

Berichte des
Bundesamtes für Seeschifffahrt und Hydrographie
Nr. 8

**WOCE-Current measurements:
The ACM8 array**

– Data Report –

Authors: Ekkehard Mittelstaedt
Jens Meincke
Holger Klein



Hamburg und Rostock 1996

1907

THE UNIVERSITY OF CHICAGO

1907

THE UNIVERSITY OF CHICAGO

1907

1907

1907

1907

1907



1907

1907

1907

I. Introduction

This volume is a graphical and statistical presentation of moored current measurements carried out jointly by the Bundesamt für Seeschifffahrt und Hydrographie (BSH) and the Institut für Meereskunde (IFM) in Hamburg. The data are part of the German contribution to the World Ocean Circulation Experiment (WOCE). They cover the period 1991 to 1995. The mooring locations (see map) are in line with the WOCE-Hydrographic section A1/E, which was repeated four times during the mooring period.

The mooring design was according to the institutions deep ocean standard, all current meters were Aanderaa RCM 4/5 or 7/8, sampling interval was one hour. The moorings were replaced annually. Four moorings were lost completely (D1, E1, D2, and F3).

Acknowledgements

This work would have not been possible without the skilled assistance of U. Drübbisch, H. Giese, H. May, and H. Wüllner in the field work and M. Neemann in the data analysis. This is also true for the experienced help we found from crews of R/V's 'Meteor', 'Valdivia', and 'Walther Herwig' during the deployment and recovery operations. Supporting funds were available from the Bundesministerium für Forschung und Technologie under grants 03F0121B (BSH) and 03F0121A (IFM) and from the Deutsche Forschungsgemeinschaft for financing the ship-time for R/V 'Meteor'.

Hamburg, December 1995

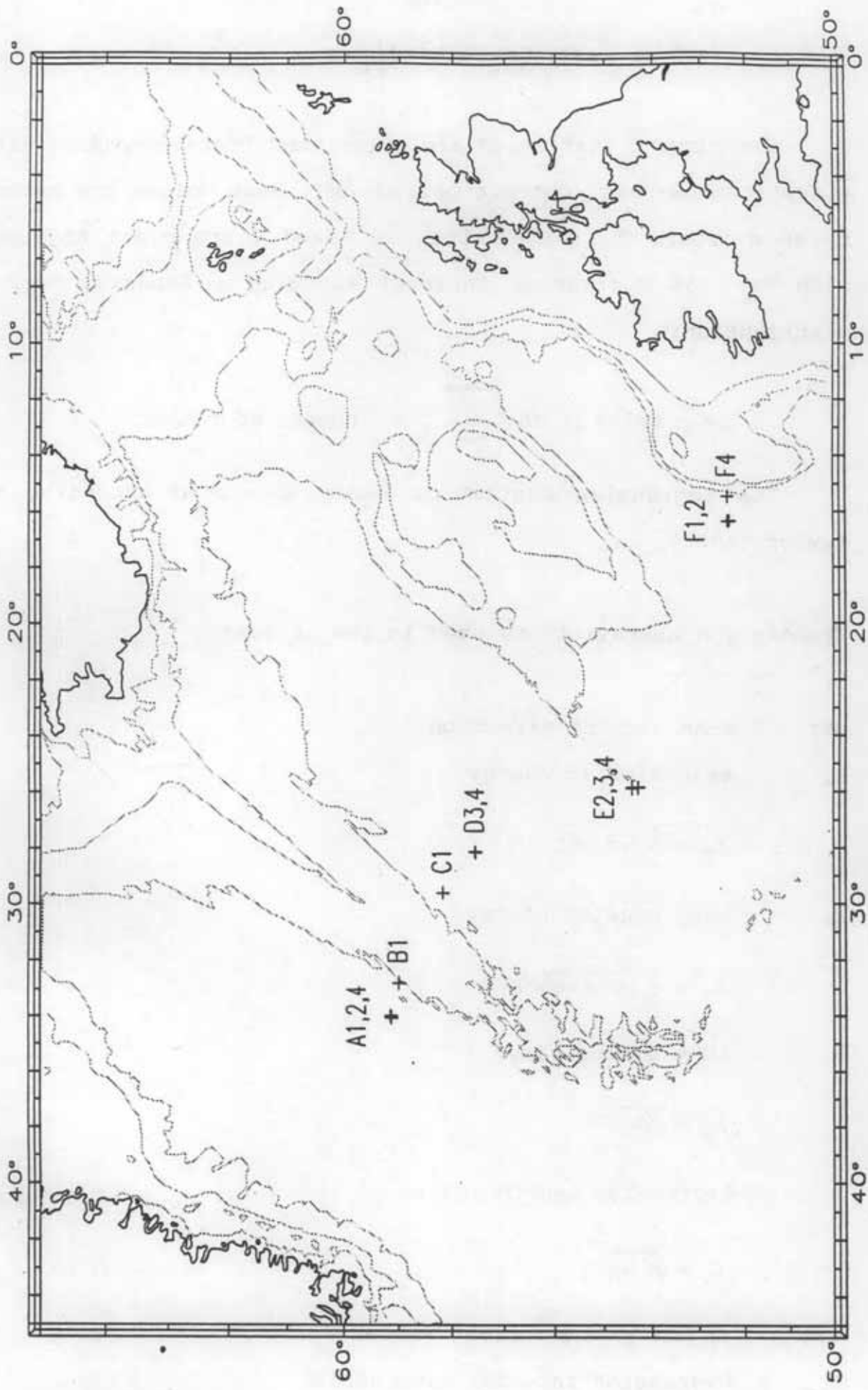
Dr. Ekkehard Mittelstaedt
Bundesamt für Seeschifffahrt
und Hydrographie

Prof. Dr. Jens Meincke
Institut für Meereskunde

Deployment statistics

Id	position		water depth	sampling depths				
	latitude	longitude		m	m	m	m	m
September 91 - September 92:								
A1	59° 8.4'N	34° 1.8'W	2855	263,	876,	2088,	2551	
B1	59° 0.0'N	32° 48.5'W	2124	209,	822,	1534,	1996	
C1	58° 10.8'N	29° 37.6'W	2067	171,	784,	1496		
D1	57° 22.3'N	28° 10.7'W	2633	not recovered				
E1	54° 18.8'N	25° 52.2'W	3072	not recovered				
F1	52° 20.4'N	16° 20.8'W	3510	210,	3010,	3460		
September 92 - September 93:								
A2	59° 8.1'N	34° 4.4'W	2630	861,	2063,	2526		
D2	57° 24.7'N	28° 13.5'W	2587	not recovered				
E2	54° 17.3'N	25° 51.4'W	3030	175, 2825				
F2	52° 22.7'N	16° 21.7'W	3481	181,	481,	781,	1981,	2981, 3431
September 93 - May 94:								
D3	57° 33.3'N	28° 10.4'W	2294	187,	780,	2280		
E3	54° 24.8'N	25° 51.7'W	3299	439, 1040				
F3	52° 24.1'N	16° 22.2'W	3501	not recovered				
May 94 - June 95:								
A4	59° 9.1'N	34° 0.0'W	2850	269,	882,	2092,	2551	
D4	57° 34.0'N	28° 9.6'W	2300	542, 1752, 2211				
E4	54° 25.3'N	25° 53.5'W	3250	439, 1041, 3095				
F4	52° 23.2'N	15° 28.5'W	2554	853,	1255,	2057,	2504	

Id = mooring identifier



Mooring positions along the WOCE-hydrographic section A1/E
 Isobaths are given at 200m, 1000m, and 2000m

II. Data processing

The current statistics are calculated from low-passed data (Gaussian low-pass, cut-off period 48^h). Mean values are marked by an overbar. The mean values of u and v are given together with the 95% confidence interval assuming a Gaussian normal distribution:

$$\text{mean value} \pm 1.96 \frac{\sqrt{u_i' u_i'}}{\sqrt{n-1}}, \quad n = \text{number of cycles.}$$

The Lagrangian statistics were calculated according to Taylor (1921).

Symbols and abbreviations used in the tables:

dir mean current direction

k_M mean kinetic energy

$$k_M = \frac{1}{2} (\overline{u^2} + \overline{v^2})$$

k_E eddy kinetic energy

$$k_E = \frac{1}{2} (\overline{u'u'} + \overline{v'v'})$$

K_i Eddy diffusivity:

$$K_i = \overline{u_i' u_i' T_i}$$

$L_{x,y}$ Lagrangian length scale:

$$L_i = \sqrt{\overline{u_i' u_i' T_i}}$$

mag magnitude of current vector V

$T_{x,y}$ Lagrangian integral time scale

$$T_i = \int_0^{\infty} R_i(\tau) d\tau$$

with $R_{x,y}$ the normalized auto-correlation function

$$R_i = \frac{1}{\overline{u'_i u'_i} T_{\max}} \int_0^{T_{\max}} u'_i(t) u'_i(t+\tau) dt$$

u, v	zonal and meridional component of V
$\overline{u' u'}$	zonal variance
$\overline{u' v'}$	covariance
$\overline{v' v'}$	meridional variance
V	mean current vector

Progressive vector diagrams

The progressive vector diagrams are processed from unfiltered data. The start position is marked by a big cross (+). Time marks (small crosses) are given every 30 days. The numbers near the tracks are the sampling depth in metres.

Time series

The time series have been processed using partly modified functions of the MATLAB Signal Processing and Optimisation Toolbox. The data have been low-passed with a 10th order IIR-Butterworth filter (infinite-duration impulse response). Filtering in both directions led to a zero phase lag.

Spectra

For spectral analysis MATLAB's spectrum subroutine was modified. The Welch-Method of overlapping segments was implemented and each segment was modified by a 10% half cosine-taper. Both modifications allow higher estimates of the degrees of freedom f and hence a minimisation of the confidence intervals indicated by a vertical bar in the spectra.

References

- Little, J.N., L. Shure, 1992: Signal Processing Toolbox User's Guide. The MathWorks, Inc., 112pp.
- Taylor, G.I., 1921: Diffusion by continuous movements. Proc. London Math. Soc., A20, 196-211.

III. Data

The data of the moorings are presented in an alphabetic order. For each position A to F the following details are given:

1) For all moorings of the respective position:

- 1.1) Mooring data
- 1.2) Low-passed current statistics

2) For each individual mooring of the respective position:

- 2.1) Progressive vector diagramm (all sampling depths)

3) For each sampling depth of the respective mooring:

- 3.1) Time series plots
- 3.2) Energy density spectra (zonal and meridional current component)
- 3.3) Progressive vector diagram

The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in all financial dealings.

Financial Reporting and Accountability

This section outlines the various methods used to collect and analyze data, ensuring that the information is reliable and valid. It also discusses the importance of regular reporting and communication with stakeholders.

The document further details the procedures for handling sensitive information and ensuring data security. It stresses the need for strict adherence to privacy policies and the implementation of robust security measures.

In conclusion, the document highlights the critical role of financial reporting and accountability in the success of any organization. It calls for a commitment to high standards of integrity and transparency.

A1, A2, A4

Mooring Data A1, A2, and A4

current meter	sampl. depth	mab	record no.	sampling time	
-	m	m	-	UTC	
A1: 8.9.91 - 5.9.92				59° 8.4'N, 34° 1.8'W	
RCM8 10335	263	2692	92090	8.9.91 13:00 -	1.6.92 16:00
RCM8 9839	876	1979	92091	8.9.91 13:00 -	5.9.92 12:00
RCM8 10336	2088	767	92092	8.9.91 13:00 -	5.9.92 12:00
RCM8 9203	2551	304	92093	8.9.91 13:00 -	5.9.92 12:00
A2: 5.9.92 - 21.10.93				59° 8.1'N, 34° 4.4'W	
RCM4 6129	861	1769	94017	5.9.92 19:00 -	21.10.93 15:00
RCM5 6700	2063	567	94018	5.9.92 19:00 -	21.10.93 16:00
RCM5 6784	2526	104	94019	5.9.92 19:00 -	29.06.93 16:00
A4: 31.5.94 - 10.6.95				59° 9.1'N, 34° 0.0'W	
RCM7 11248	269	2581	95030	31.5.94 10:00 -	10.6.95 8:00
RCM7 11292	882	1968	95031	31.5.94 10:00 -	10.6.95 8:00
RCM7 9870	2092	758	95032	31.5.94 10:00 -	10.6.95 8:00
RCM8 10335	2551	299	95033	31.5.94 10:00 -	2.8.94 8:00

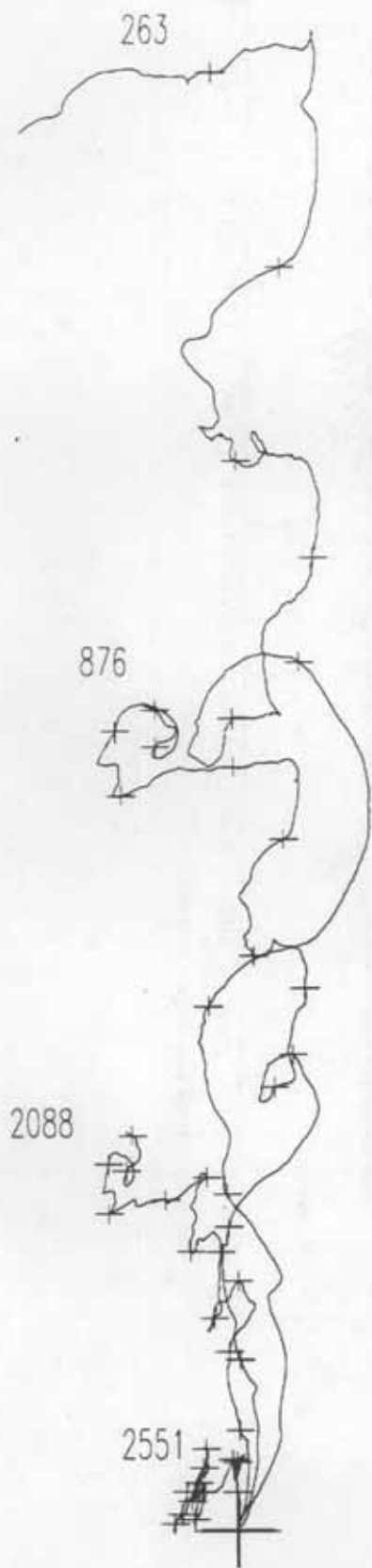
mab = metres above bottom

Current statistics (low-passed data)

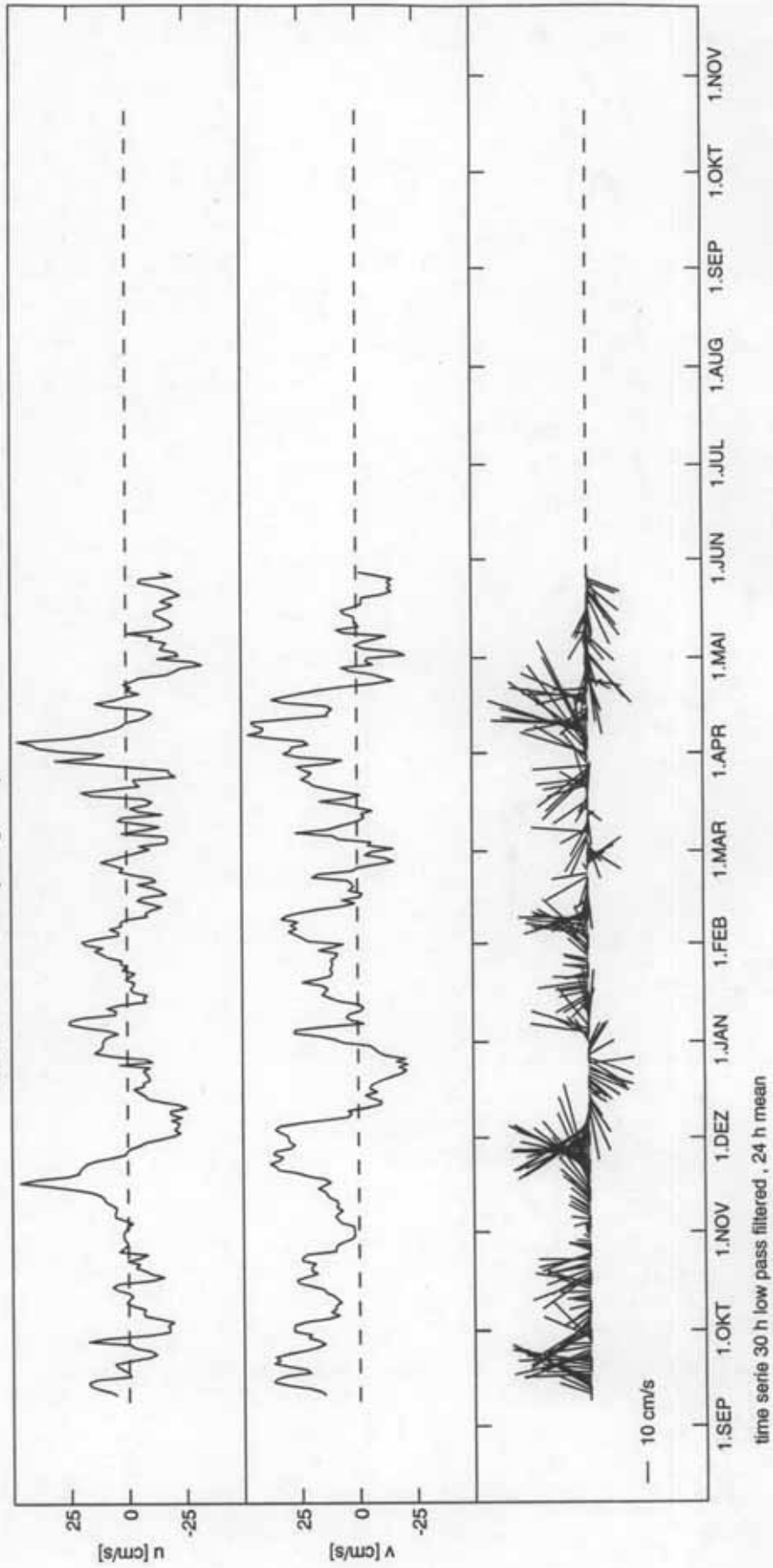
Id	sampl. depth	rec. length	u		mag V	$\frac{u'u'}{v'v'}$		$\frac{u'v'}{v'v'}$	k_E		T_x T_y	L_x L_y		K_x K_y	dir.
			cm/s	cm/s		cm/s	cm ² /s ²		cm ² /s ²	cm ² /s ²		cm ² /s ²	cm ² /s ²		
A1:	263	265	-1.7±0.33		21.7	186.2	62.9	209.1	5.2	60.8	83.0	351			
			11.0±0.19		11.1	232.1		61.8	7.1	93.8	143.0				
	876	361	-0.5±0.13		9.6	36.7	17.1	41.2	6.5	33.9	20.5	354			
			4.7±0.14		4.8	45.7		12.3	8.6	50.2	33.9				
2088	361		-0.6±0.06		5.8	8.2	5.9	13.3	6.1	15.1	4.3	344			
			2.3±0.09		2.3	18.5		2.7	6.9	25.6	11.0				
2551	361		-0.2±0.04		3.4	3.9	5.8	10.3	4.7	8.1	1.6	337			
			0.4±0.09		0.5	16.7		0.1	3.8	13.4	5.5				
A2:	861	409	-1.5±0.12		8.5	38.4	3.4	44.5	6.6	35.6	22.1	238			
			-0.9±0.14		1.7	50.5		1.5	8.6	53.0	37.6				
	2063	409	-1.2±0.07		7.0	12.4	2.2	21.8	5.6	17.1	6.0	202			
			-2.9±0.11		3.1	31.1		4.8	8.5	41.0	22.9				
2526	295		-1.2±0.05		10.7	4.1	5.2	31.0	4.2	7.4	1.5	187			
			-9.5±0.18		9.6	57.9		45.9	4.6	30.5	23.2				
A4:	269	373	3.3±0.27		18.6	171.1	64.6	177.2	7.0	79.4	103.9	33			
			4.8±0.28		5.7	183.2		16.5	3.4	39.7	53.8				
	882	373	-0.6±0.12		6.4	35.7	14.4	29.7	8.2	42.6	25.4	329			
			1.1±0.10		1.2	23.6		0.8	2.9	12.4	6.0				
2092	373		-0.5±0.10		6.5	24.2	8.1	21.8	8.6	36.4	17.9	341			
			1.6±0.09		1.7	19.4		1.4	4.1	15.6	6.8				
2551	63		-1.7±0.21		4.3	17.4	5.6	11.8	3.4	12.4	5.2	298			
			0.9±0.13		1.9	6.2		1.9	2.3	5.0	1.2				

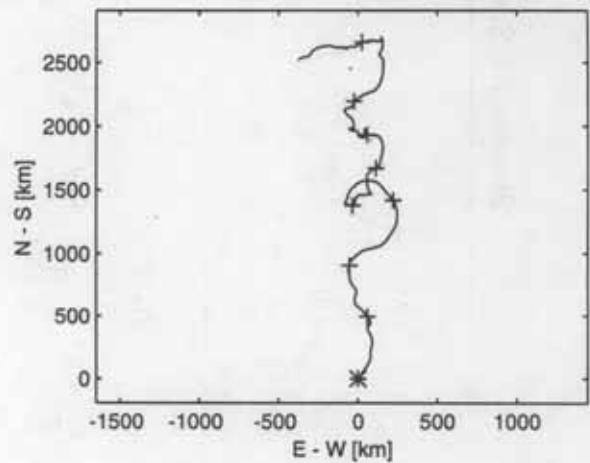
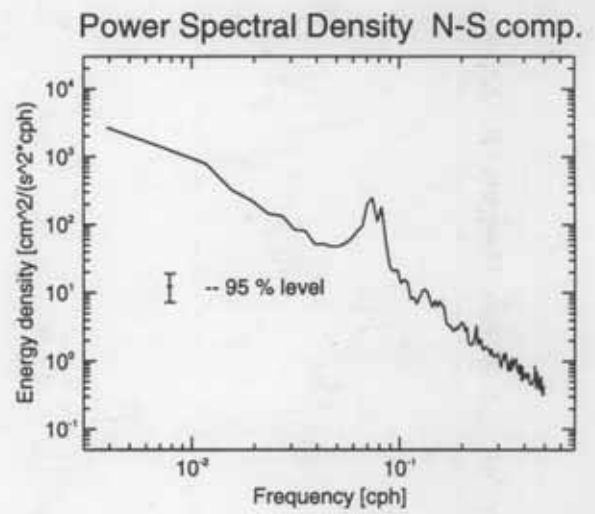
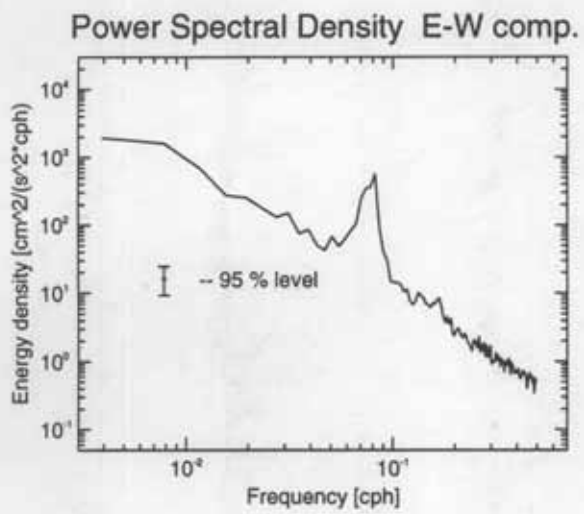
100 km

A1

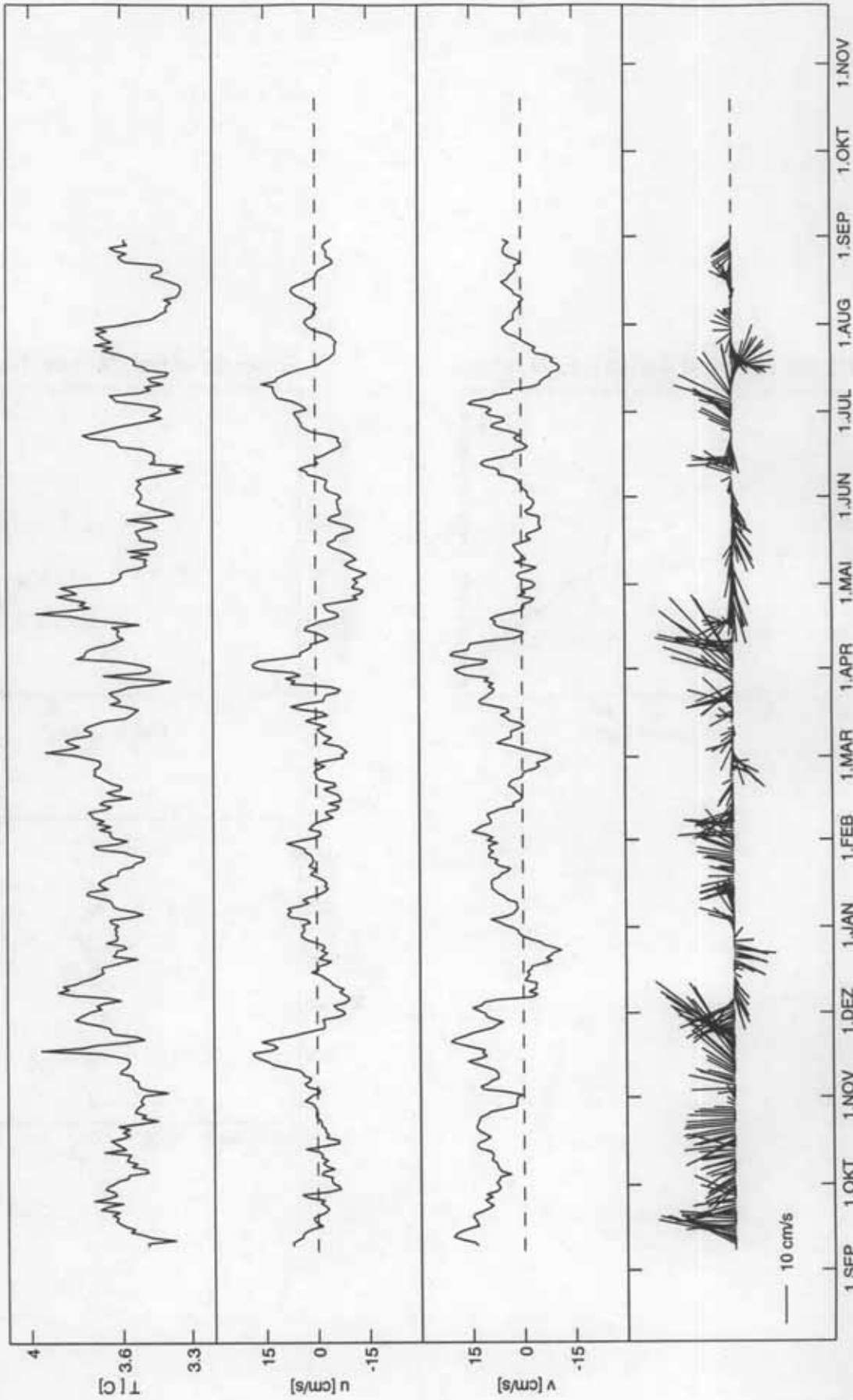


Station A1 Sampling Depth : 263m Record Nr. 92090



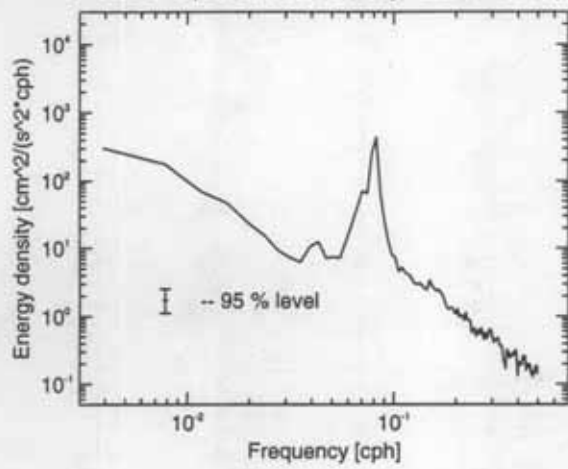


Station A1 Sampling Depth : 876m Record Nr. 92091

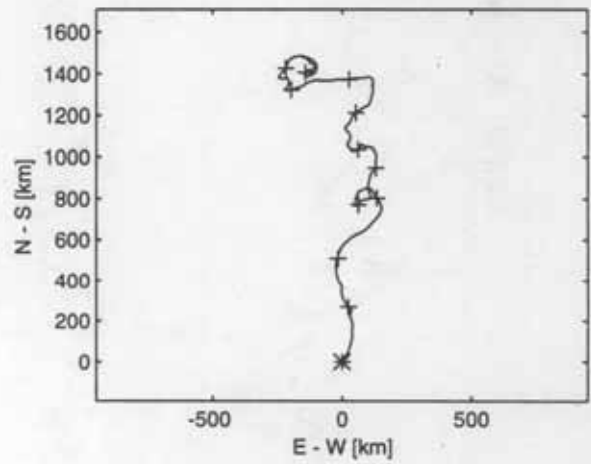
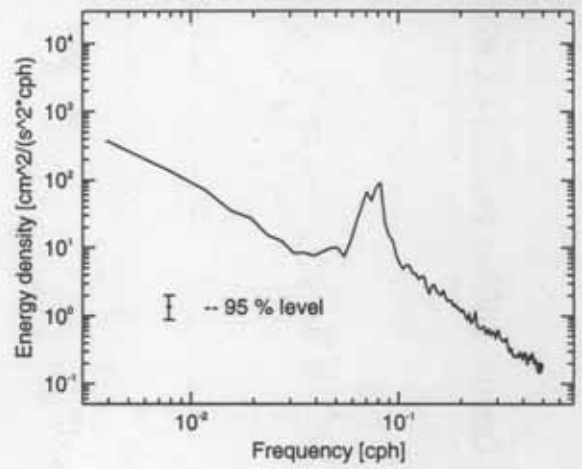


time serie 30 h low pass filtered , 24 h mean

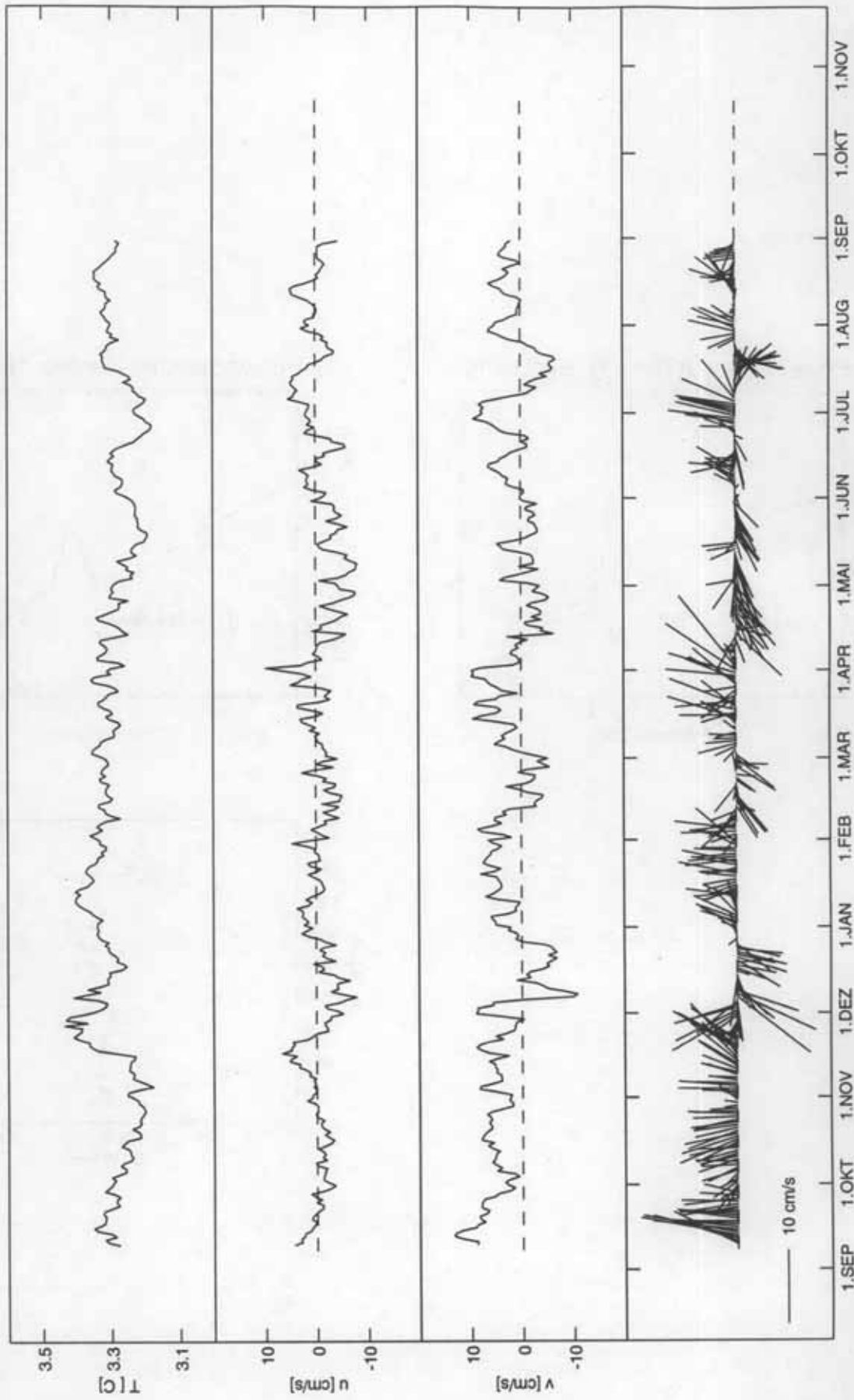
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

