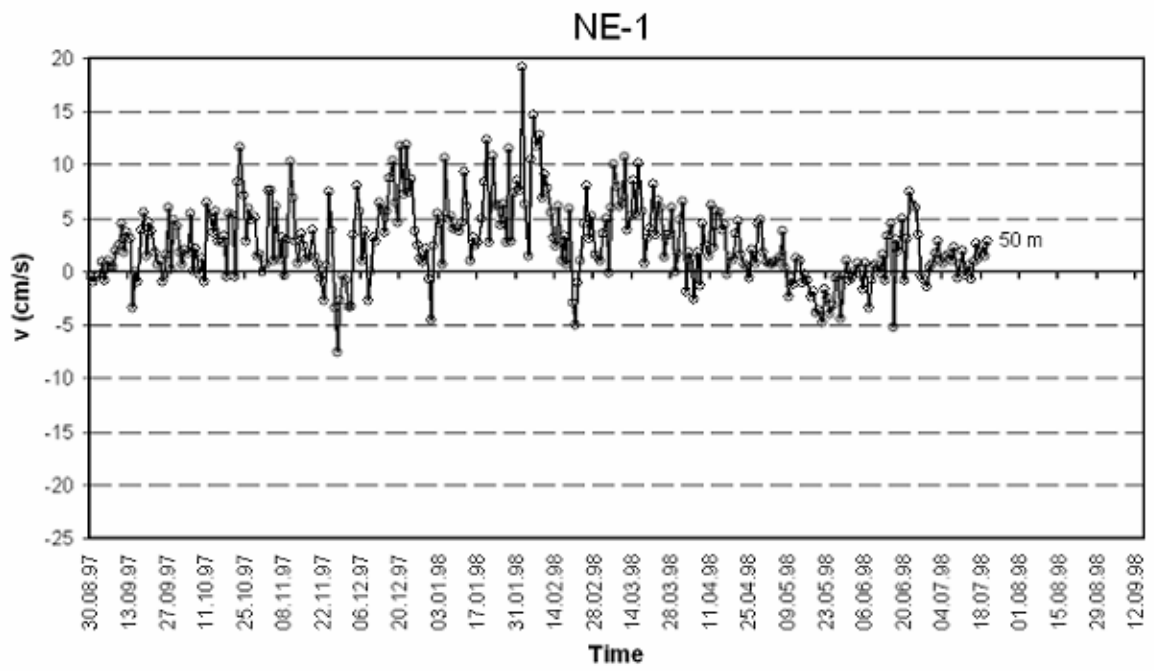
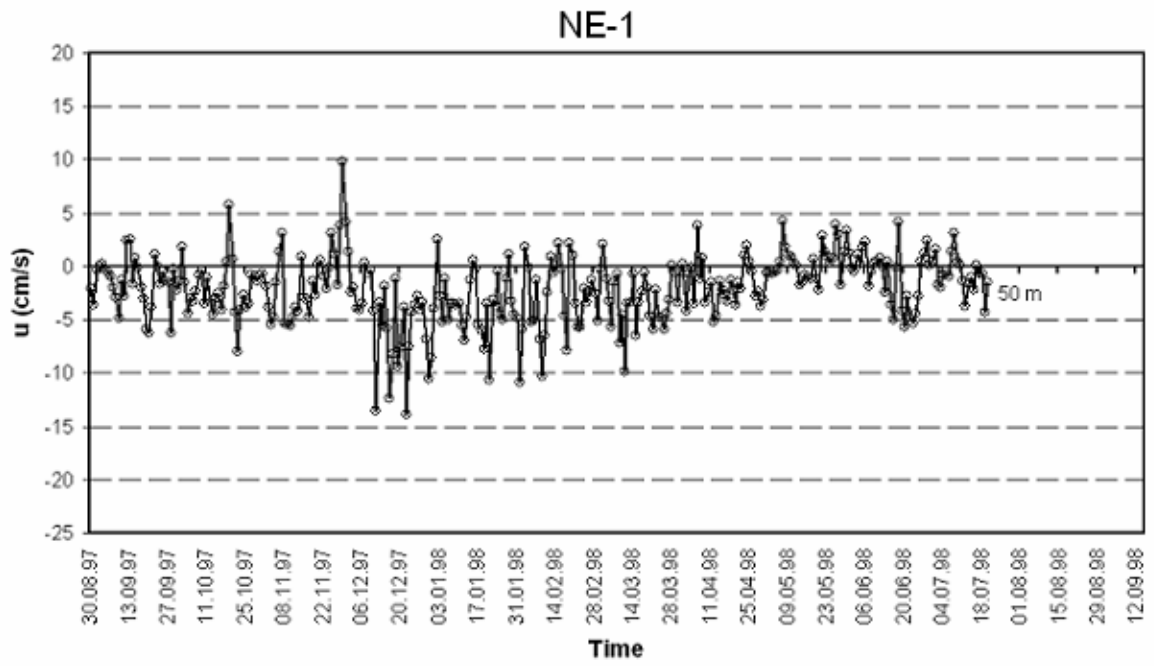


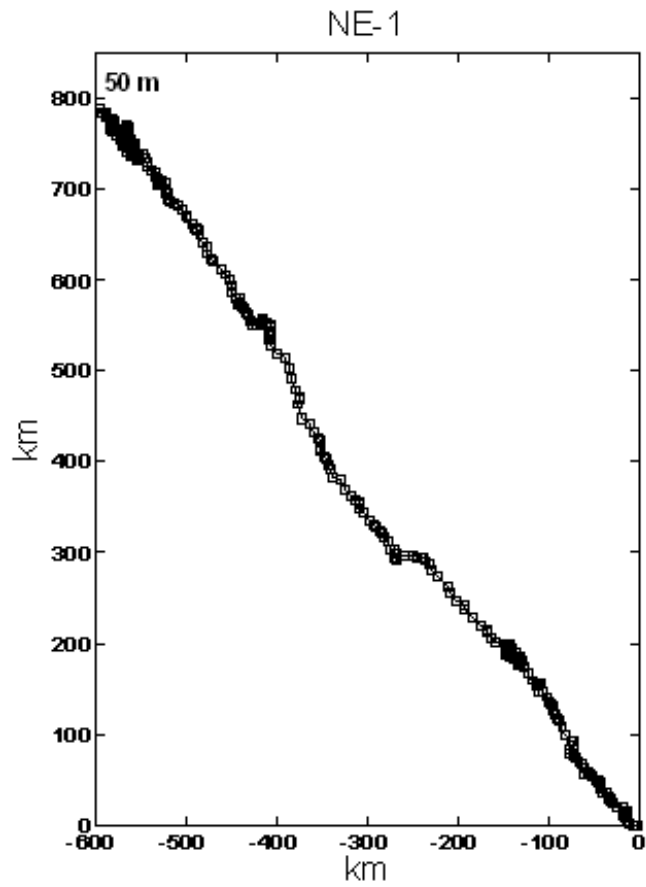
| | SW-1 | NE-1 |
|------------|------------|------------|
| Lat. (°N) | 57°05' | 57°26' |
| Long. (°E) | 19°45' | 20°21' |
| Depth (m) | 220 | 220 |
| SI (h) | 1 | 1 |
| Start | 30.08.1997 | 30.08.1997 |
| End | 14.09.1998 | 20.07.1998 |





| SW-1 | | |
|------------------|--------|--------|
| Above Bottom (m) | u50 | v50 |
| N (d) | 381,00 | 381,00 |
| Mean (cm/s) | 0,31 | -3,19 |
| STD (cm/s) | 3,31 | 3,85 |
| Schiefe | -0,45 | -1,00 |
| Kurtosis | 2,11 | 2,52 |
| Min. (cm/s) | -12,94 | -23,96 |
| Max. (cm/s) | 14,73 | 5,47 |
| Range (cm/s) | 27,67 | 29,43 |

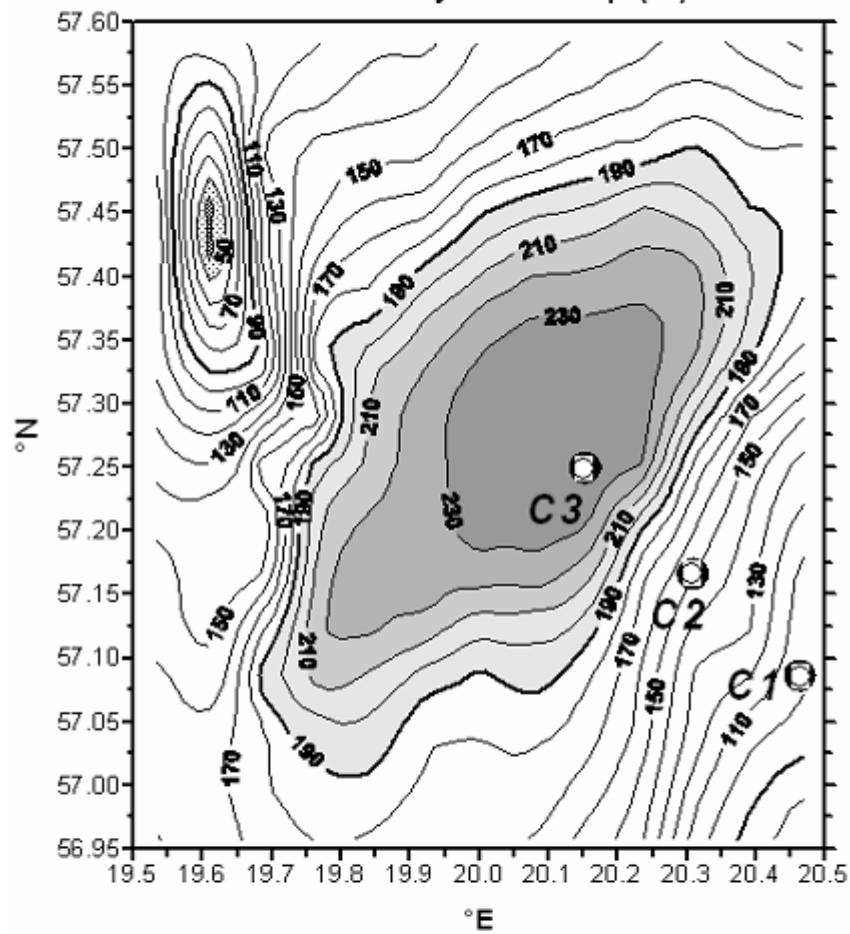




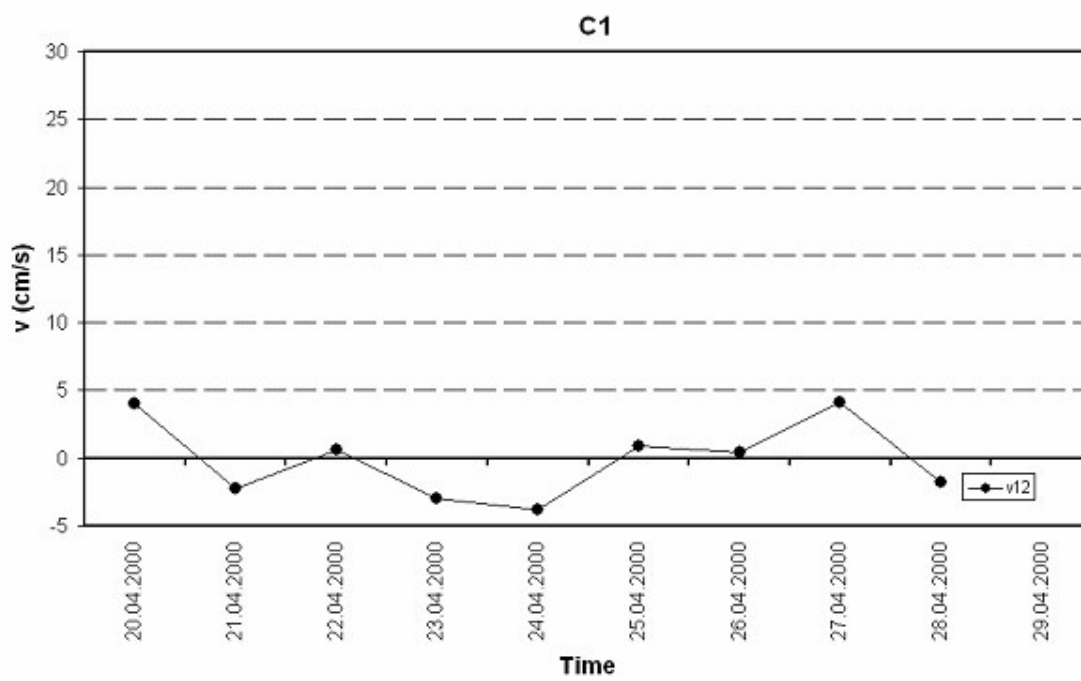
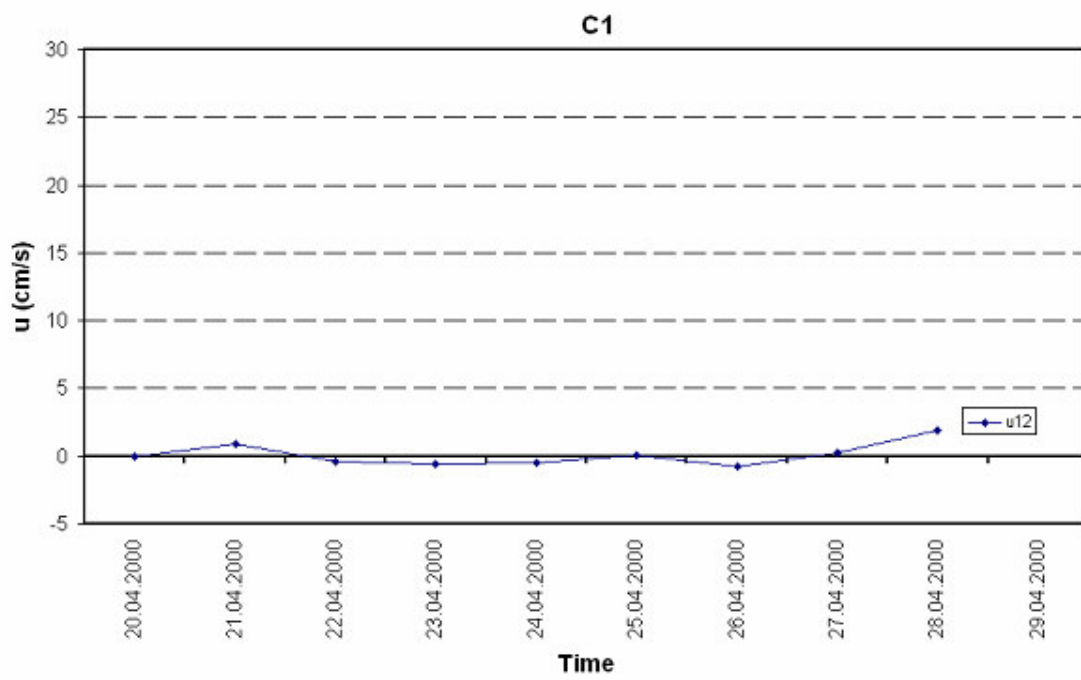
| | | |
|------------------|--------|--------|
| NE-1 | u50 | v50 |
| Above Bottom (m) | u50 | v50 |
| N (d) | 325,00 | 325,00 |
| Mean (cm/s) | -2,12 | 2,81 |
| STD (cm/s) | 3,10 | 3,72 |
| Schiefe | -0,45 | 0,63 |
| Kurtosis | 1,58 | 1,05 |
| Min. (cm/s) | -13,92 | -7,48 |
| Max. (cm/s) | 9,86 | 19,15 |
| Range (cm/s) | 23,78 | 26,63 |

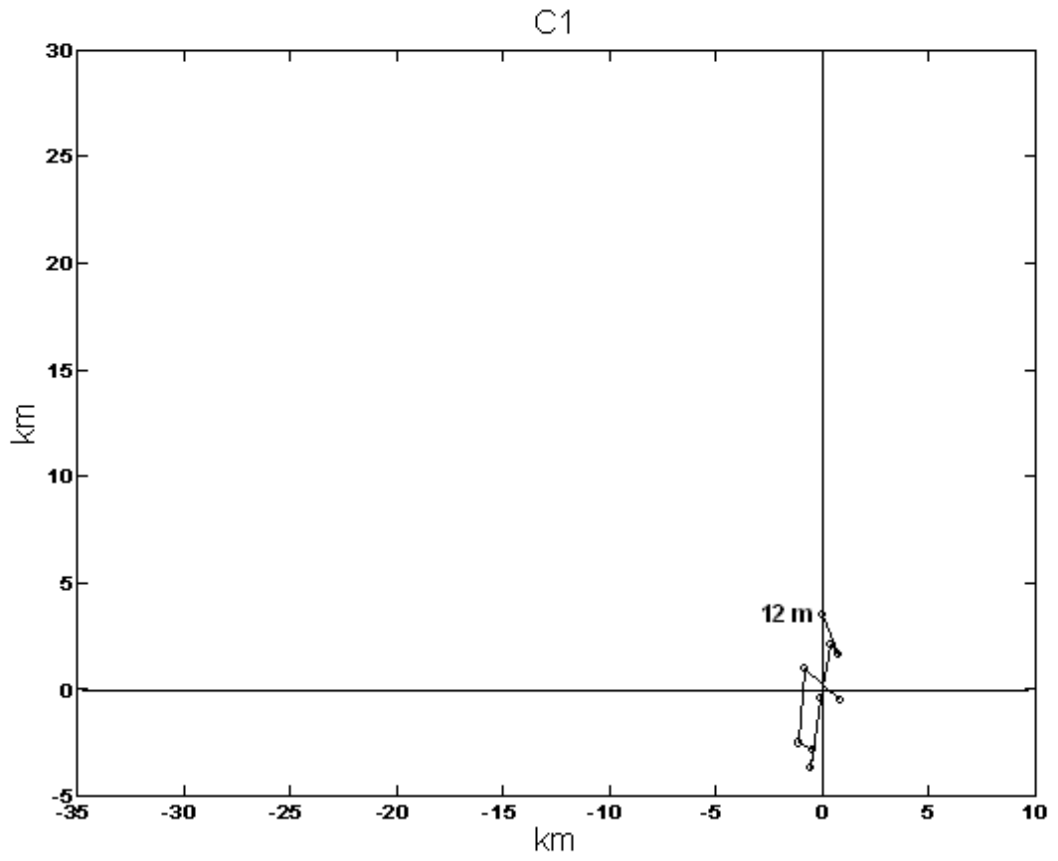
C-00

EGB: Bathymetric Map (m)