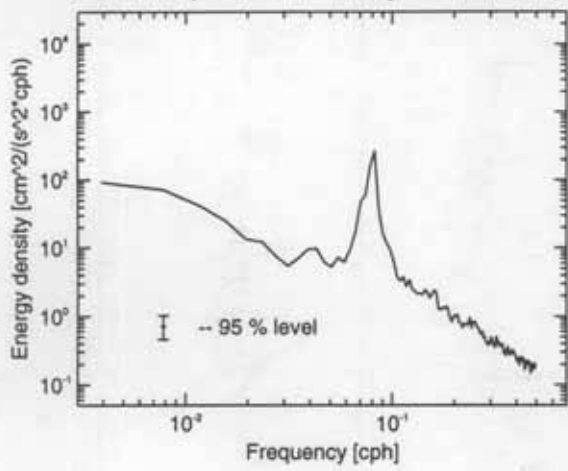


Station A1 Sampling Depth : 2088m Record Nr. 92092

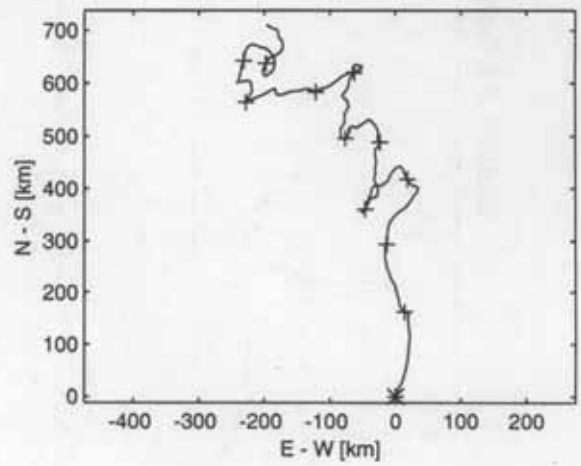
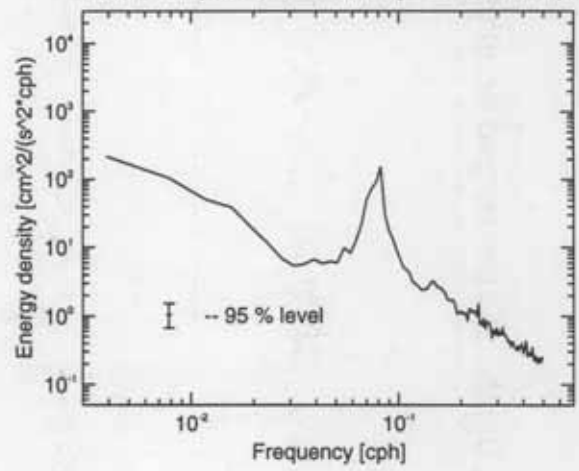


time serie 30 h low pass filtered , 24 h mean

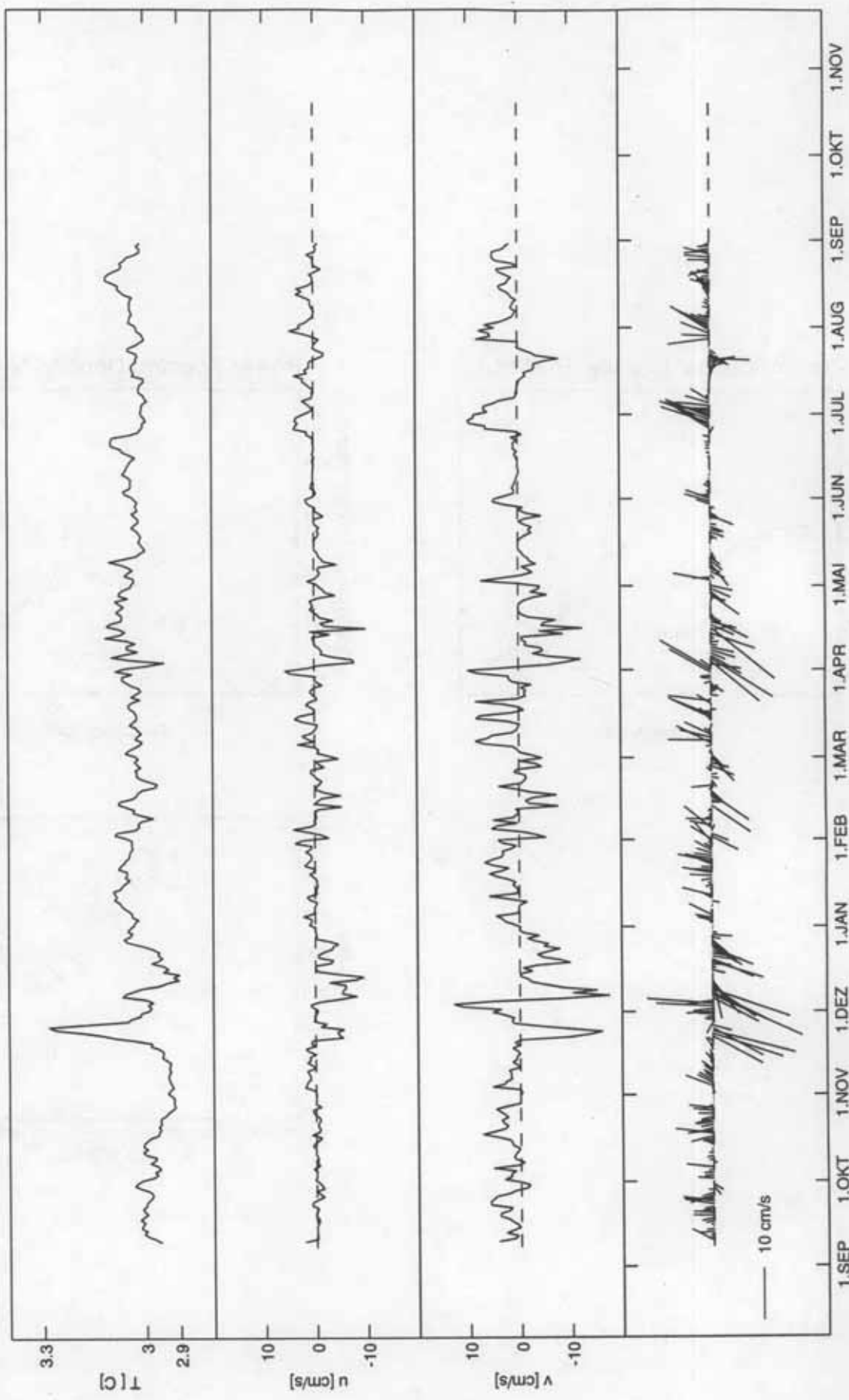
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

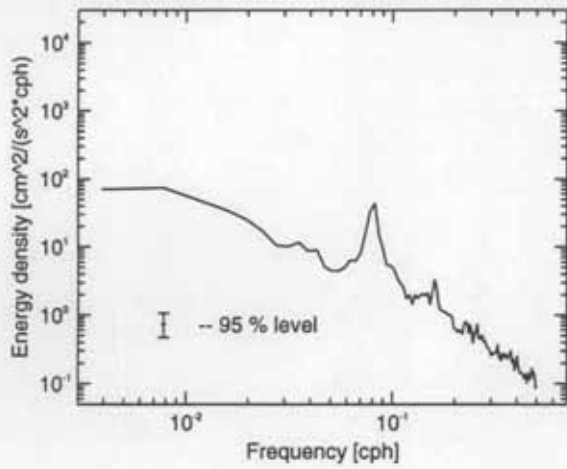


Station A1 Sampling Depth : 2551m Record Nr. 92093



time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

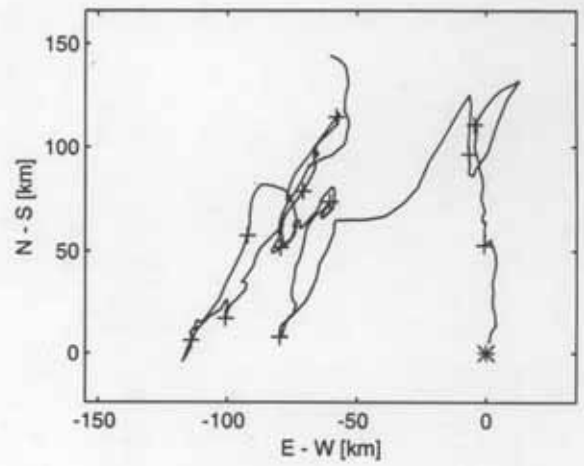
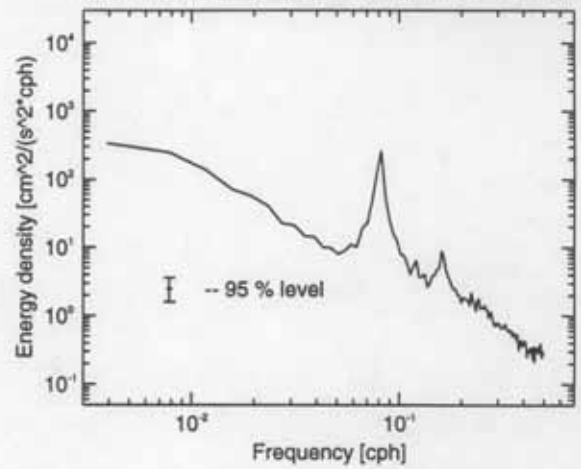


Figure 1. [Faint, illegible text]



Figure 2. [Faint, illegible text]

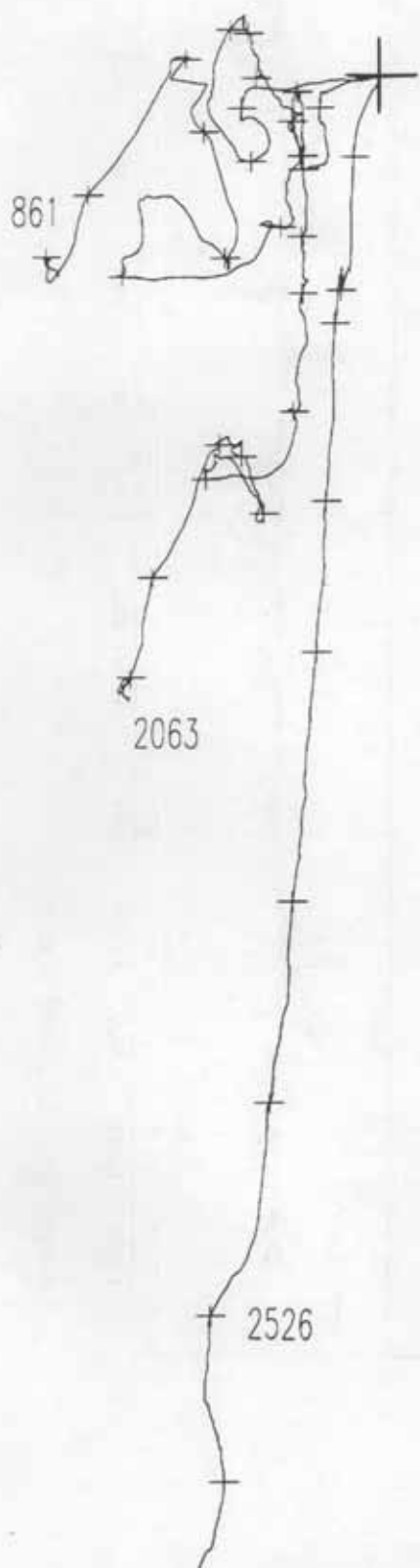


Figure 3. [Faint, illegible text]

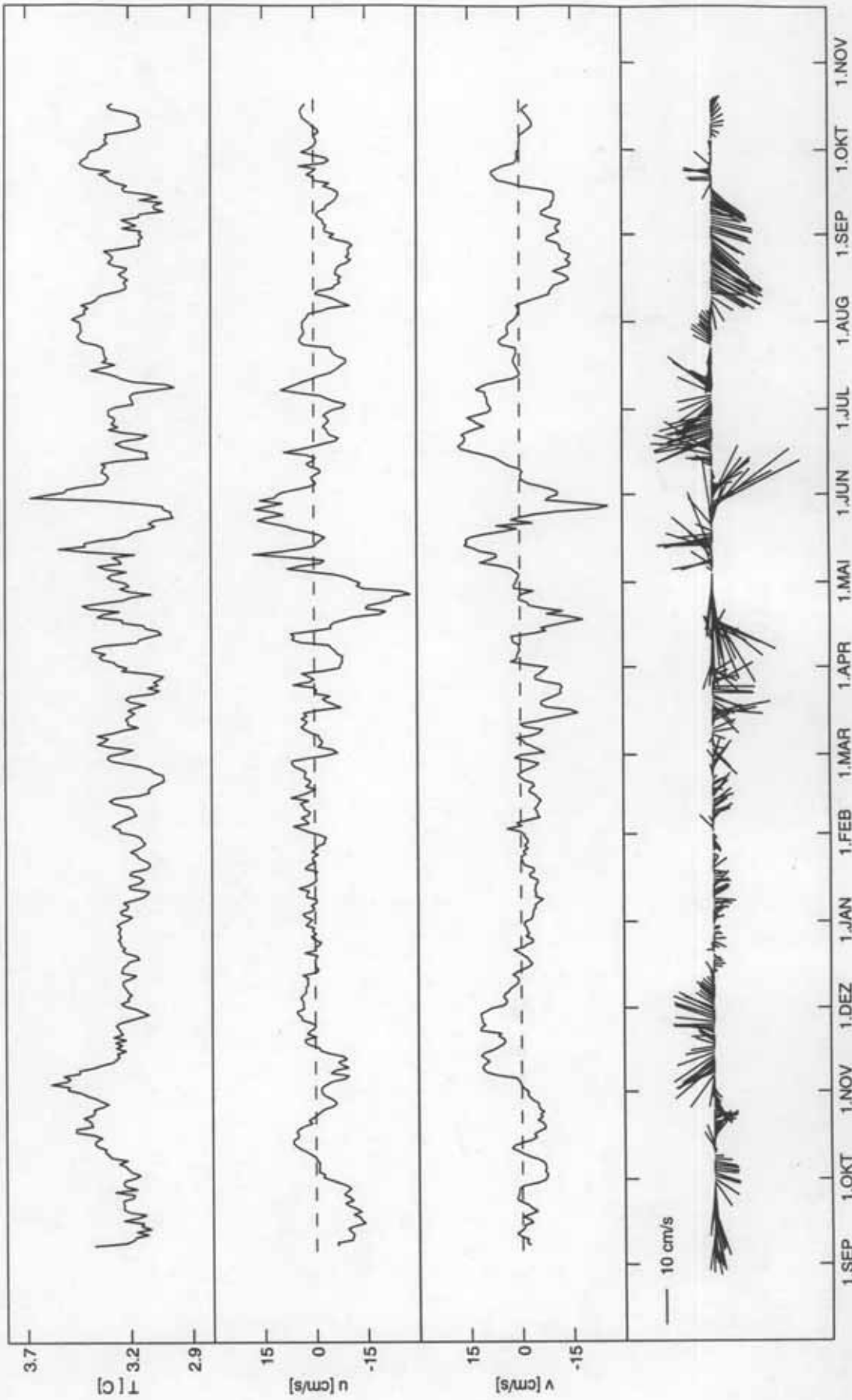


100 km

A2

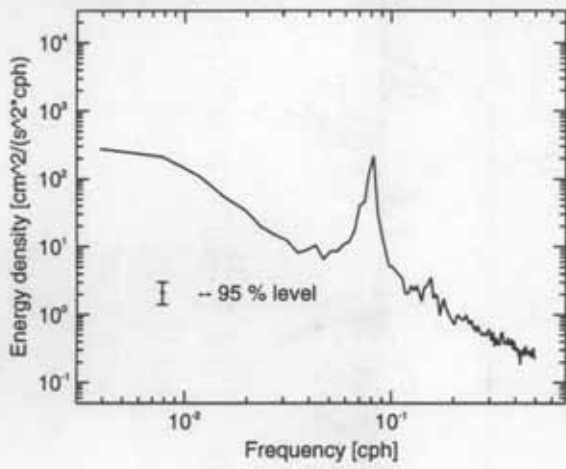


Station A2 Sampling Depth : 861m Record Nr. 94017

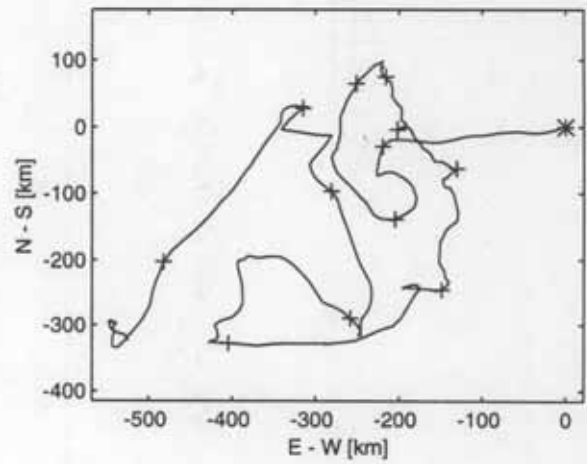
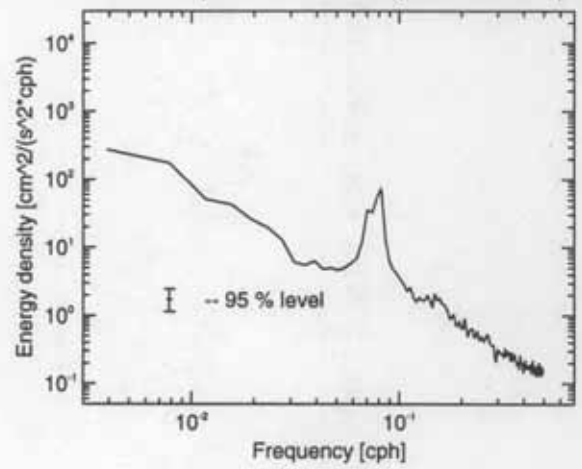


time serie 30 h low pass filtered , 24 h mean

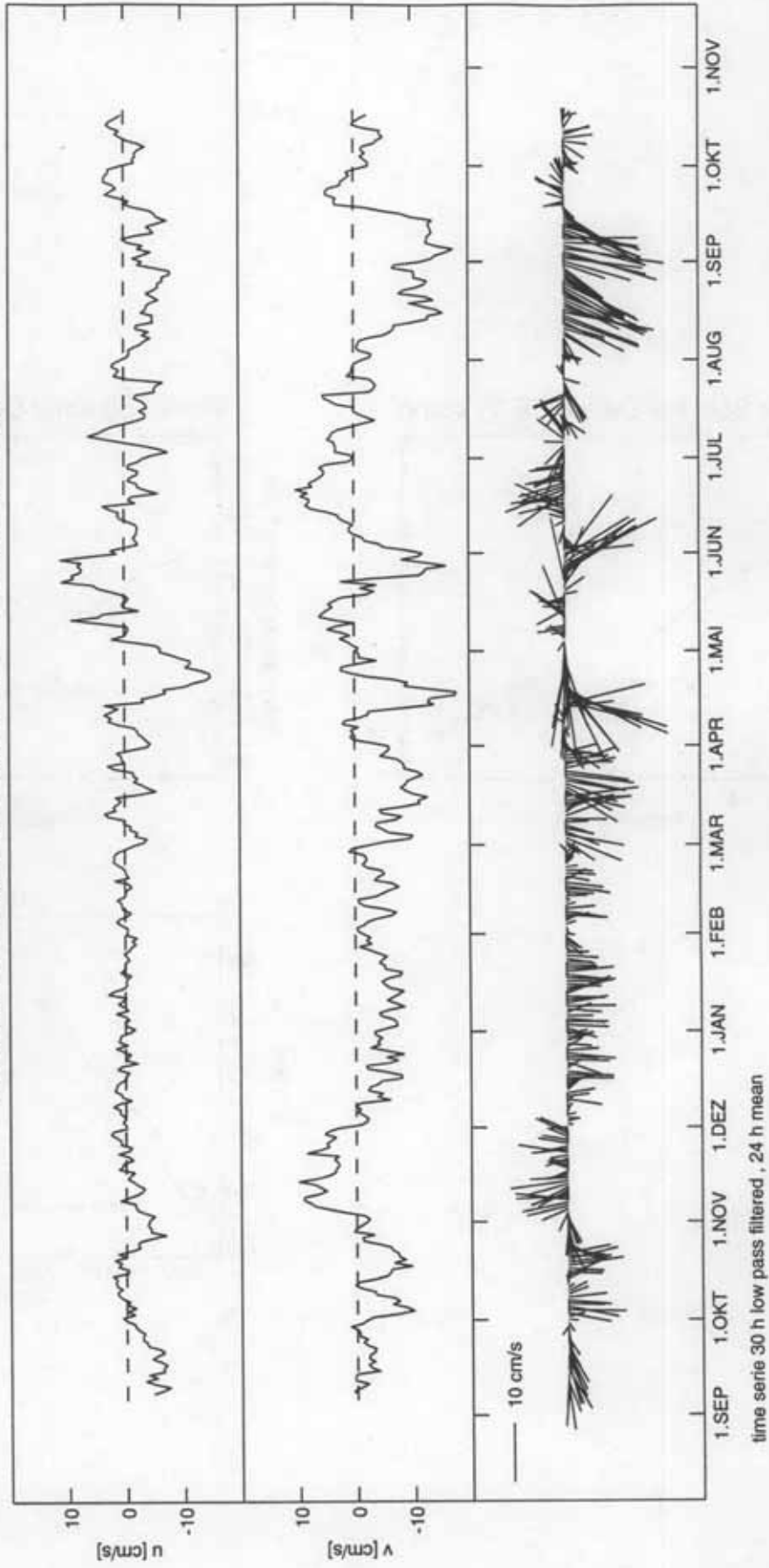
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

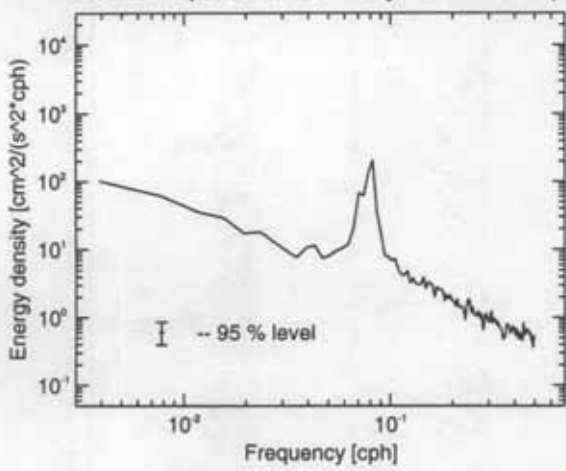


Station A2 Sampling Depth : 2063m Record Nr. 94018

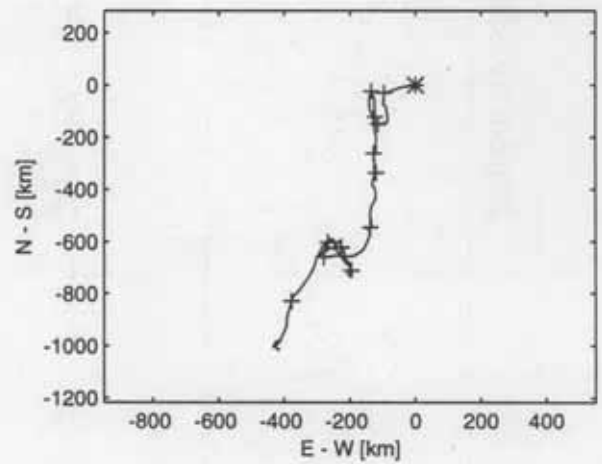
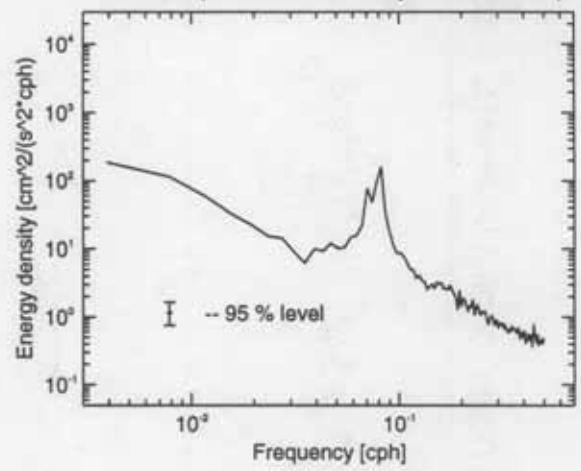


time serie 30 h low pass filtered , 24 h mean

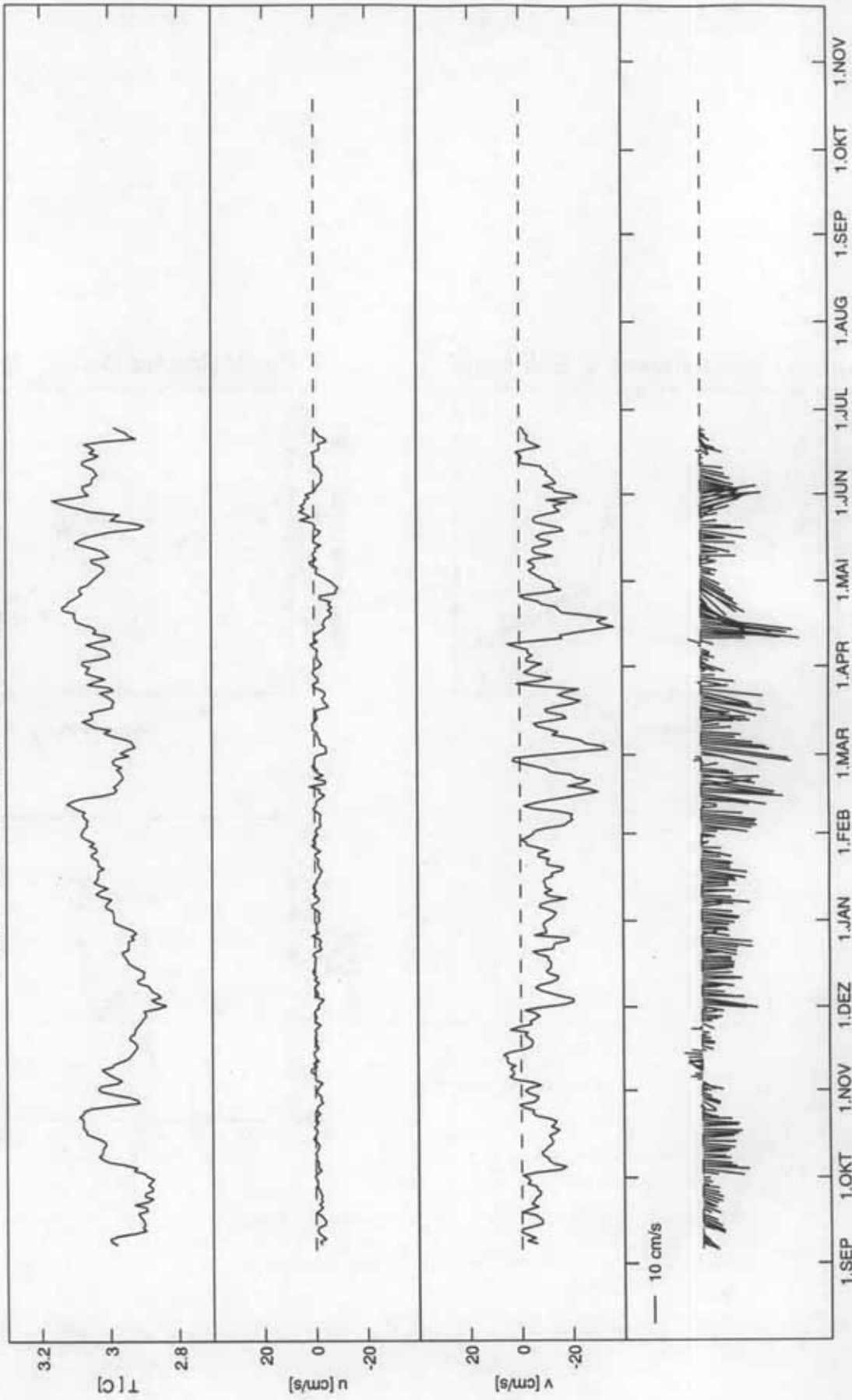
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

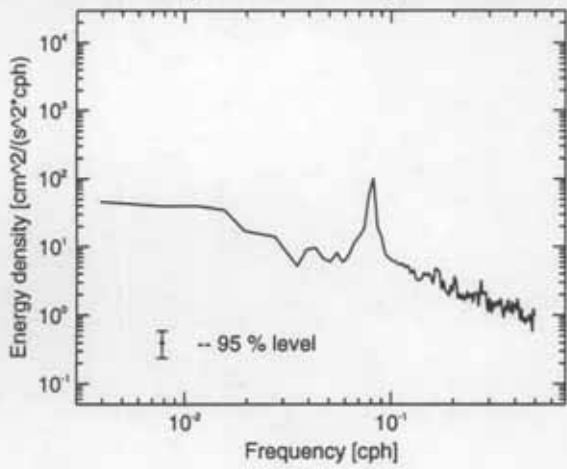


Station A2 Sampling Depth : 2526m Record Nr. 94019

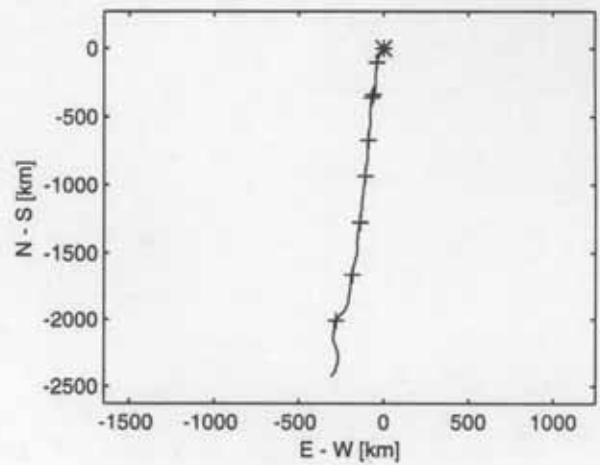
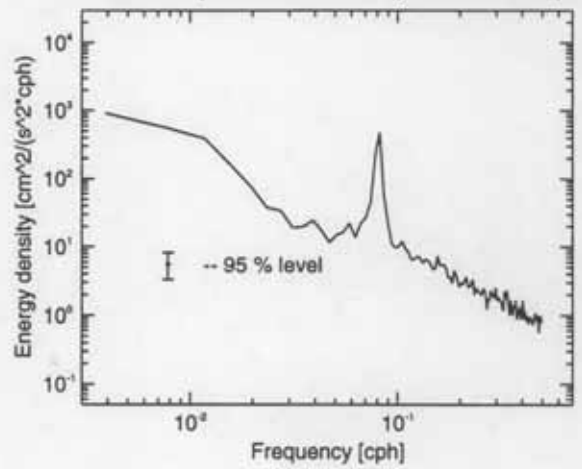


time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.

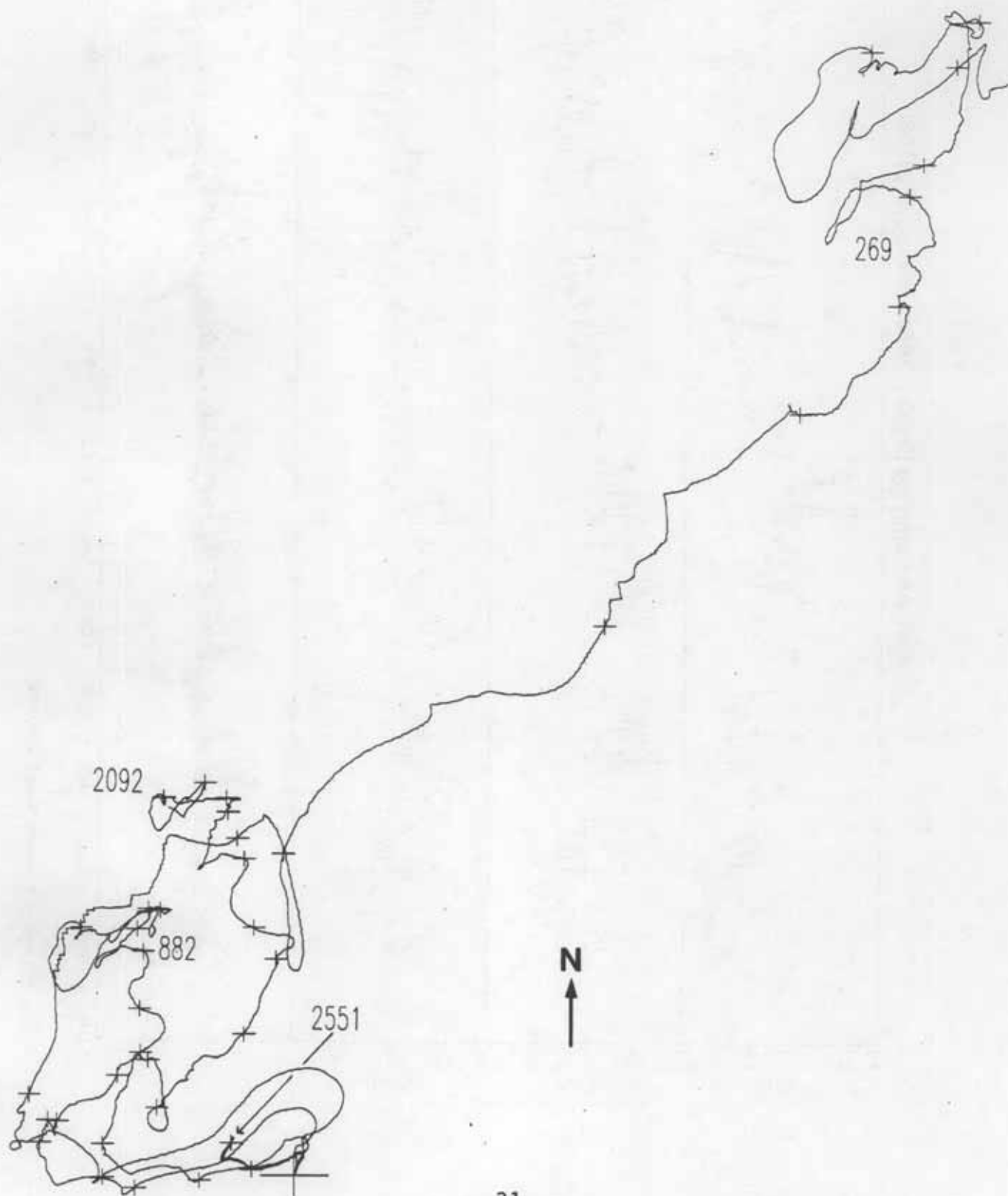


Power Spectral Density N-S comp.