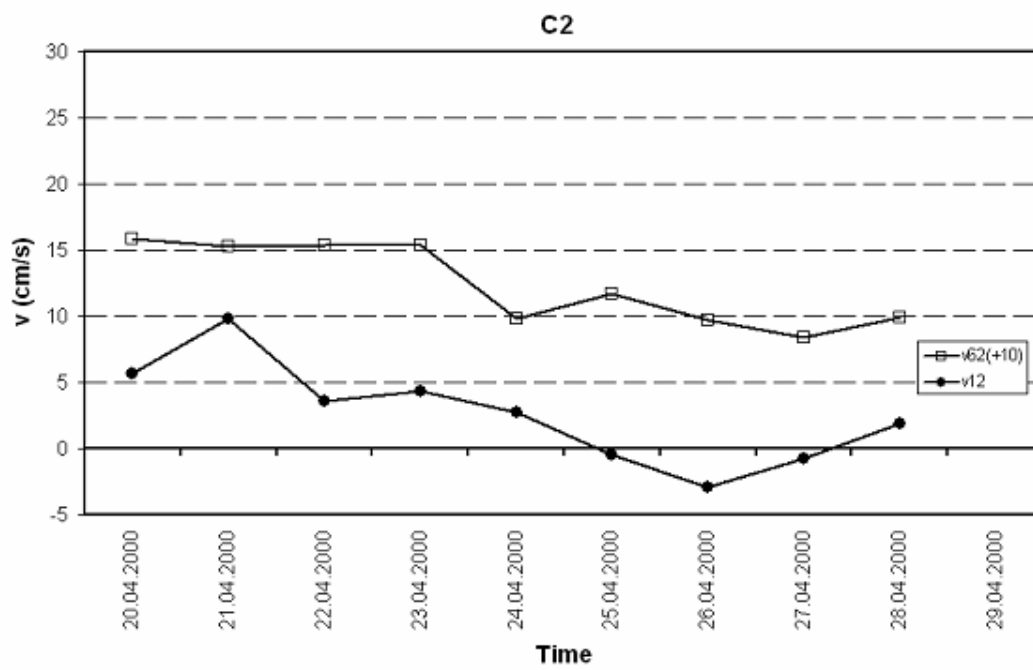
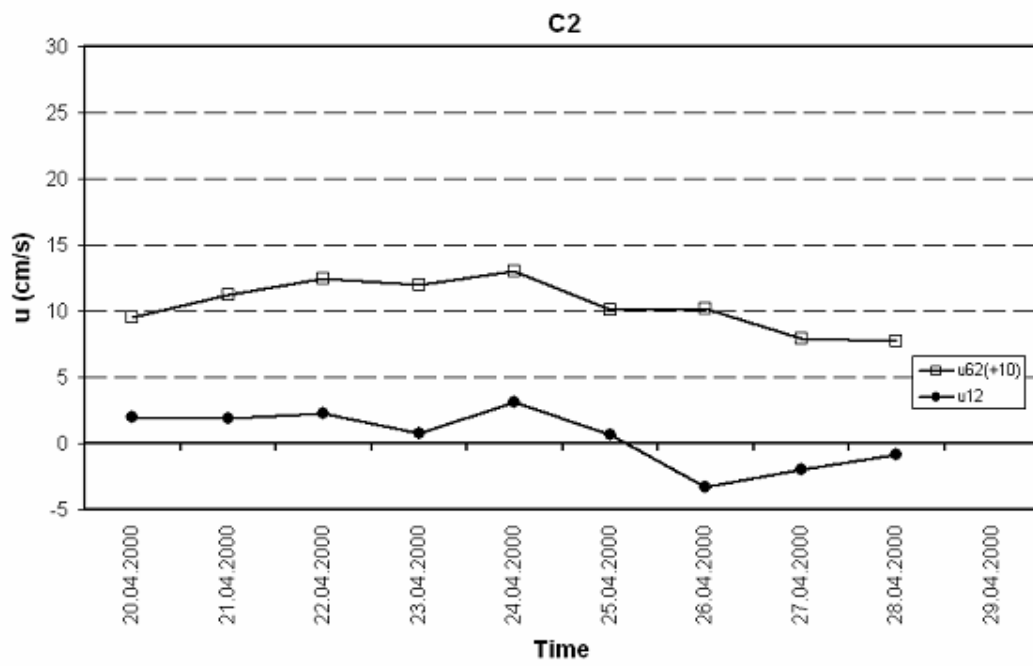


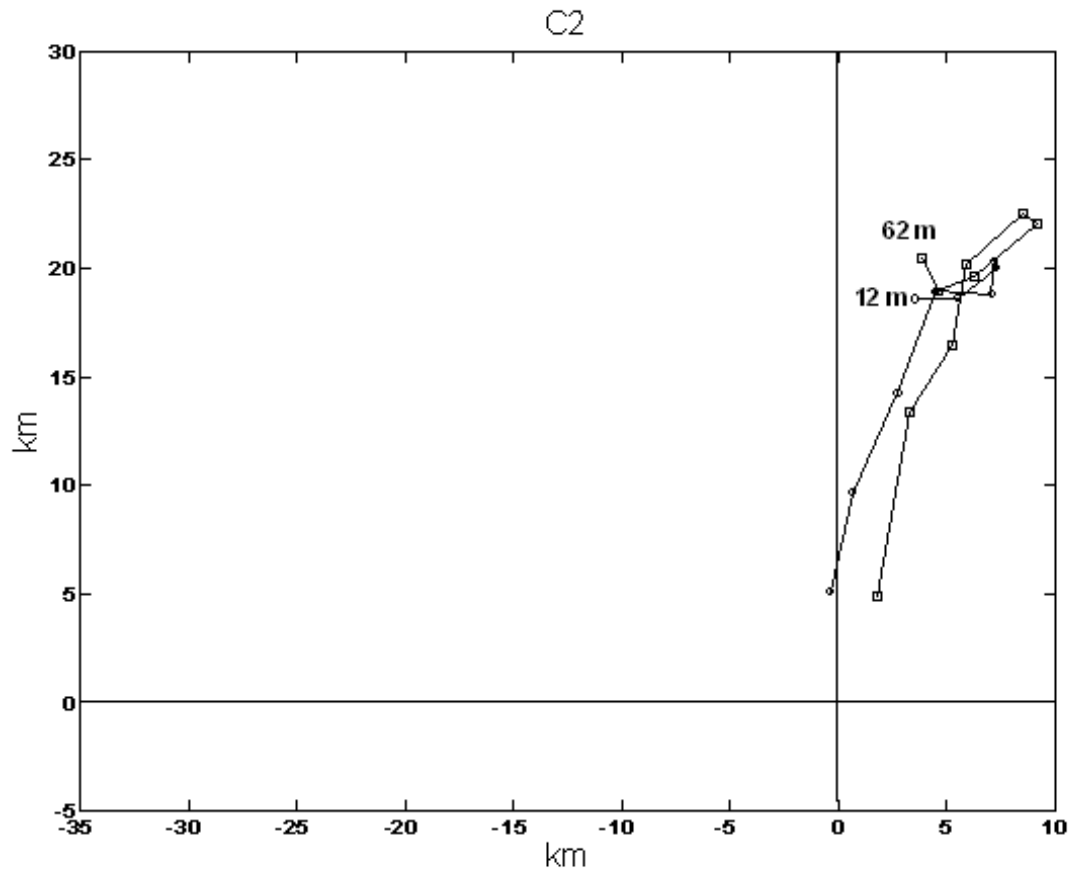
| | C1 | C2 | C3 |
|------------|------------|------------|------------|
| Lat. (°N) | 57°05' | 57°10' | 57°15' |
| Long. (°E) | 20°28' | 20°19' | 20°09' |
| Depth (m) | 102 | 152 | 237 |
| SI (min) | 2 | 2 | 2 |
| Start | 20.04.2000 | 20.04.2000 | 20.04.2000 |
| End | 28.04.2000 | 28.04.2000 | 29.04.2000 |



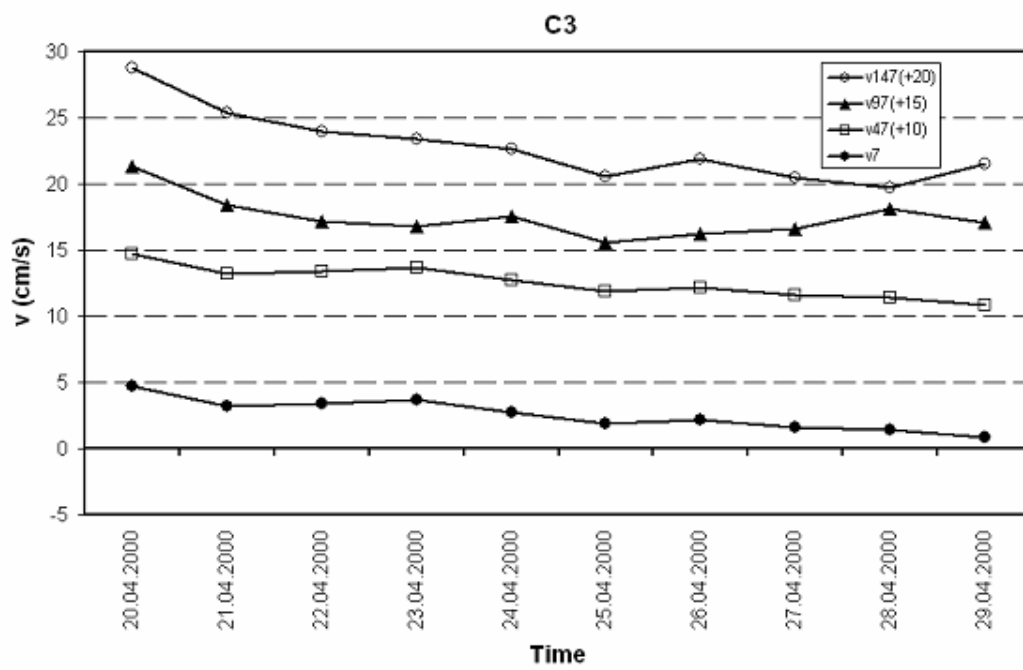
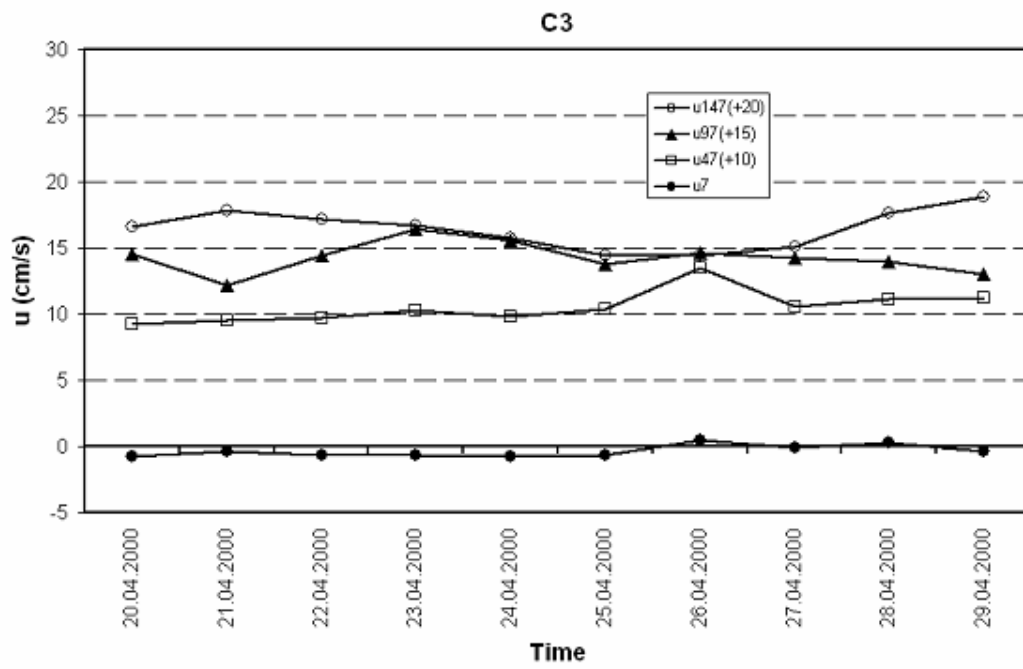


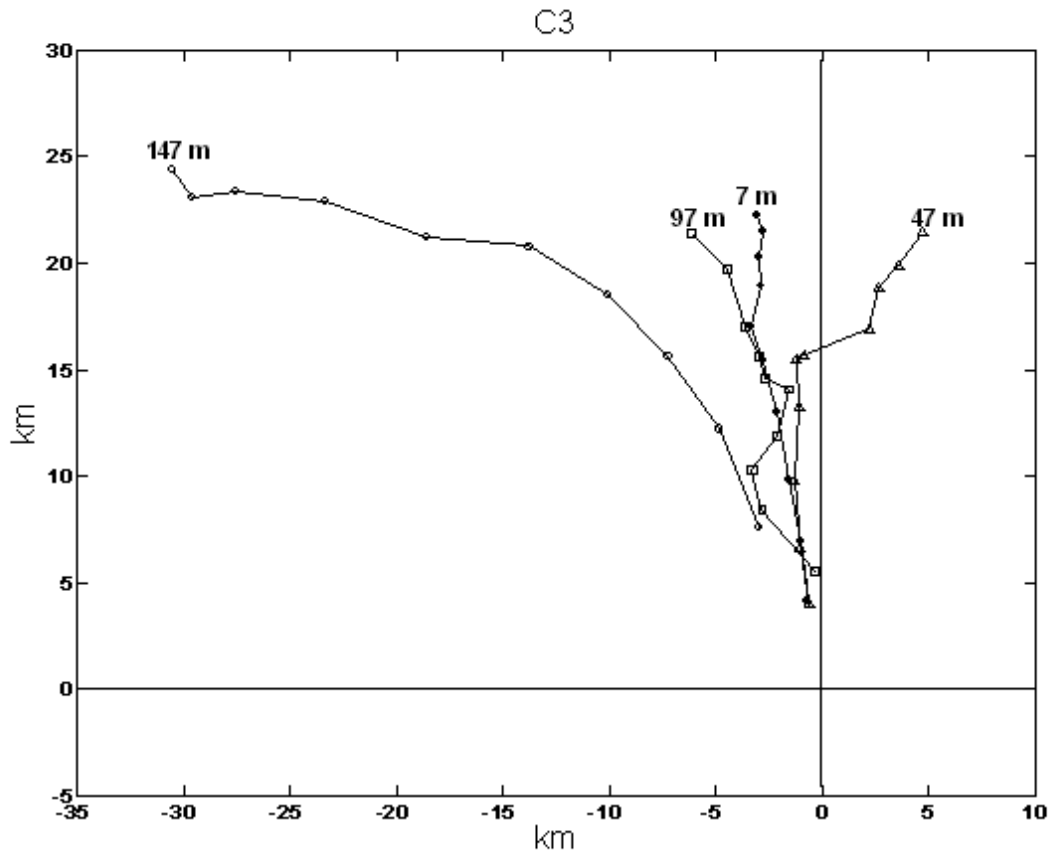
| C1 | | |
|------------------|-------|-------|
| Above Bottom (m) | u12 | v12 |
| N (d) | 9,00 | 9,00 |
| Mean (cm/s) | 0,11 | -0,07 |
| STD (cm/s) | 0,85 | 2,87 |
| Skewness | 1,15 | 0,31 |
| Kurtosis | 0,41 | -1,16 |
| Min. (cm/s) | -0,73 | -3,76 |
| Max. (cm/s) | 1,94 | 4,12 |
| Range (cm/s) | 2,67 | 7,88 |





| C2 | u62 | v62 | u12 | v12 |
|------------------|-------|-------|-------|-------|
| Above Bottom (m) | | | | |
| N (d) | 9,00 | 9,00 | 9,00 | 9,00 |
| Mean (cm/s) | 0,46 | 2,39 | 0,49 | 2,64 |
| STD (cm/s) | 1,88 | 3,06 | 2,14 | 3,82 |
| Skewness | -0,18 | 0,02 | -0,59 | 0,38 |
| Kurtosis | -1,18 | -1,76 | -0,89 | -0,43 |
| Min. (cm/s) | -2,30 | -1,64 | -3,29 | -2,89 |
| Max. (cm/s) | 3,00 | 5,84 | 3,11 | 9,81 |
| Range (cm/s) | 5,30 | 7,48 | 6,40 | 12,70 |