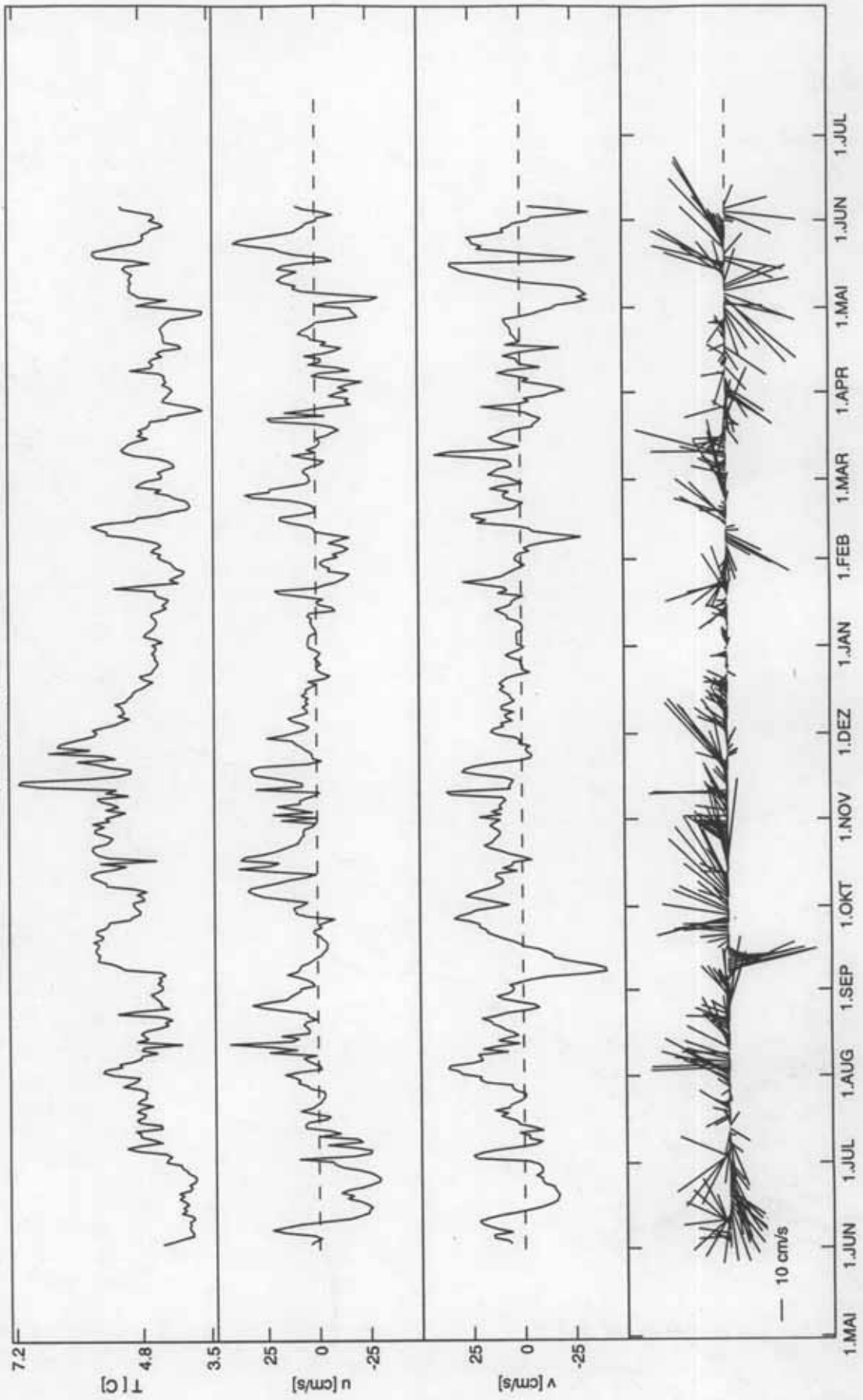


A4


100 km

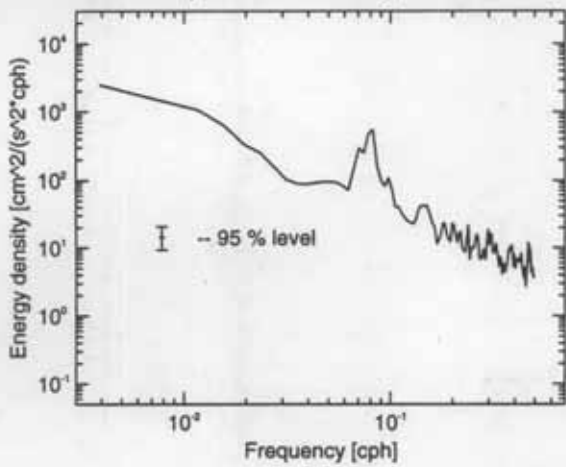


Station A4 Sampling Depth : 269m Record Nr. 95030

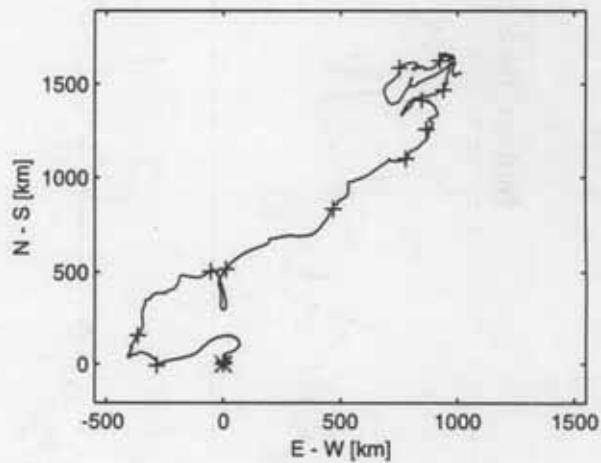
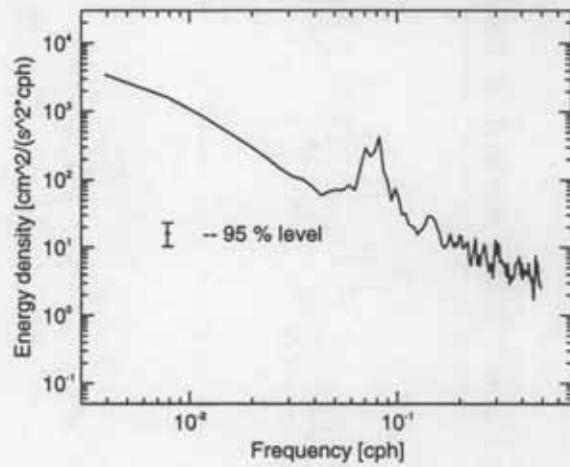


time serie 30 h low pass filtered , 24 h mean

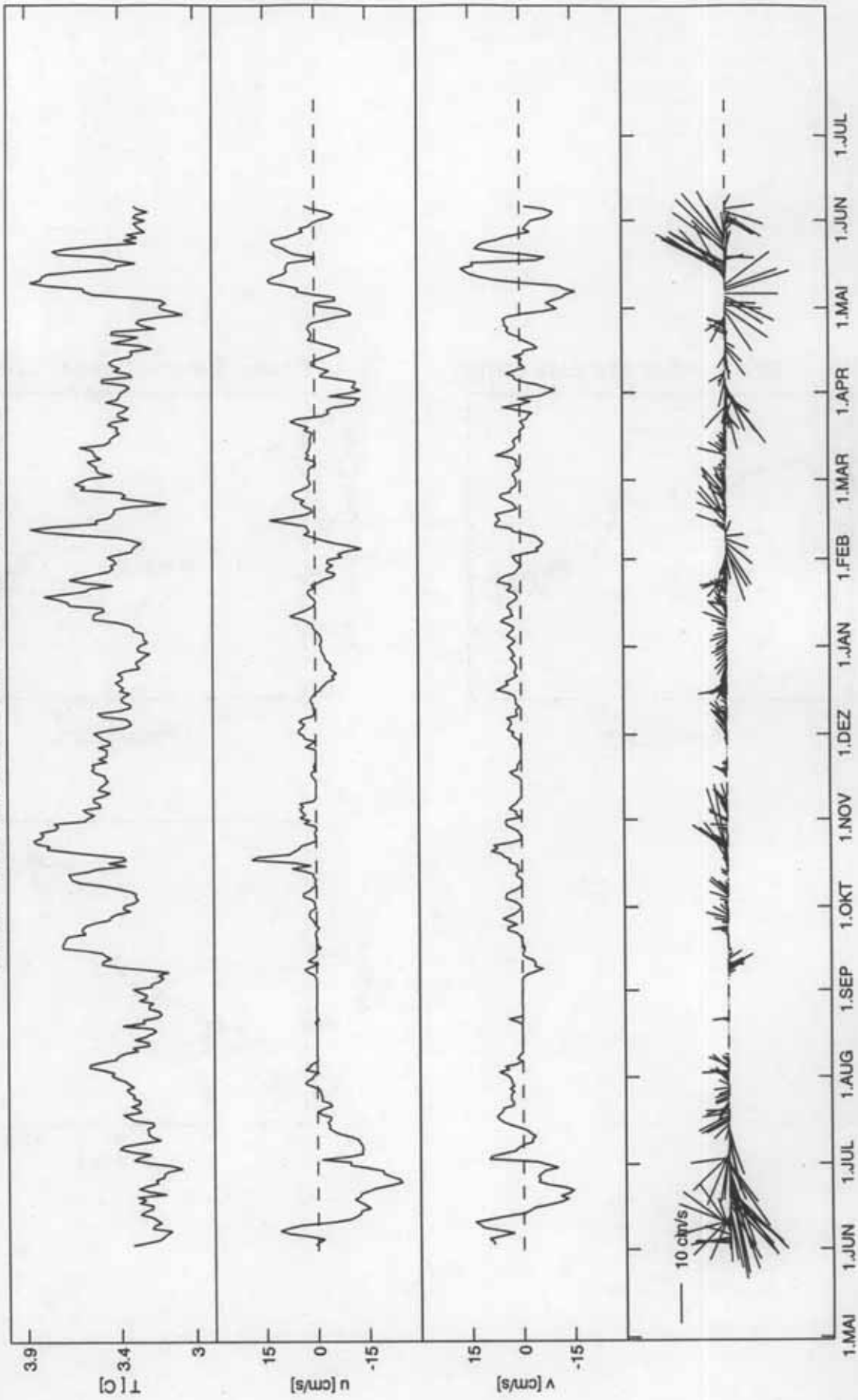
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

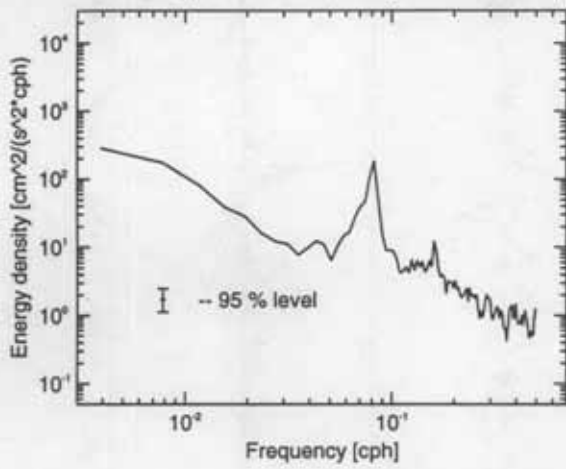


Station A4 Sampling Depth : 882m Record Nr. 95031

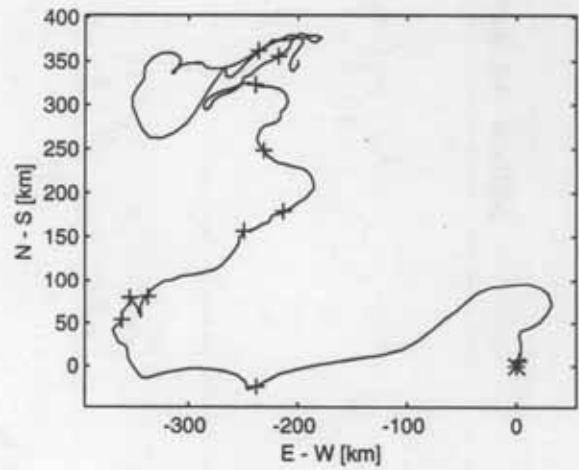
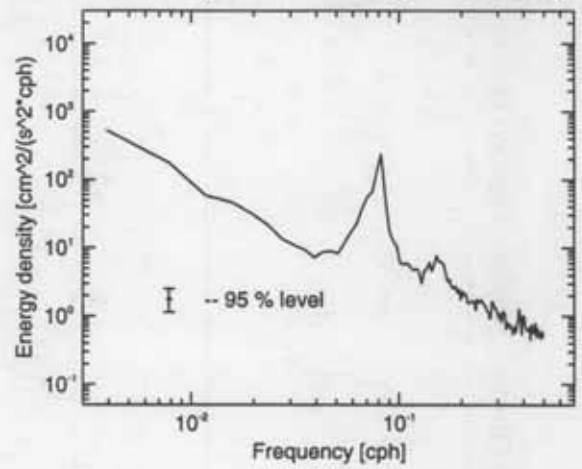


time serie 30 h low pass filtered , 24 h mean

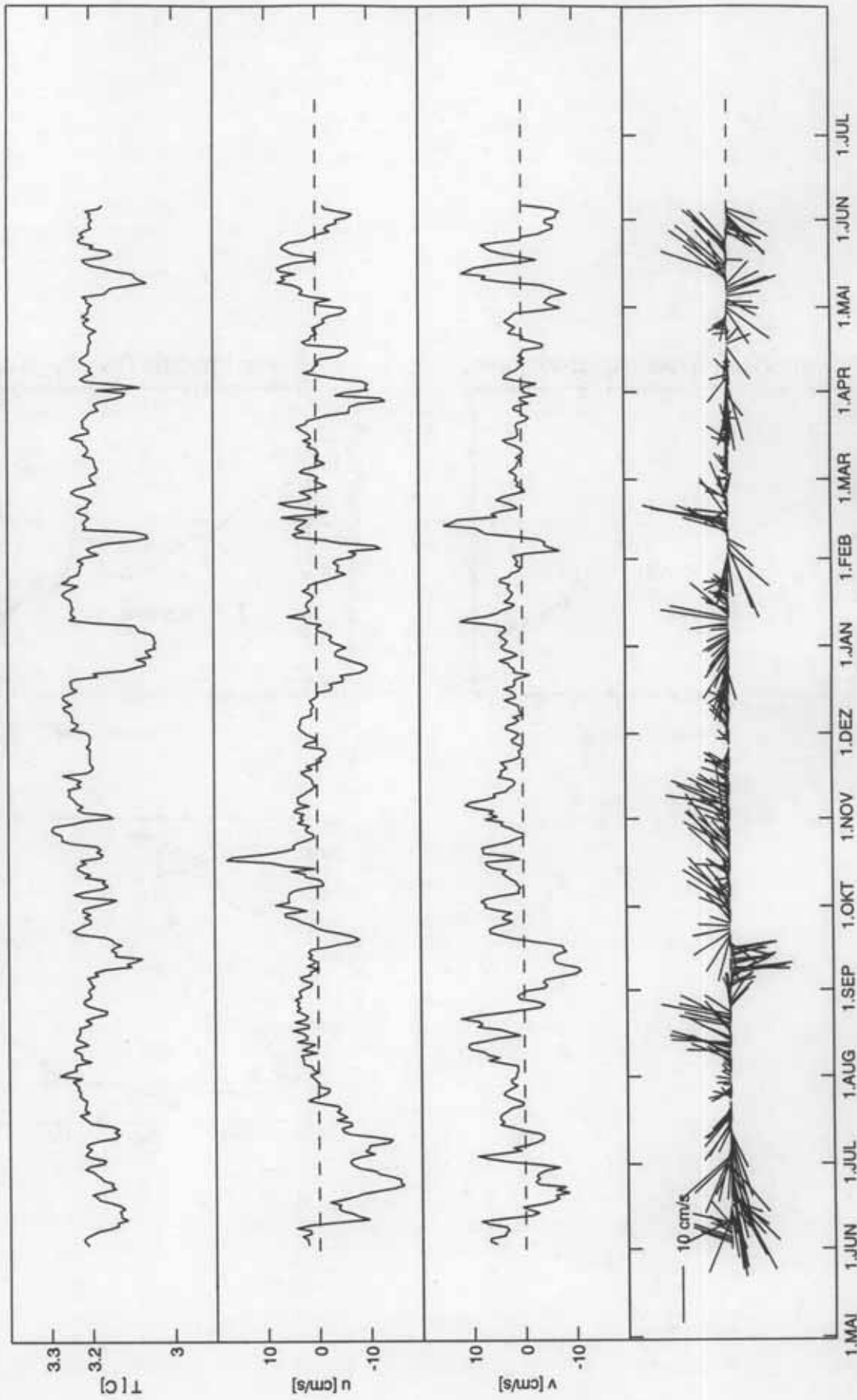
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

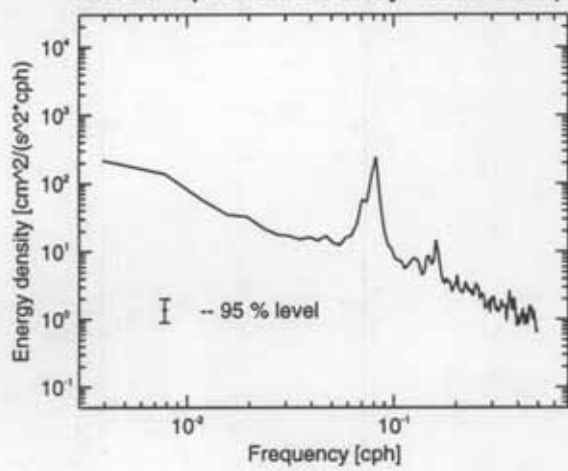


Station A4 Sampling Depth : 2092m Record Nr. 95032

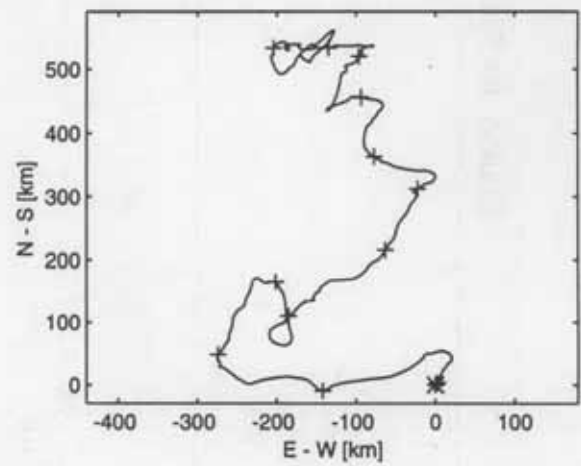
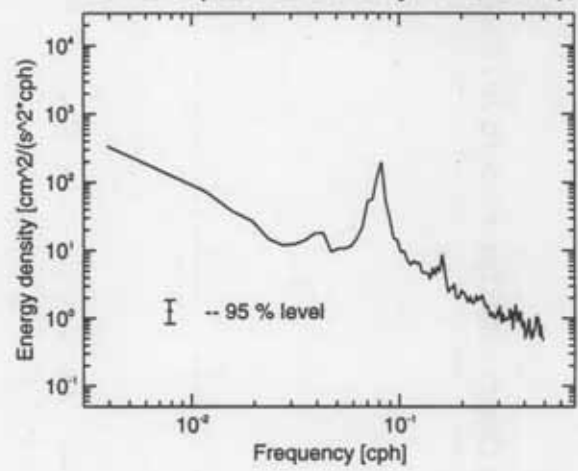


time serie 30 h low pass filtered , 24 h mean

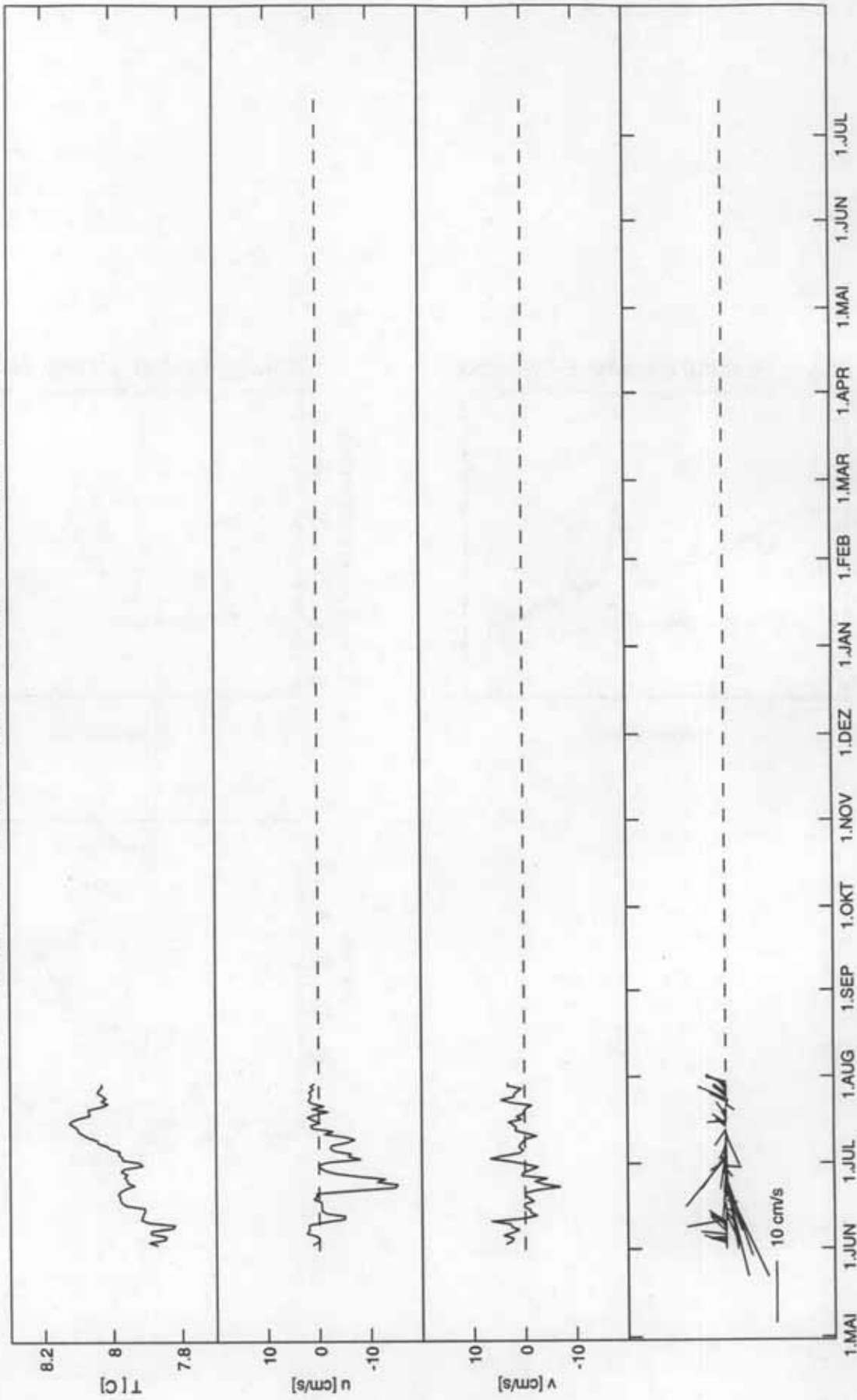
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

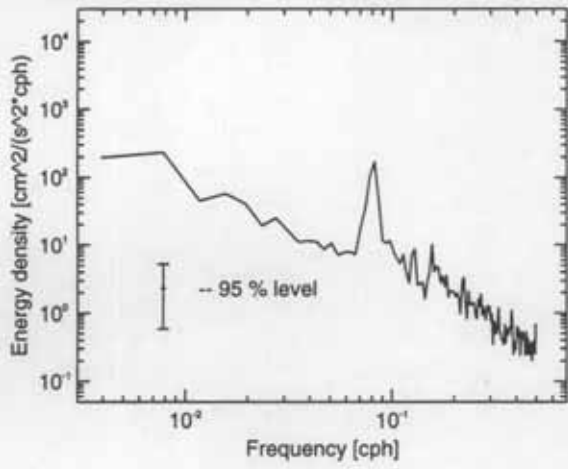


Station A4 Sampling Depth : 2551m Record Nr. 95033

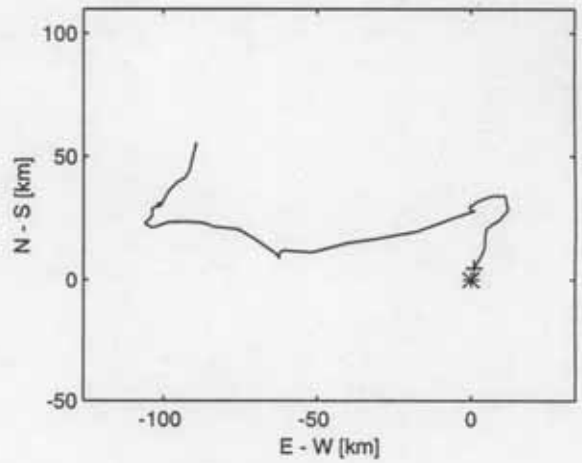
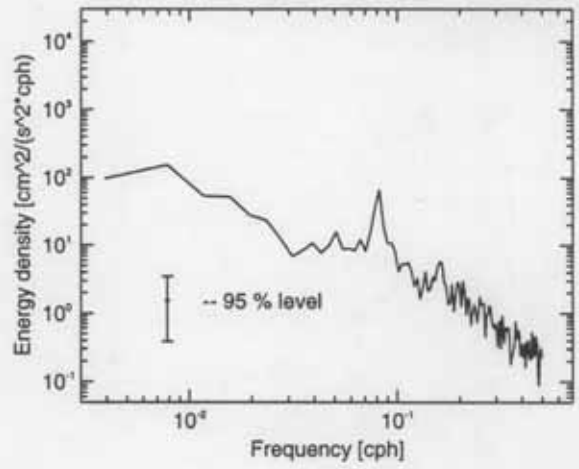


time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.



Power Spectral Density N-S comp.



B1

Mooring Data B1

current meter	sampl. depth	mab	record no.	sampling time
-	m	m	-	UTC
B1:		8.9.91 - 5.9.92		59° 0.0'N, 32° 48.5'W
RCM8 9815	209	1901	92086	8.9.91 21:00 - 5.9.92 06:00
RCM8 9841	822	1288	92087	8.9.91 21:00 - 5.9.92 06:00
RCM8 9840	1534	576	92088	8.9.91 21:00 - 5.9.92 06:00
RCM8 9221	1996	114	92089	8.9.91 21:00 - 5.9.92 06:00

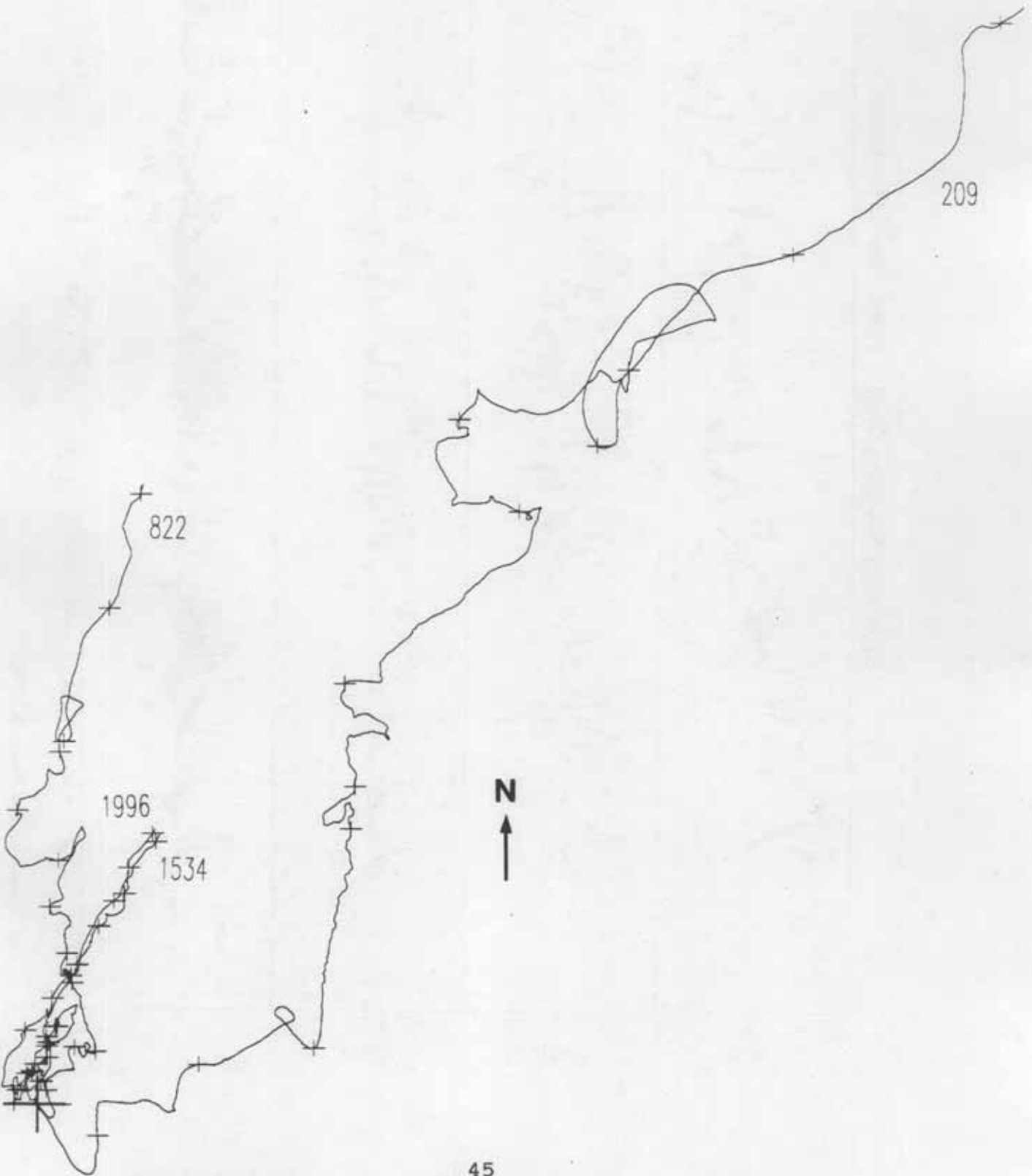
mab = metres above bottom

Current statistics (low-passed data)

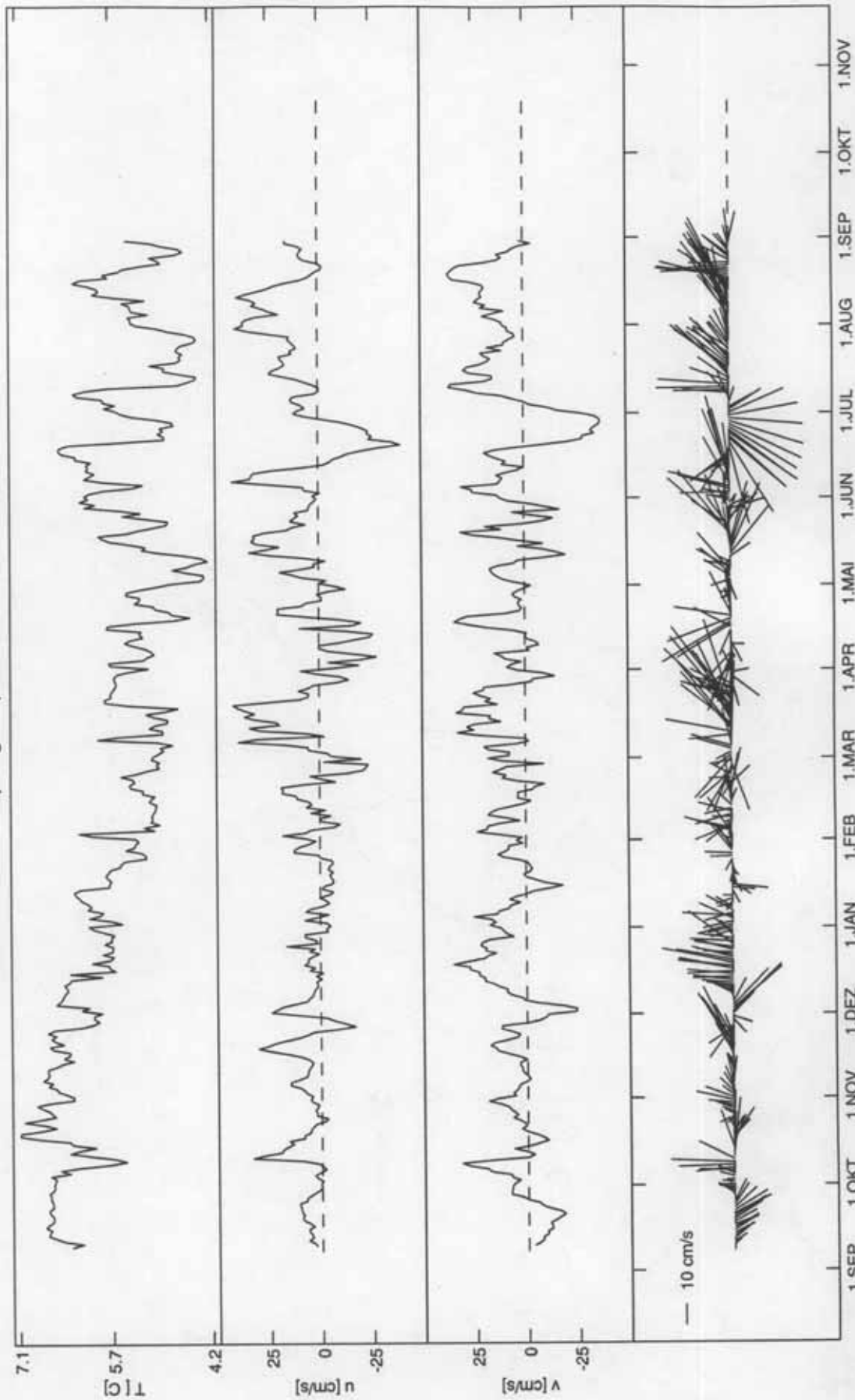
Id	sampl. depth	rec. length	u		mag V	$\frac{\overline{u'u'}}{\overline{v'v'}}$	$\overline{u'v'}$	k_z		T_x	T_y	L_x		K_x	K_y	dir.
			days	cm/s				cm/s	cm ² /s ²			cm ² /s ²	cm ² /s ²			
B1:	209	360	6.6±0.29	20.0	196.1	41.0	193.3	4.5	54.9	76.8	42					
	822	360	7.3±0.29	9.8	190.4	7.4	47.9	4.3	51.7	71.4	10					
1534	360	0.7±0.10	8.7	22.9	29.5	3.7	8.7	5.1	15.4	7.4	25					
	360	4.1±0.13	4.2	36.1	8.4	16.1	4.4	26.4	15.9	4.6						
1996	360	0.8±0.07	5.3	11.9	1.9	1.9	4.5	17.7	8.0	1.9	24					
	360	1.8±0.09	1.9	20.3	6.3	12.0	2.5	6.4	1.9	3.5						
			0.8±0.06	4.0	9.0				9.0							
			1.8±0.08	2.0	15.0											