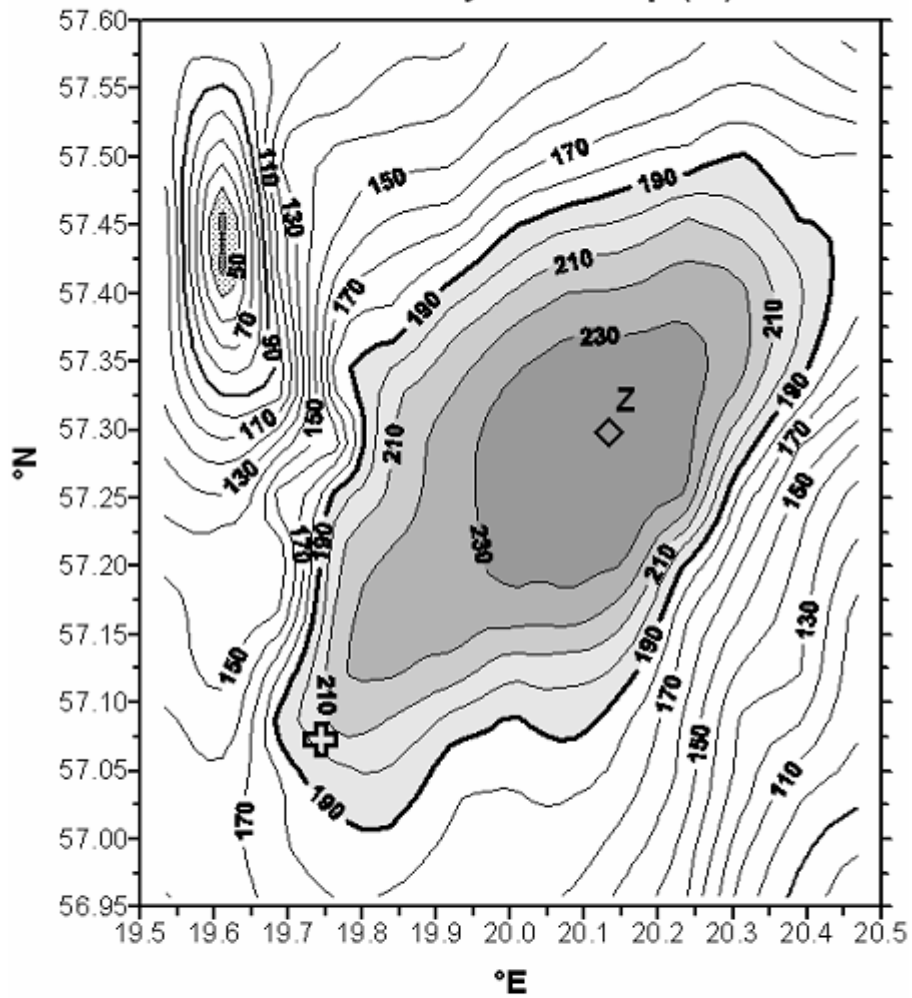




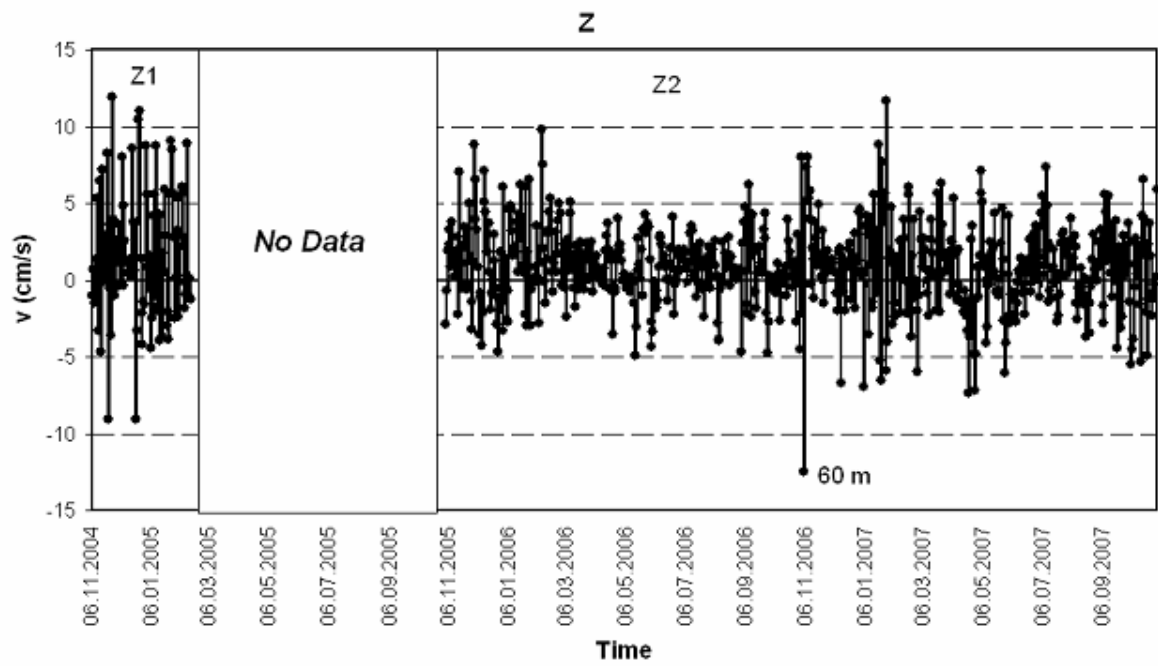
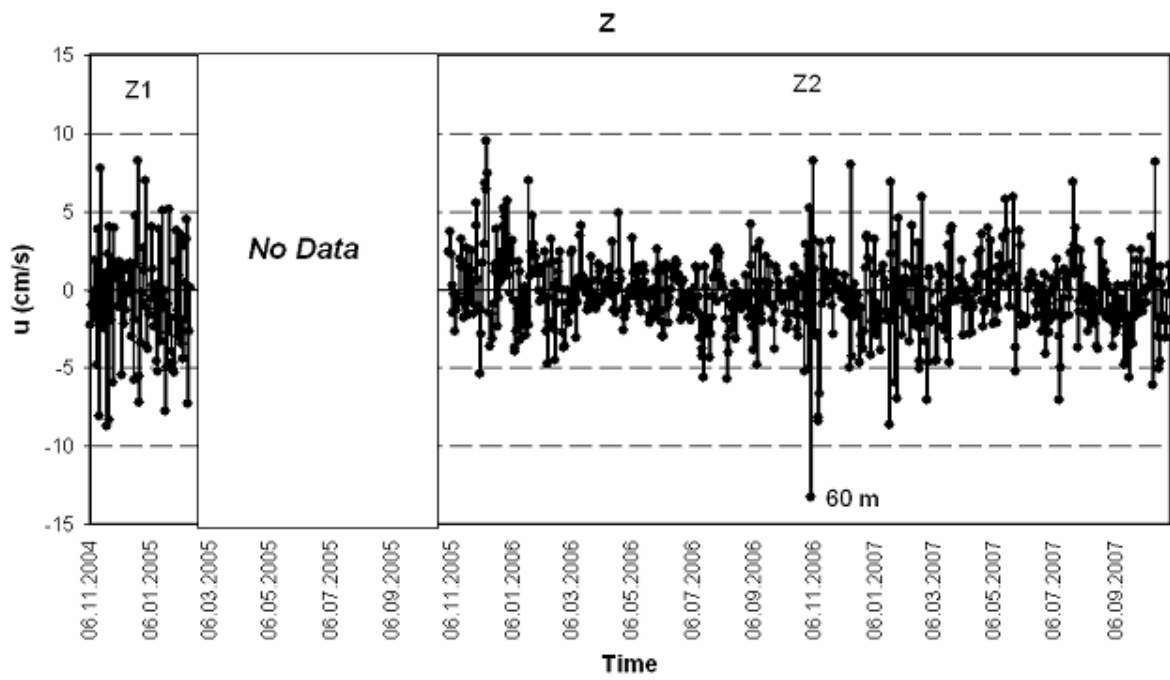
| C3 | u147 | v147 | u97 | v97 | u47 | v47 | u7 | v7 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Above Bottom (m) | 10,00 | 10,00 | 10,00 | 10,00 | 10,00 | 10,00 | 10,00 | 10,00 |
| N (d) | 10,00 | 10,00 | 10,00 | 10,00 | 10,00 | 10,00 | 10,00 | 10,00 |
| Mean (cm/s) | -3,54 | 2,83 | -0,72 | 2,48 | 0,55 | 2,48 | -0,35 | 2,57 |
| STD (cm/s) | 1,49 | 2,72 | 1,19 | 1,60 | 1,23 | 1,37 | 0,45 | 1,20 |
| Skewness | 0,00 | 1,01 | -0,02 | 1,40 | 1,42 | -0,03 | 0,90 | 0,29 |
| Kurtosis | -1,12 | 0,33 | -0,23 | 1,55 | 1,45 | -0,99 | -0,58 | -0,82 |
| Min. (cm/s) | -5,56 | -0,31 | -2,85 | 0,58 | -0,73 | 0,22 | -0,76 | 0,82 |
| Max. (cm/s) | -1,13 | 8,80 | 1,38 | 6,34 | 3,52 | 4,61 | 0,50 | 4,75 |
| Range (cm/s) | 4,43 | 9,11 | 4,23 | 5,76 | 4,25 | 4,39 | 1,26 | 3,93 |

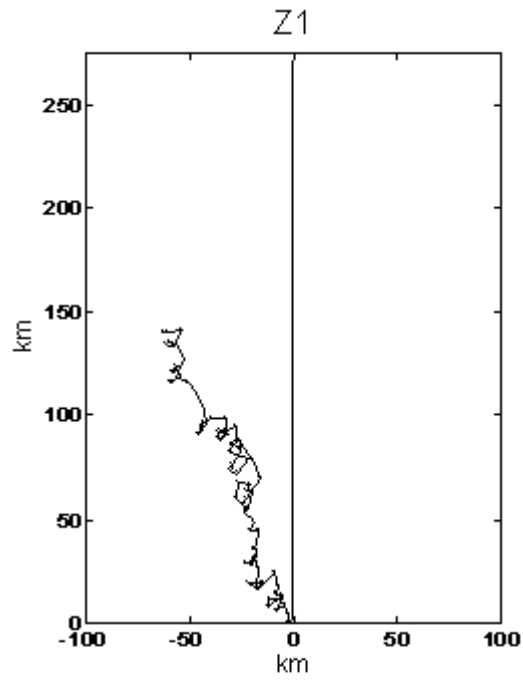
Z

EGB: Bathymetric Map (m)

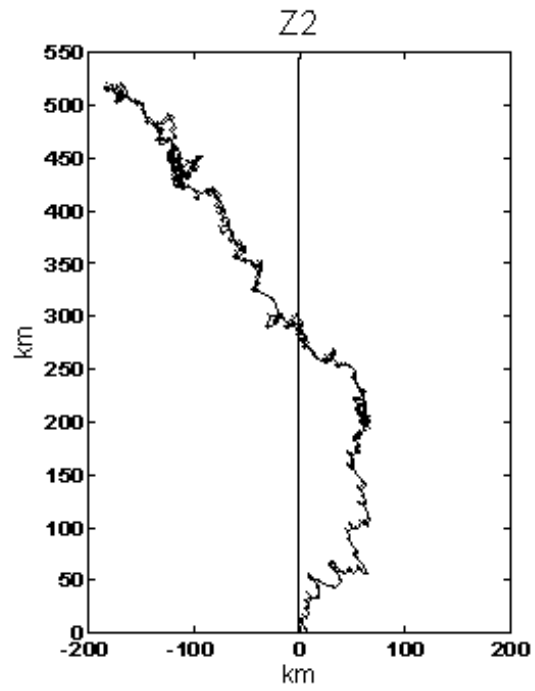


| | Z1 | Z2 |
|-----------|------------|------------|
| Lat.(°N) | 57°19' | 57°19' |
| Long.(°E) | 20°09' | 20°09' |
| Depth (m) | 185 | 185 |
| SI (min) | 30 | 30 |
| Start | 16.11.2004 | 02.11.2005 |
| End | 14.02.2005 | 30.10.2007 |





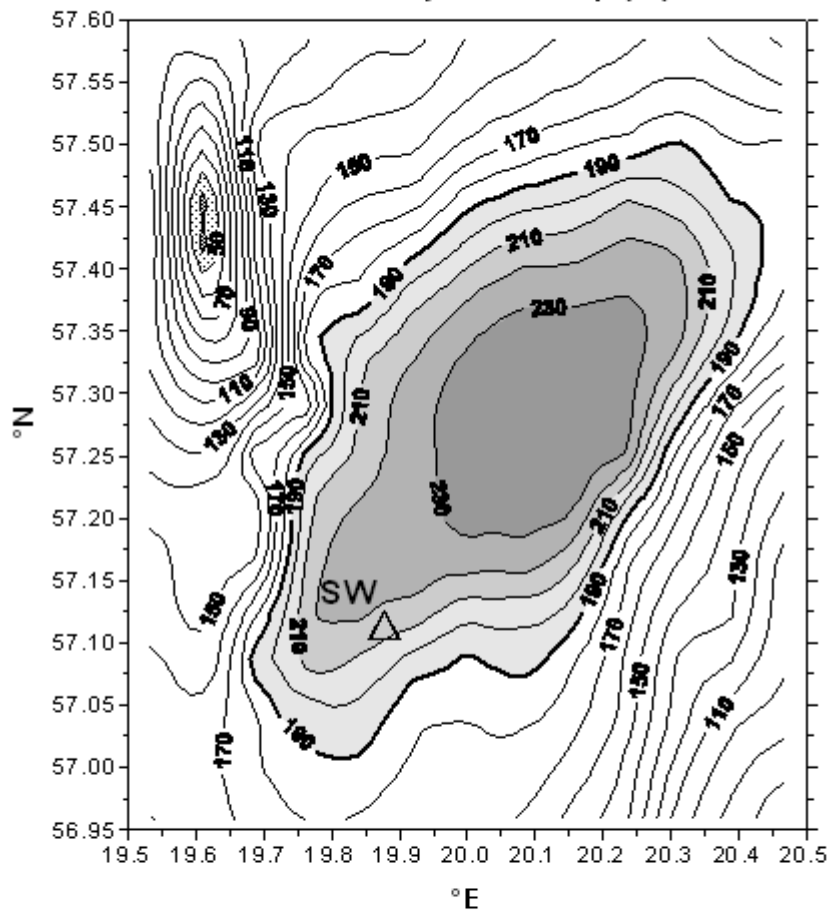
| Z1 | | |
|--------------|--------|--------|
| Above Bottom | u60 | v60 |
| N (d) | 101,00 | 101,00 |
| Mean (cm/s) | -0,72 | 1,60 |
| STD (cm/s) | 3,55 | 4,11 |
| Skewness | 0,00 | 0,24 |
| Kurtosis | -0,13 | 0,03 |
| Min. (cm/s) | -8,72 | -9,05 |
| Max. (cm/s) | 8,23 | 11,94 |
| Range (cm/s) | 16,95 | 20,99 |



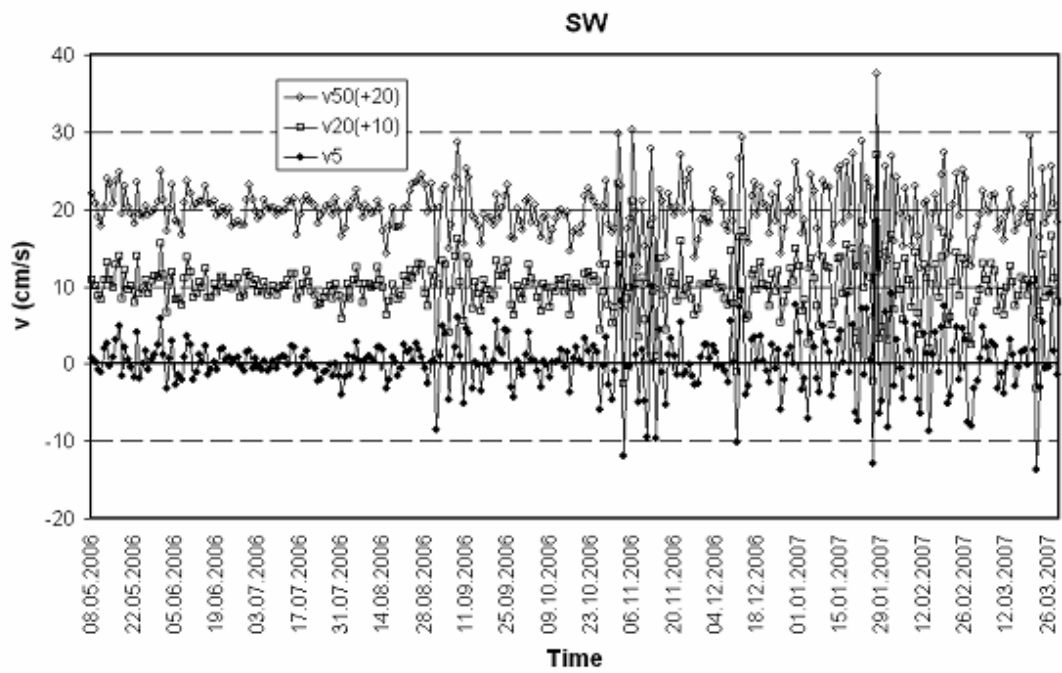
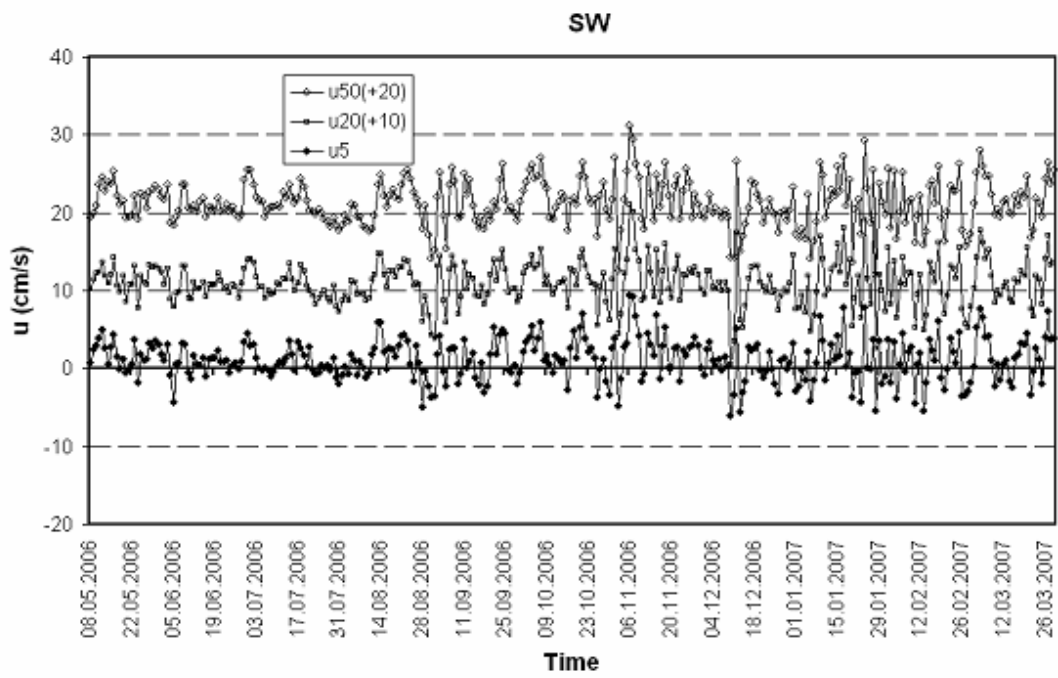
| Z2 | | |
|--------------|--------|--------|
| Above Bottom | u60 | v60 |
| N (d) | 729,00 | 728,00 |
| Mean (cm/s) | -0,27 | 0,83 |
| STD (cm/s) | 2,42 | 2,61 |
| Skewness | 0,12 | -0,06 |
| Kurtosis | 2,73 | 1,74 |
| Min. (cm/s) | -13,23 | -12,51 |
| Max. (cm/s) | 10,00 | 11,66 |
| Range (cm/s) | 23,23 | 24,17 |

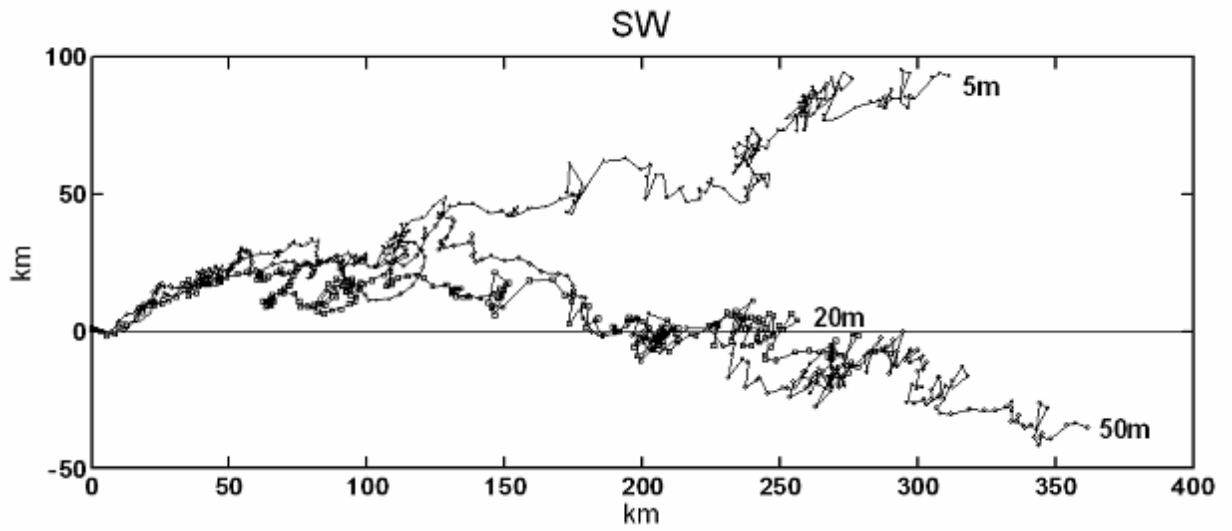
SW

EGB: Bathymetric Map (m)



| | |
|-----------|------------|
| | SW |
| Lat.(°N) | 57°07' |
| Long.(°E) | 19°52' |
| Depth (m) | 217 |
| SI (h) | 1 |
| Start | 08.05.2006 |
| End | 29.03.2007 |

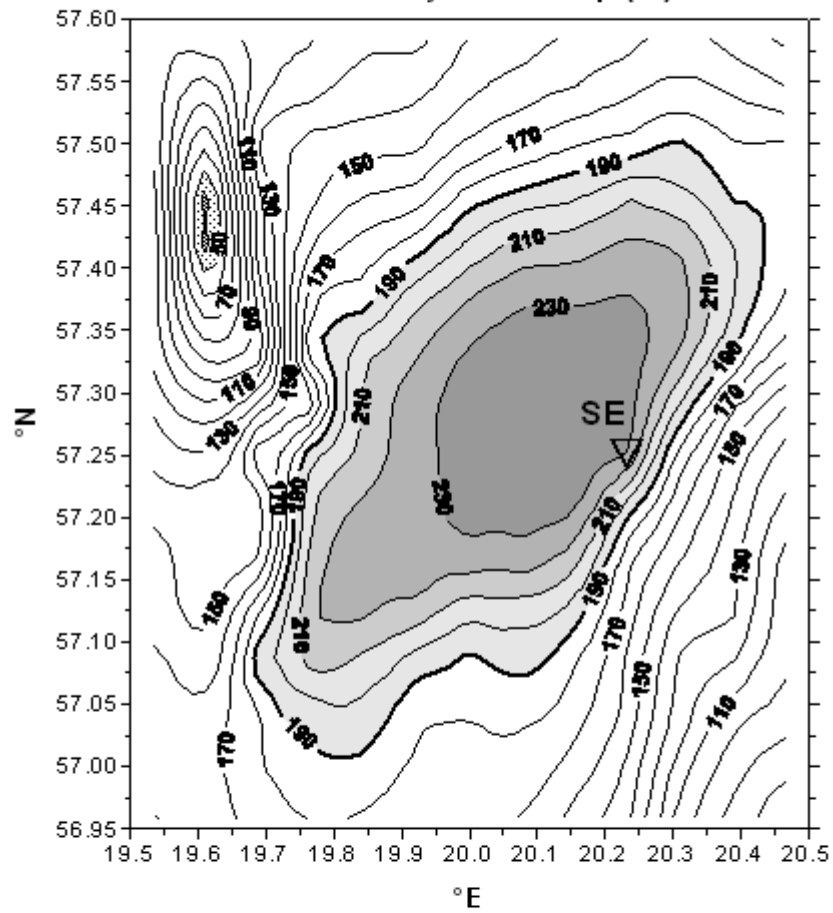




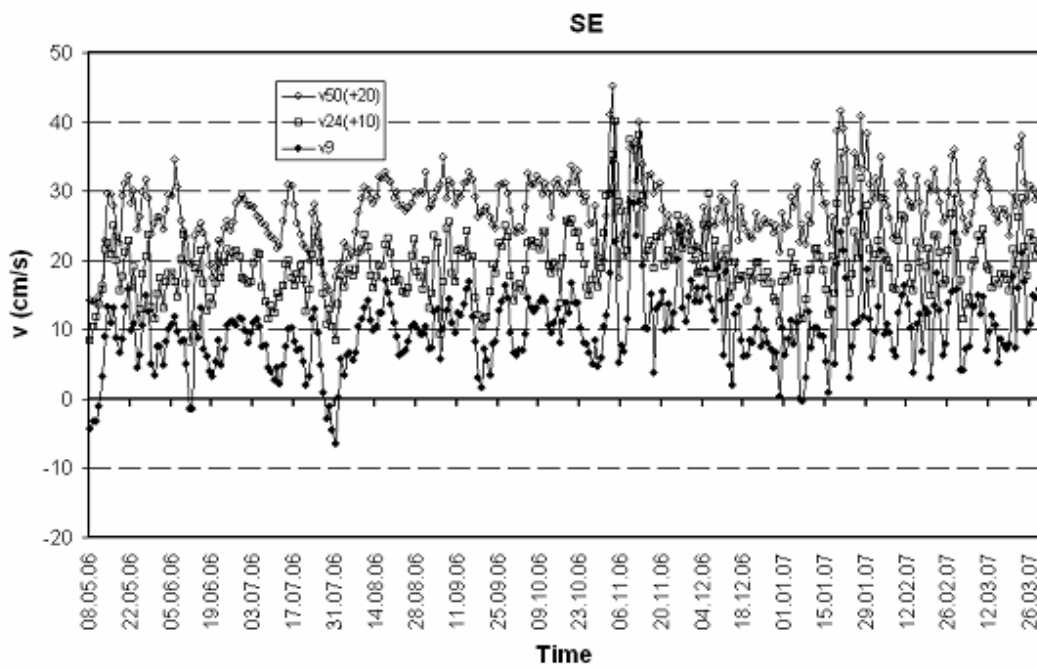
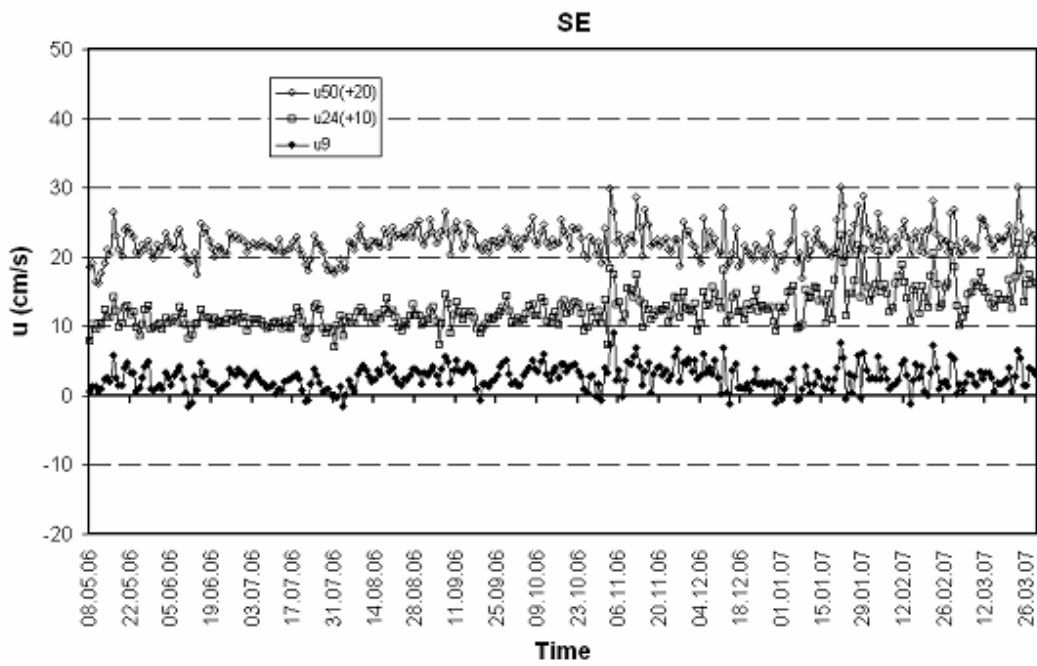
| SW | u50 | v50 | u20 | v20 | u5 | v5 |
|------------------|--------|--------|--------|--------|--------|--------|
| Above Bottom (m) | | | | | | |
| N (d) | 326,00 | 326,00 | 326,00 | 326,00 | 326,00 | 326,00 |
| Mean (cm/s) | 1,29 | -0,12 | 1,03 | -0,03 | 1,11 | 0,33 |
| STD (cm/s) | 2,94 | 3,79 | 2,84 | 3,49 | 2,68 | 3,81 |
| Skewness | -0,02 | -0,08 | -0,02 | -0,01 | 0,05 | 0,15 |
| Kurtosis | 0,40 | 2,63 | 1,17 | 3,67 | 0,25 | 3,15 |
| Min. (cm/s) | -7,92 | -14,20 | -9,47 | -13,11 | -6,14 | -13,67 |
| Max. (cm/s) | 11,13 | 17,58 | 11,11 | 17,09 | 9,39 | 18,46 |
| Range (cm/s) | 19,05 | 31,78 | 20,58 | 30,20 | 15,53 | 32,13 |

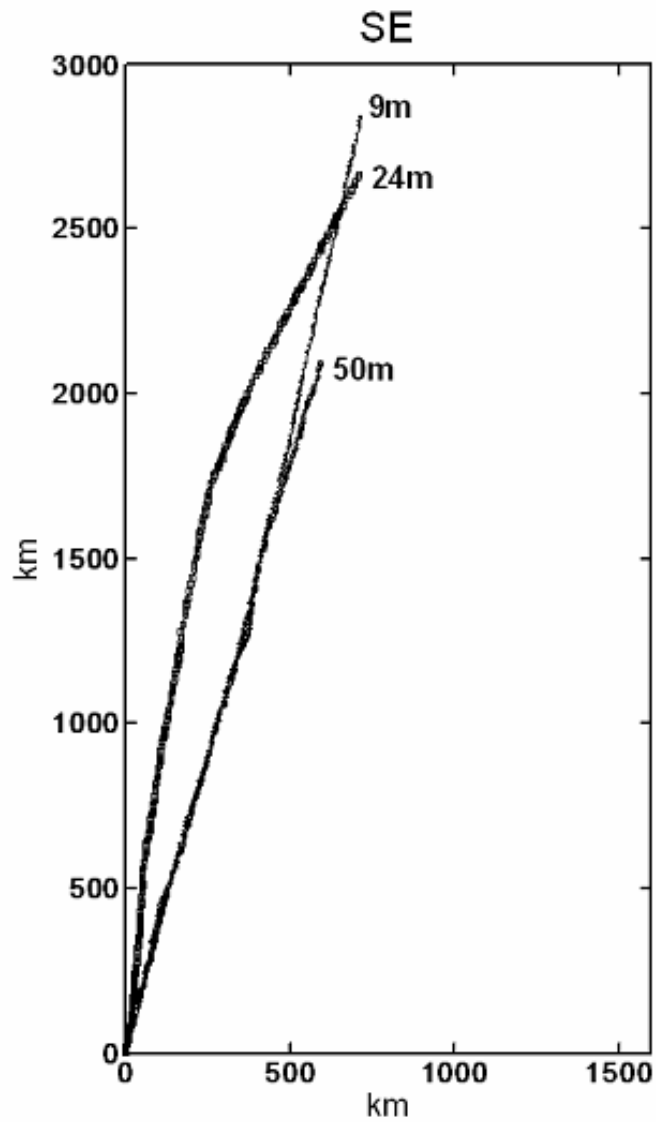
SE

EGB: Bathymetric Map (m)



| | |
|-----------|------------|
| | SE |
| Lat.(°N) | 57°15' |
| Long.(°E) | 20°15' |
| Depth (m) | 221 |
| SI (h) | 1 |
| Start | 08.05.2006 |
| End | 29.03.2007 |

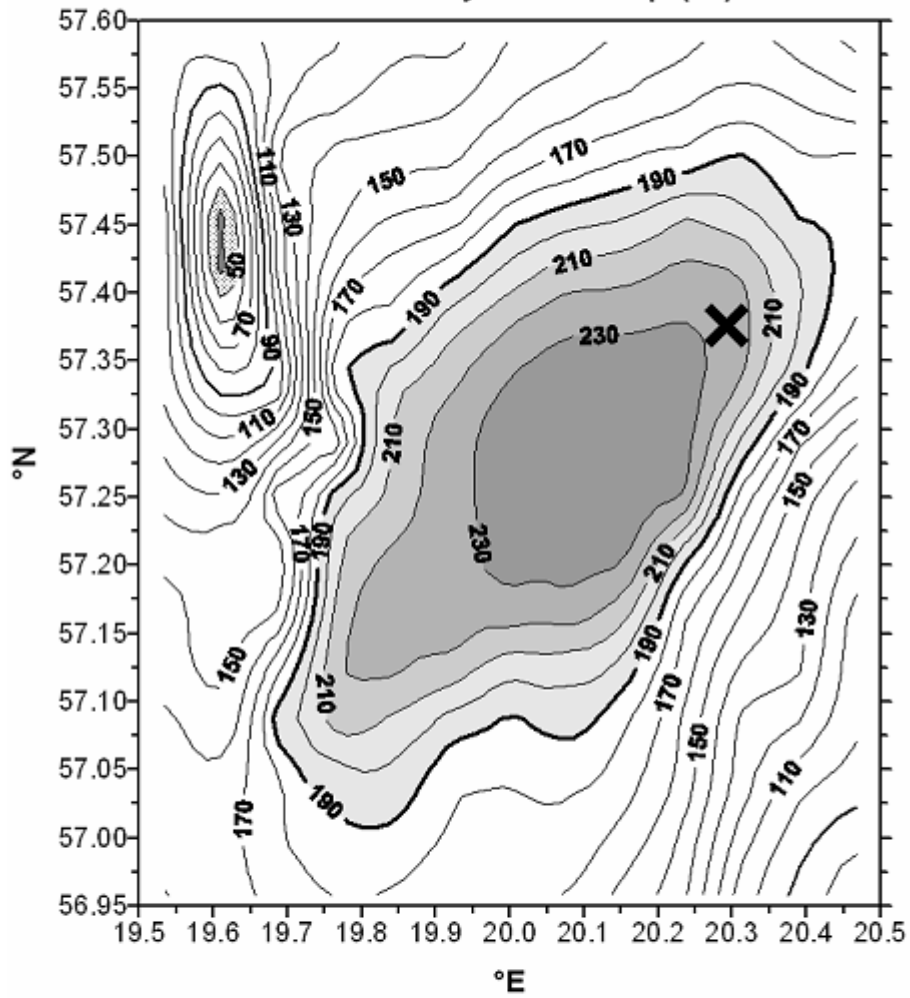




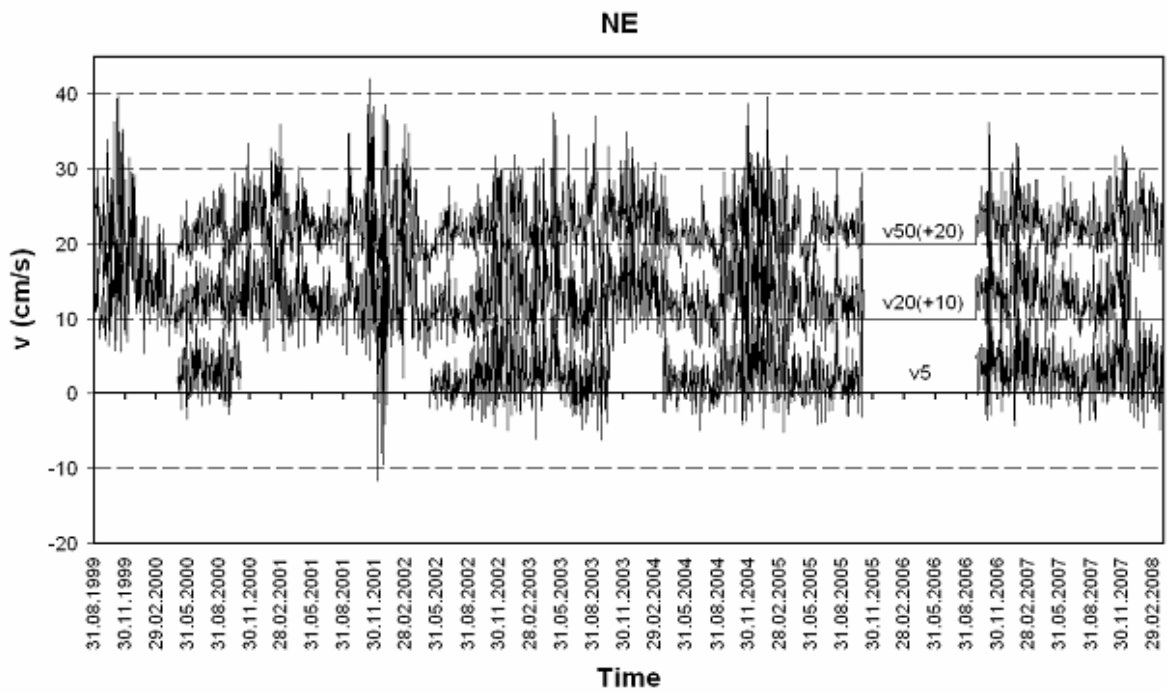
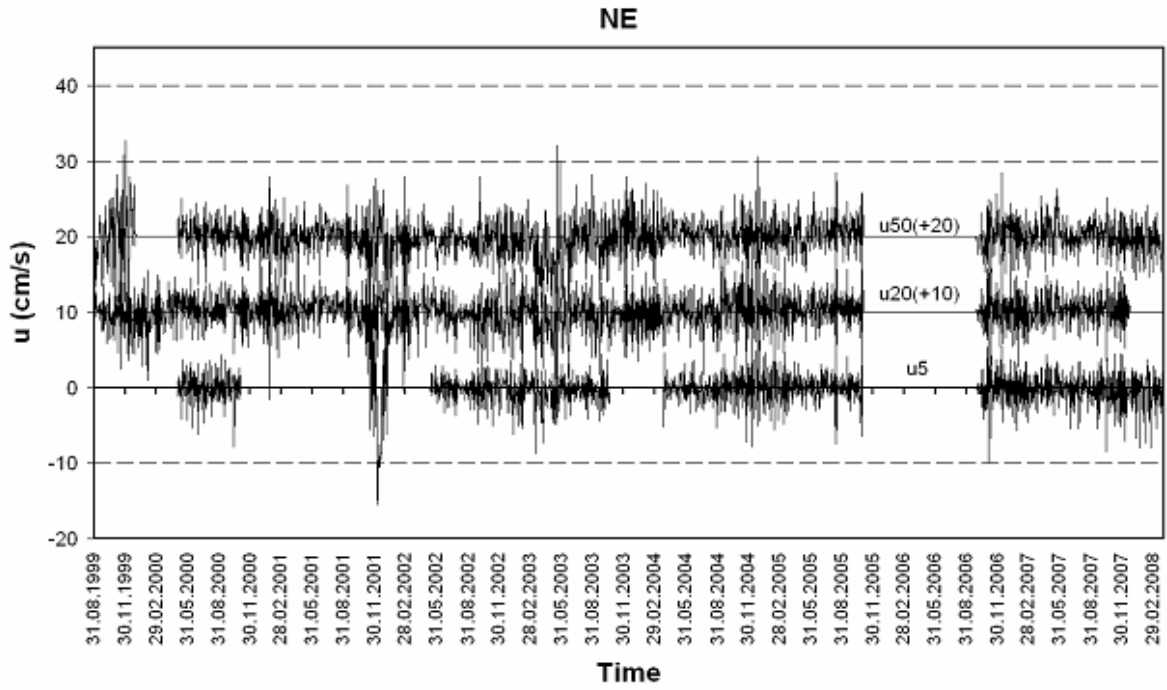
| SE | u50 | v50 | u24 | v24 | u9 | v9 |
|------------------|--------|--------|--------|--------|--------|--------|
| Above Bottom (m) | | | | | | |
| N (d) | 326,00 | 326,00 | 326,00 | 326,00 | 326,00 | 326,00 |
| Mean (cm/s) | 2,12 | 7,42 | 2,52 | 9,46 | 2,55 | 10,08 |
| STD (cm/s) | 2,18 | 4,77 | 2,65 | 4,94 | 1,75 | 5,55 |
| Skewness | 0,57 | 0,02 | 1,16 | 0,82 | 0,29 | 0,49 |
| Kurtosis | 1,40 | 1,08 | 1,84 | 1,97 | 0,27 | 1,97 |
| Min. (cm/s) | -3,77 | -6,46 | -2,95 | -1,73 | -1,70 | -6,51 |
| Max. (cm/s) | 10,01 | 25,11 | 13,17 | 30,08 | 9,04 | 34,22 |
| Range (cm/s) | 13,78 | 31,57 | 16,12 | 31,81 | 10,74 | 40,73 |

NE

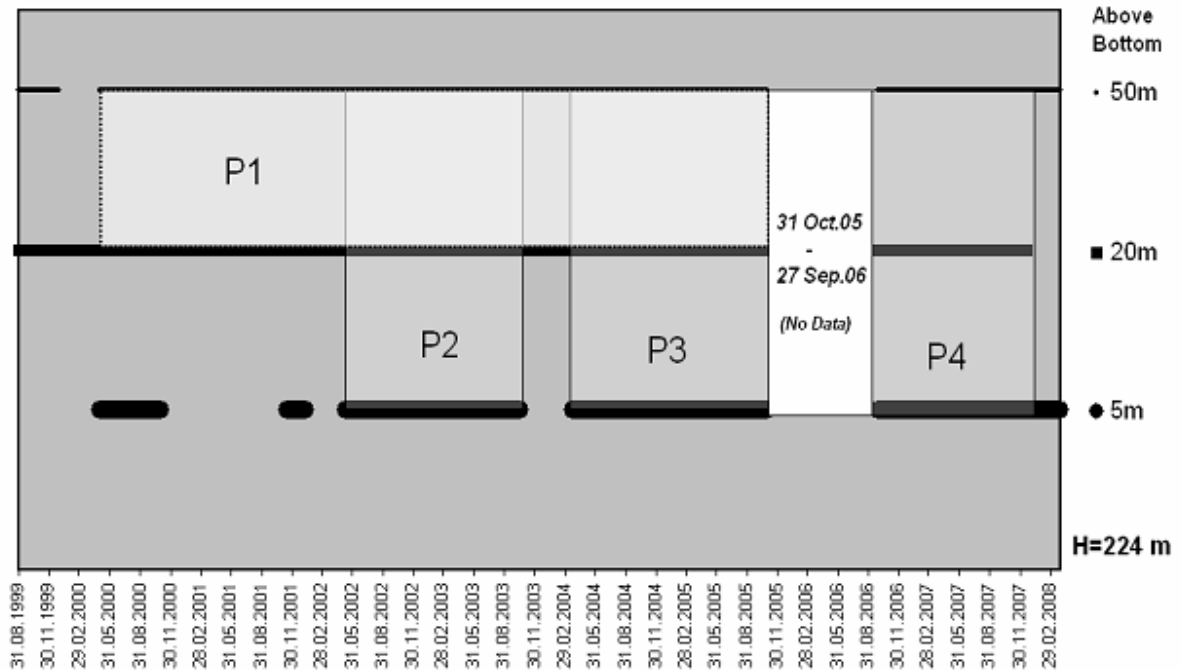
EGB: Bathymetric Map (m)