100 km

B1

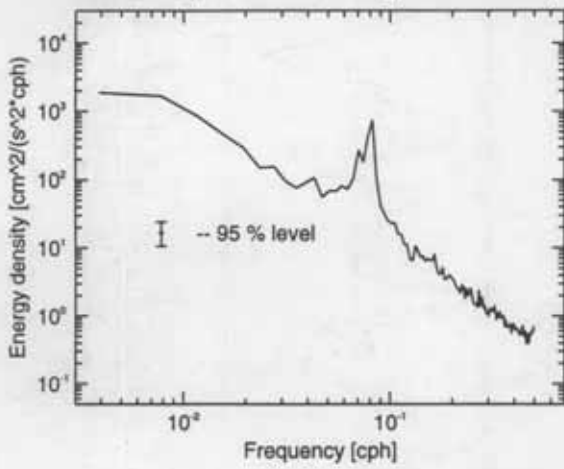


Station B1 Sampling Depth : 209m Record Nr. 92086

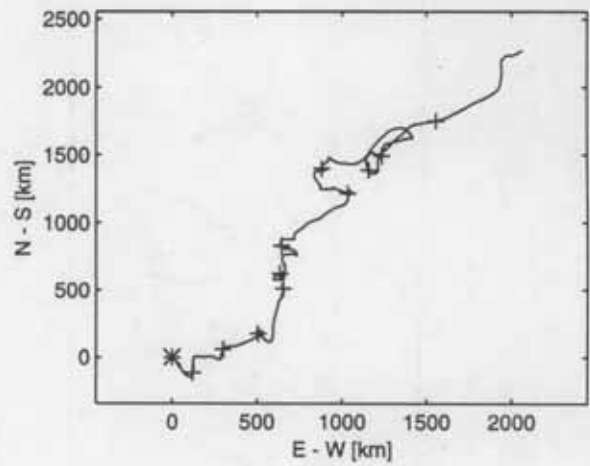
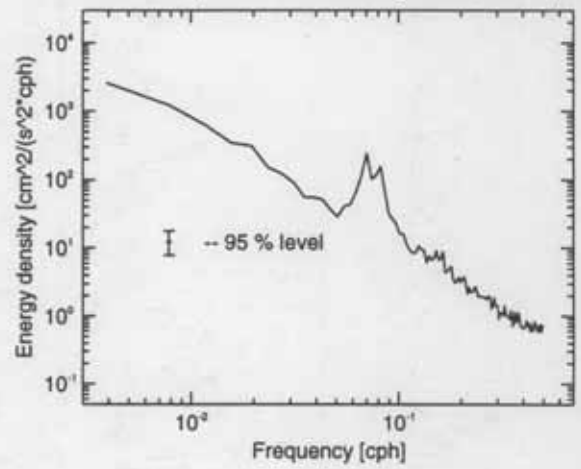


time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

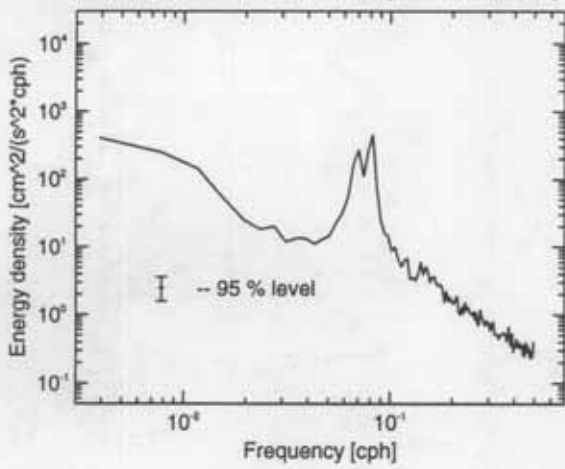


Station B1 Sampling Depth : 822m Record Nr. 92087

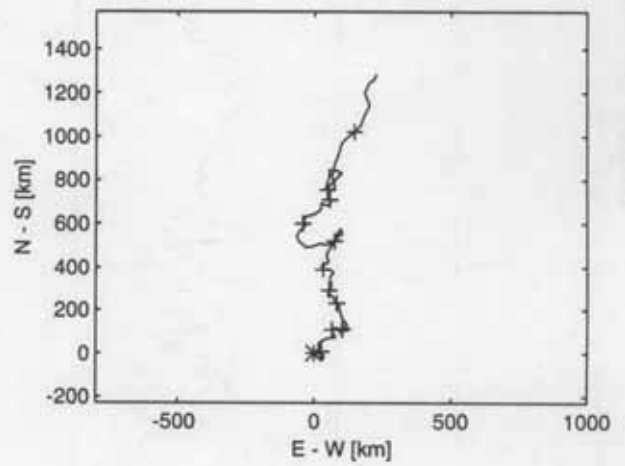
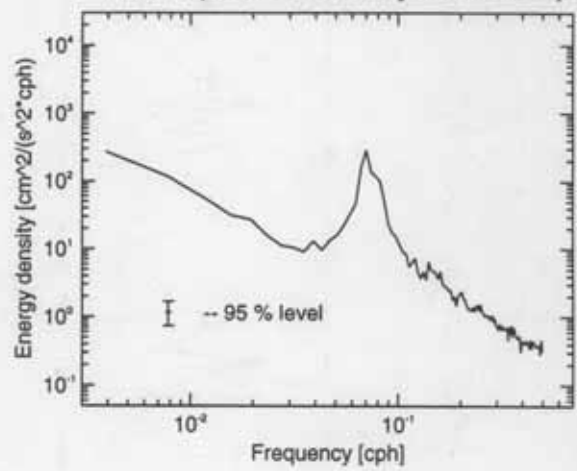


time serie 30 h low pass filtered , 24 h mean

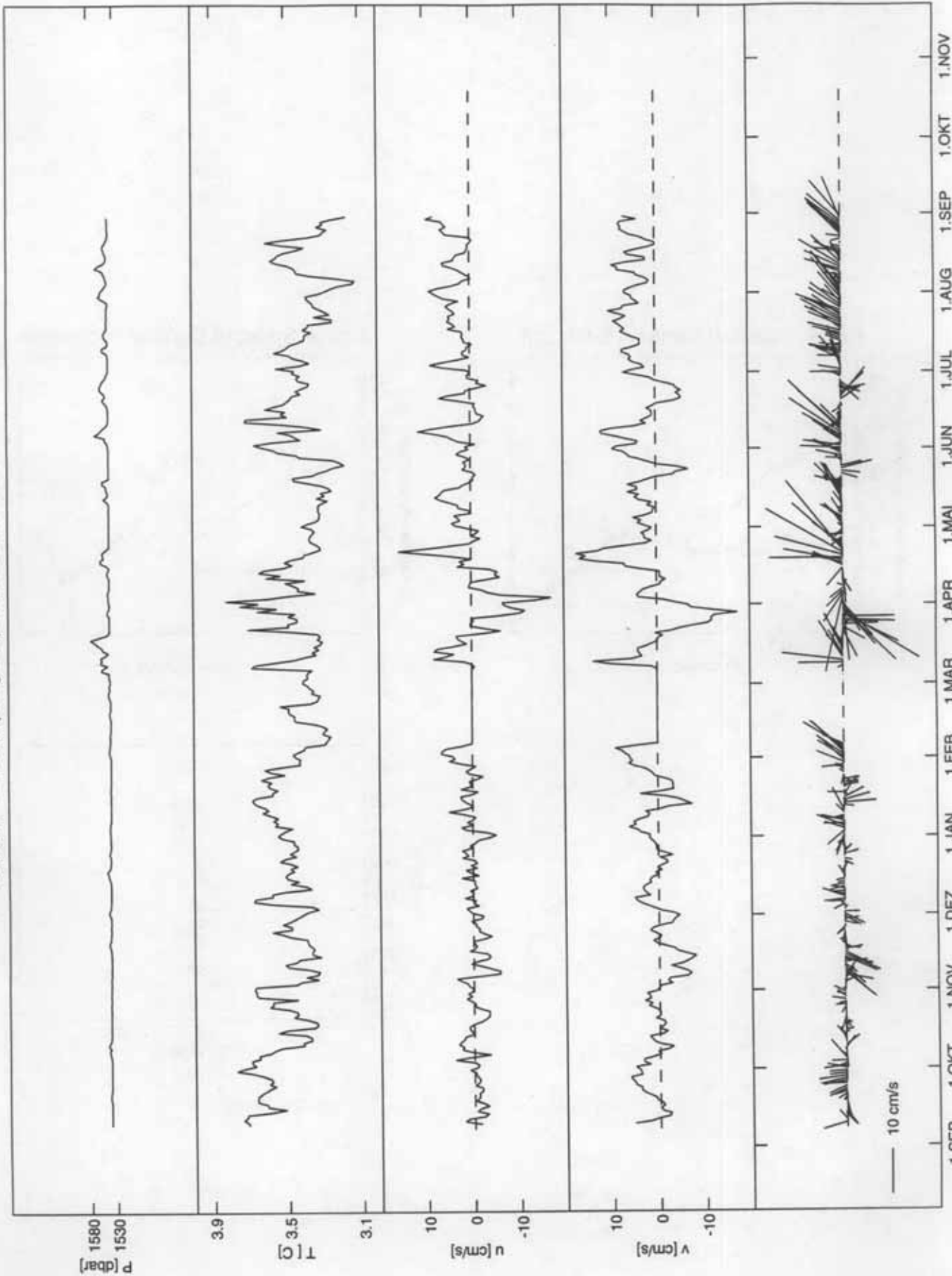
Power Spectral Density E-W comp.



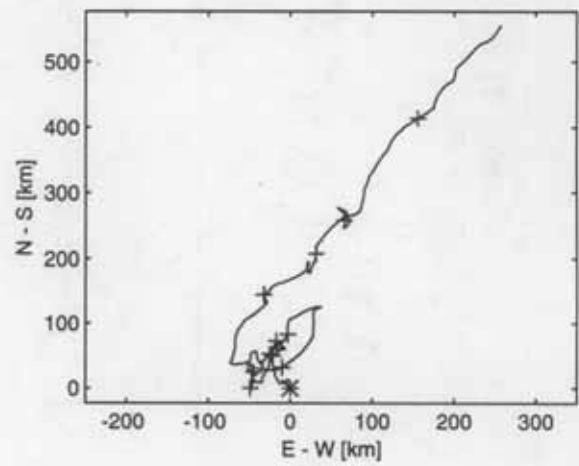
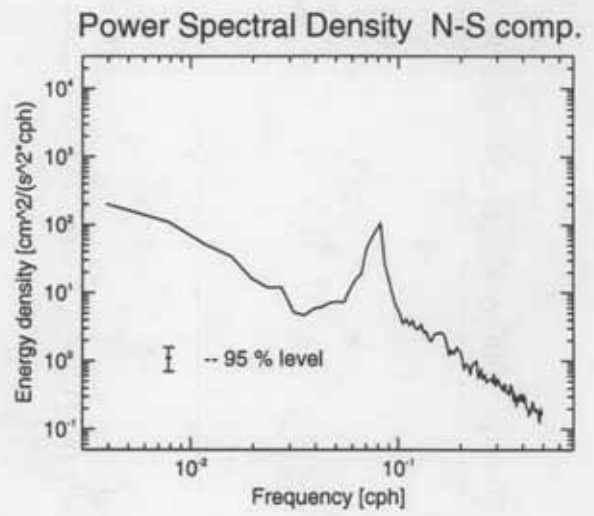
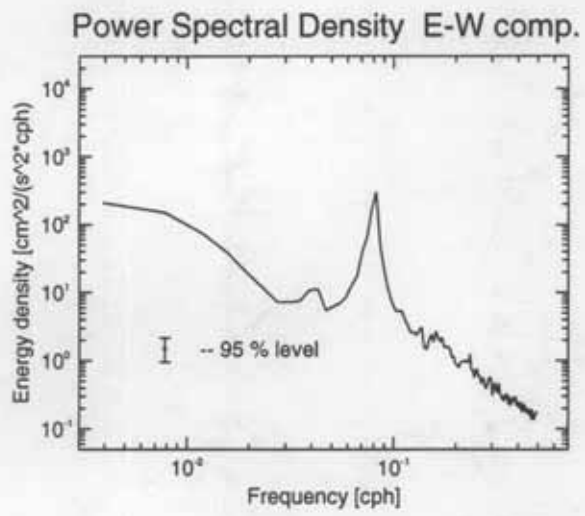
Power Spectral Density N-S comp.



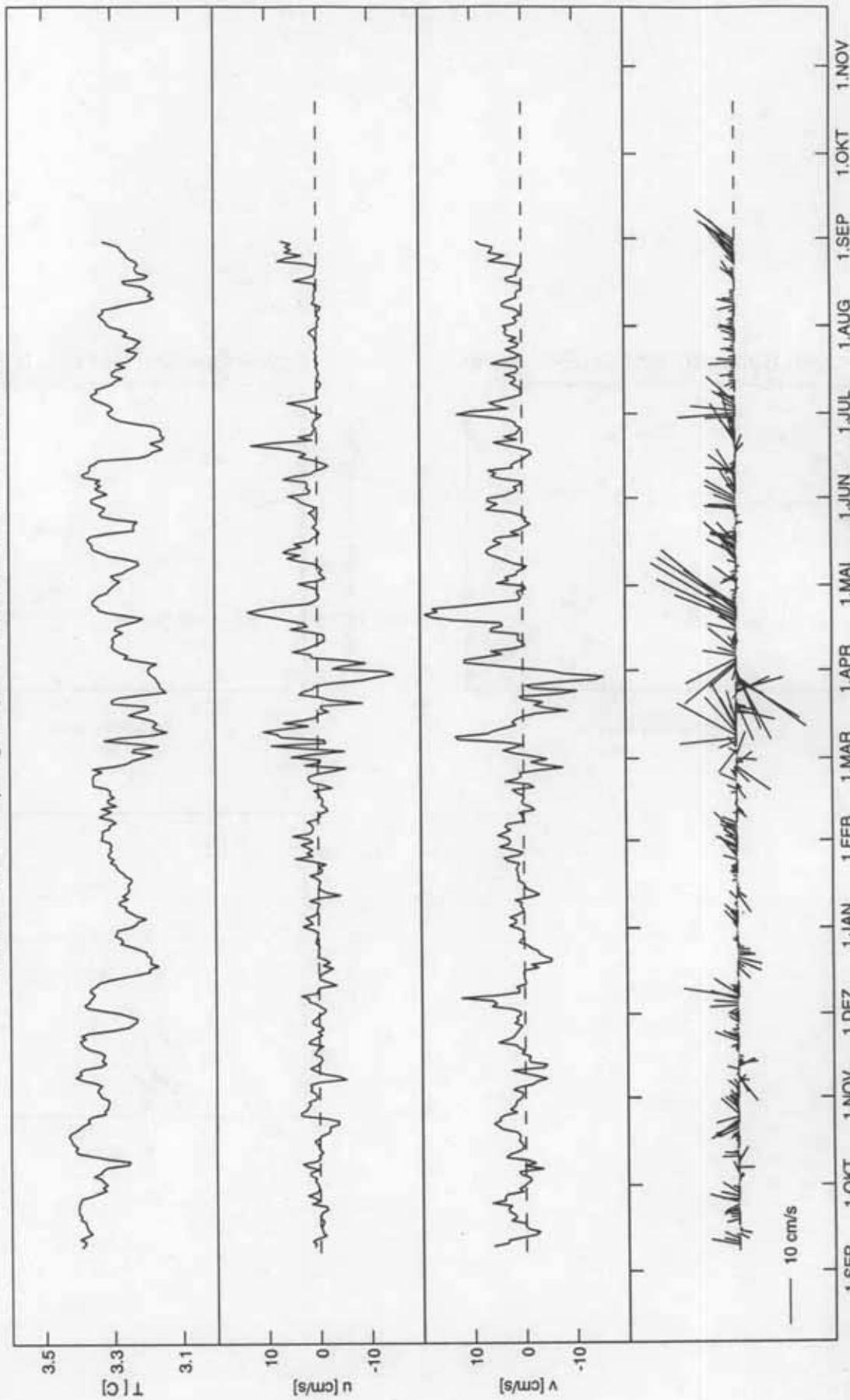
Station B1 Sampling Depth : 1534m Record Nr. 92088



time serie 30 h low pass filtered , 24 h mean

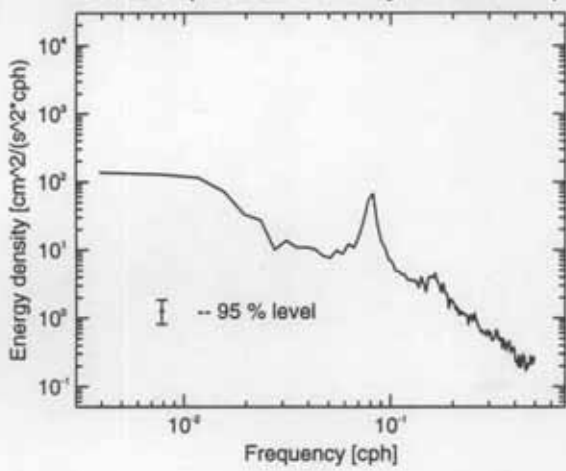


Station B1 Sampling Depth : 1996m Record Nr. 92089



time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

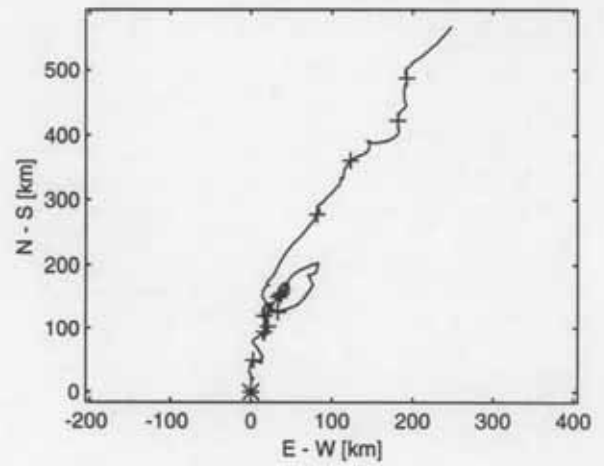
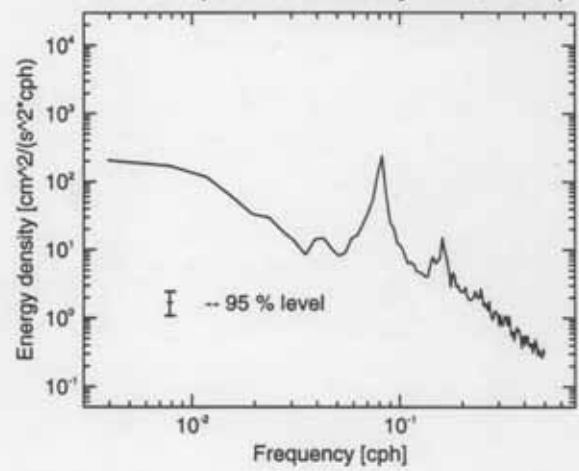


Figure 1. *Estimated values of the parameters of the model.*



Figure 2. *Estimated values of the parameters of the model.*



Figure 3. *Estimated values of the parameters of the model.*



Figure 4. *Estimated values of the parameters of the model.*



C1

Mooring Data C1

current meter	sampl. depth	mab	record no.	sampling time
-	m	m	-	UTC
C1: 10.9.91 - 4.9.92				58° 10.8'N, 29° 37.6'W
RCM8 9835	171	1896	92082	10.9.91 17:00 - 4.9.92 07:00
RCM8 9869	784	1283	92083	10.9.91 17:00 - 4.9.92 08:00
RCM8 9836	1496	571	92084	10.9.91 17:00 - 4.9.92 08:00

mab = metres above bottom

Current statistics (low-passed data)

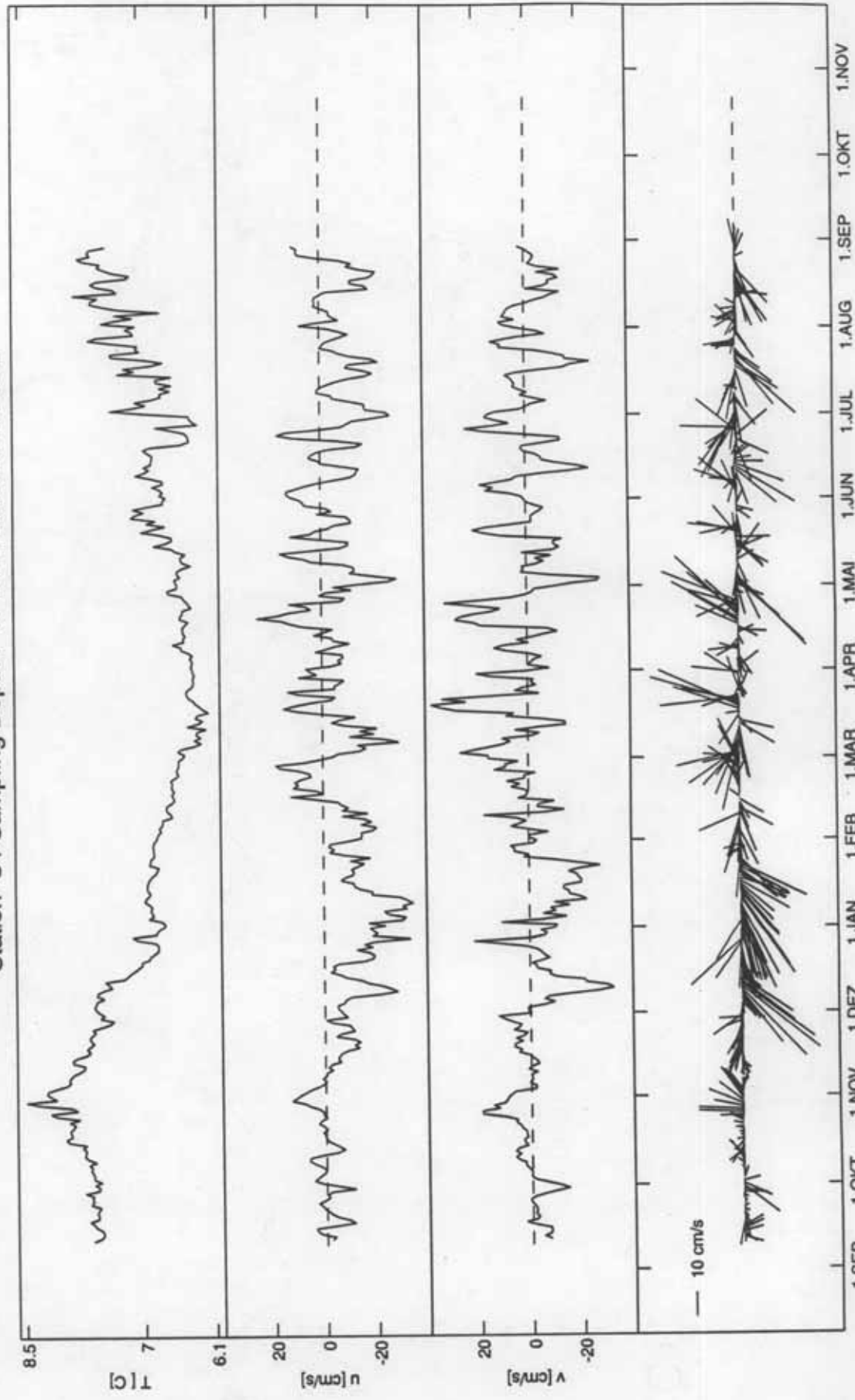
Id	sampl. depth	rec. length	u		mag V	$\overline{u'u'}$ $\overline{v'v'}$		$\overline{u'v'}$		k_E k_H		T_x T_y		L_x L_y		K_x K_y		dir.
			days	cm/s		cm/s	cm/s	cm/s	cm ² /s ²	cm ² /s ²	cm ² /s ²	cm ² /s ²	days	days	km	km	cm ² /sx10 ⁶	
C1:	171	358	-5.3±0.23	14.7	113.9	53.9	117.1	8.6	79.0	84.3	270							
	784	358	<-0.1±0.23	5.3	120.2	10.6	13.9	3.2	30.8	33.7	271							
			-3.3±0.11	7.7	28.3		28.9	9.7	44.6	23.7								
			<0.1±0.11	3.3	29.4		5.3	4.4	20.5	11.1								
	1496	358	-1.8±0.08	5.6	16.4	0.7	14.3	3.6	12.8	5.2	299							
			1.0±0.07	2.1	12.3		2.1	2.7	8.2	2.9								

C1

100 km

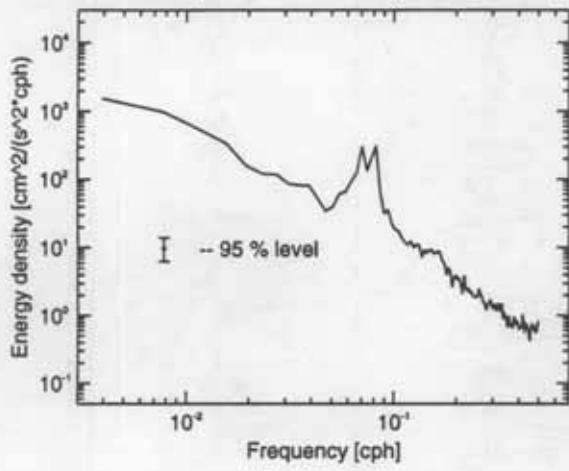


Station C1 Sampling Depth : 171m Record Nr. 92082

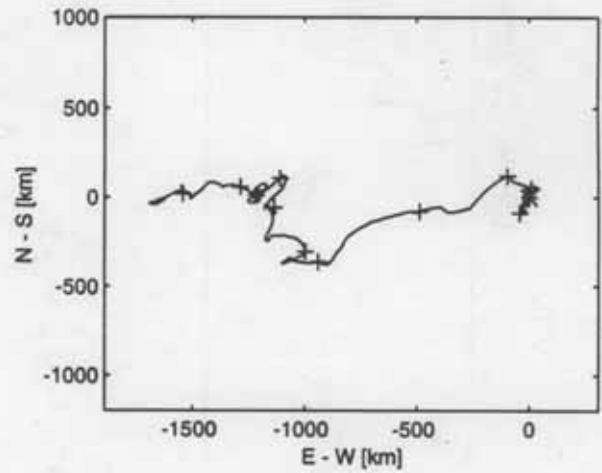
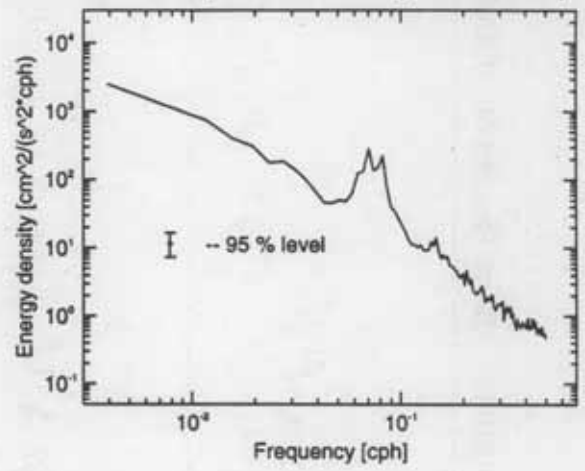


time serie 30 h low pass filtered , 24 h mean

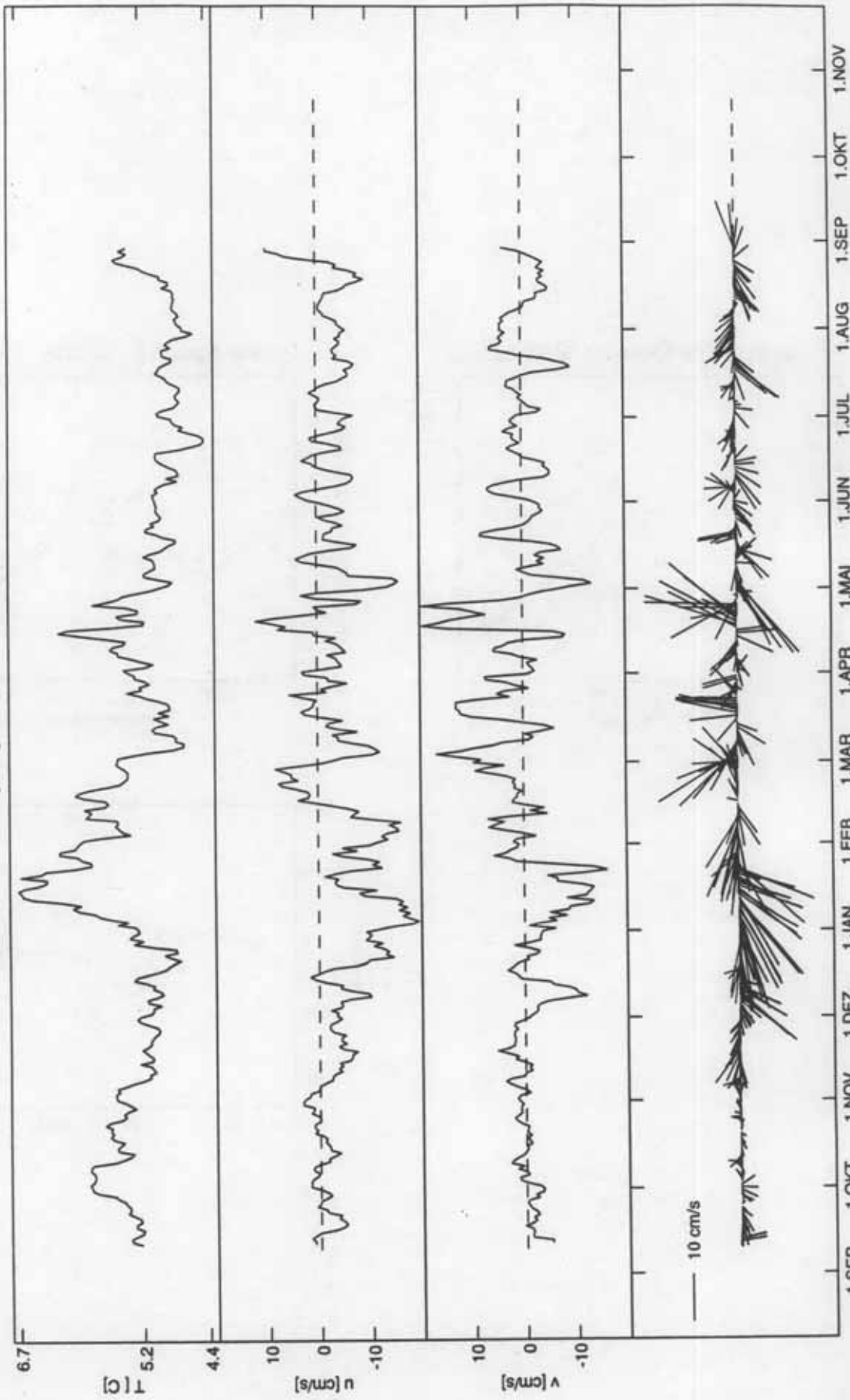
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

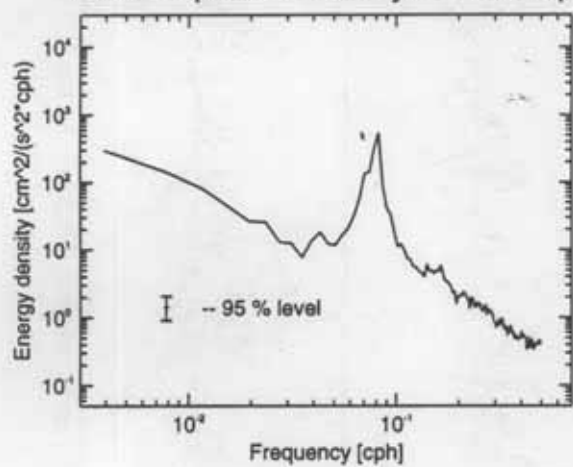


Station C1 Sampling Depth : 784m Record Nr. 92083

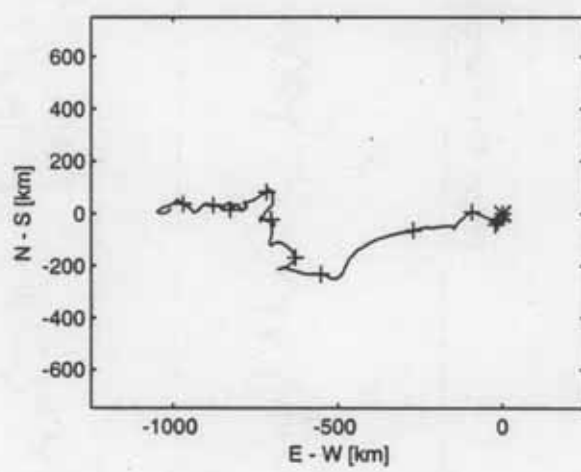
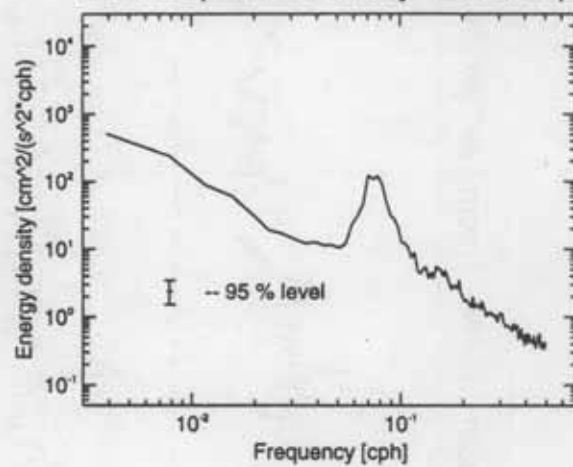


time serie 30 h low pass filtered , 24 h mean

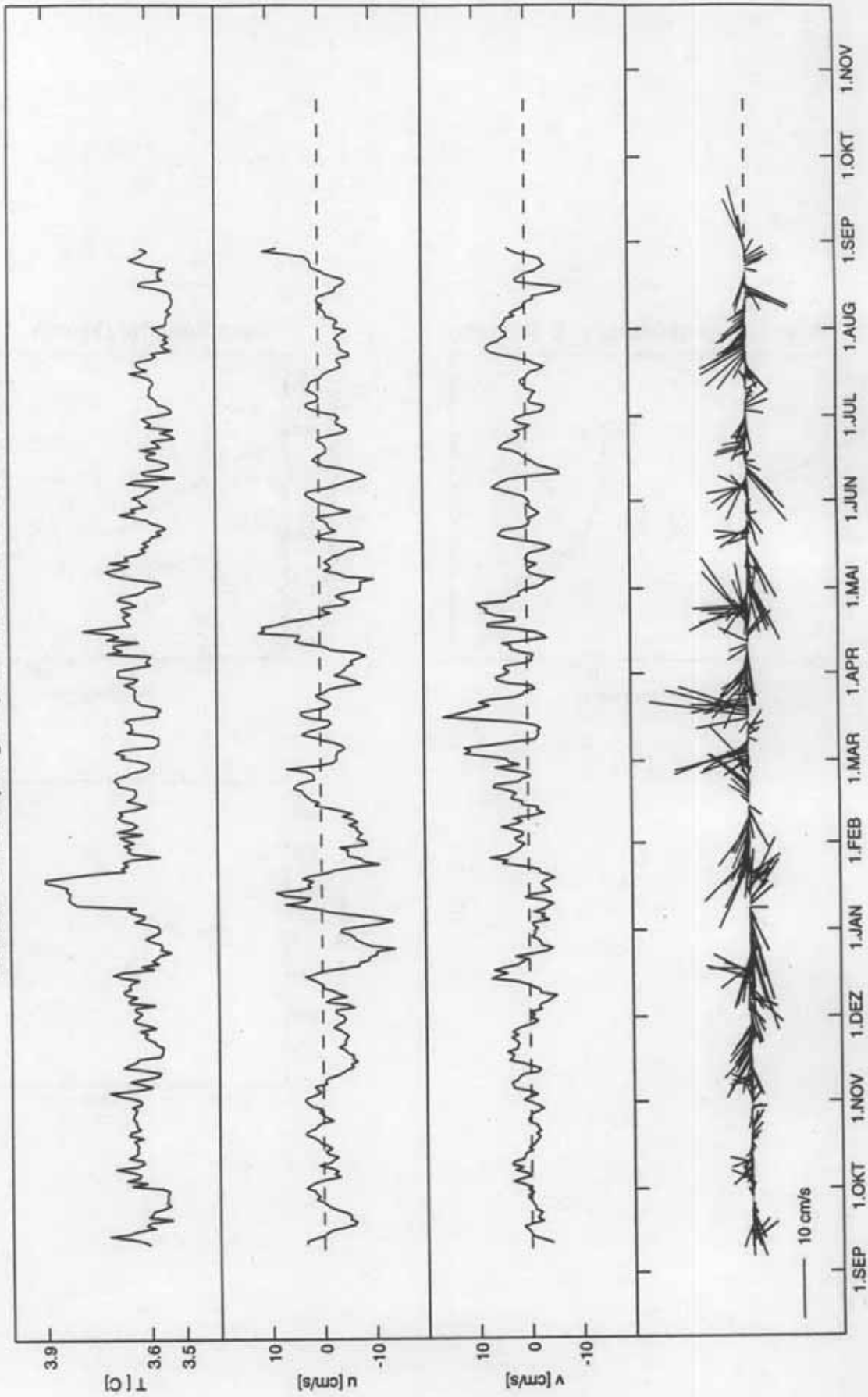
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

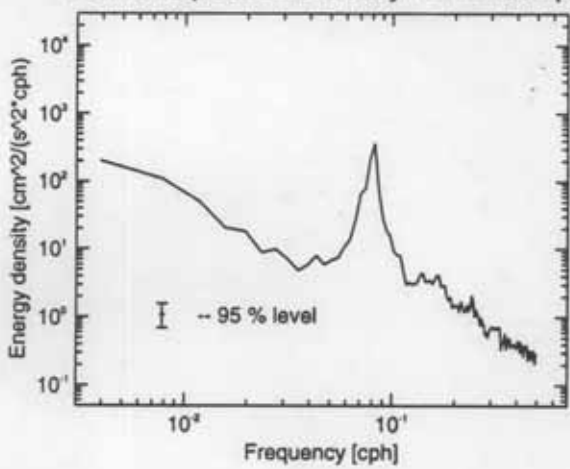


Station C1 Sampling Depth : 1496m Record Nr. 92084

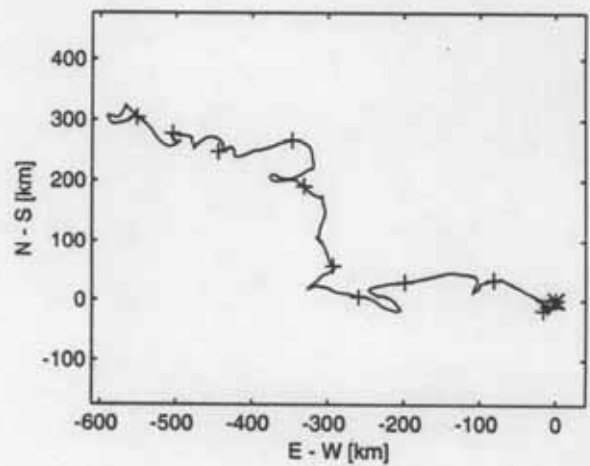
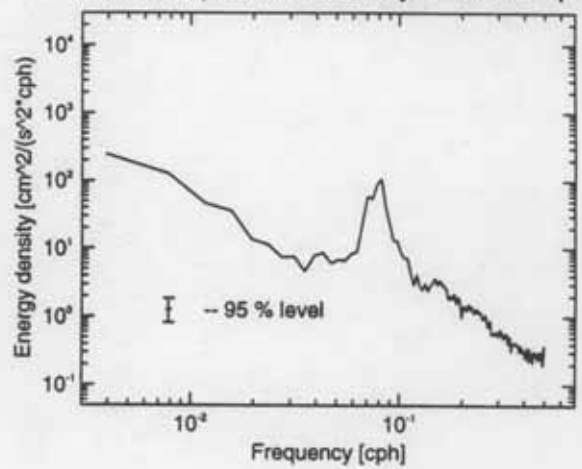


time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.