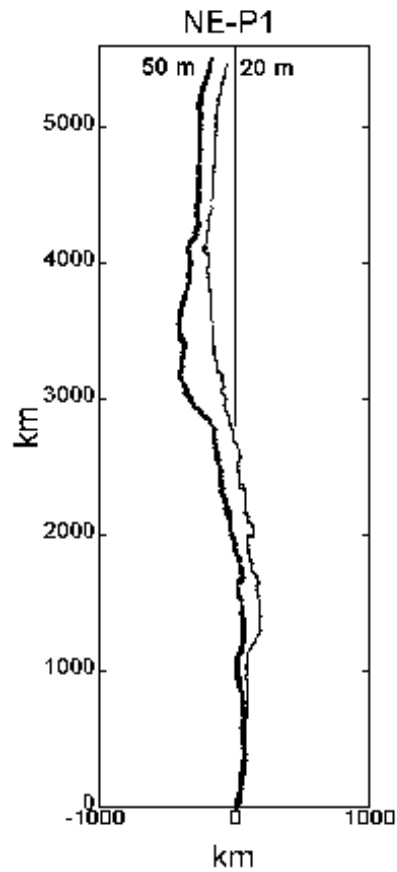
| | |
|------------|------------|
| | NE |
| Lat. (°N) | 57°23' |
| Long. (°E) | 20°19' |
| Depth (m) | 224 |
| SI (h) | 1 |
| Start | 31.08.1999 |
| End | 30.03.2008 |



NE-Recordings (31 Aug. 99 - 30 Mar. 08)

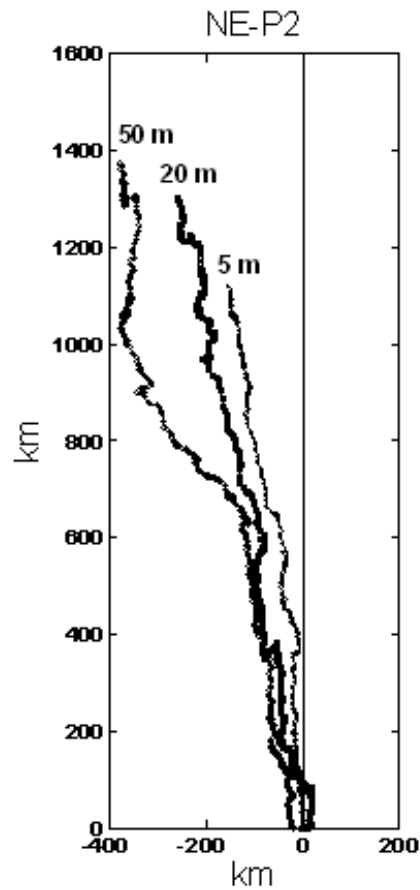


| Total | u50 | v50 | u20 | v20 | u5 | v5 |
|------------------|---------|---------|---------|---------|---------|---------|
| Above Bottom (m) | | | | | | |
| N (d) | 2680,00 | 2680,00 | 2703,00 | 2703,00 | 1907,00 | 1907,00 |
| Mean (cm/s) | -0,06 | 3,22 | -0,02 | 3,31 | -0,23 | 3,05 |
| STD (cm/s) | 2,63 | 3,74 | 2,42 | 3,99 | 2,24 | 3,75 |
| Skewness | -0,47 | 0,83 | -0,29 | 0,88 | -0,66 | 1,12 |
| Kurtosis | 3,11 | 1,86 | 2,05 | 1,47 | 4,74 | 3,37 |
| Min. (cm/s) | -15,78 | -11,18 | -12,44 | -7,87 | -15,48 | -11,65 |
| Max. (cm/s) | 12,67 | 22,05 | 12,00 | 24,69 | 11,29 | 24,41 |
| Range (cm/s) | 28,45 | 33,23 | 24,44 | 32,56 | 26,77 | 36,06 |



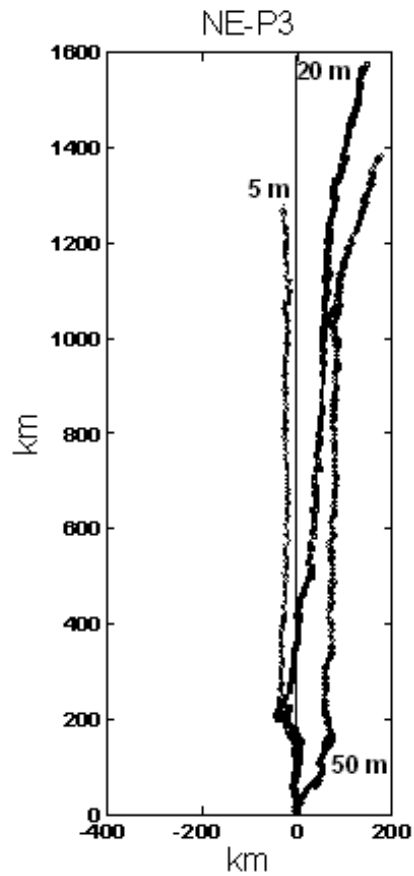
P1 (01.05.2000-30.10.2005)

| Above Bottom (m) | u50 | v50 | u20 | v20 |
|------------------|---------|---------|---------|---------|
| N (d) | 2009,00 | 2009,00 | 2009,00 | 2009,00 |
| Mean (cm/s) | -0,10 | 3,17 | -0,03 | 3,15 |
| STD (cm/s) | 2,61 | 3,78 | 2,44 | 4,05 |
| Skewness | -0,59 | 0,89 | -0,28 | 0,92 |
| Kurtosis | 3,37 | 1,86 | 2,21 | 1,57 |
| Min. (cm/s) | -15,78 | -11,18 | -12,44 | -7,87 |
| Max. (cm/s) | 12,03 | 22,05 | 12,00 | 24,69 |
| Range (cm/s) | 27,81 | 33,23 | 24,44 | 32,56 |



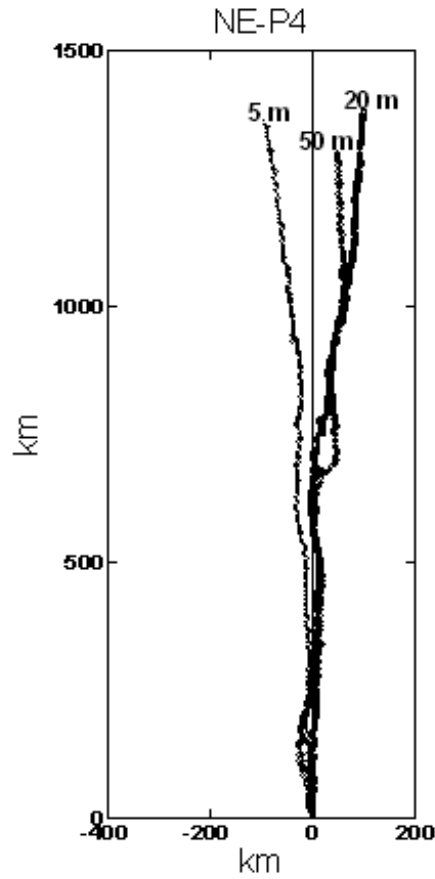
P2 (09.05.2002-19.10.2003)

| Above Bottom (m) | u50 | v50 | u20 | v20 | u5 | v5 |
|------------------|--------|--------|--------|--------|--------|--------|
| N (d) | 529,00 | 529,00 | 529,00 | 529,00 | 529,00 | 529,00 |
| Mean (cm/s) | -0,82 | 3,00 | -0,57 | 2,84 | -0,33 | 2,44 |
| STD (cm/s) | 3,00 | 3,68 | 2,59 | 4,17 | 1,82 | 3,41 |
| Skewness | -0,50 | 0,62 | -0,39 | 0,87 | -0,52 | 0,82 |
| Kurtosis | 3,31 | 1,42 | 2,45 | 1,09 | 1,65 | 1,14 |
| Min. (cm/s) | -15,78 | -11,18 | -12,44 | -6,20 | -8,69 | -6,14 |
| Max. (cm/s) | 12,03 | 17,49 | 11,38 | 21,90 | 5,72 | 16,23 |
| Range (cm/s) | 27,81 | 28,67 | 23,82 | 28,10 | 14,41 | 22,37 |



P3 (23.03.2004-30.10.2005)

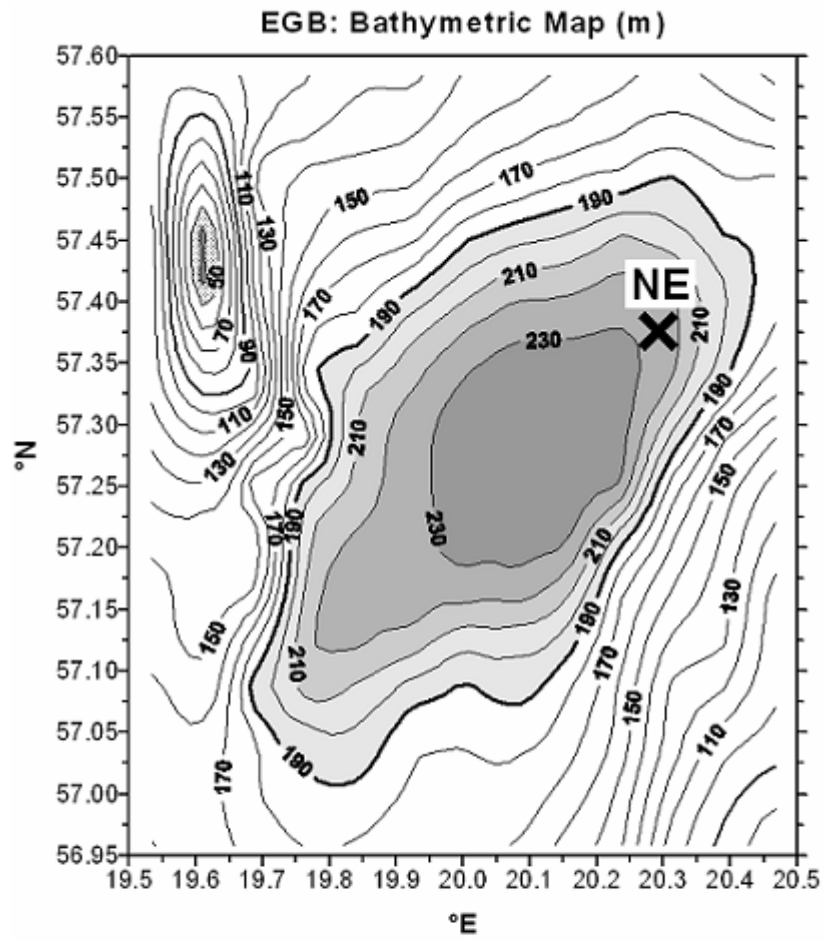
| Above Bottom (m) | u50 | v50 | u20 | v20 | u5 | v5 |
|------------------|--------|--------|--------|--------|--------|--------|
| N (d) | 587,00 | 587,00 | 587,00 | 587,00 | 587,00 | 587,00 |
| Mean (cm/s) | 0,35 | 2,72 | 0,29 | 3,10 | -0,05 | 2,51 |
| STD (cm/s) | 2,07 | 3,49 | 2,42 | 4,04 | 1,87 | 3,33 |
| Skewness | 0,33 | 1,14 | 0,24 | 1,03 | -0,16 | 1,14 |
| Kurtosis | 1,47 | 2,43 | 2,00 | 1,56 | 2,19 | 2,58 |
| Min. (cm/s) | -6,23 | -7,94 | -8,33 | -5,74 | -7,78 | -5,19 |
| Max. (cm/s) | 10,59 | 19,72 | 12,00 | 20,75 | 8,24 | 18,50 |
| Range (cm/s) | 16,82 | 27,66 | 20,33 | 26,49 | 16,02 | 23,69 |



P4 (28.09.2006-21.12.2007)

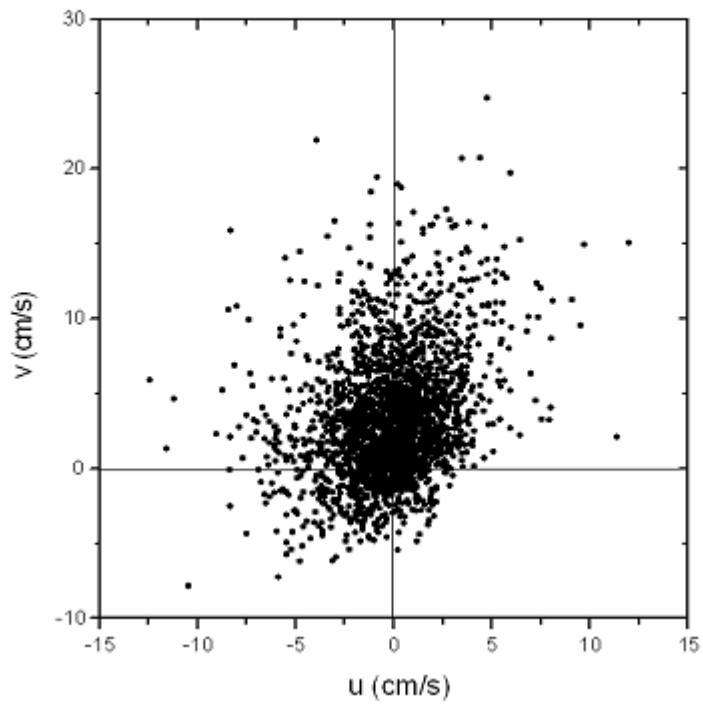
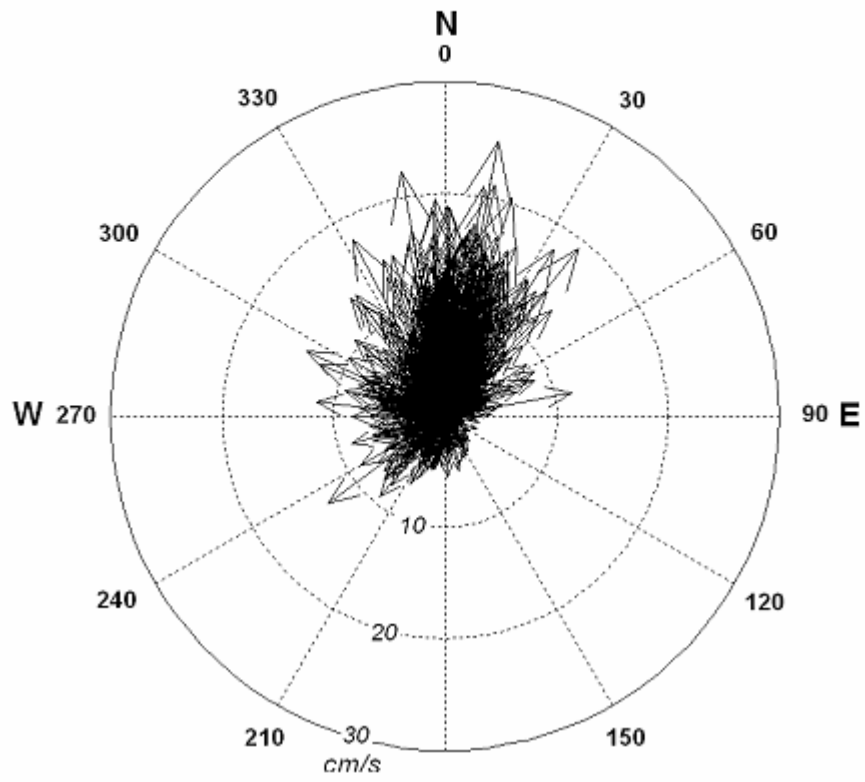
| Above Bottom (m) | u50 | v50 | u20 | v20 | u5 | v5 |
|------------------|--------|--------|--------|--------|--------|--------|
| N (d) | 450,00 | 450,00 | 450,00 | 450,00 | 450,00 | 450,00 |
| Mean (cm/s) | 0,13 | 3,34 | 0,26 | 3,55 | -0,23 | 3,50 |
| STD (cm/s) | 2,08 | 3,02 | 2,15 | 3,22 | 2,09 | 3,27 |
| Skewness | -0,07 | 0,67 | -0,29 | 0,71 | -0,46 | 0,81 |
| Kurtosis | 1,30 | 1,63 | 1,62 | 1,61 | 1,40 | 2,01 |
| Min. (cm/s) | -9,58 | -6,03 | -10,35 | -6,95 | -9,80 | -4,23 |
| Max. (cm/s) | 8,45 | 16,27 | 7,62 | 16,58 | 5,47 | 19,31 |
| Range (cm/s) | 18,03 | 22,30 | 17,97 | 23,53 | 15,27 | 23,54 |