Power Spectral Density N-S comp.



D3, D4

Mooring Data D3 and D4

current meter	sampl. depth	mab	record no.	sampling time
-	m	m	-	UTC
D3: 16.9.93 - 29.5.94				57° 33.3'N, 28° 10.4'W
RCM8 9836	187	2107	94025	16.9.93 12:00 - 29.5.94 06:00
RCM8 9841	780	1514	94026	16.9.93 12:00 - 29.5.94 06:00
RCM8 9203	2280	14	94028	16.9.93 12:00 - 29.5.94 06:00
D4: 29.5.94 - 8.6.95				57° 34.0'N, 28° 9.6'W
RCM7 11294	542	1758	95027	29.5.94 12:00 - 8.6.95 6:00
RCM8 9840	1752	548	95028	29.5.94 12:00 - 8.6.95 6:00
RCM8 9869	2211	89	95029	29.5.94 12:00 - 8.6.95 6:00

mab = metres above bottom

Current statistics (low-passed data)

Id	sampl. depth	rec. length	u		mag V	$\frac{u'u'}{v'v'}$		$u'v'$	k_z k_H		T_x T_y	\angle	L_x L_y		K_x K_y	dir.
			cm/s	cm/s		cm/s	cm/s		cm ² /s ²	cm ² /s ²			cm ² /s ²	cm ² /s ²		
D3:	187	253	-0.1±0.27	4.3±0.25	15.4	117.6	23.3	106.5	4.7	43.7	47.2	359				
	780	253	<0.1±0.14	2.8±0.16	4.3	95.4	4.1	9.1	8.5	71.7	70.0	1				
	2280	253	-1.6±0.13	4.5±0.15	7.7	33.5	4.9	32.0	4.4	21.1	11.7	341				
D4:	542	373	2.3±0.21	7.5±0.18	14.6	104.7	31.7	88.7	6.5	57.5	58.9	18				
	1752	373	<0.1±0.07	2.1±0.08	7.7	72.8	-1.5	29.8	5.6	41.4	35.3	2				
	2211	373	-1.2±0.06	1.1±0.08	5.8	15.0	1.1	13.3	5.1	14.9	5.0	314				
					2.1	8.0		2.2	7.5	25.2	9.8					
					5.1	16.7		12.3	1.8	4.3	1.2					
					1.7			1.4	6.2	21.9	8.9					



D3

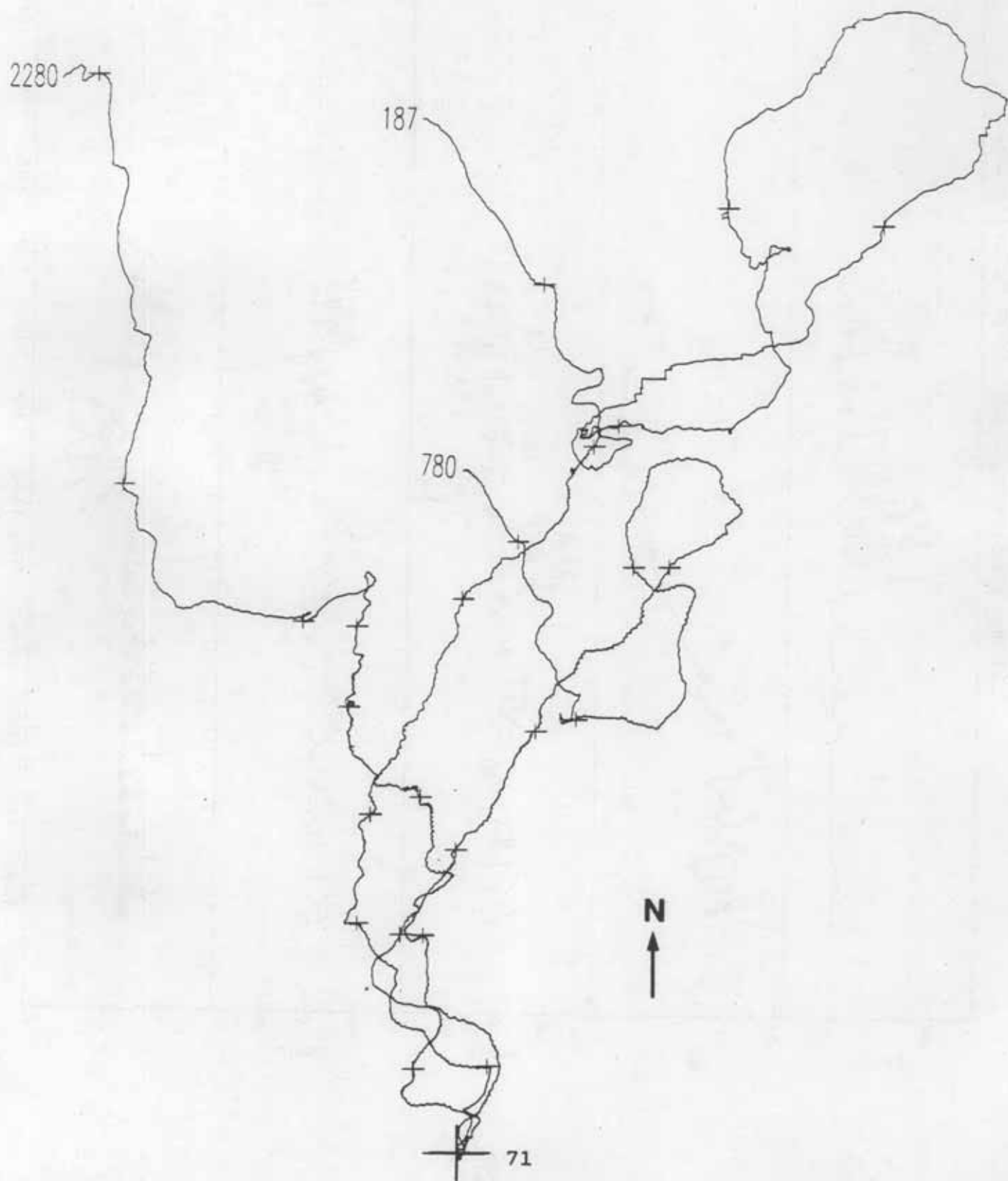
2280

187

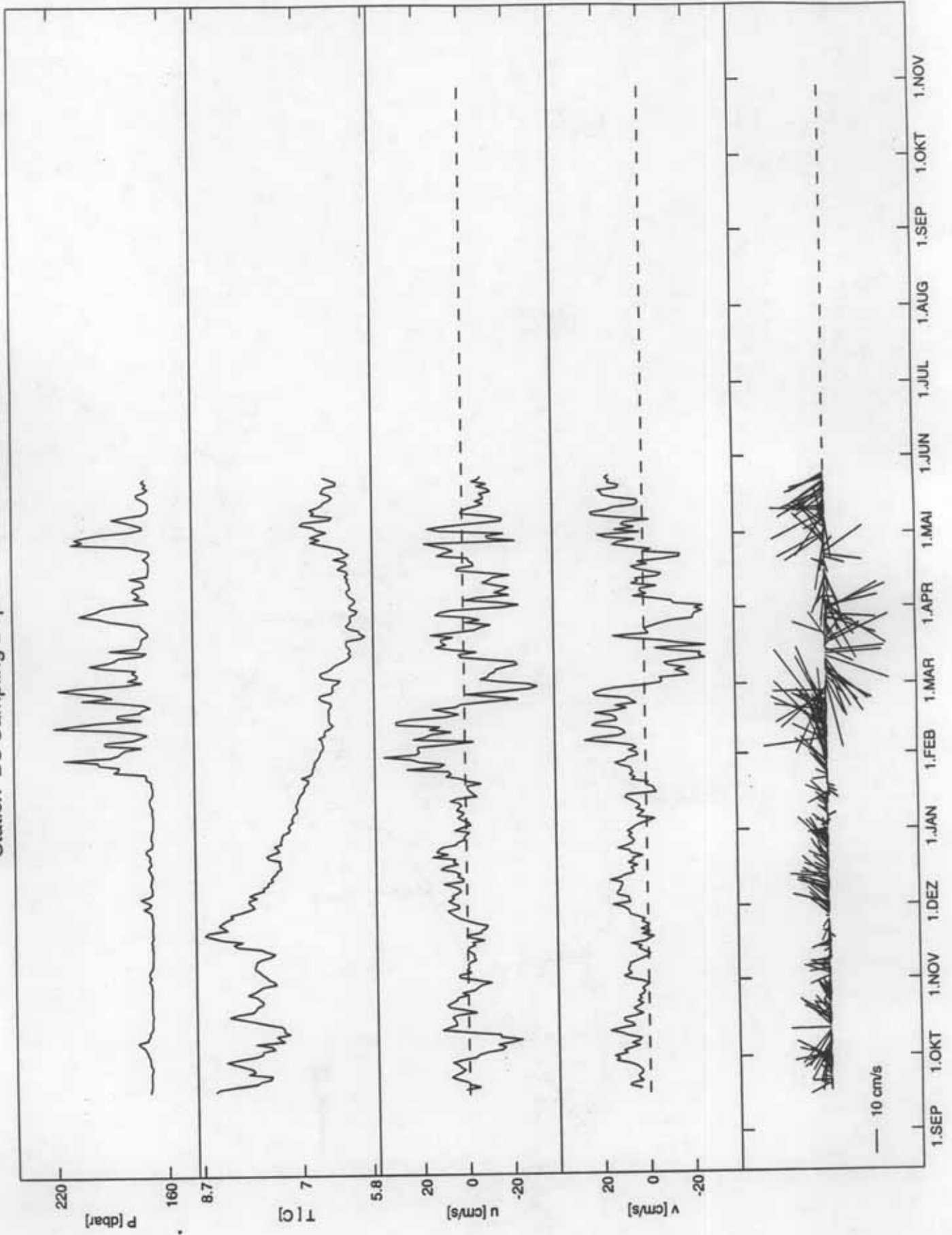
780

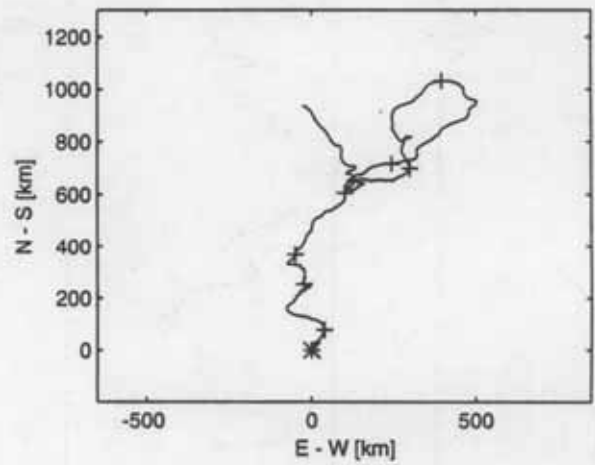
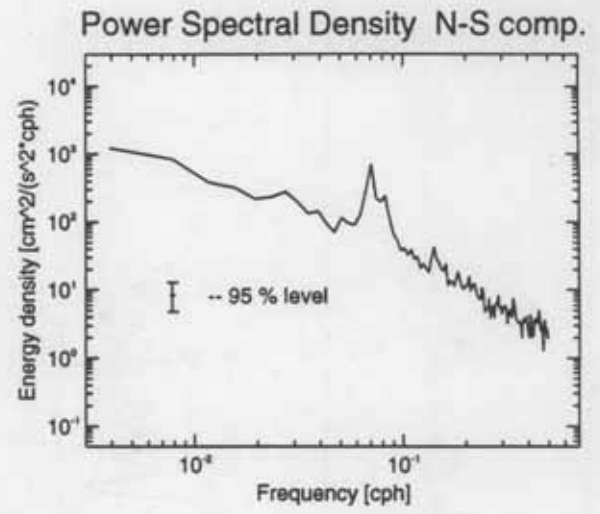
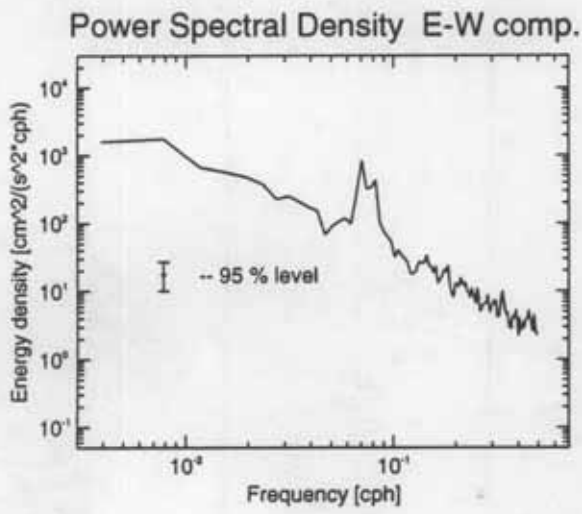


71

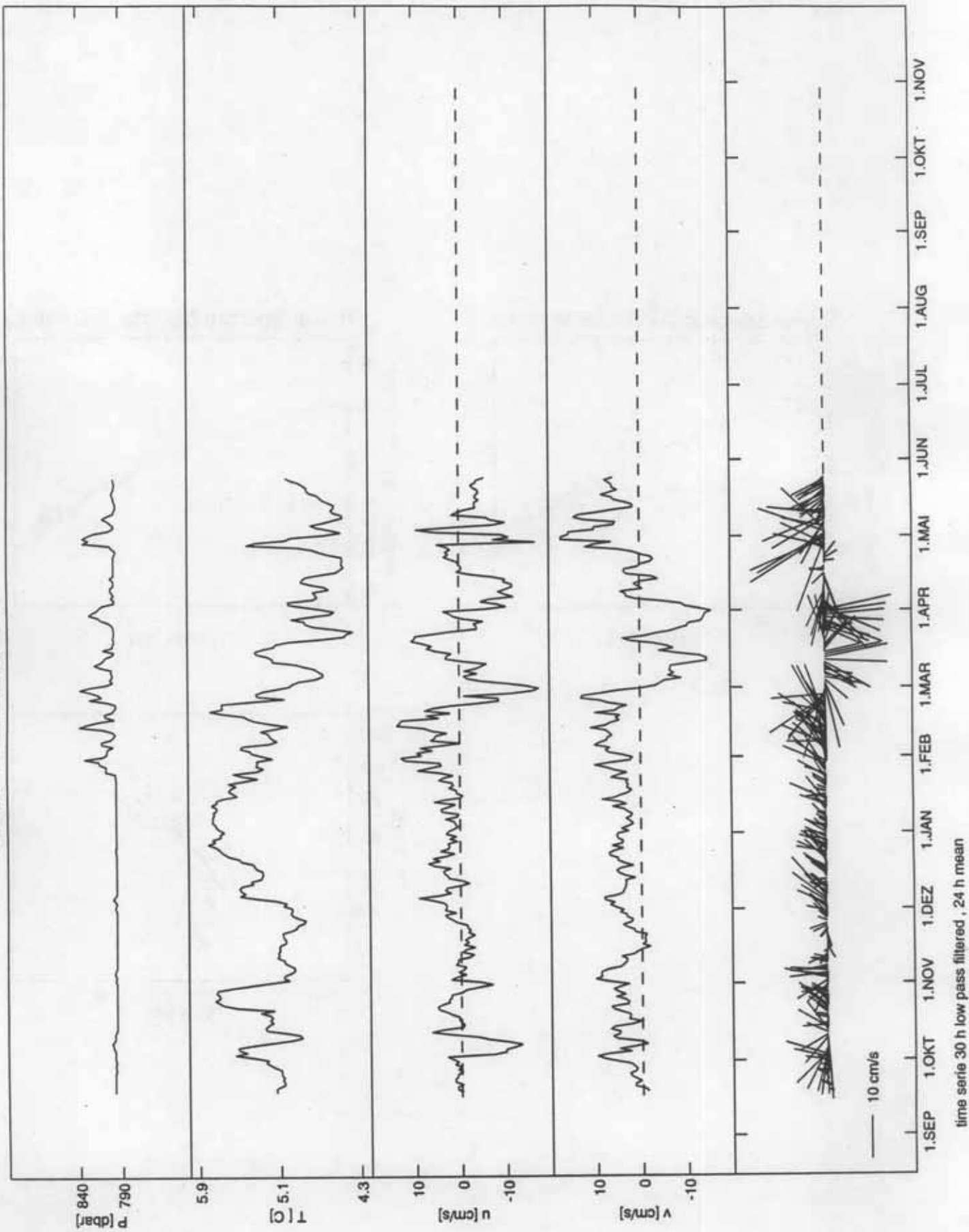


Station D3 Sampling Depth : 187m Record Nr. 94025



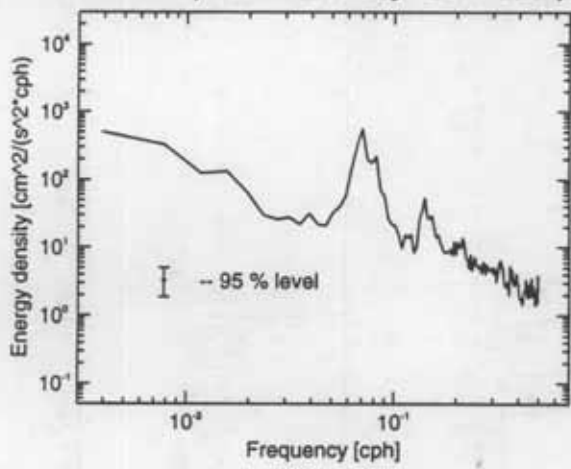


Station D3 Sampling Depth : 780m Record Nr. 94026

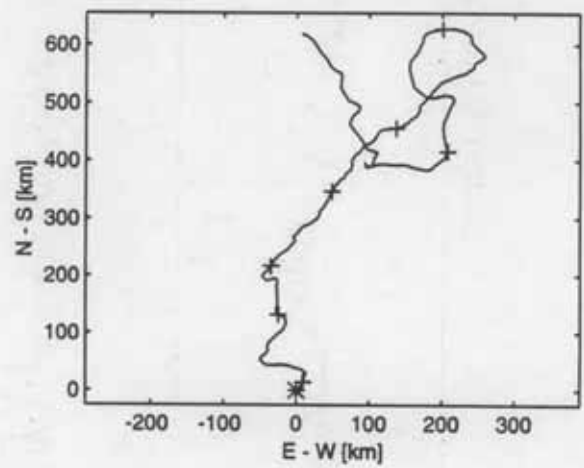
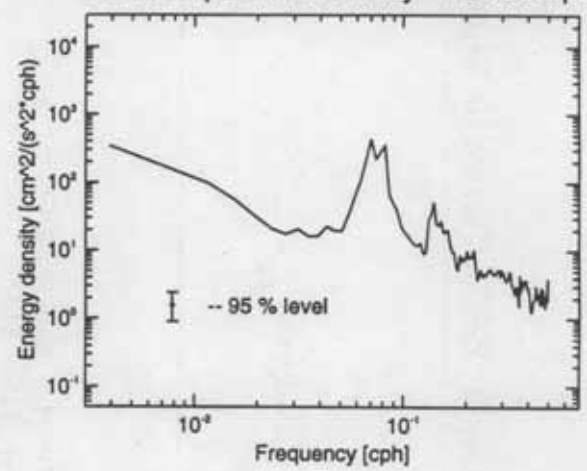


time serie 30 h low pass filtered , 24 h mean

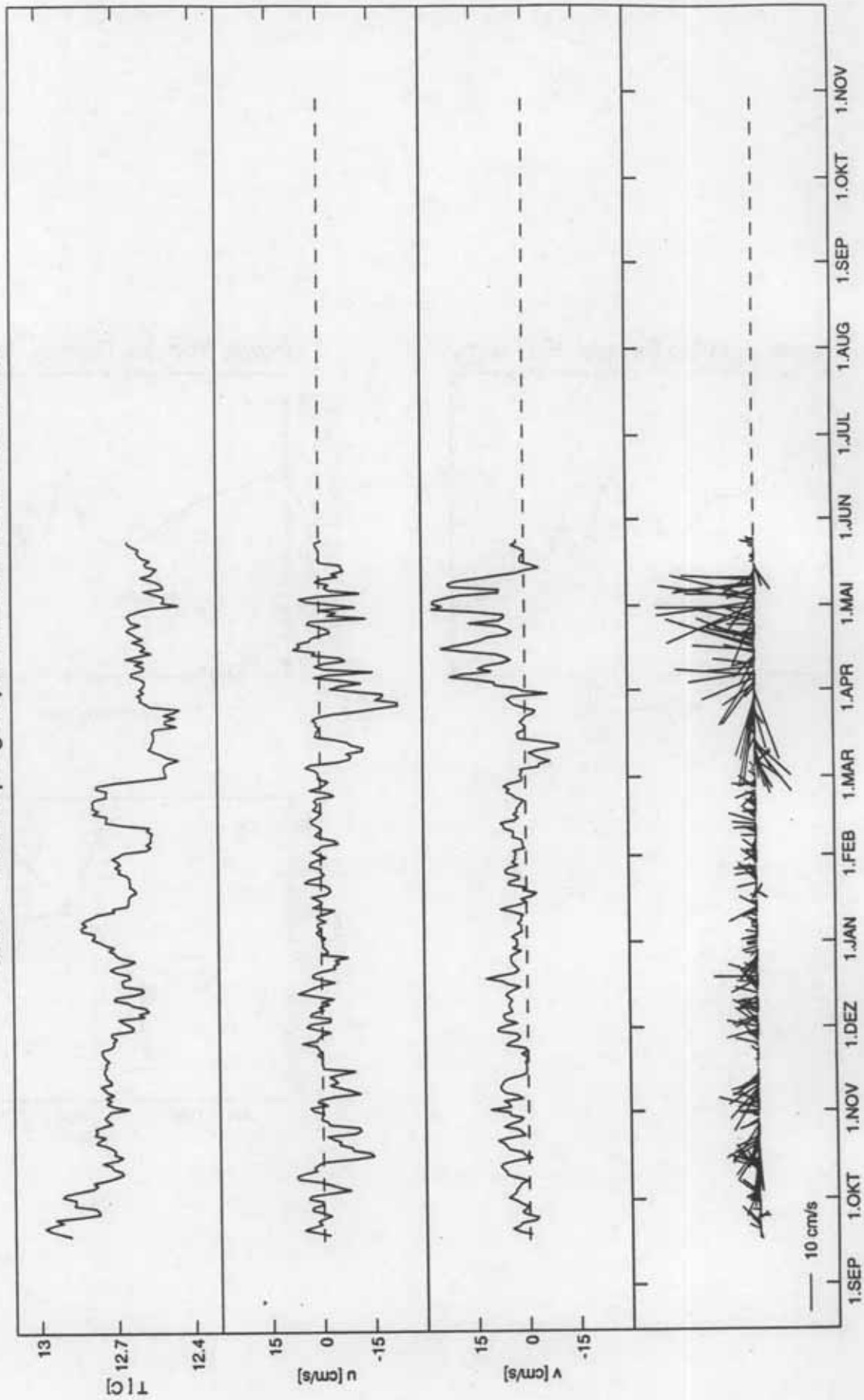
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

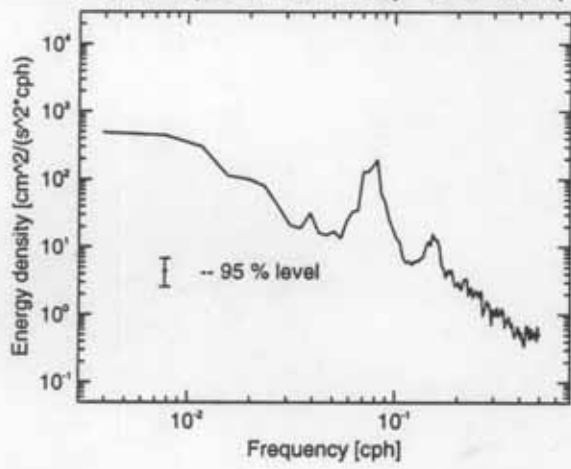


Station D3 Sampling Depth : 2280m Record Nr. 94028

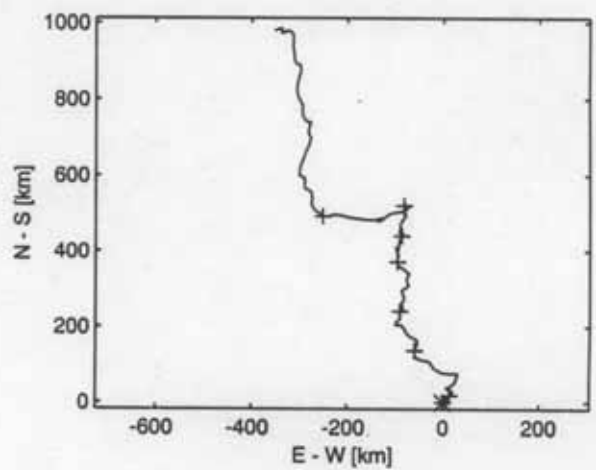
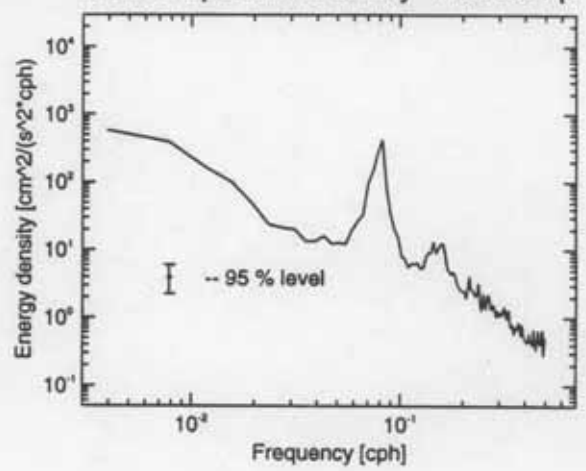


time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.



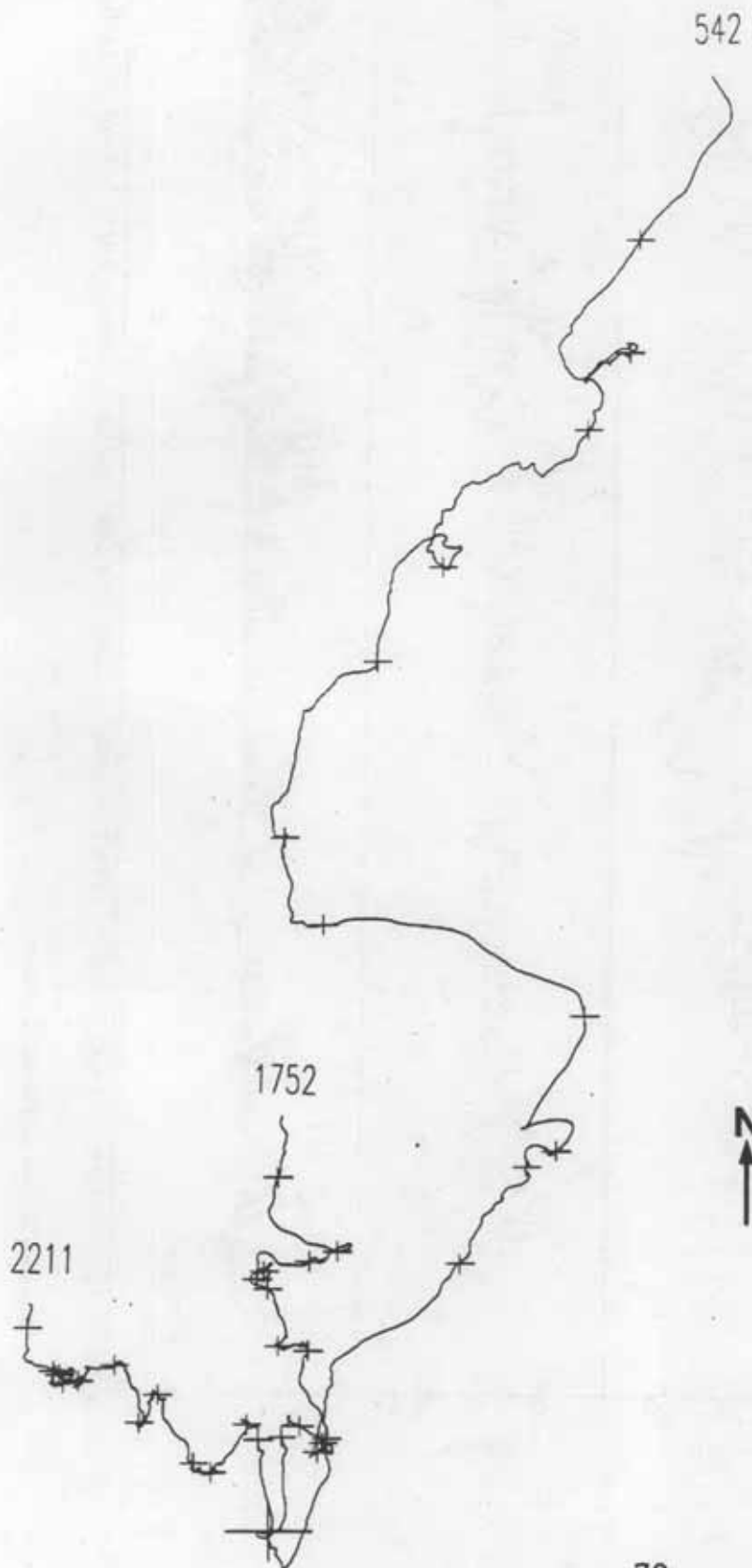
Power Spectral Density N-S comp.