NE - L

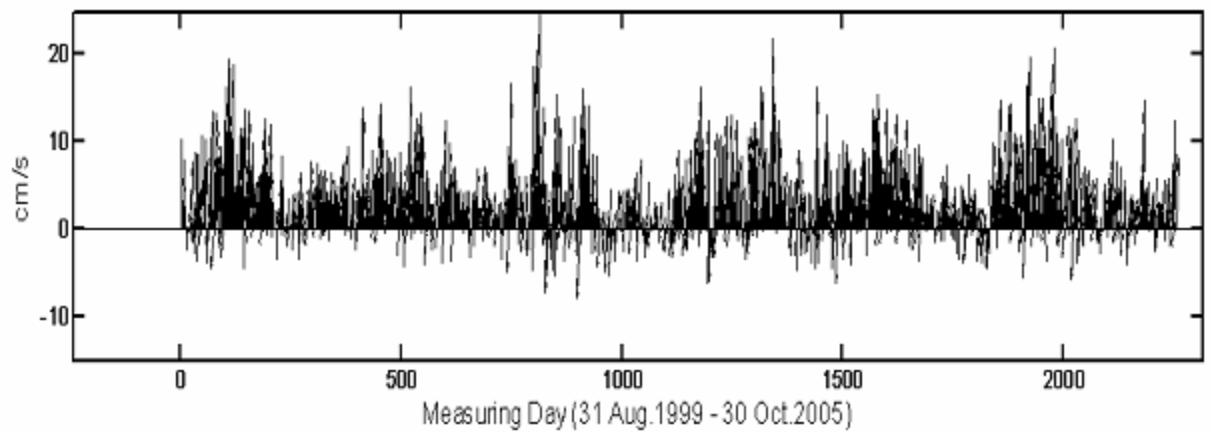
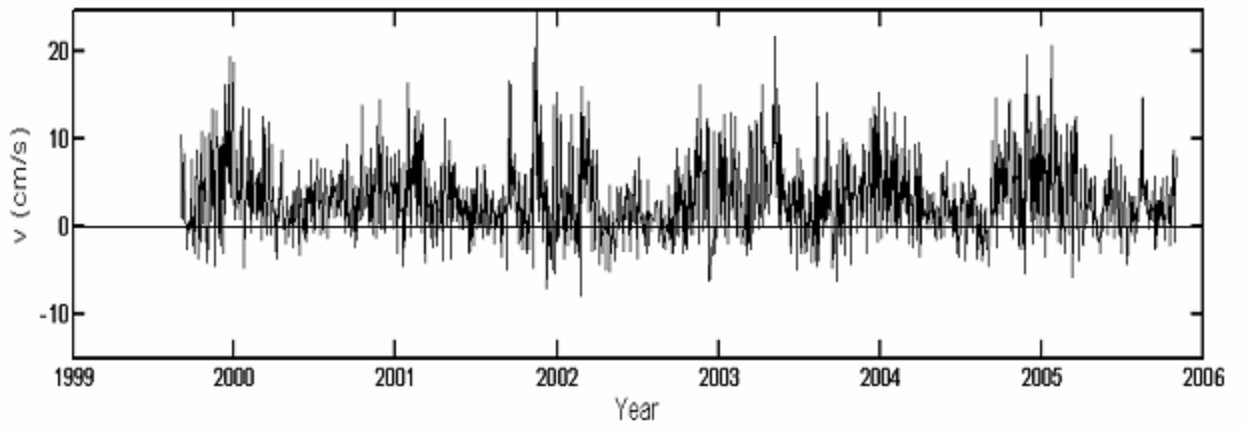
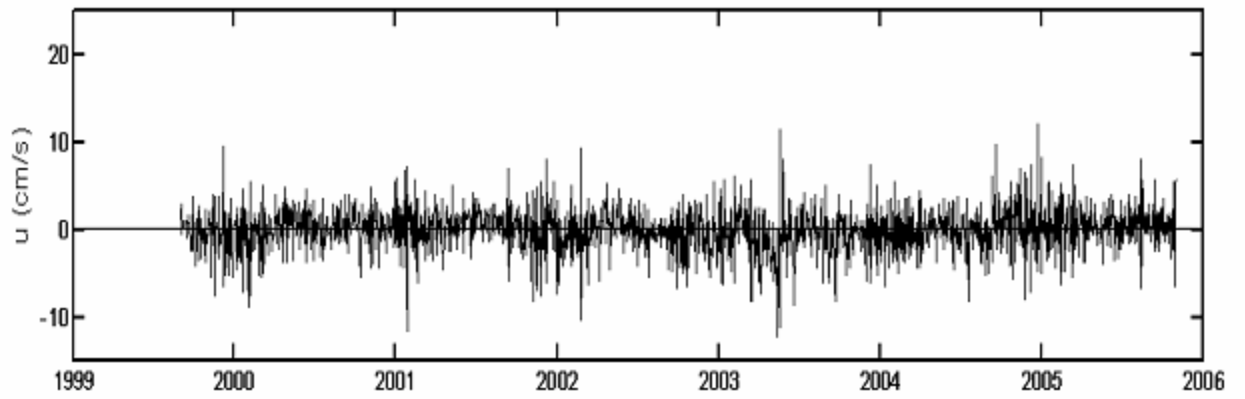


| | | |
|------------------|---------|---------|
| NE | | |
| Above Bottom (m) | u20 | v20 |
| N (d) | 2253,00 | 2253,00 |
| Mean (cm/s) | -0,08 | 3,26 |
| STD (cm/s) | 2,46 | 4,13 |
| Skewness | -0,28 | 0,91 |
| Kurtosis | 2,06 | 1,38 |
| Min. (cm/s) | -12,44 | -7,87 |
| Max. (cm/s) | 12,00 | 24,69 |
| Range (cm/s) | 24,44 | 32,56 |

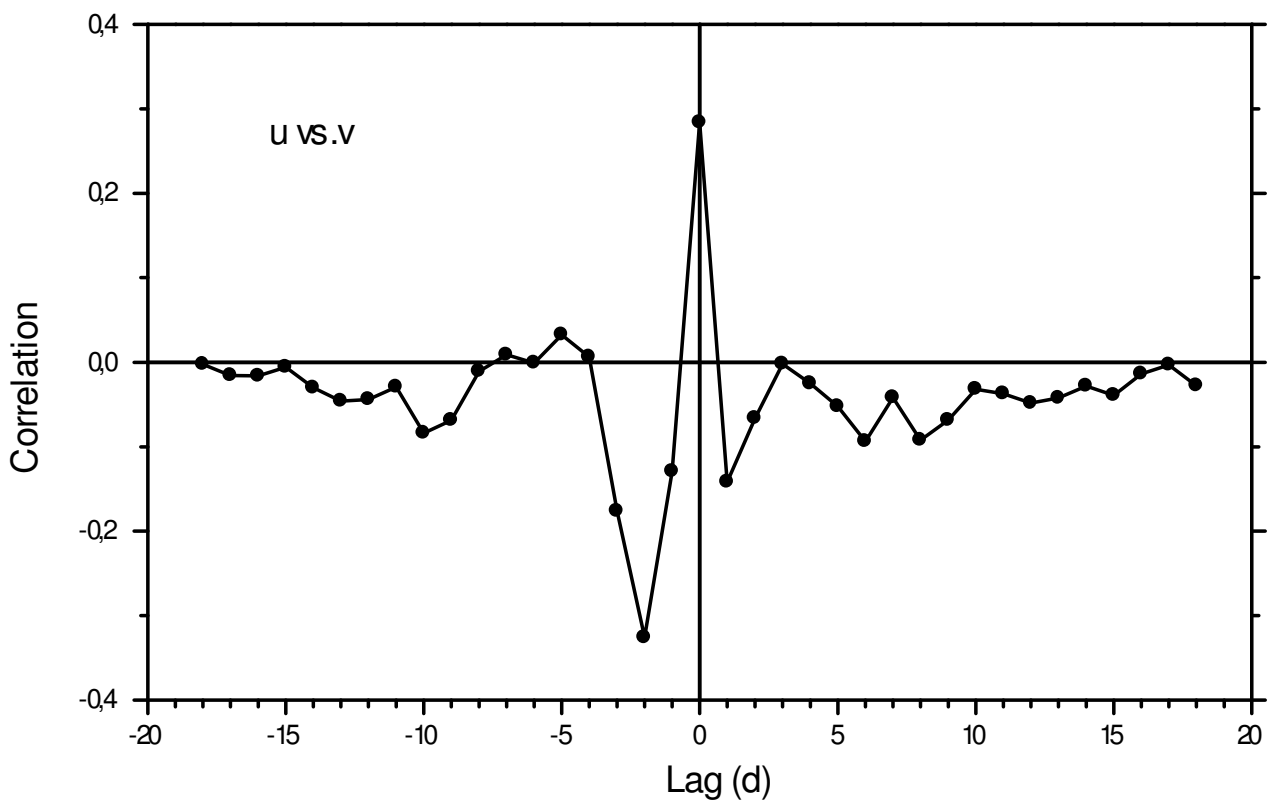
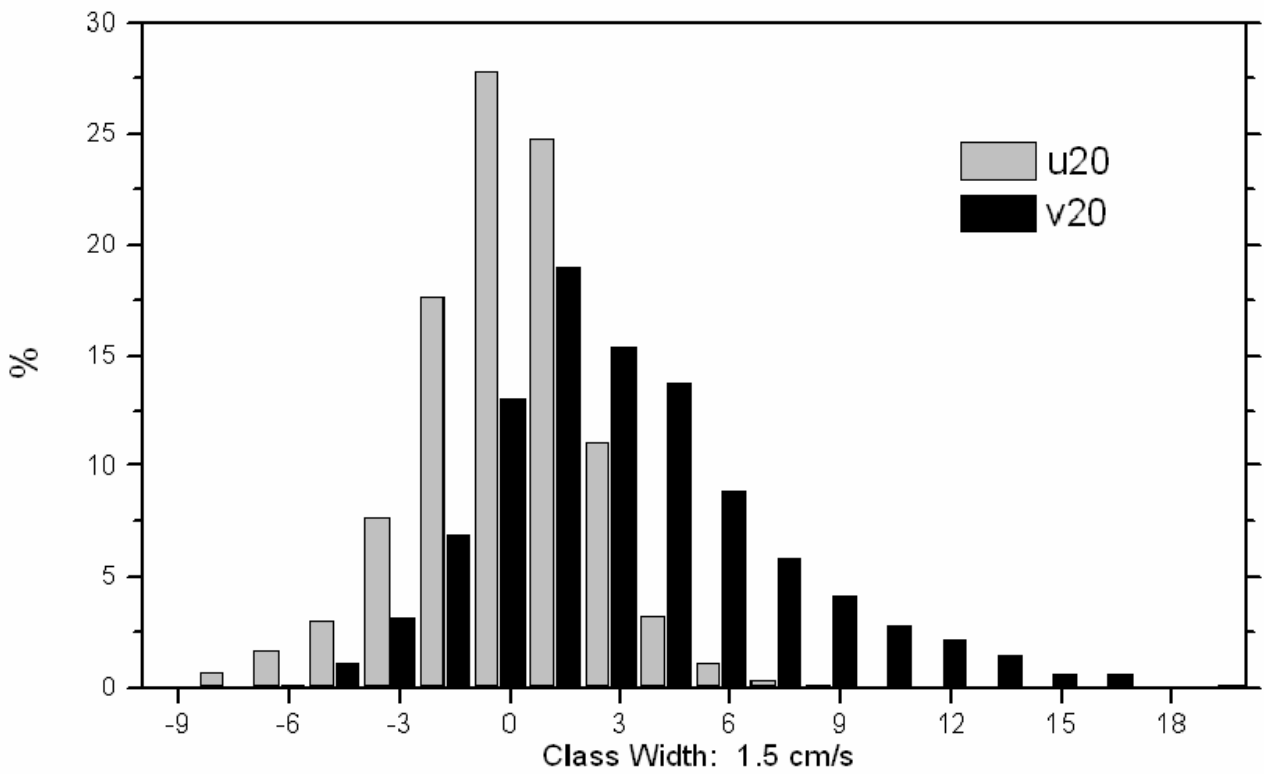
Scatter (°)



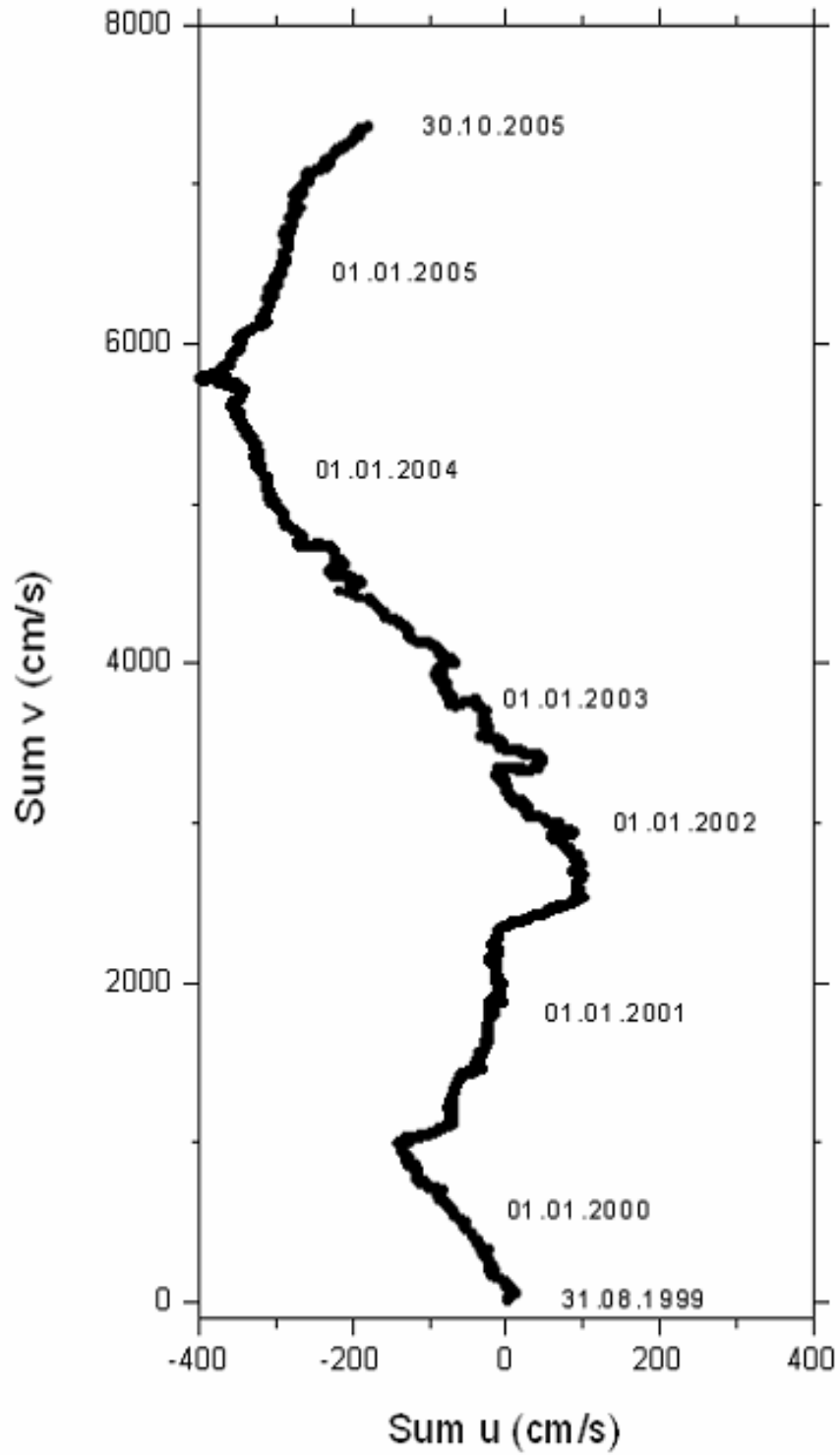
Time Series



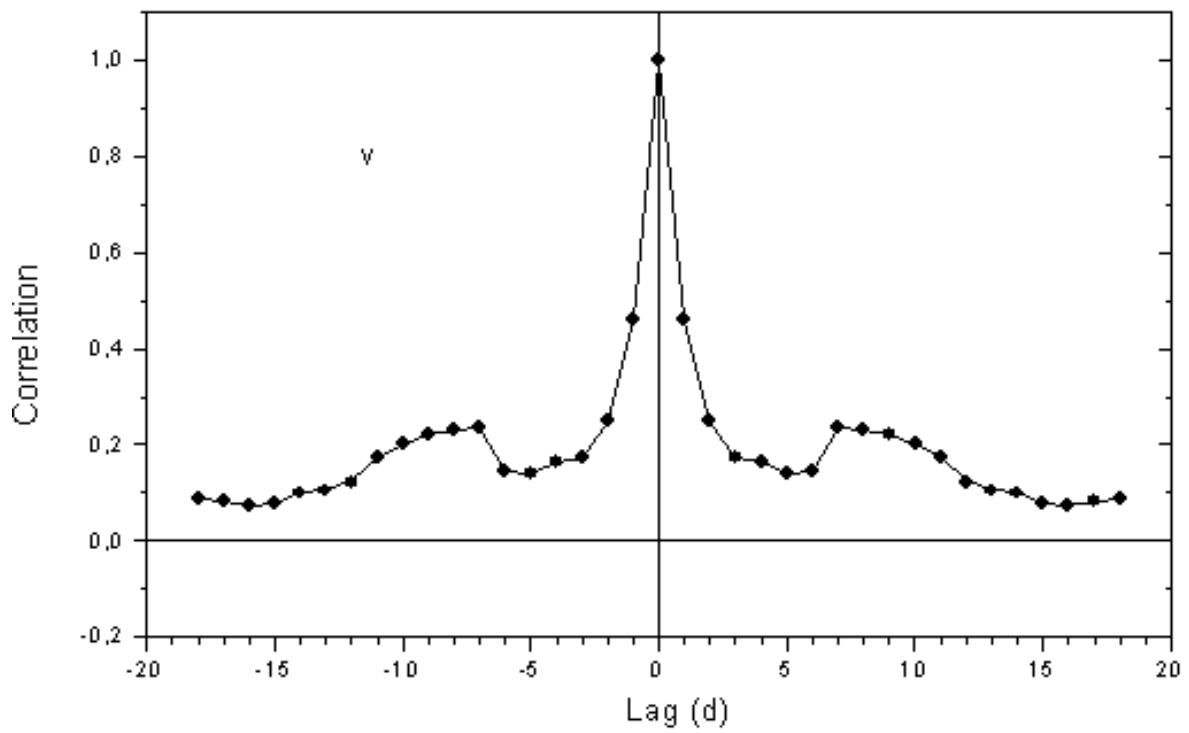
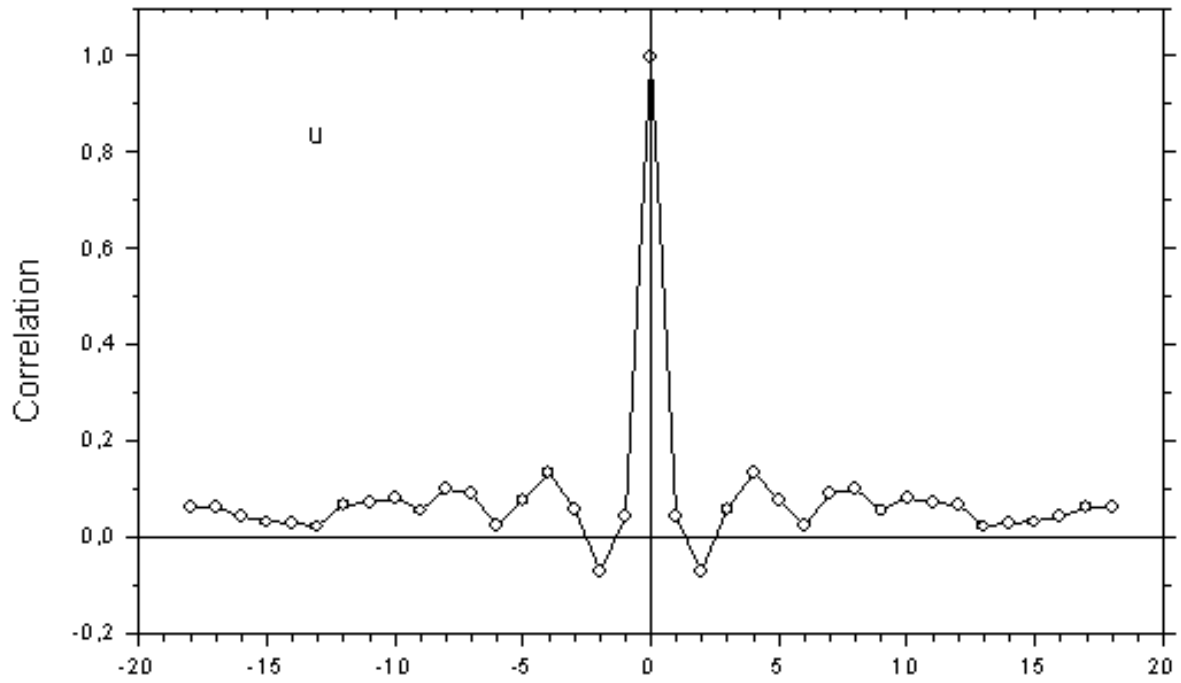
Frequency Distribution/ Lag Correlation