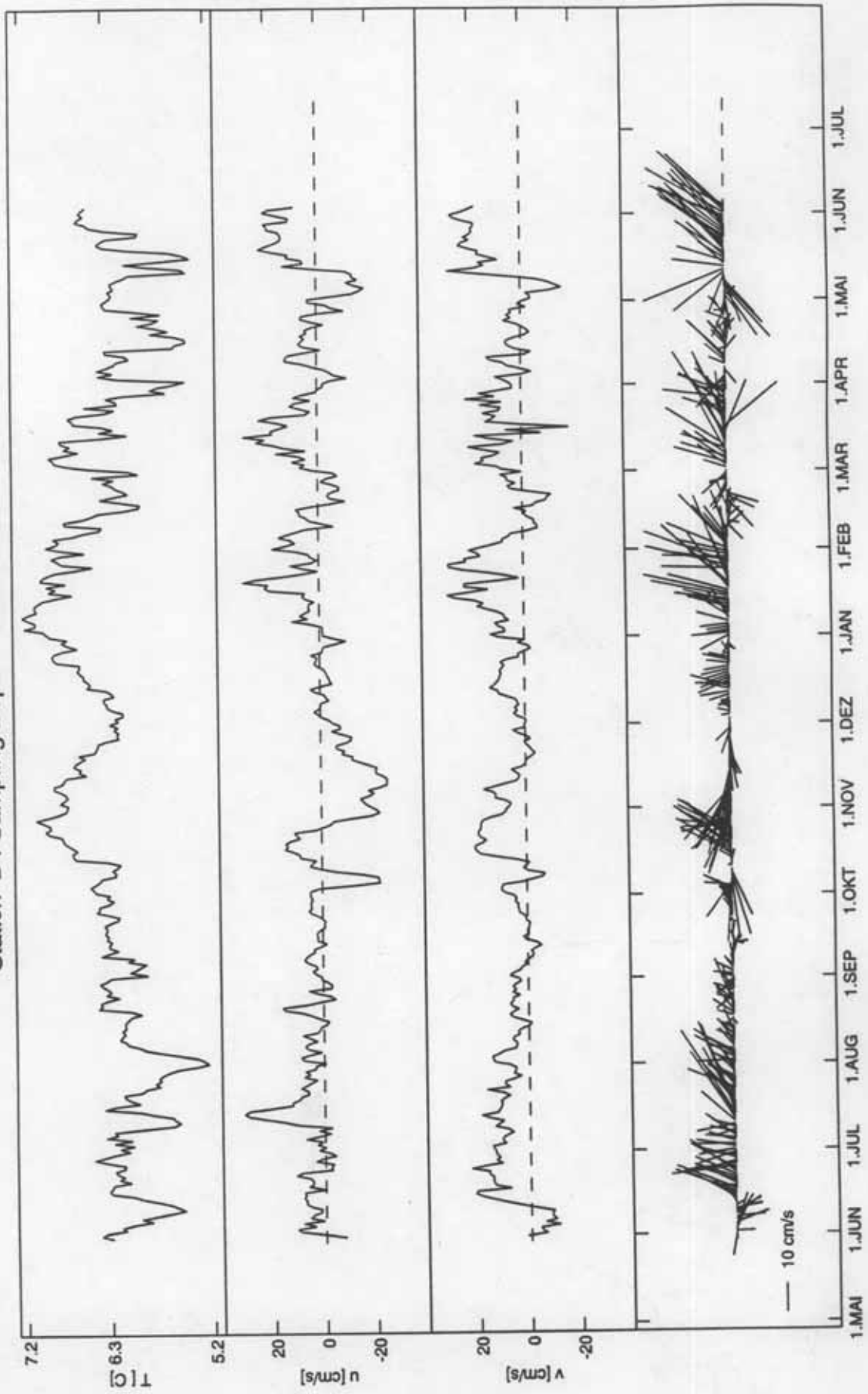
D4



100 km

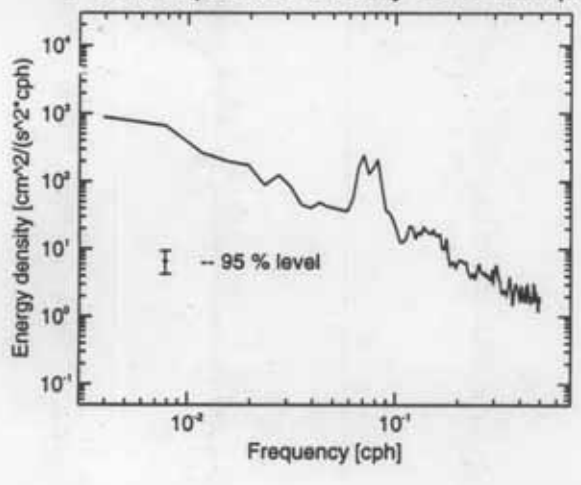


Station D4 Sampling Depth : 542m Record Nr. 95027

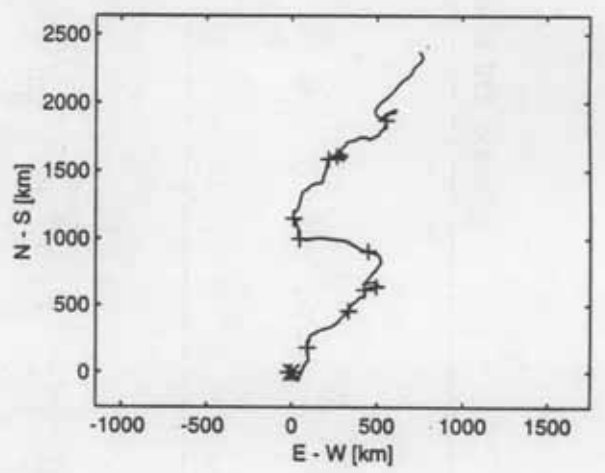
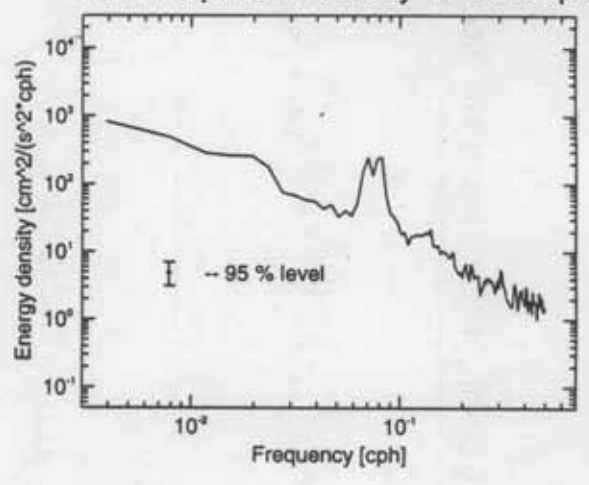


time serie 30 h low pass filtered , 24 h mean

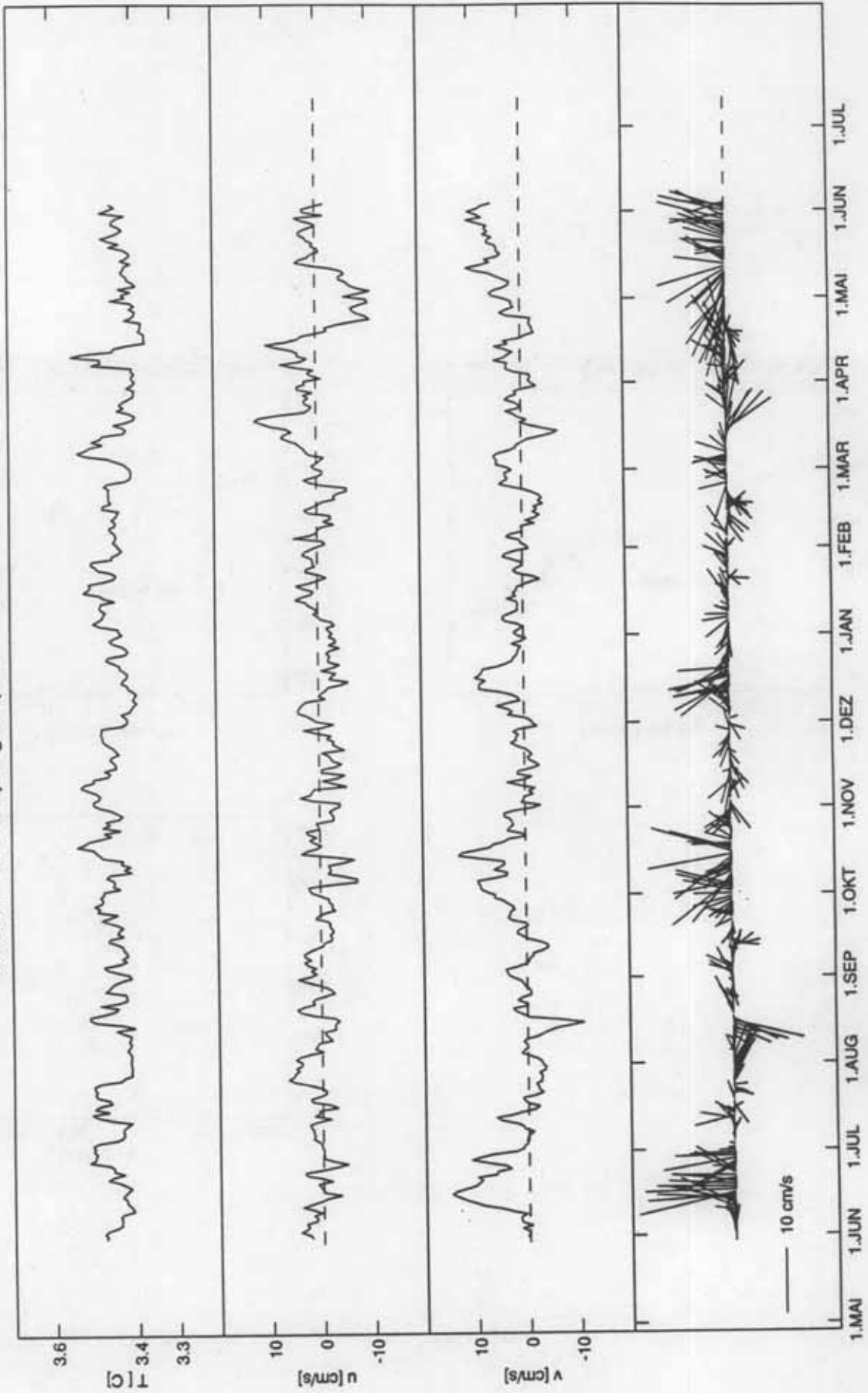
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

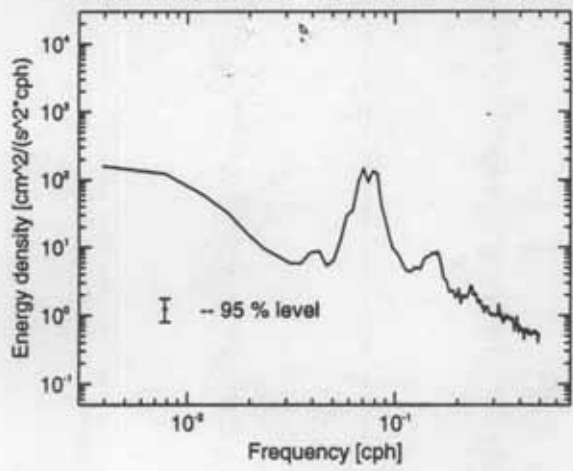


Station D4 Sampling Depth : 1752m Record Nr. 95028

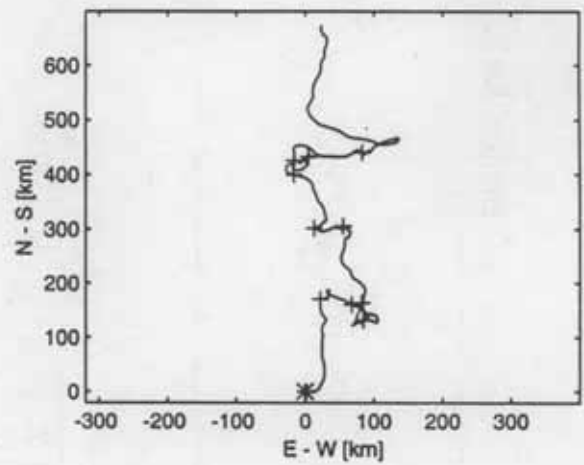
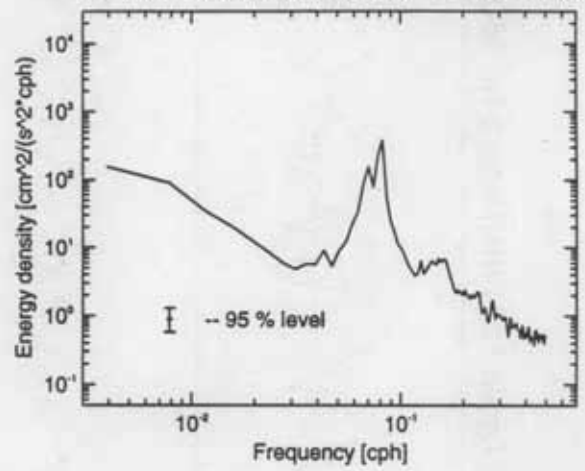


time serie 30 h low pass filtered , 24 h mean

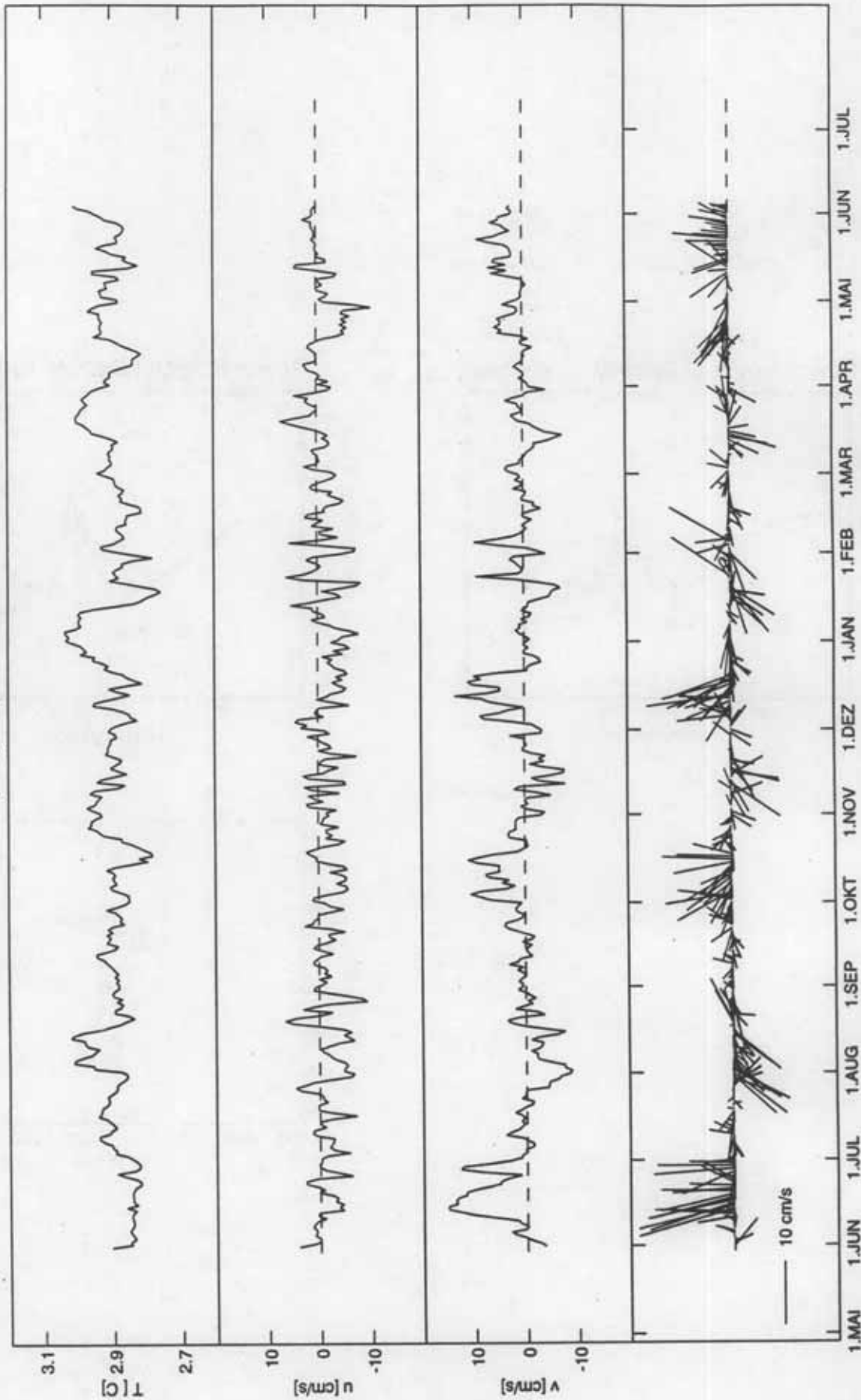
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

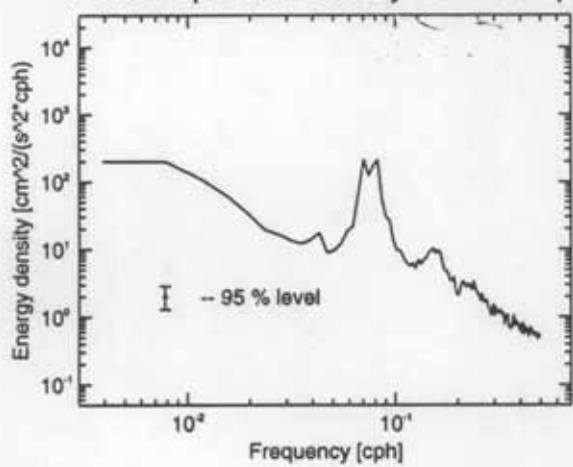


Station D4 Sampling Depth : 2211m Record Nr. 95029

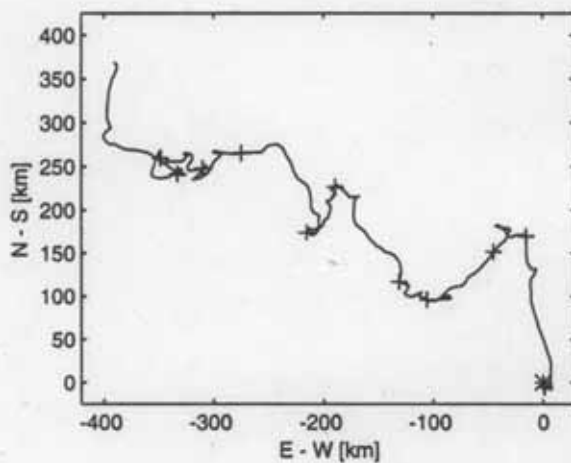
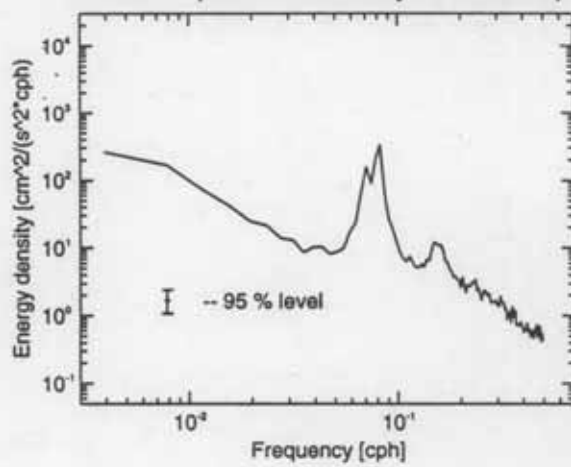


time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.



Power Spectral Density N-S comp.



E2, E3, E4

Mooring Data E2, E3, and E4

current meter	sampl. depth	mab	record no.	sampling time
-	m	m	-	UTC
E2: 2.9.92 - 14.9.93				54° 17.3'N, 25° 51.4'W
RCM4 2012	175	2855	93053	2.9.92 14:00 - 11.9.93 4:00
RCM8 9386	2825	205	93050	2.9.92 14:00 - 14.9.93 2:00
E3: 15.9.93 - 27.5.94				54° 24.8'N, 25° 51.7'W
RCM5 6119	439	2860	94029	15.9.93 12:00 - 27.5.94 6:00 ¹⁾
RCM4 8514	1040	2259	94030	15.9.93 12:00 - 27.5.94 6:00
E4: 27.5.94 - 6.6.95				54° 25.3'N, 25° 53.5'W
RCM5 6846	439	2811	95019	27.5.94 16:00 - 6.6.95 3:00
RCM5 6761	1041	2209	95020	27.5.94 16:00 - 6.6.95 6:00
RCM5 6808	3095	155	95022	27.5.94 16:00 - 6.6.95 6:00 ¹⁾

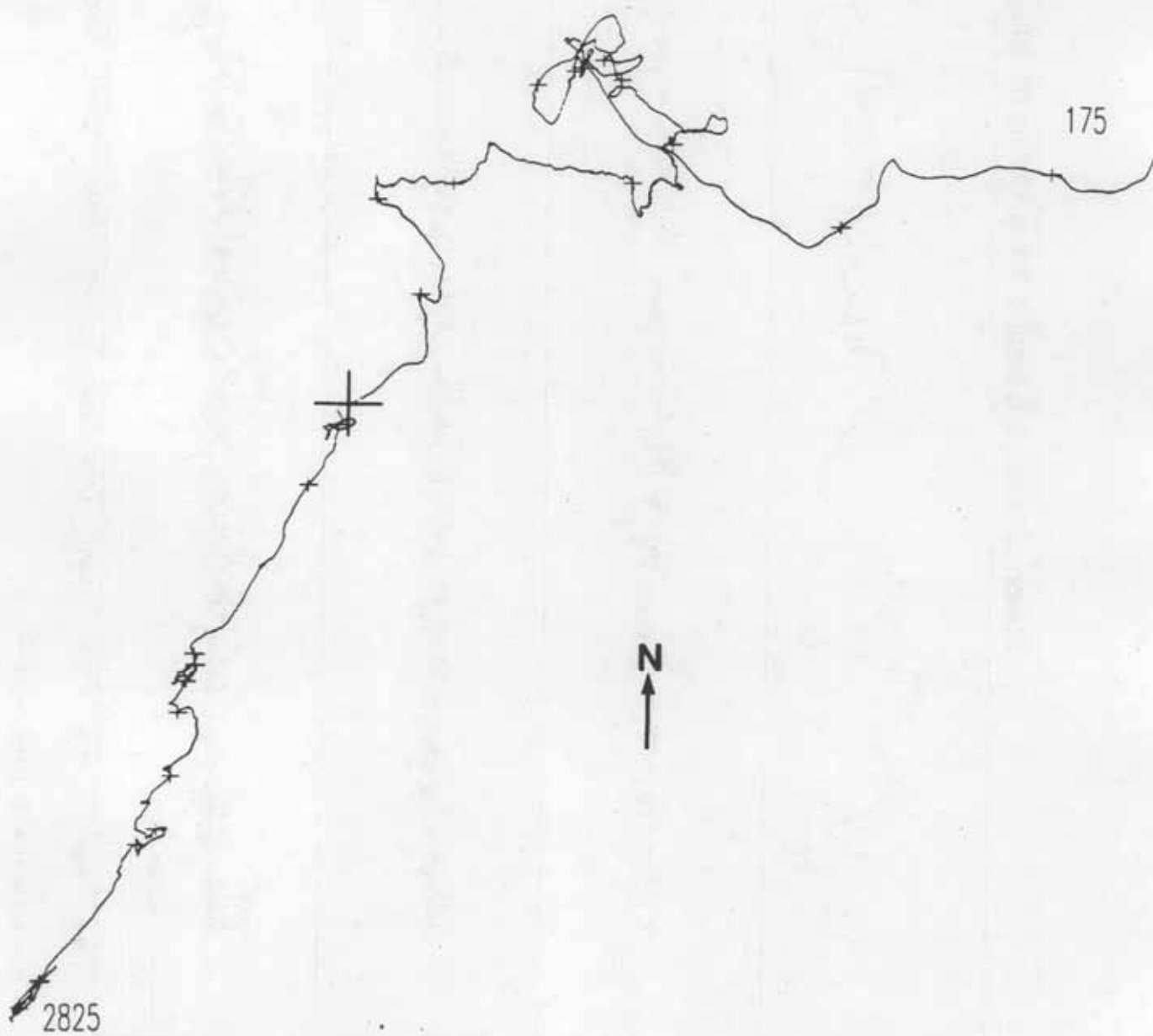
mab = metres above bottom
¹⁾ no direction, only speed

Current statistics (low-passed data)

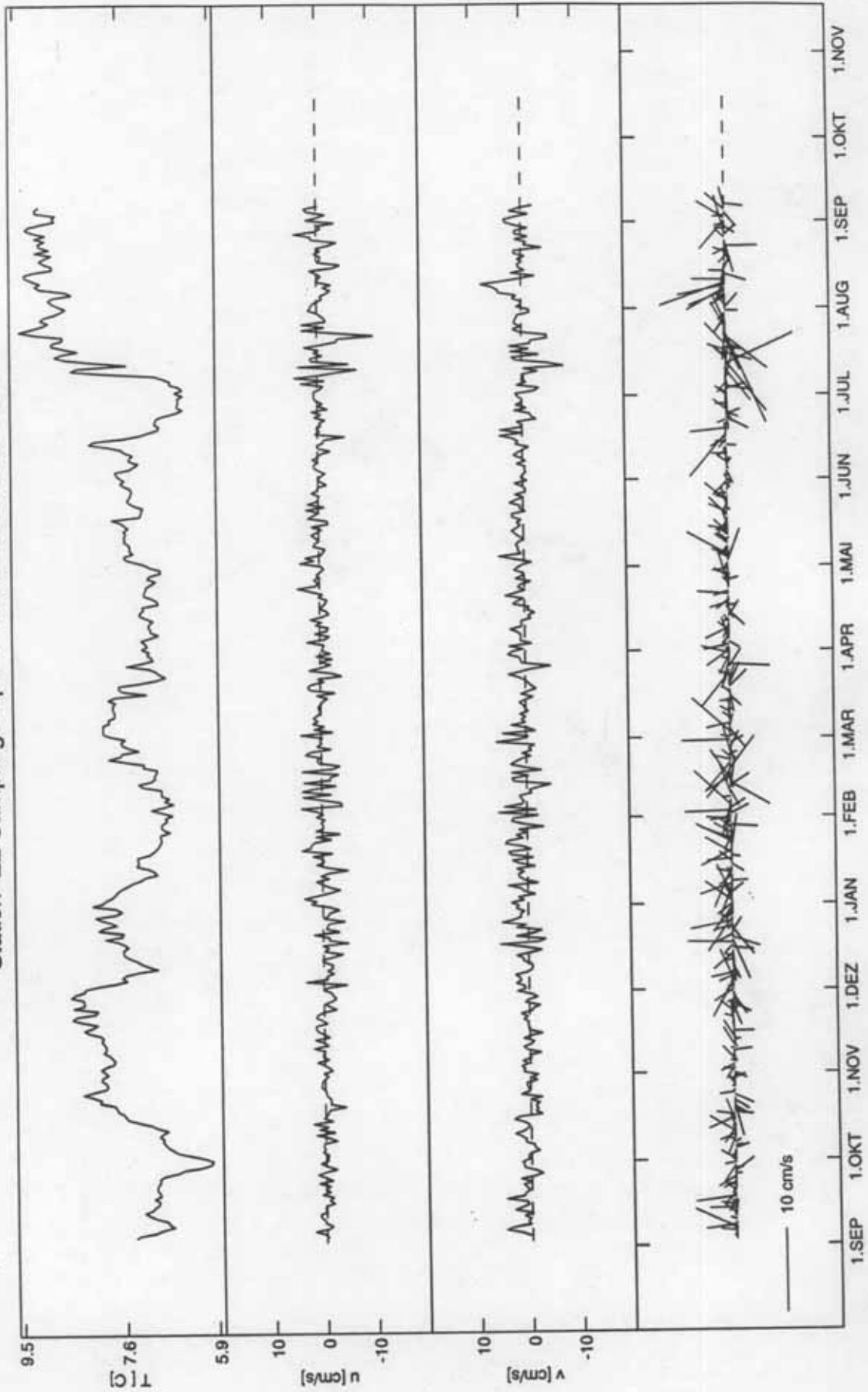
Id	sampl. depth	rec. length	u		mag	$\frac{u'u'}{v'v'}$	$\frac{u'v'}{v'v'}$	k_z		T_x	T_y	L_x	L_y	K_x	K_y	dir.
			cm/s	cm/s				cm/s	cm/s							
E2:	175	373	3.0±0.15	0.9±0.14	11.0	53.1	-13.7	48.8	13.4	84.5	61.6	73				
			-1.1±0.08	-2.2±0.10	7.0	16.8	13.8	19.1	3.7	23.5	15.7	206				
E3:	439	252	1.8±0.10	-0.3±0.08	10.9	15.1	no direction, only speed	12.6	12.6	42.3	16.4	261				
			1.8	1.8	6.3	10.2	3.7	1.7	6.4	17.7	5.6					
E4:	439	372	1.4±0.12	5.1±0.09	9.5	34.8	-5.9	26.3	16.5	84.2	49.6	15				
			1.2±0.06	2.9±0.05	5.2	17.9	3.3	7.2	6.6	24.2	10.2	22				
	3095	372			5.2	6.9	no direction, only speed	4.8	11.4	26.0	6.9					

E2

100 km

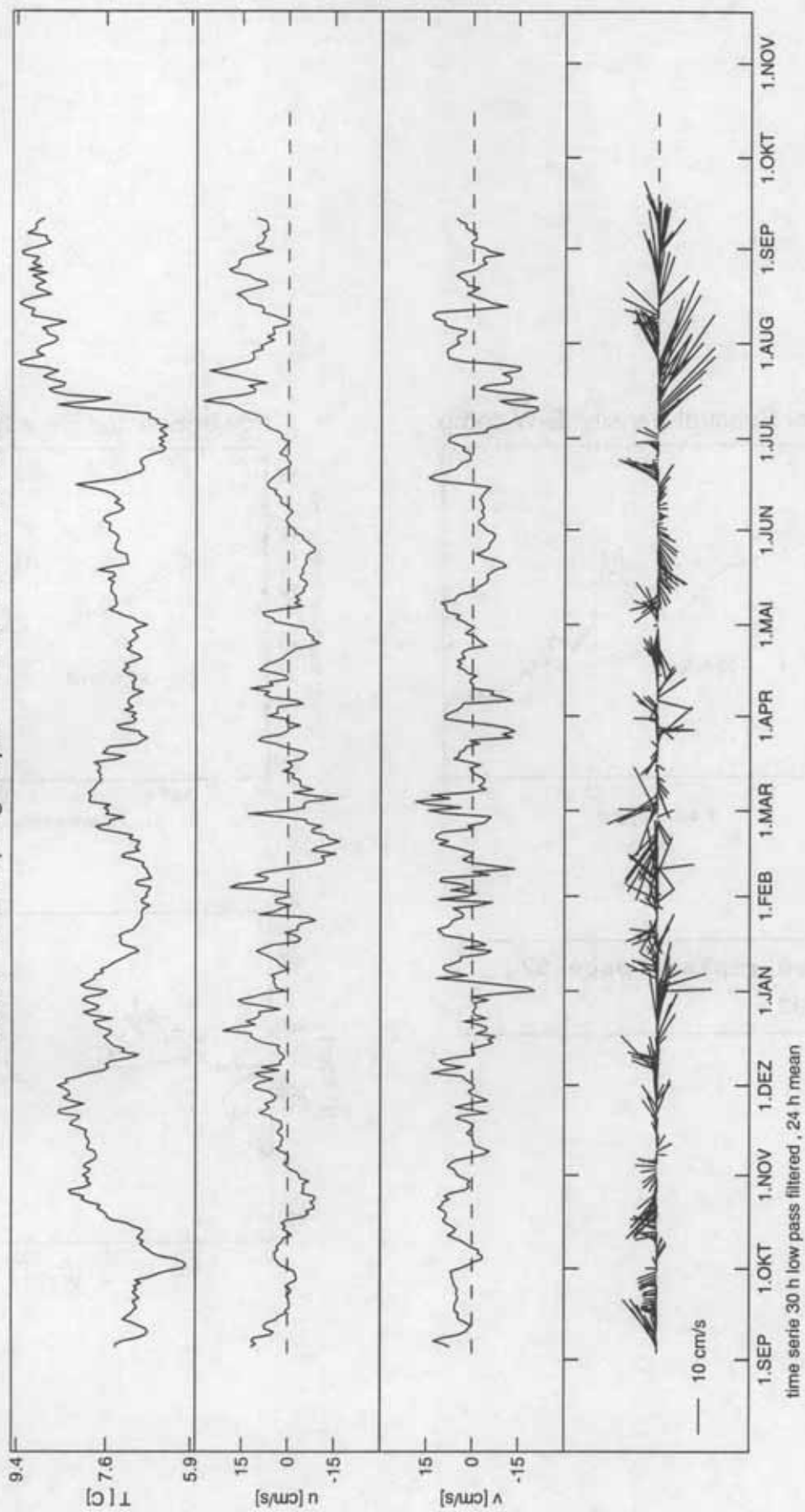


Station E2 Sampling Depth : 175m Record Nr. 93053

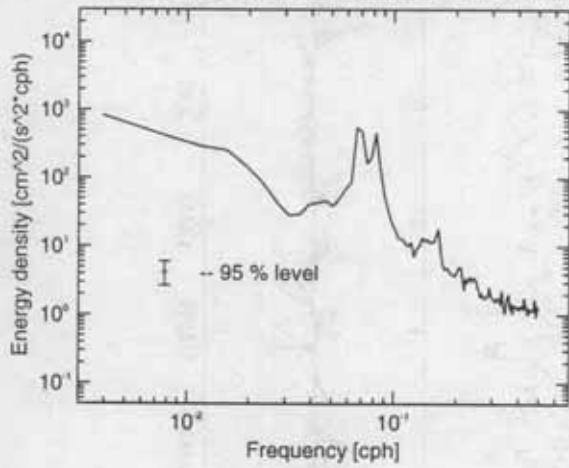


time serie 30 h low pass filtered , 24 h mean

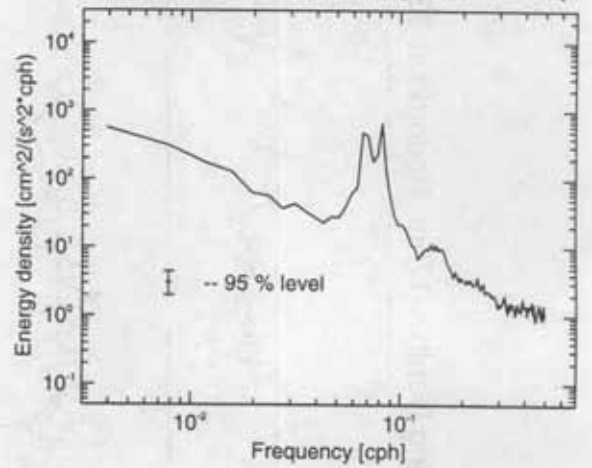
Station E2 Sampling Depth : 175m Record Nr. 93053



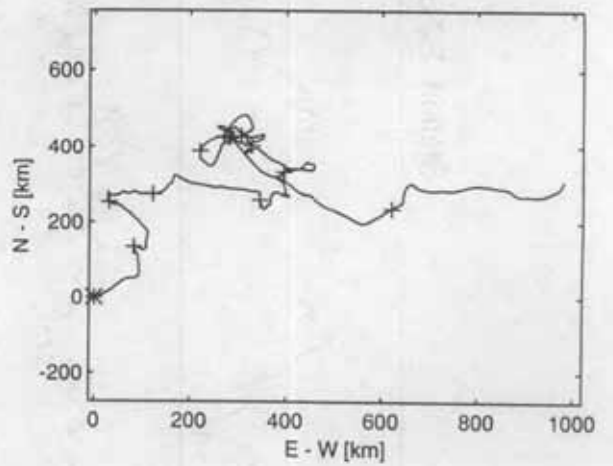
Power Spectral Density E-W comp.



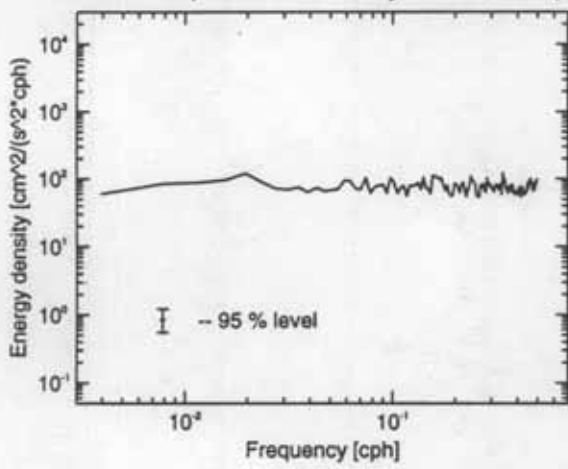
Power Spectral Density N-S comp.



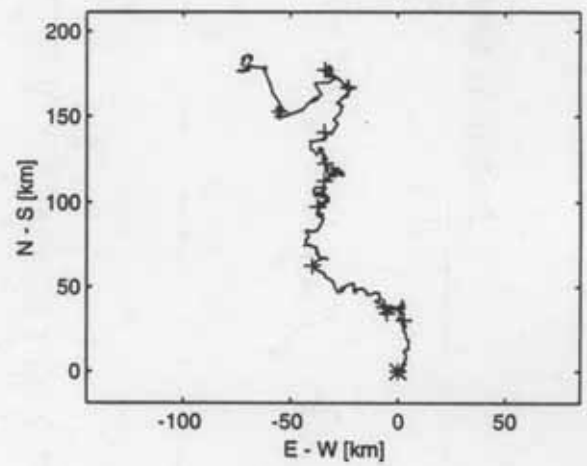
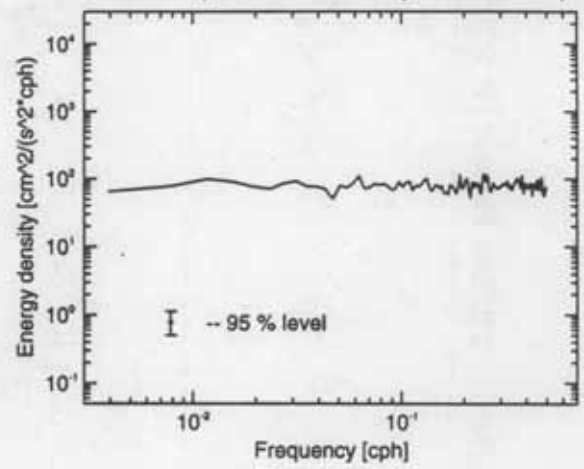
Please replace page 92
and 93



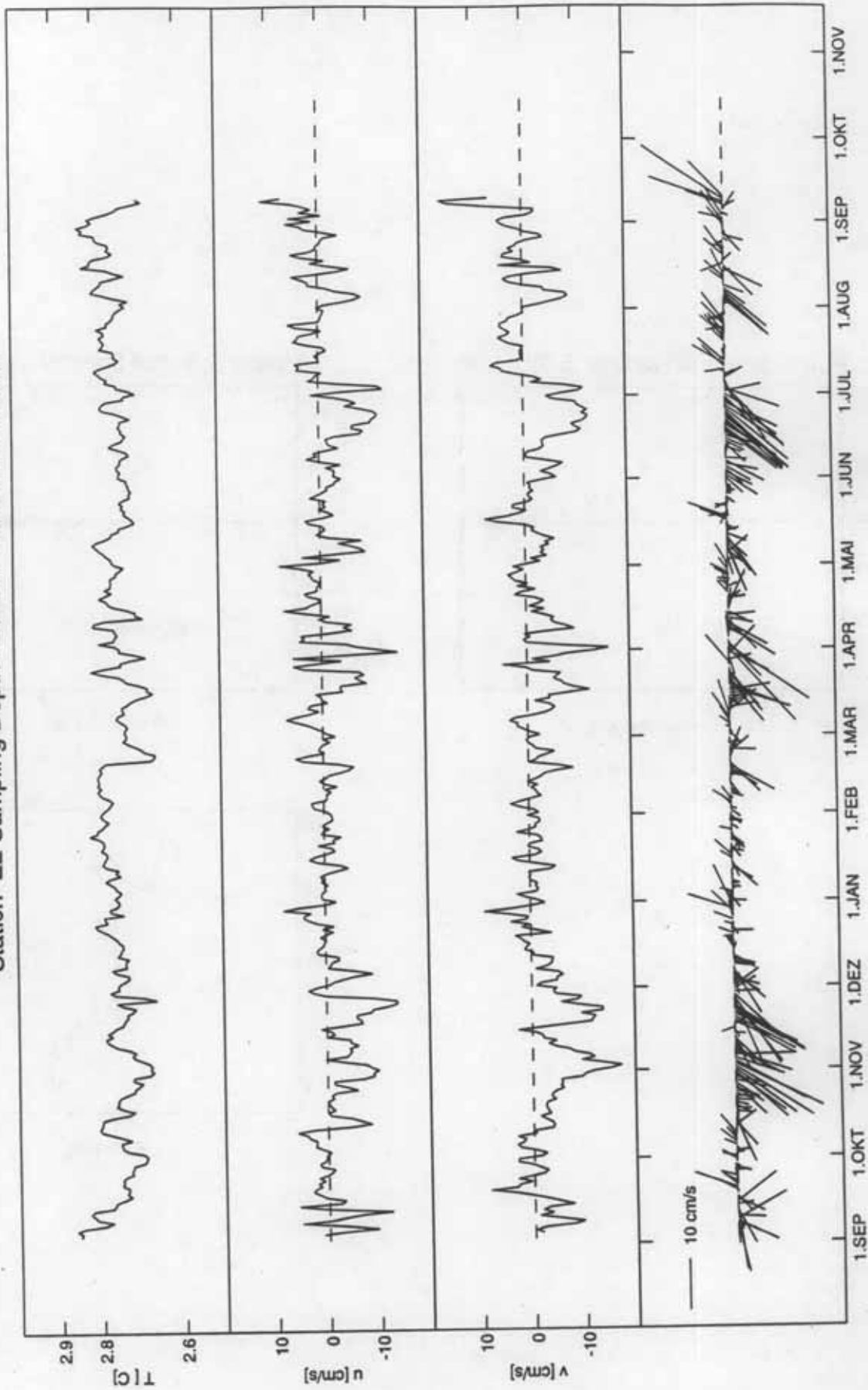
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

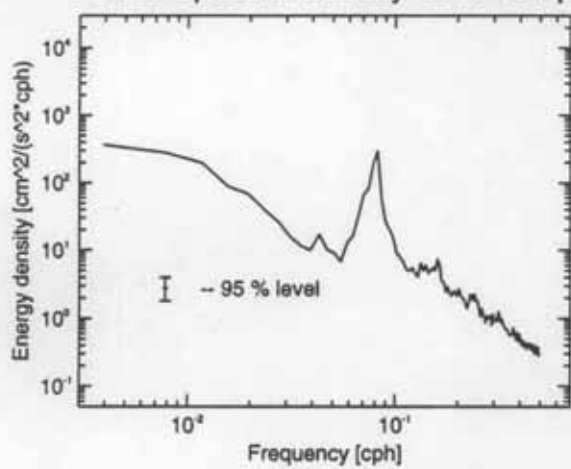


Station E2 Sampling Depth : 2825m Record Nr. 93050

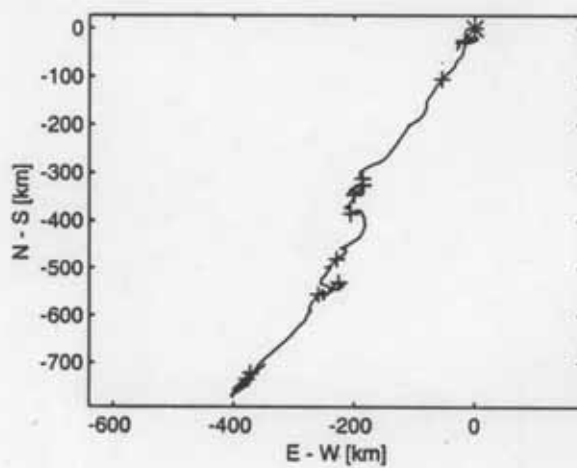
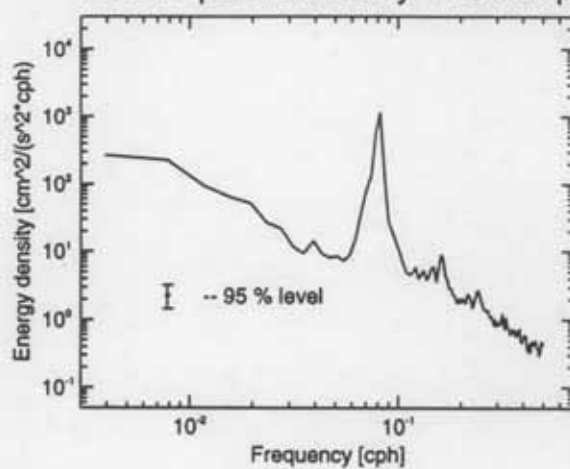


time serie 30 h low pass filtered , 24 h mean

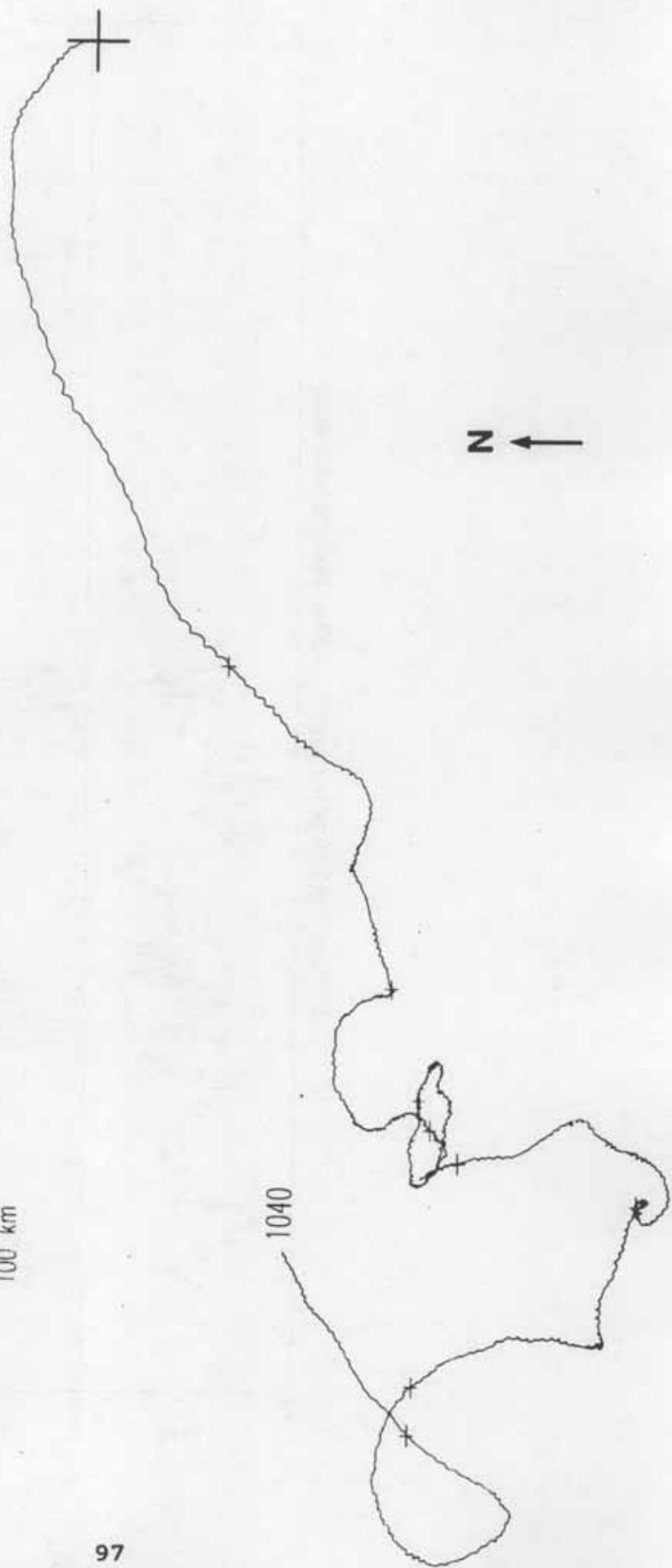
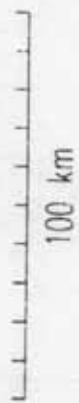
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.



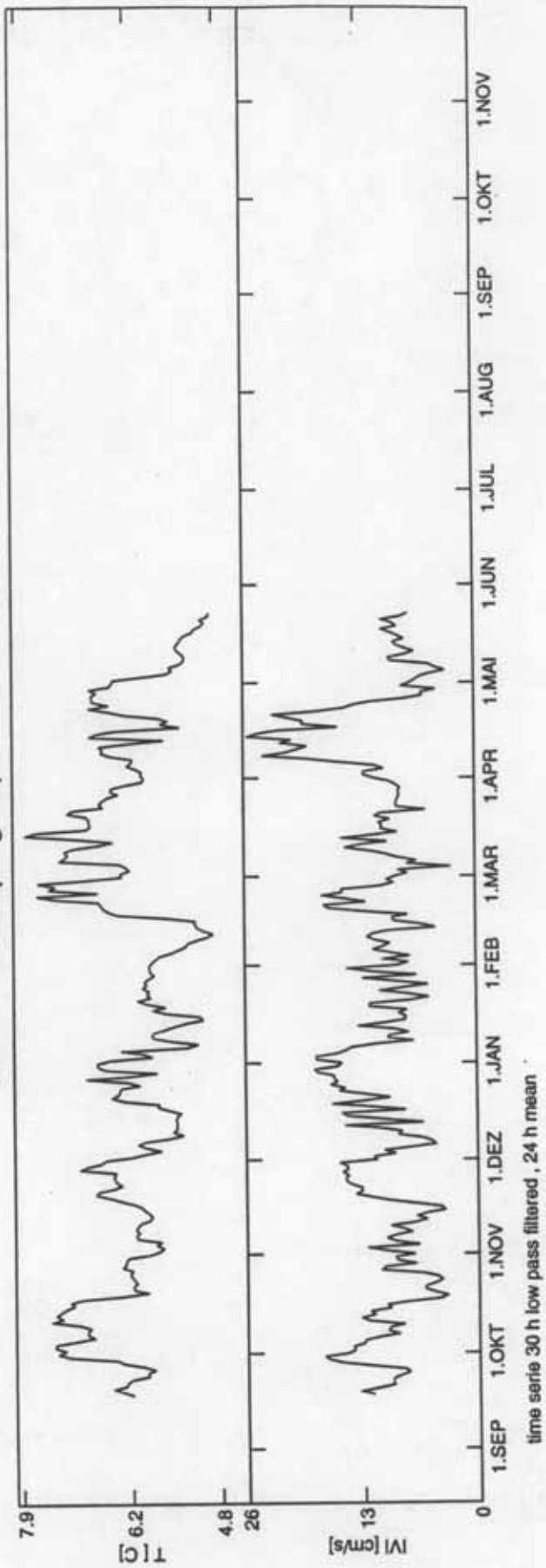
E3



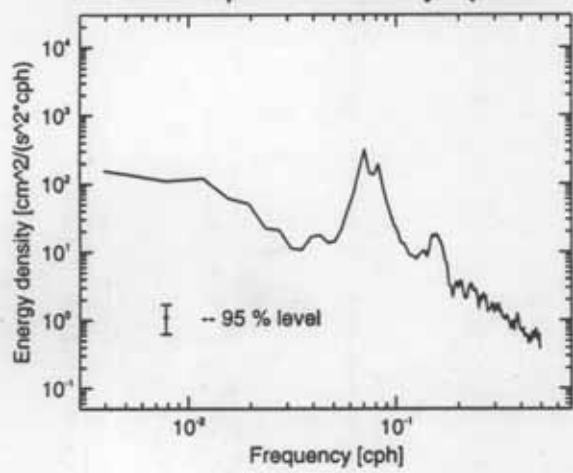
N

1040

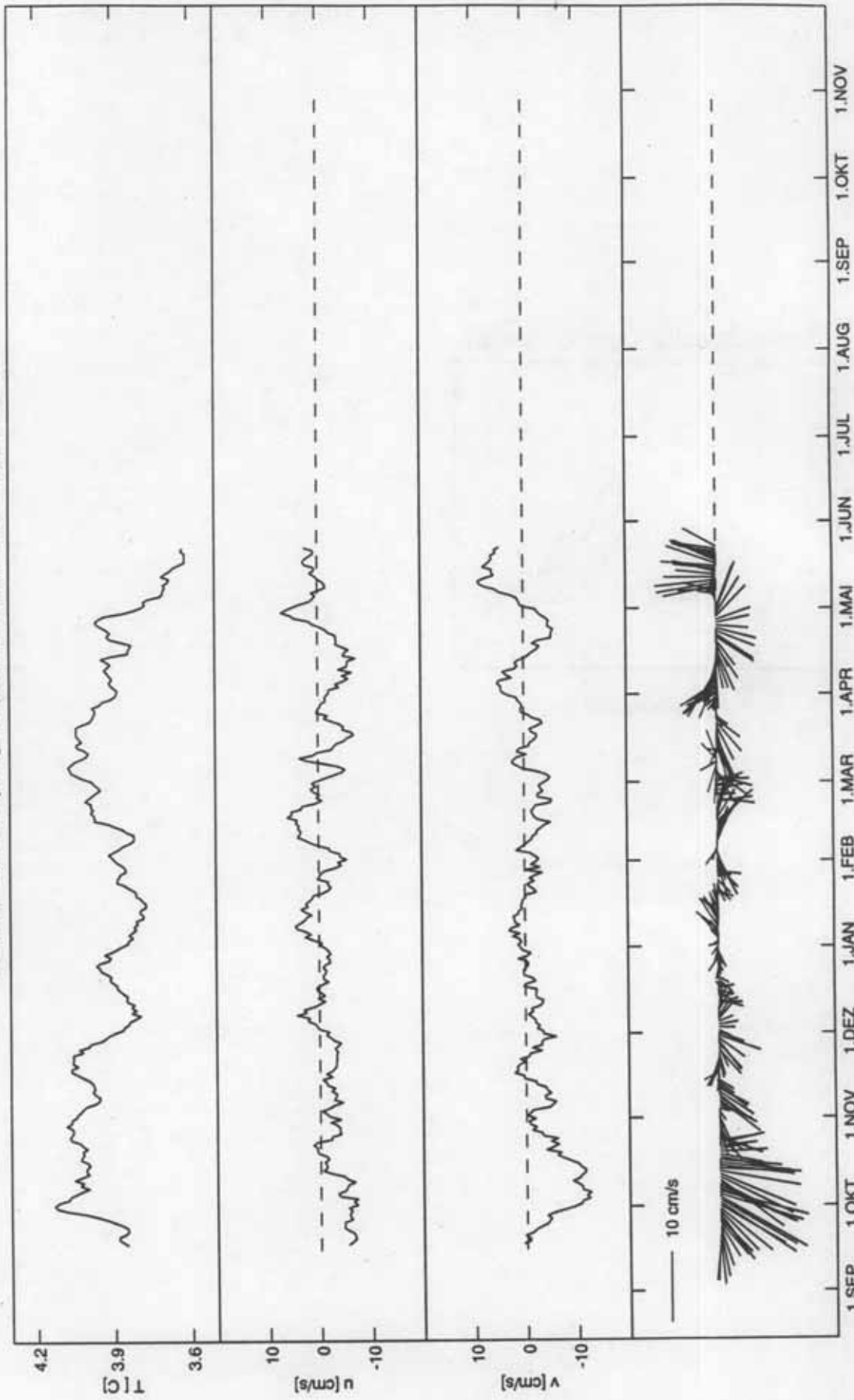
Station E3 Sampling Depth : 439m Record Nr. 94029



Power Spectral Density Speed

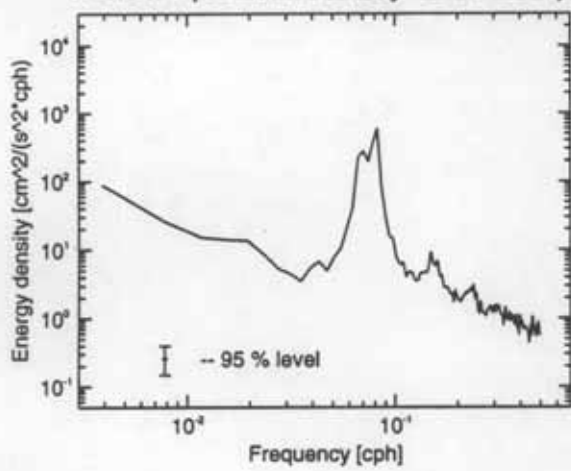


Station E3 Sampling Depth : 1040m Record Nr. 94030

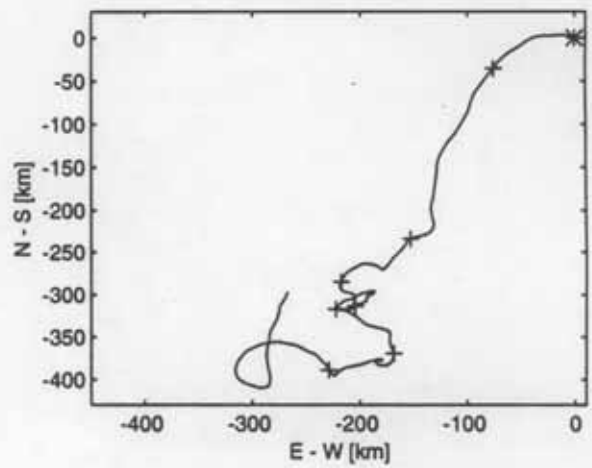
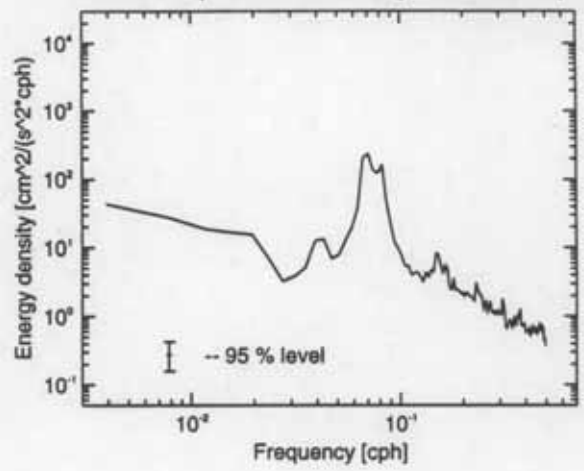


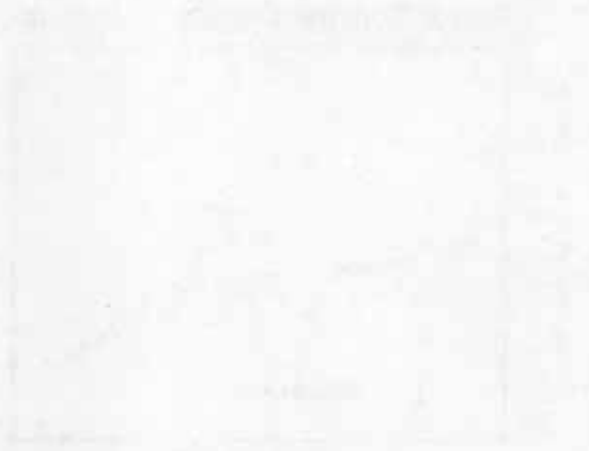
time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.

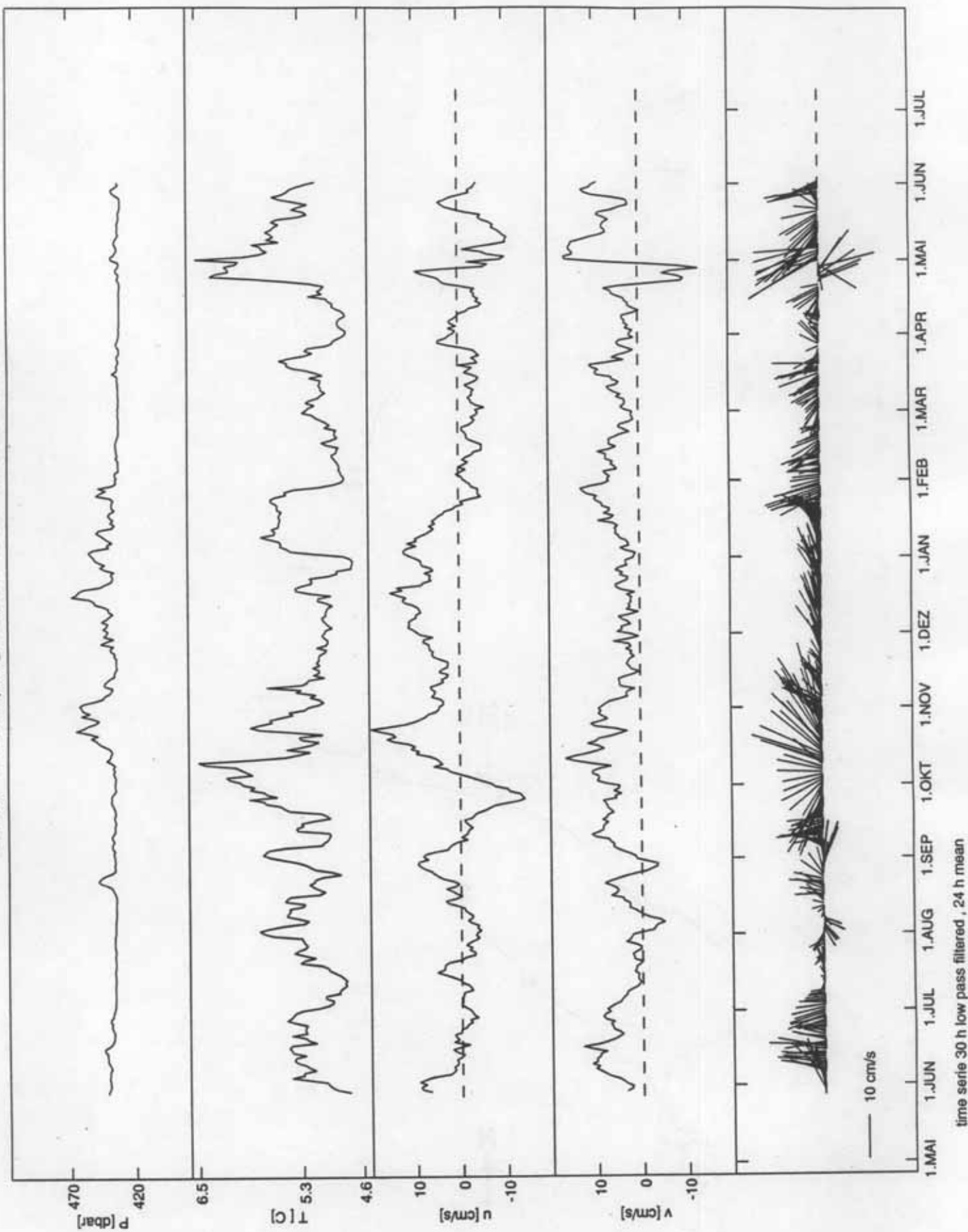


Power Spectral Density N-S comp.

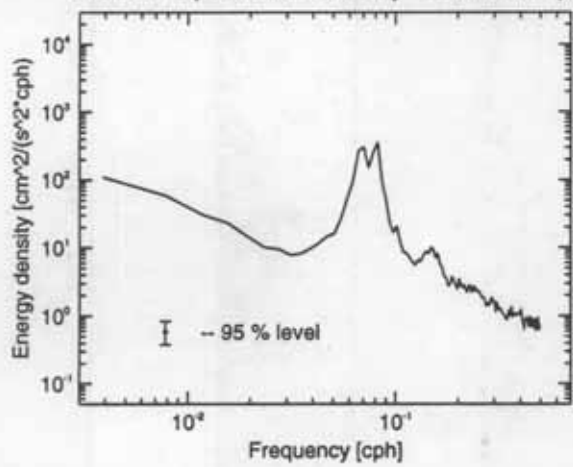




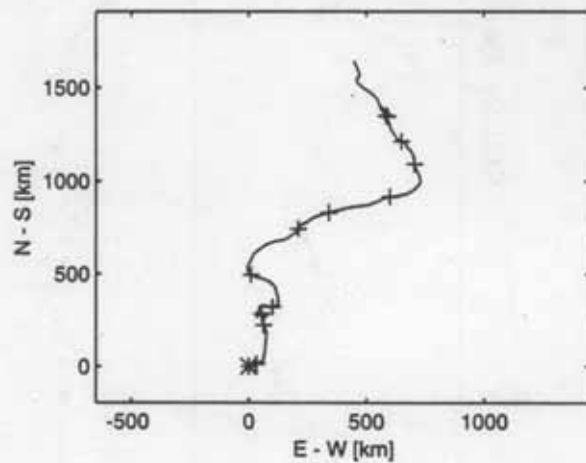
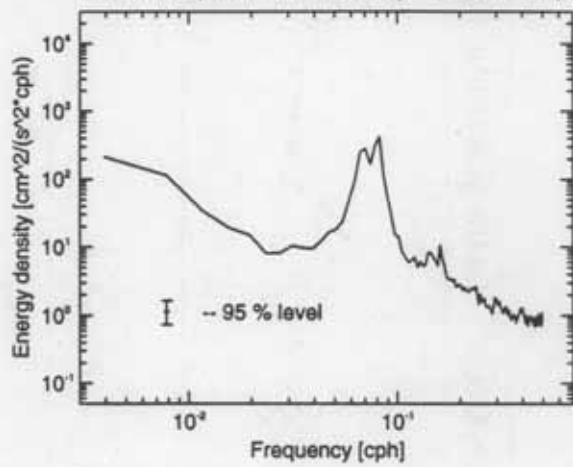
Station E4 Sampling Depth : 439m Record Nr. 95019



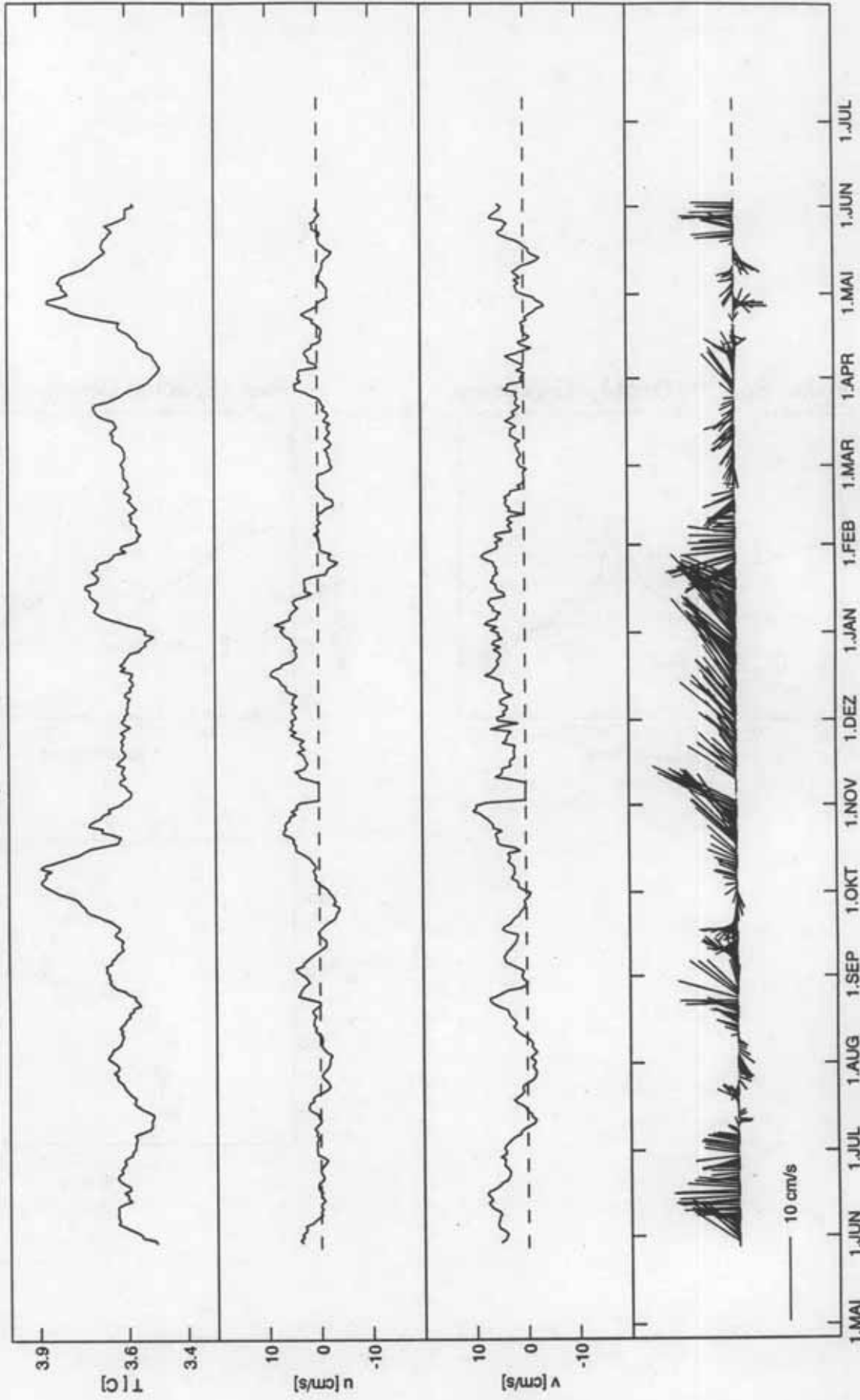
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

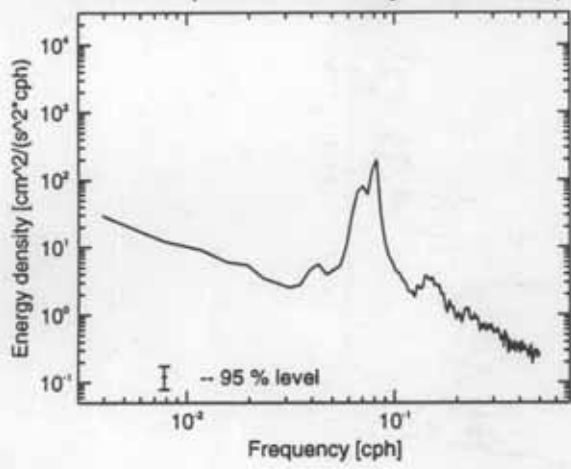


Station E4 Sampling Depth : 1041m Record Nr. 95020

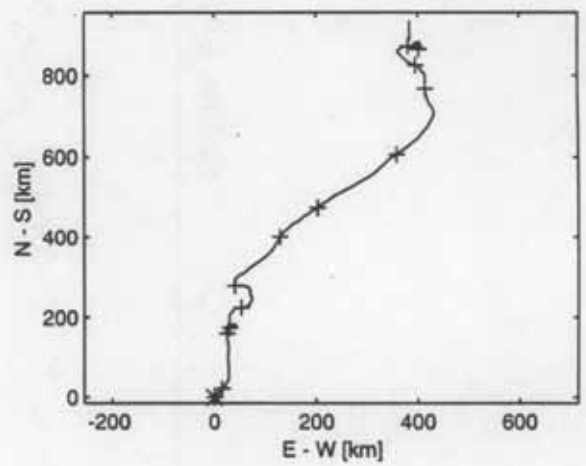
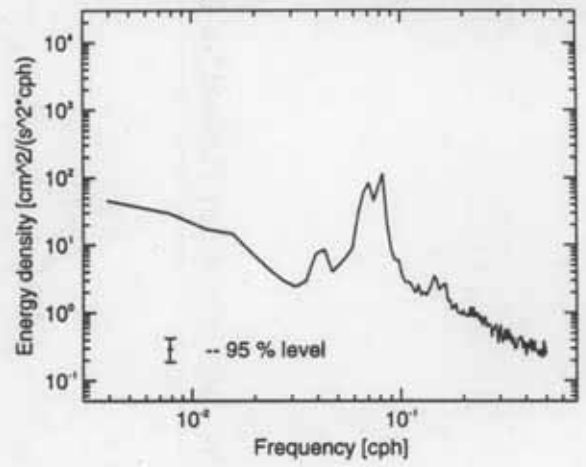


time serie 30 h low pass filtered , 24 h mean

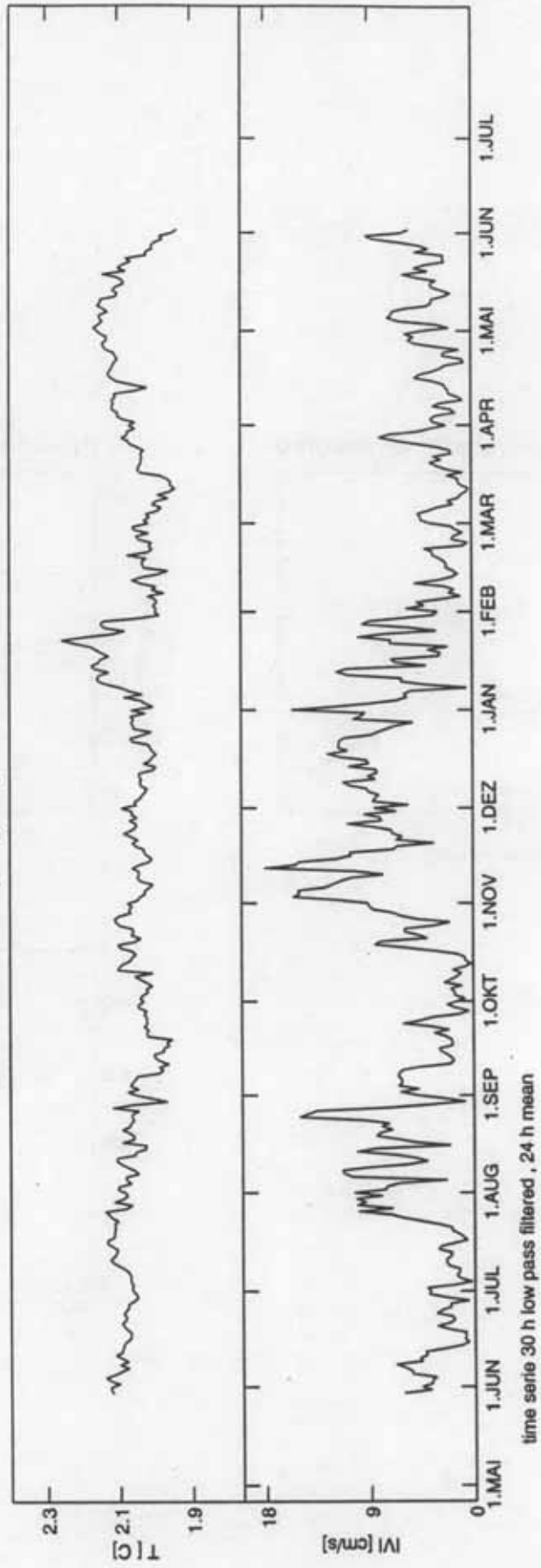
Power Spectral Density E-W comp.

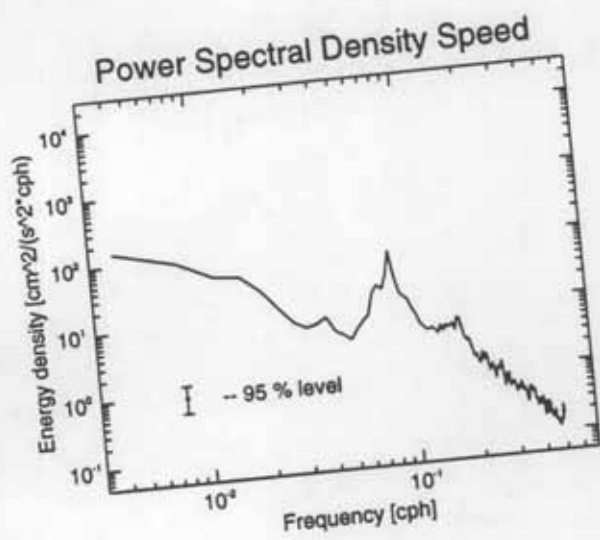


Power Spectral Density N-S comp.