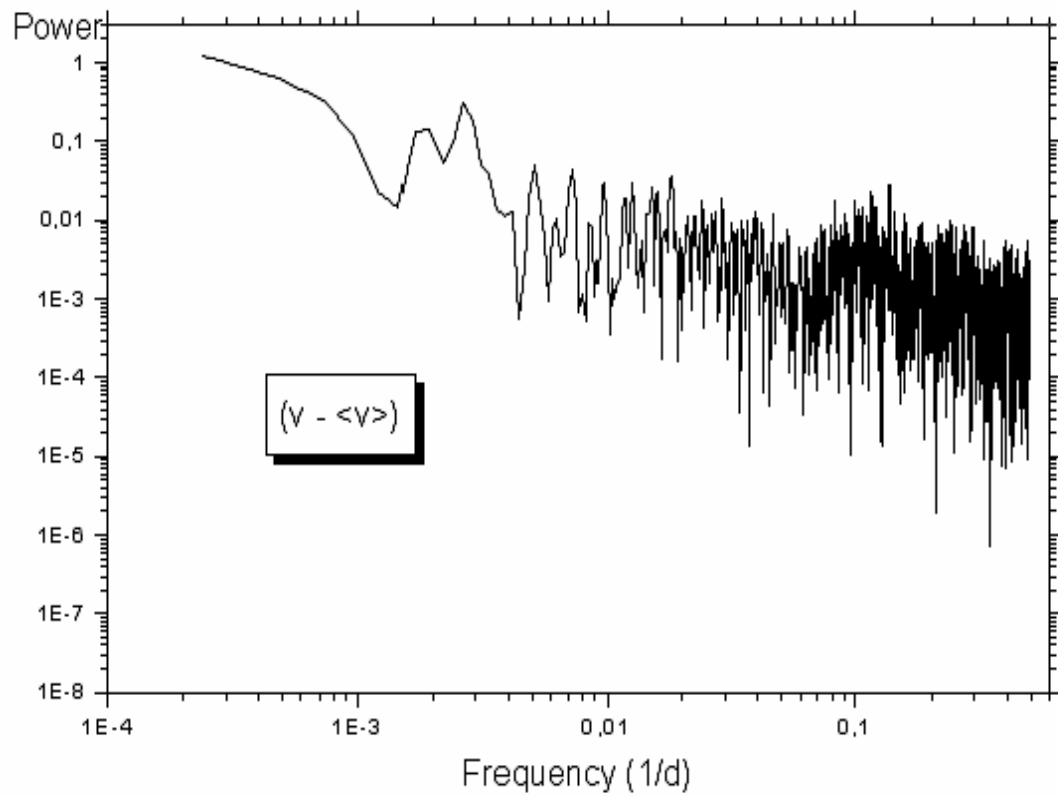
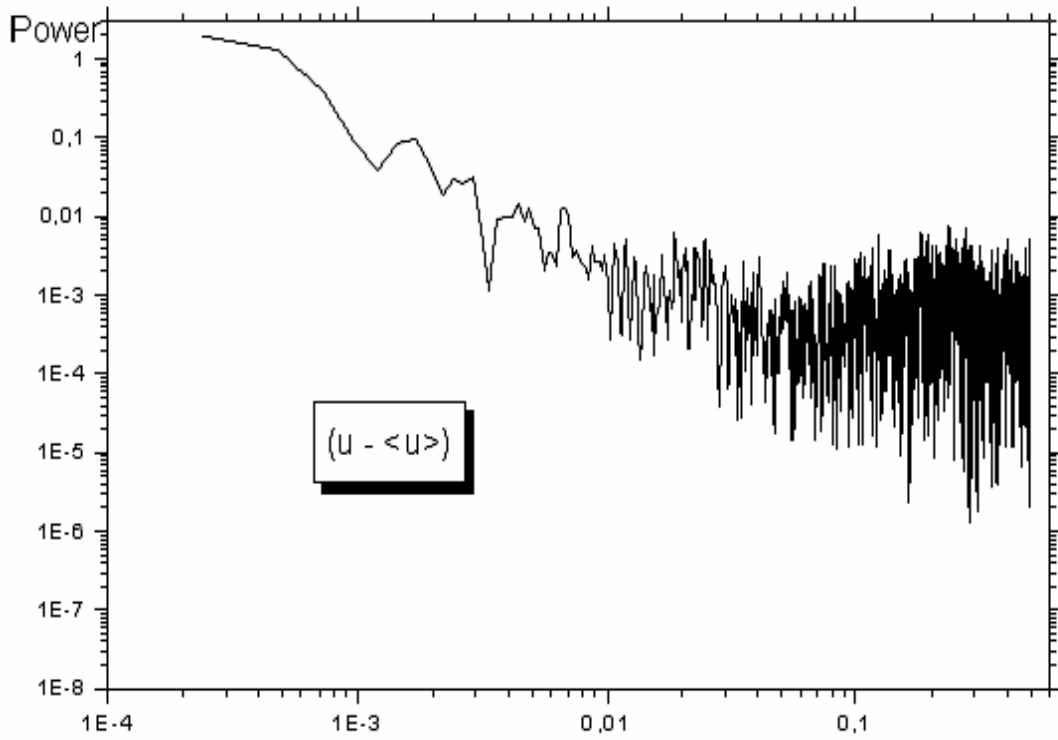
PVD



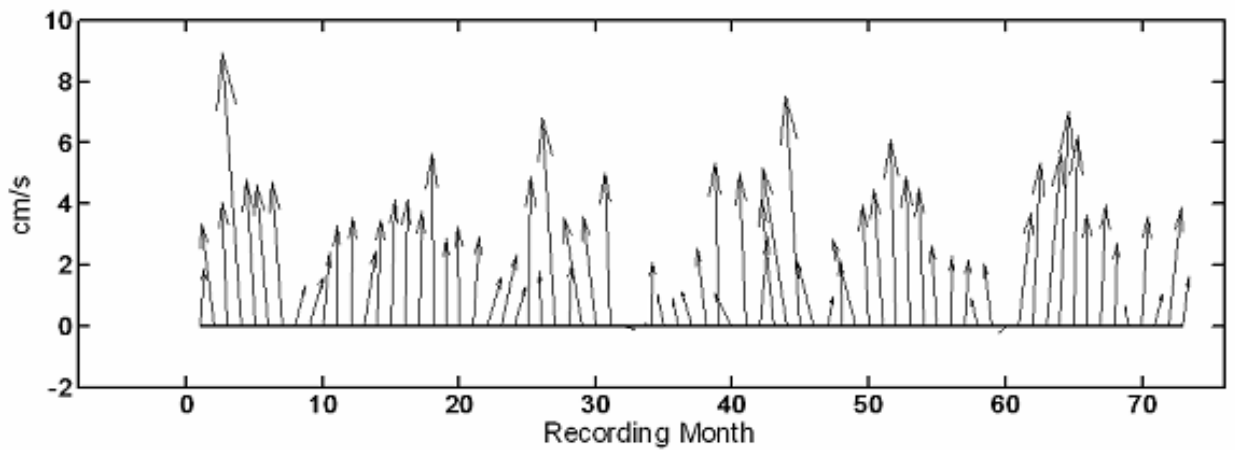
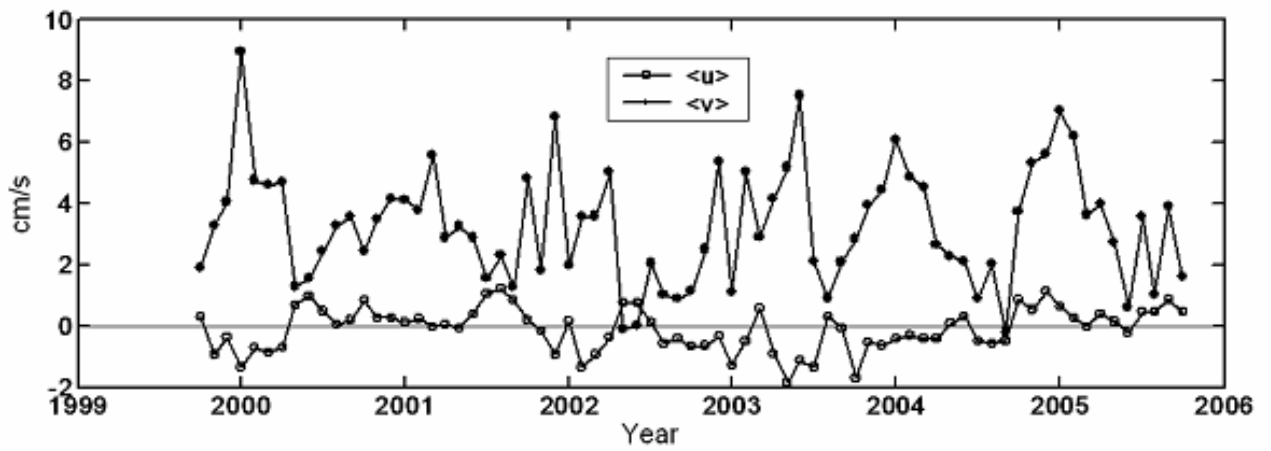
Autocorrelation



Power Spectra

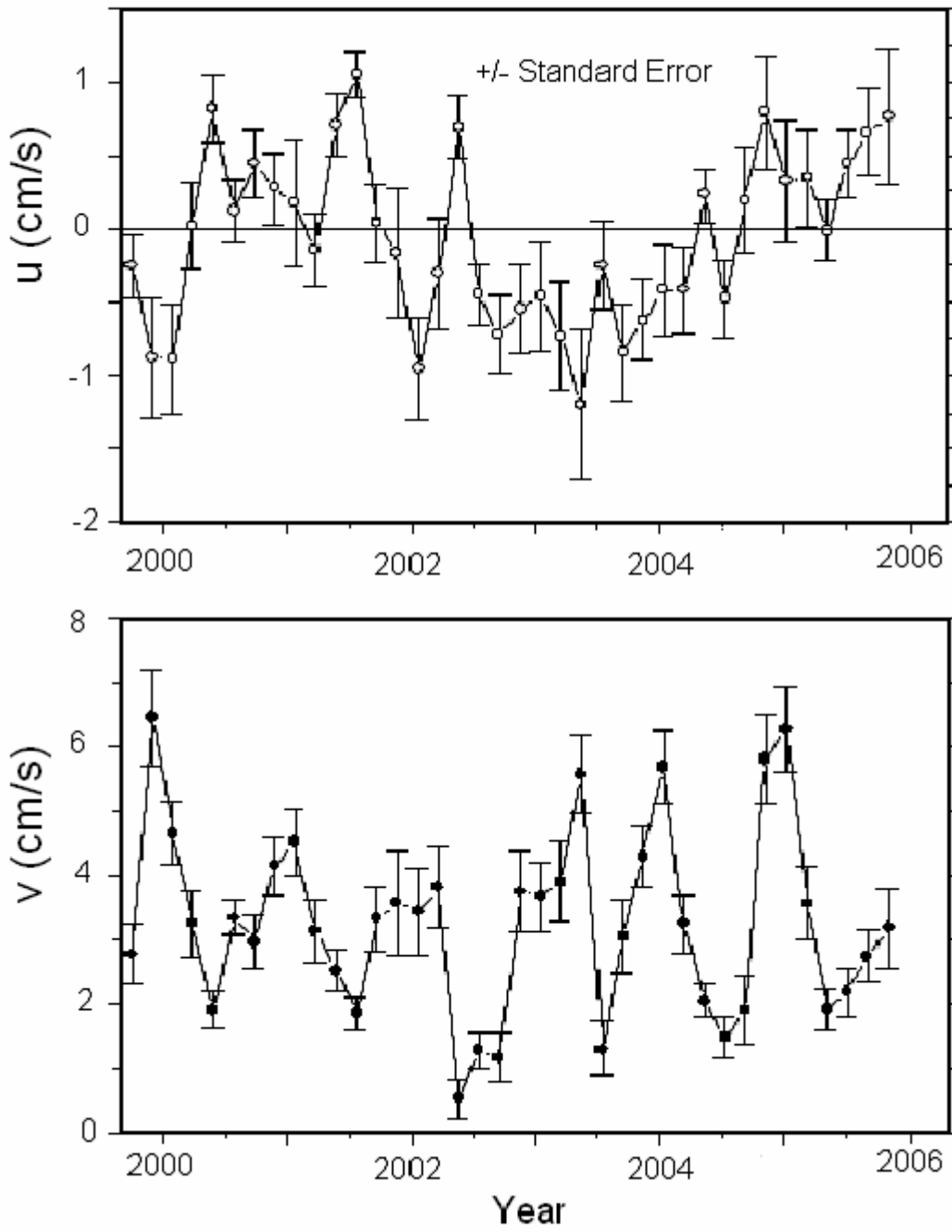


Monthly Averages



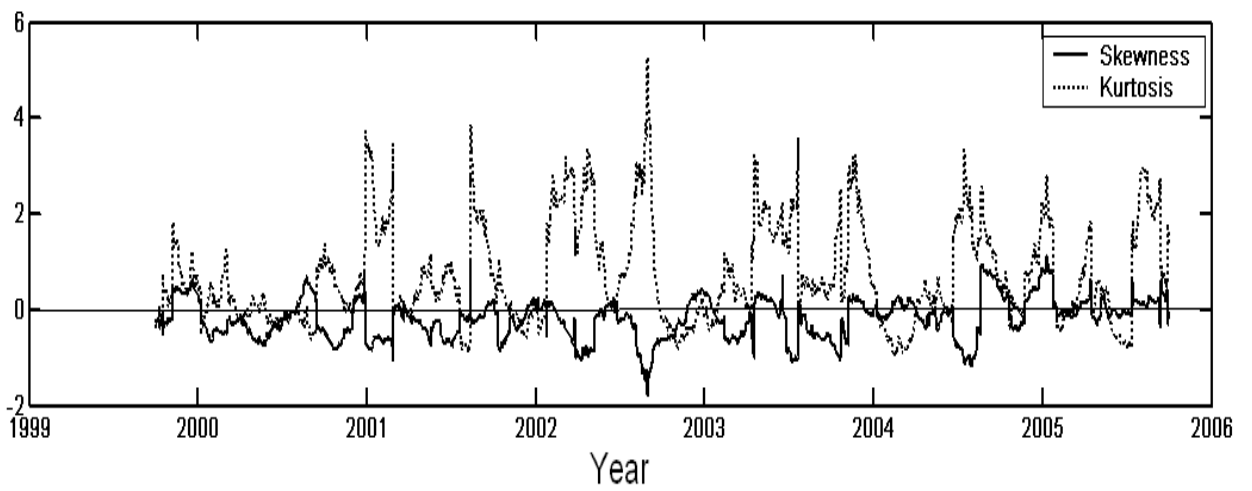
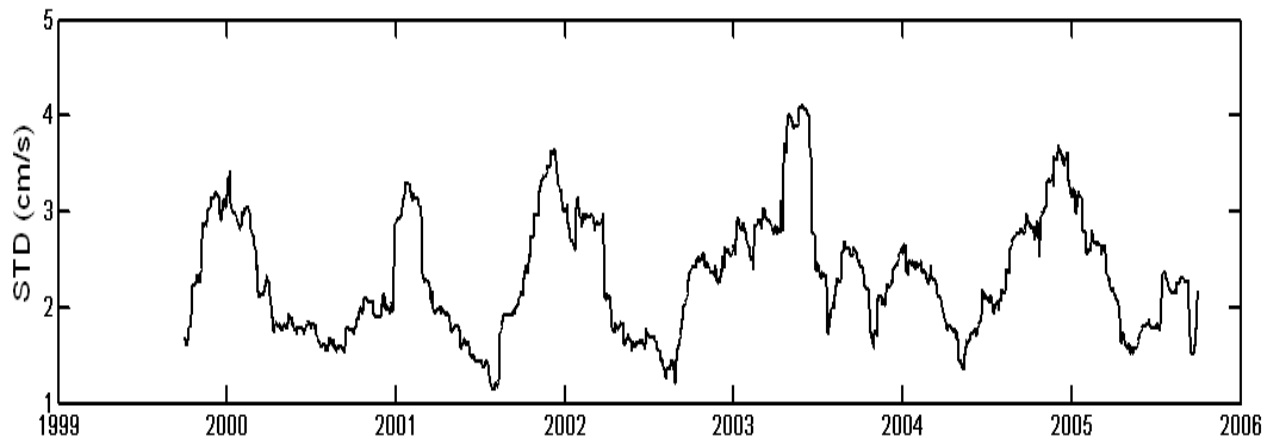
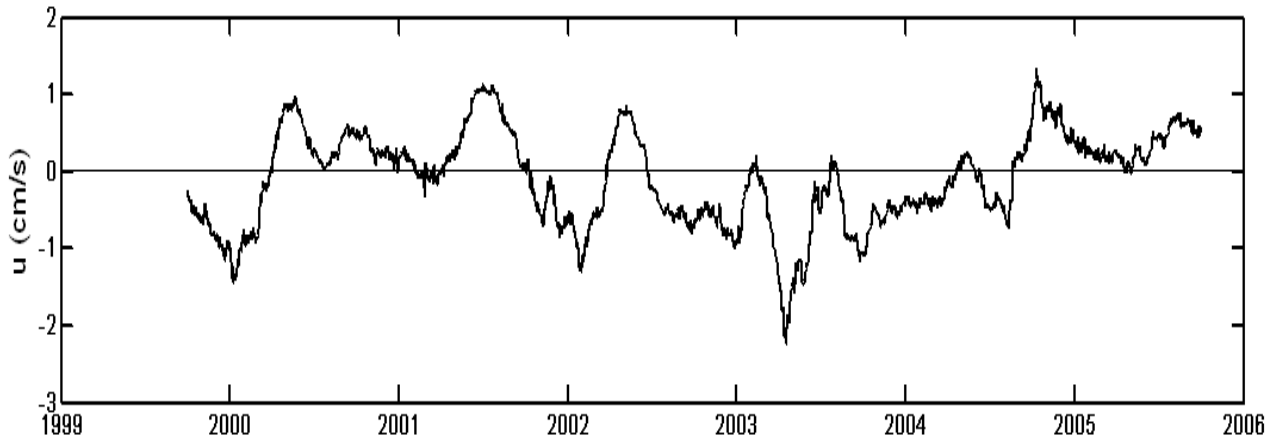
| | | |
|------------------|-------|-------|
| NE-L | | |
| Above Bottom (m) | <u>20 | <v>20 |
| N (m) | 72,00 | 72,00 |
| Mean (cm/s) | -0,10 | 3,29 |
| STD (cm/s) | 0,70 | 1,88 |
| Skewness | -0,29 | 0,44 |
| Kurtosis | -0,49 | 0,07 |
| Min. (cm/s) | -1,82 | -0,23 |
| Max. (cm/s) | 1,20 | 8,91 |
| Range | 3,02 | 9,14 |

60 d - Averages

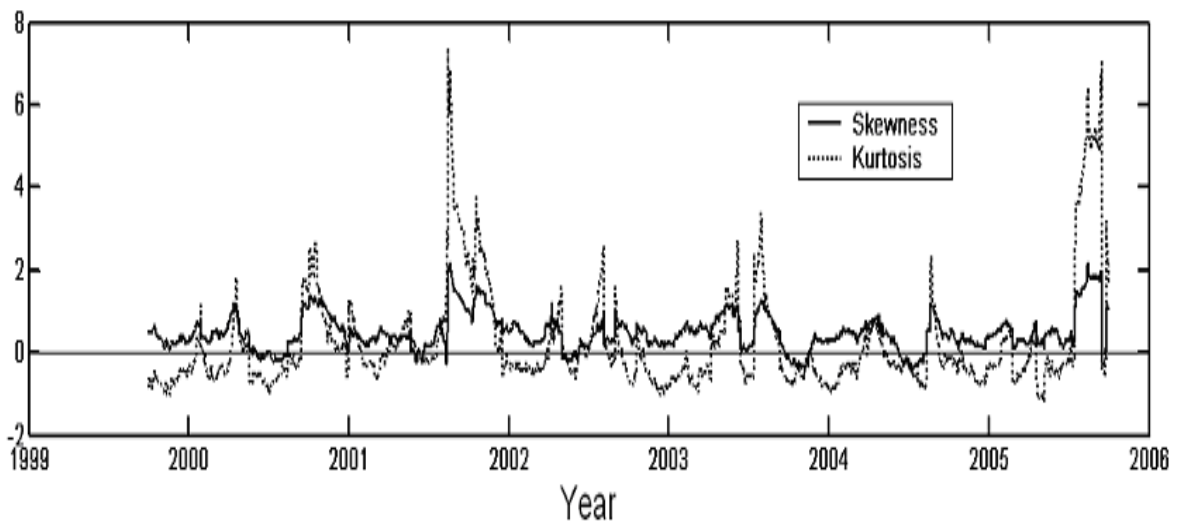
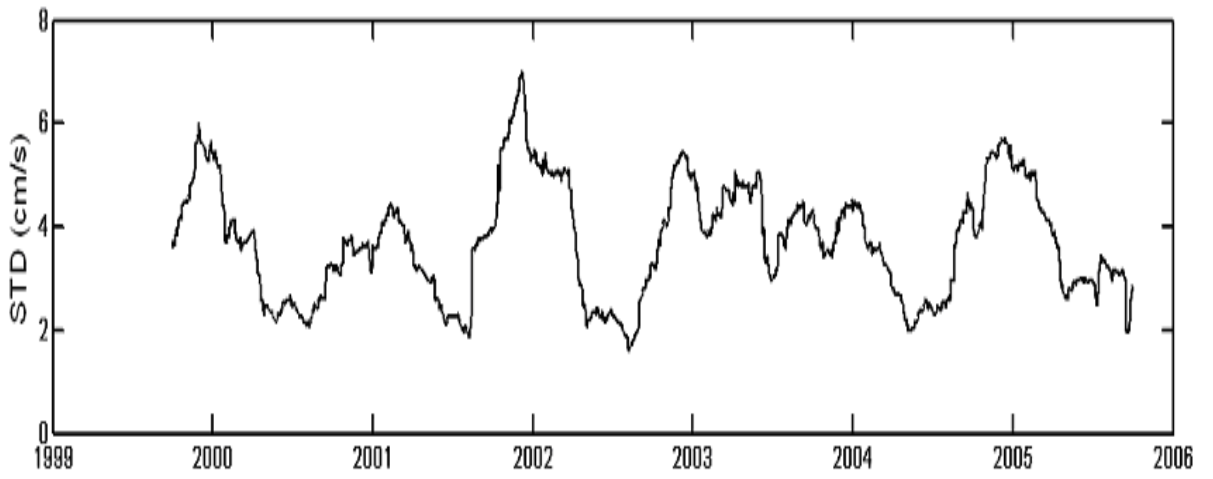
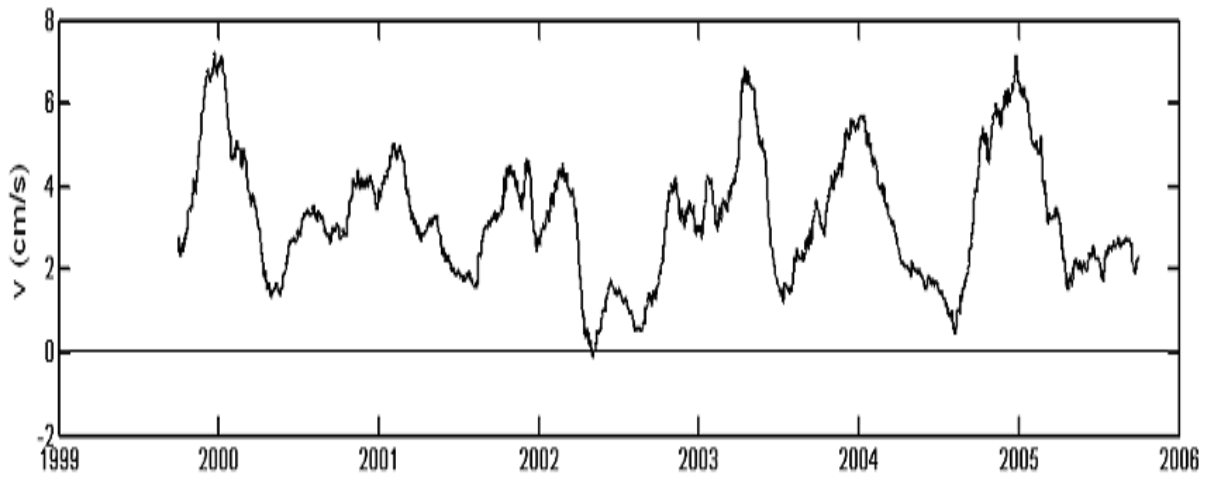


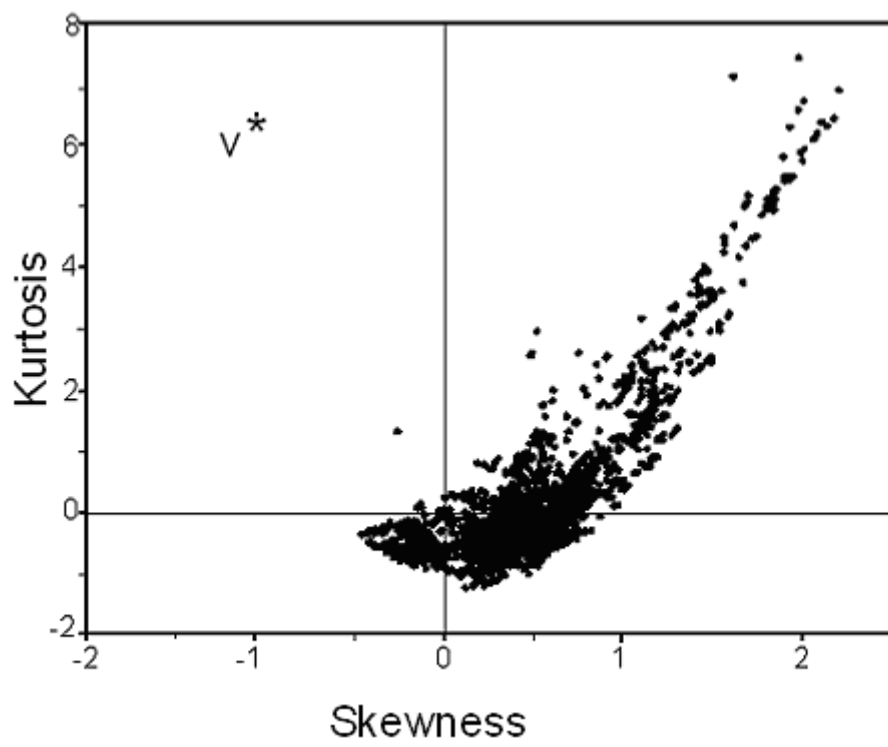
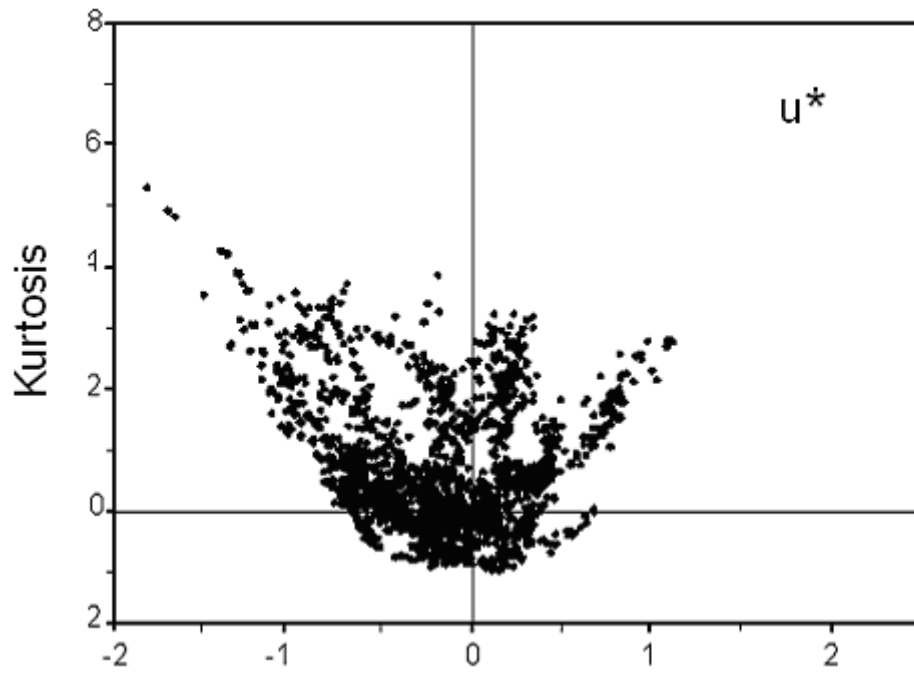
60-Days Running Statistics (*):

u^*

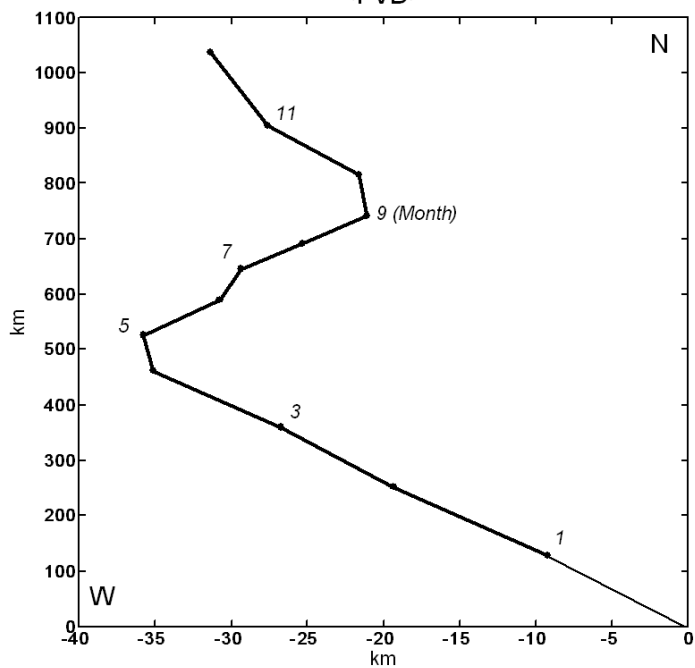
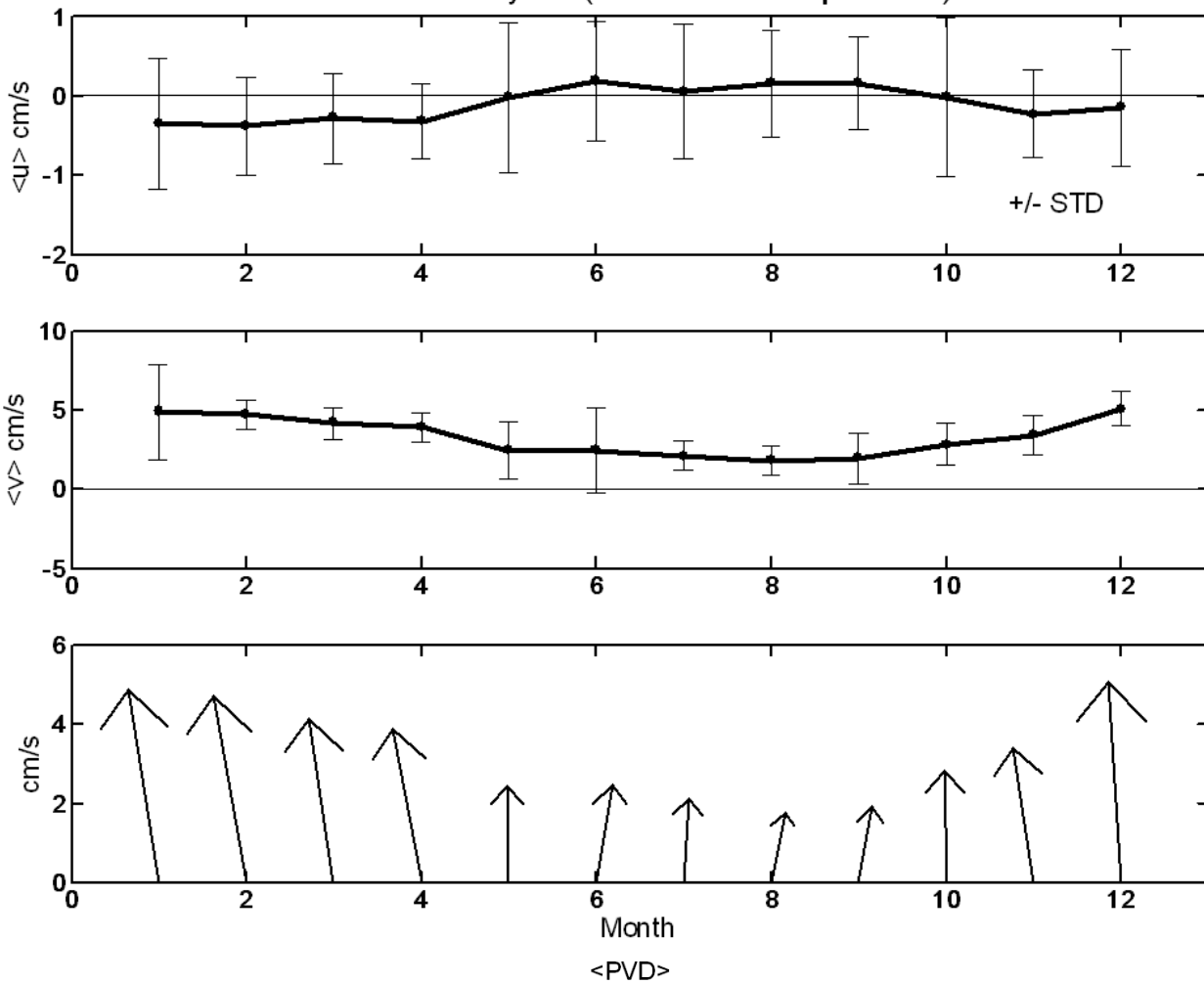


v^*

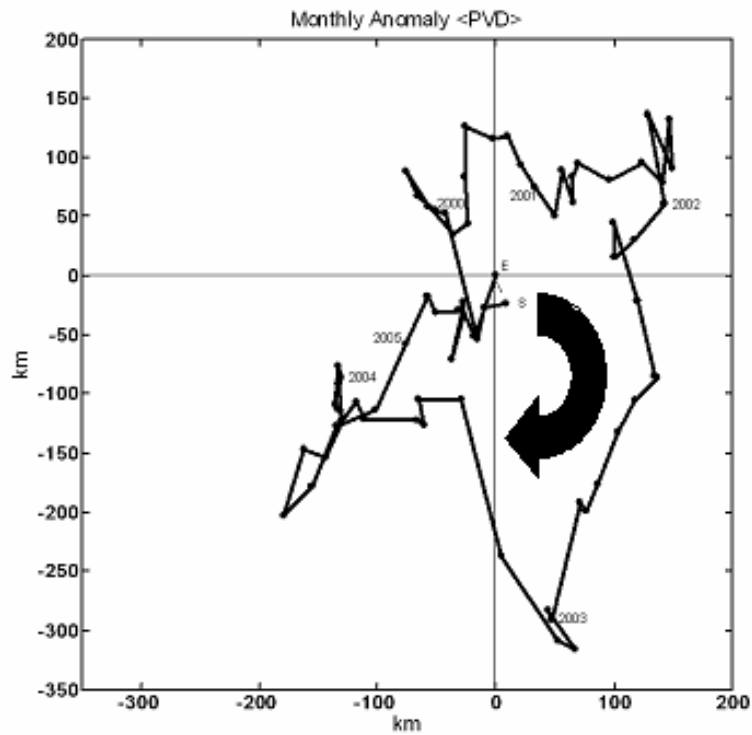
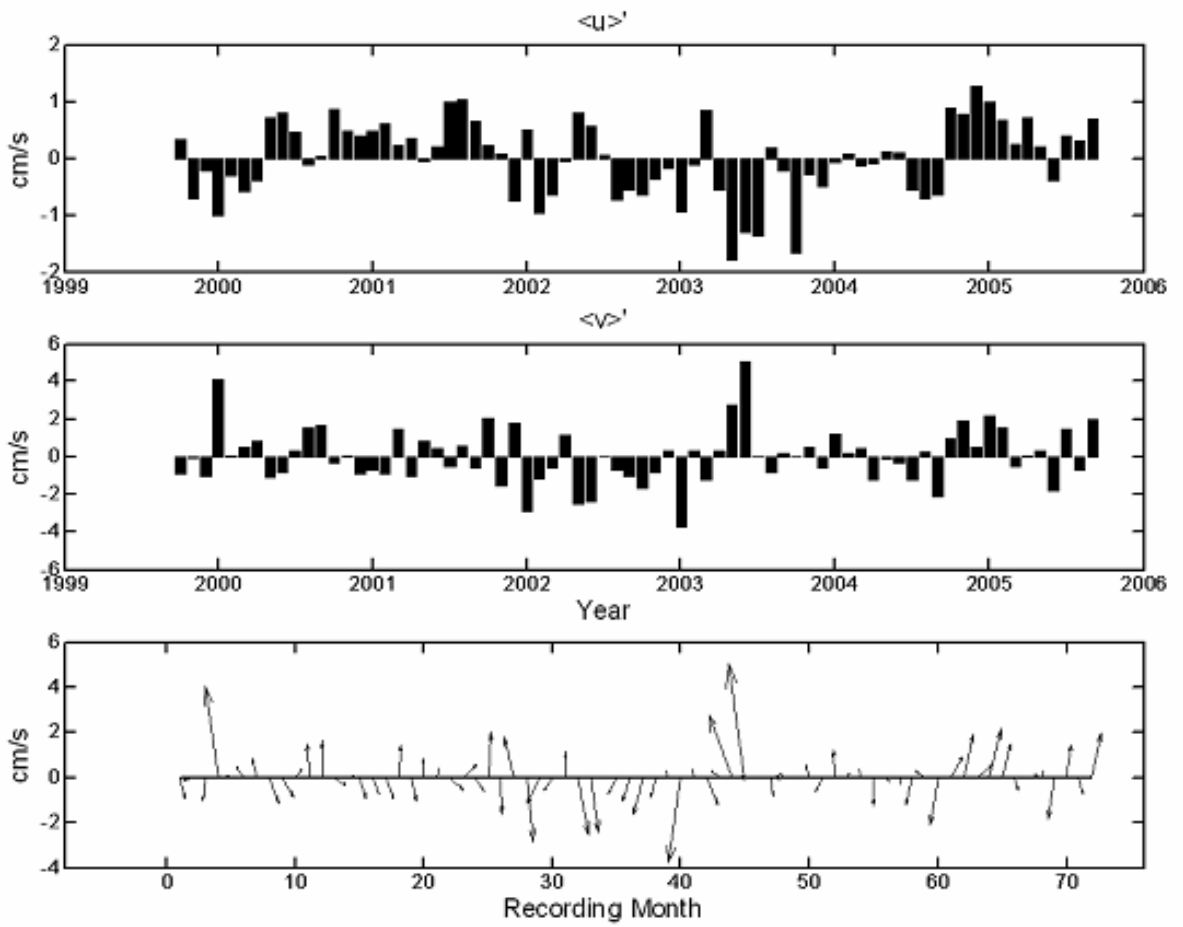




Seasonal Cycle (Oct.1999 - Sept.2005)



Monthly Anomaly



Appendix:

Data Link:

http://www.io-warnemuende.de/baltic2008/documents/chapter20/current_egb