Station E4 Sampling Depth : 3095m Record Nr. 95022





F1, F2, F4

Mooring Data F1, F2, and F4

current meter	sampl. depth	mab	record no.	sampling time			
-	m	m	-	UTC			
F1: 19.9.91 - 30.8.92				52° 20.4'N, 16° 20.8'W			
RCM5 6784	210	3300	92067	19.9.91 14:00	-	30.8.92 6:00	
RCM5 6808	510	3000	92066	19.9.91 14:00	-	30.8.92 6:00 ¹⁾	
RCM5 6838	810	2700	92065	19.9.91 14:00	-	30.8.92 5:00 ¹⁾	
RCM5 6859	2010	1500	92064	19.9.91 14:00	-	29.8.92 14:00 ¹⁾	
RCM5 6789	3010	500	92063	19.9.91 14:00	-	30.8.92 6:00	
RCM5 6822	3460	50	92062	19.9.91 14:00	-	19.2.92 12:00	
F2: 30.8.92 - 11.9.93				52° 22.7'N, 16° 21.7'W			
RCM4 996	181	3300	93049	30.8.92 18:00	-	5.8.93 8:00	
RCM5 6968	481	3000	93048	30.8.92 18:00	-	10.9.93 0:00 ²⁾	
RCM5 6890	781	2700	93047	30.8.92 18:00	-	5.9.93 7:00	
RCM5 6969	1981	1500	93046	30.8.92 18:00	-	11.9.93 17:00	
RCM8 10082	2981	200	93045	30.8.92 18:00	-	4.9.93 1:00	
RCM8 9358	3431	50	93044	30.8.92 18:00	-	5.8.93 23:00	
F4: 23.5.94 - 31.5.95				52° 23.2'N, 15° 28.5'W			
RCM5 6968	853	1701	95023	23.5.94 10:00	-	31.5.95 7:00	
RCM5 6835	1255	1299	95024	23.5.94 10:00	-	31.5.95 7:00	
RCM5 6969	2057	497	95025	23.5.94 10:00	-	31.5.95 7:00	
RCM5 6890	2504	50	95026	23.5.94 10:00	-	19.5.95 16:00	

mab = metres above bottom

¹⁾ no speed, only direction

²⁾ 30.8.92 - 15.5.93 speed data questionable. Current statistics are calculated from 16.5.93 - 10.9.93

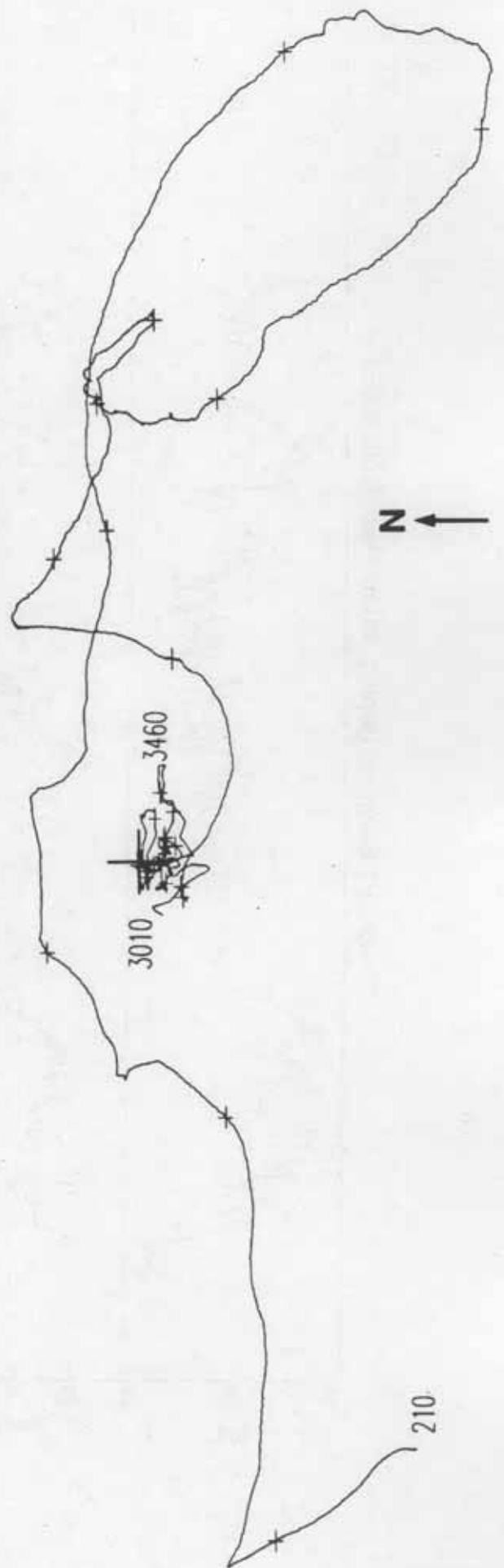
Current statistics (low-passed data)

Id	sampl. depth	rec. length	u		mag V	$\frac{u'u'}{v'v'}$	$\frac{u'v'}{v'v'}$	k_z k_H	T_x T_y	L_x L_y	K_x K_y	dir.
			cm/s	cm/s								
F1:	210	345	-2.8±0.26		20.2	286.8	-64.0	214.2	21.4	313.6	531.2	246
	3010	345	-1.3±0.36		3.1	141.6	-0.5	5.0	9.1	93.4	111.1	249
	3460	152	-0.2±0.06		4.9	8.7		9.0	1.9	4.9	1.4	
			-0.1±0.07		0.3	9.3	-0.4	<0.1	1.8	4.7	1.4	214
			-0.4±0.18		6.3	30.1		18.1	7.9	37.6	20.6	
			-0.5±0.08		0.7	6.1		0.2	1.8	3.8	0.9	
F2:	181	340	-2.5±0.19		13.9	80.6	13.7	76.8	7.5	58.5	52.5	240
	481	116	-1.4±0.19		2.8	73.0		4.1	21.8	161.3	137.9	192
	781	370	-2.7±0.39		18.8	111.1	8.3	93.1	6.1	55.5	58.4	
	1981	377	-12.5±0.32		12.8	75.0	12.8	81.6	11.1	83.2	72.1	228
	2981	369	-1.2±0.15		10.5	50.5	-0.2	49.1	10.0	61.3	43.5	
	3431	340	-1.1±0.14		1.6	47.7	1.6	1.3	31.9	190.6	131.6	
			-2.2±0.14		6.8	24.5		21.2	8.6	36.7	18.2	264
			-0.2±0.05		2.2	18.1		2.5	25.5	93.8	39.9	195
			-0.2±0.08		5.0	7.4		6.4	2.1	4.9	1.3	
			-0.8±0.06		0.9	5.5		0.4	3.3	6.8	1.6	
			-0.7±0.10		6.9	20.0		13.5	1.8	6.8	3.0	233
			-0.5±0.08		0.9	13.5		0.4	2.6	8.3	3.0	
F4:	853	371	0.3±0.08		7.1	16.2	8.4	22.3	26.6	92.5	37.2	174
	1255	371	-2.4±0.08		2.5	28.5		3.0	20.0	92.4	49.3	189
	2057	371	-0.8±0.09		8.3	19.8	12.0	32.1	24.1	92.5	41.1	
	2504	359	-4.8±0.14		4.8	44.3	-0.7	11.6	15.5	89.1	59.3	199
				-0.6±0.06		7.4	7.2	20.6	7.7	17.8	4.8	
			-1.8±0.12		1.9	34.1		1.7	11.8	59.5	34.7	345
			-0.8±0.02		8.1	1.1	1.0	5.0	1.9	1.7	0.2	
			2.8±0.06		2.9	8.9		4.3	1.8	4.7	1.4	

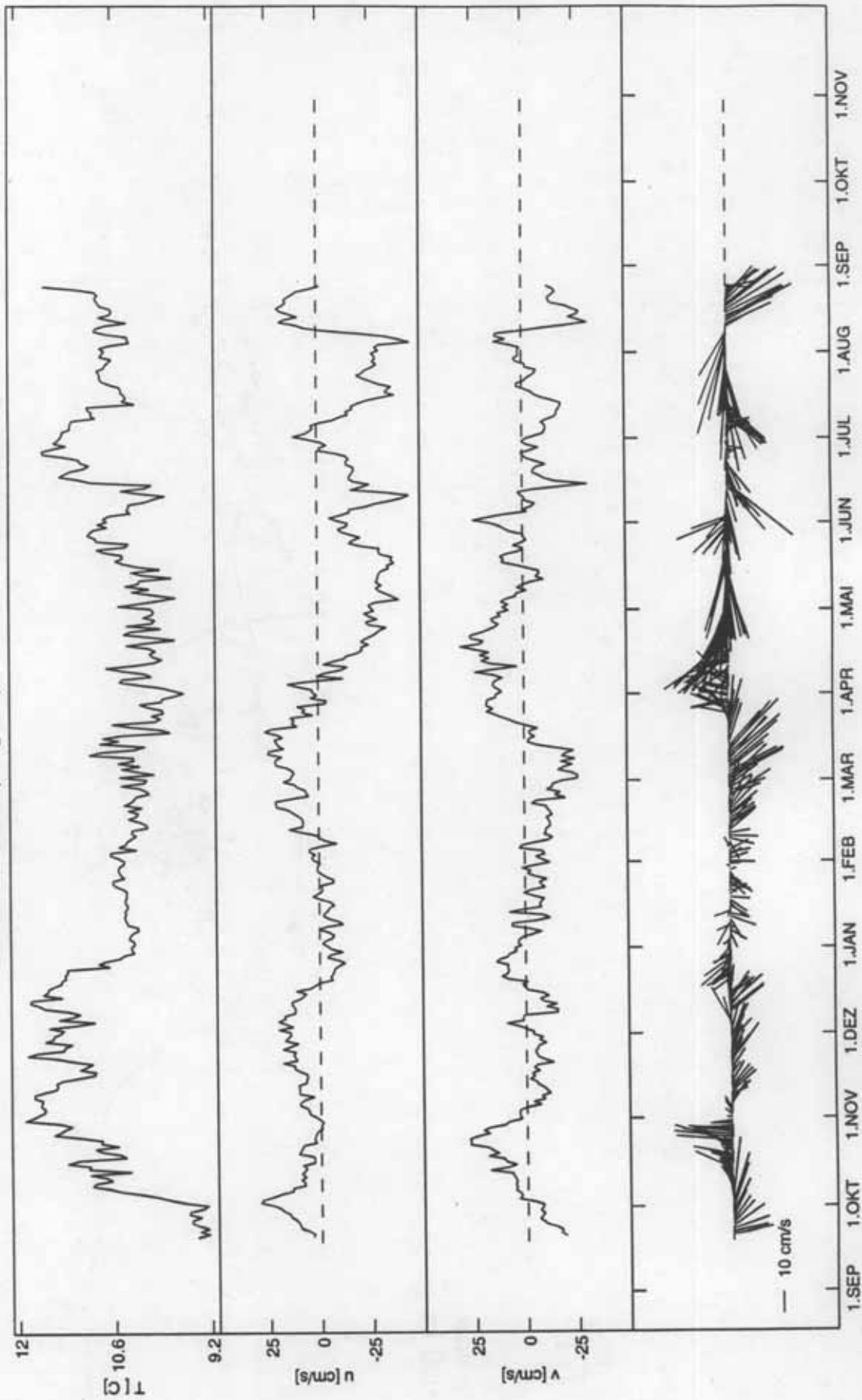
F1

100 km

115

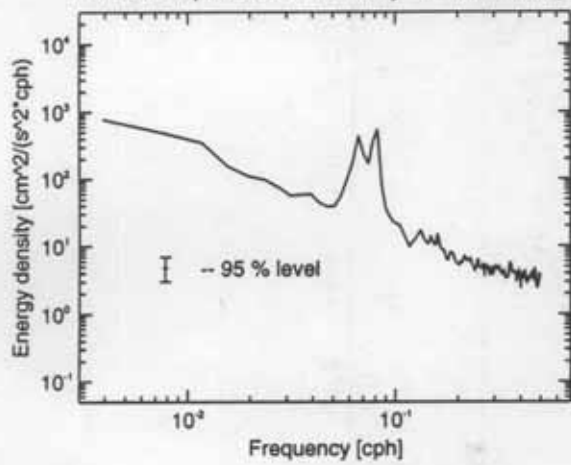


Station F1 Sampling Depth : 210m Record Nr. 92067

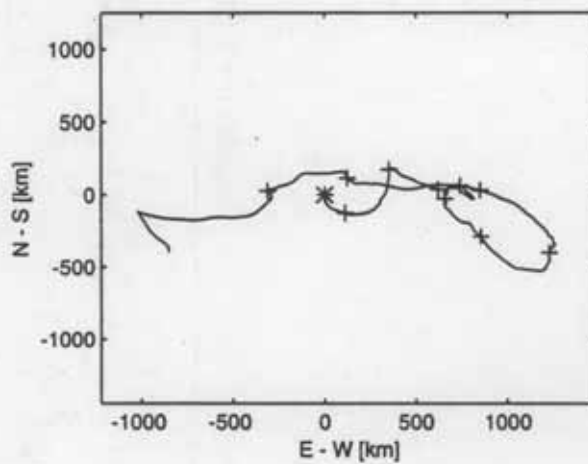
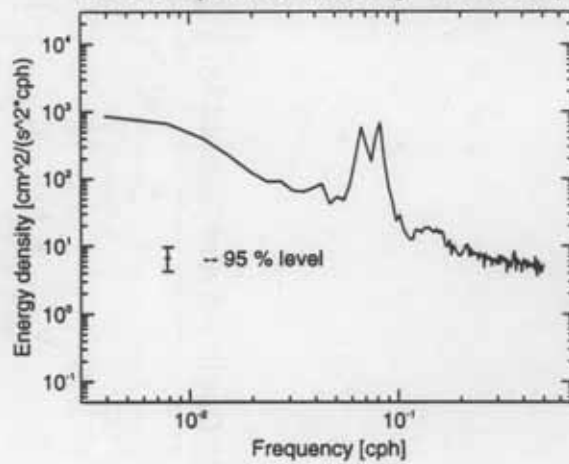


time serie 30 h low pass filtered , 24 h mean

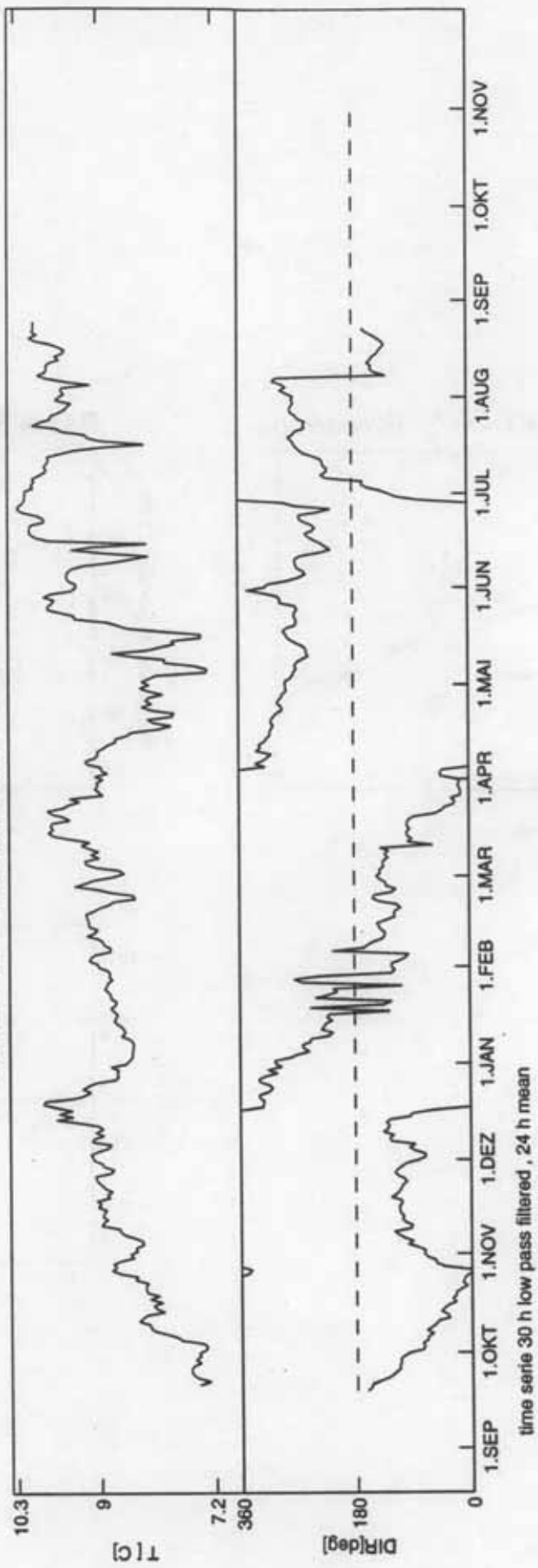
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

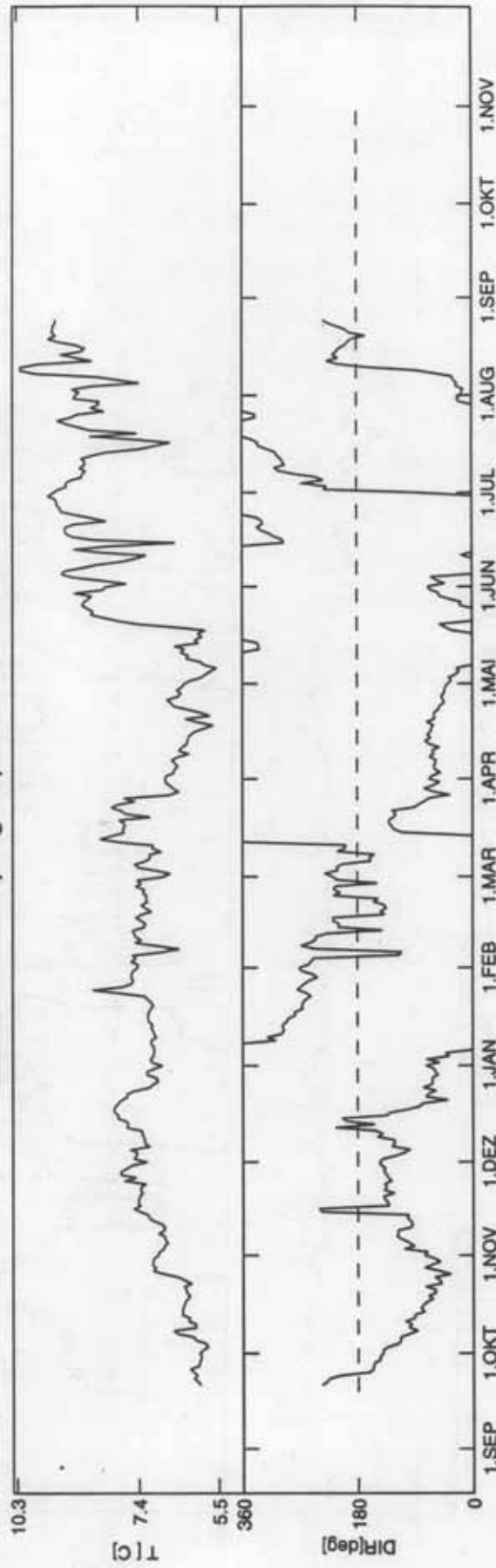


Station F1 Sampling Depth : 510m Record Nr. 92066



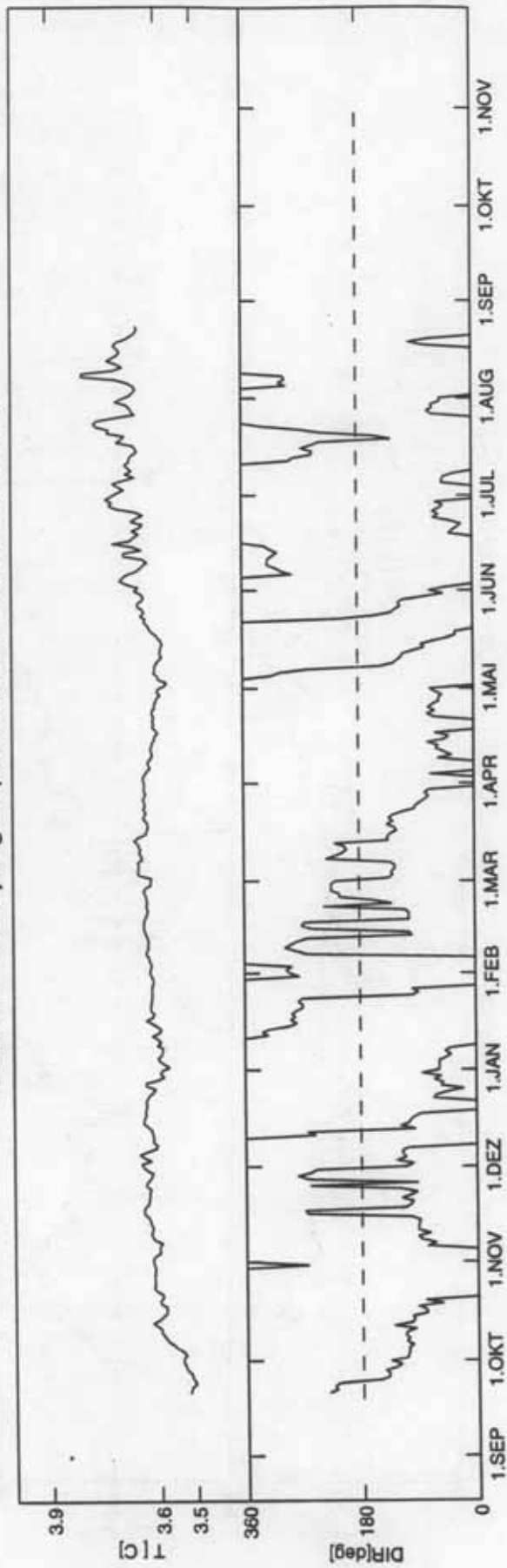
time serie 30 h low pass filtered , 24 h mean

Station F1 Sampling Depth : 810m Record Nr. 92065



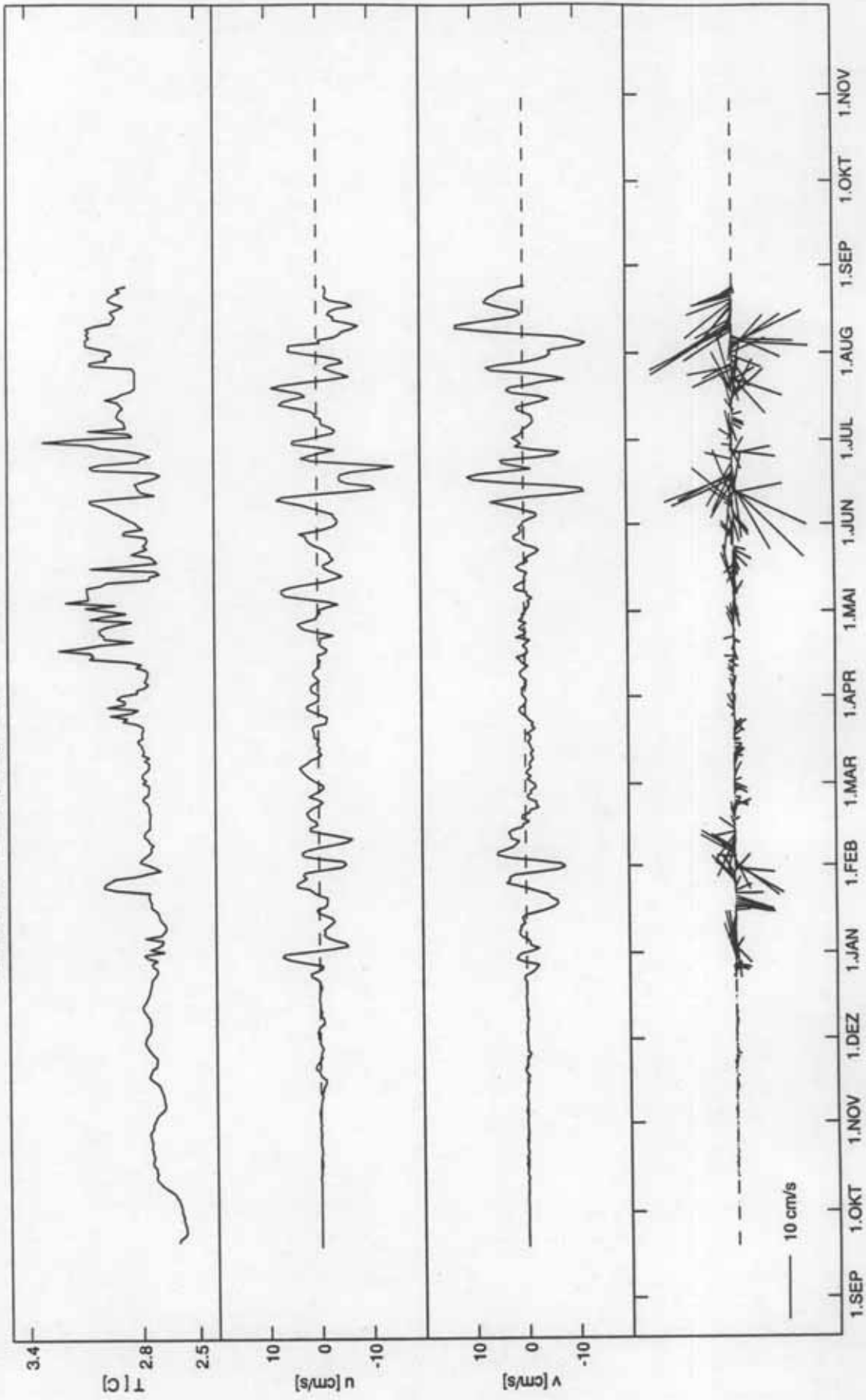
time serie 30 h low pass filtered , 24 h mean

Station F1 Sampling Depth : 2010m Record Nr. 92064



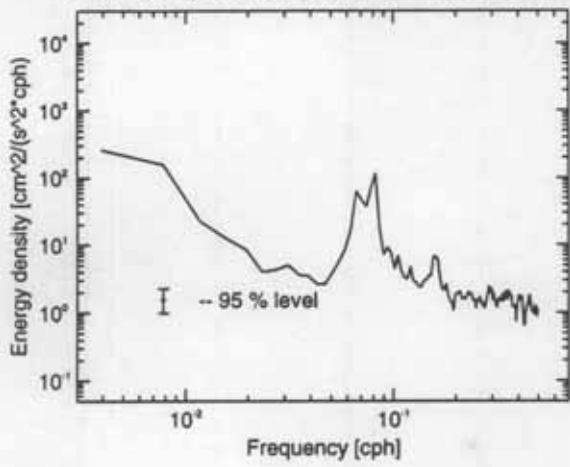
time serie 30 h low pass filtered , 24 h mean

Station F1 Sampling Depth : 3010m Record Nr. 92063

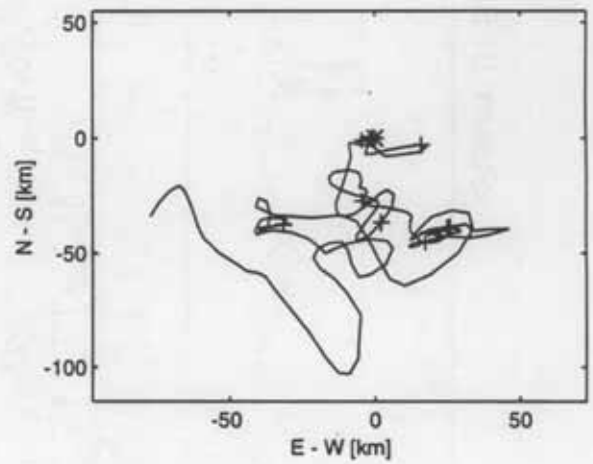
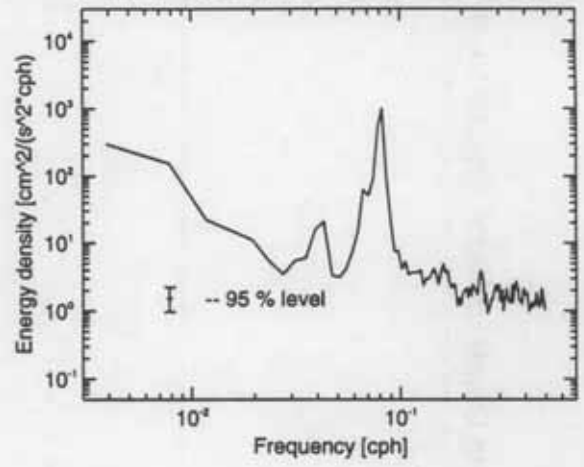


time serie 30 h low pass filtered , 24 h mean

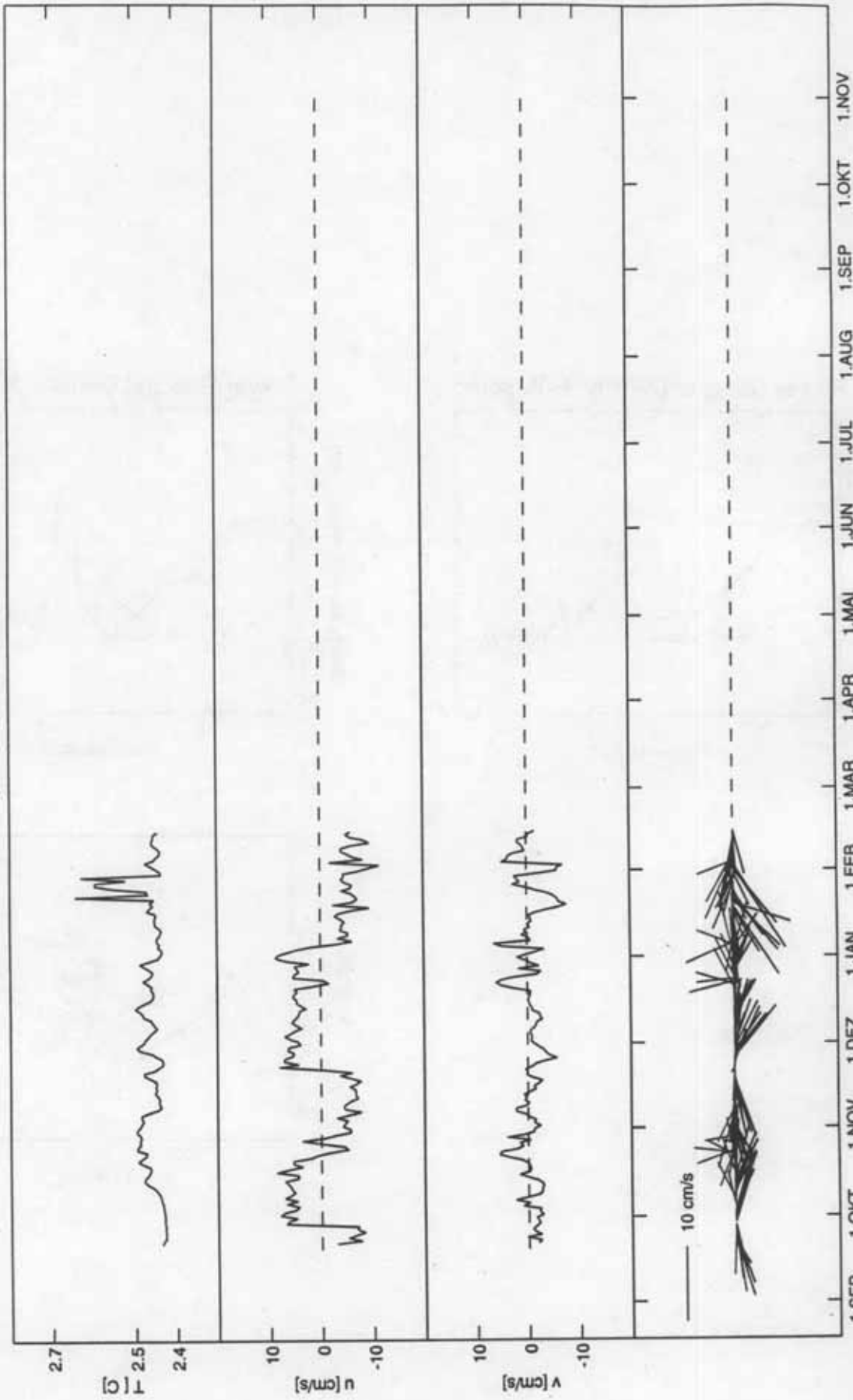
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

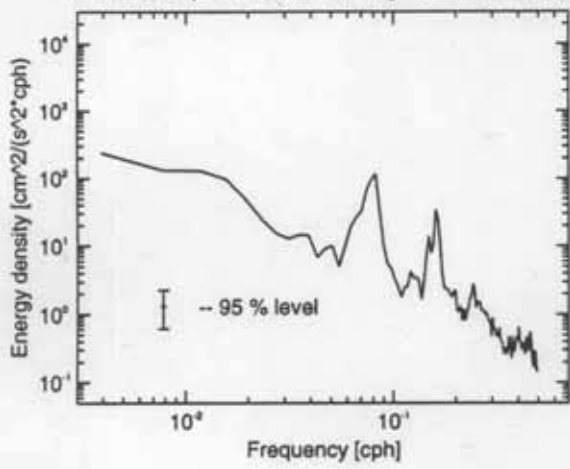


Station F1 Sampling Depth : 3460m Record Nr. 92062

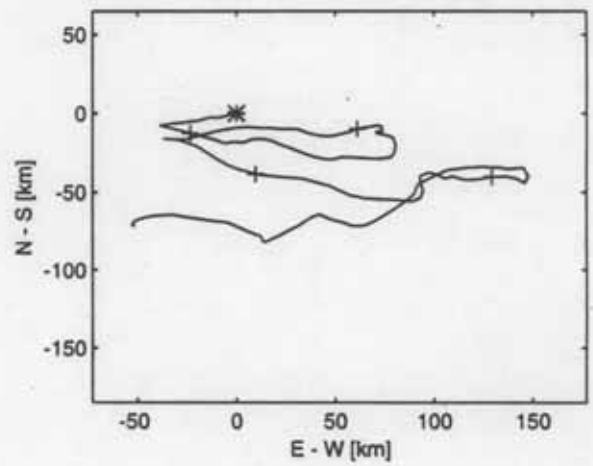
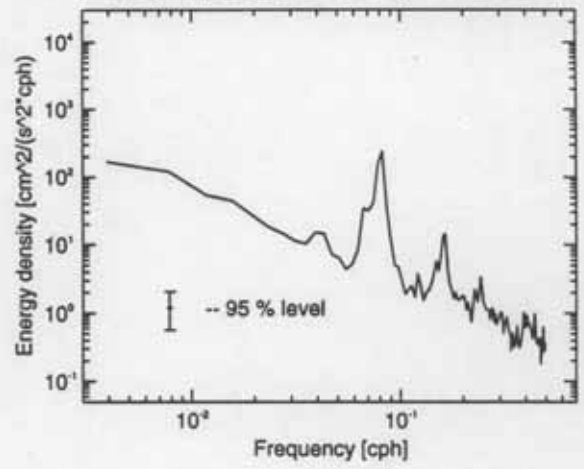


time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.



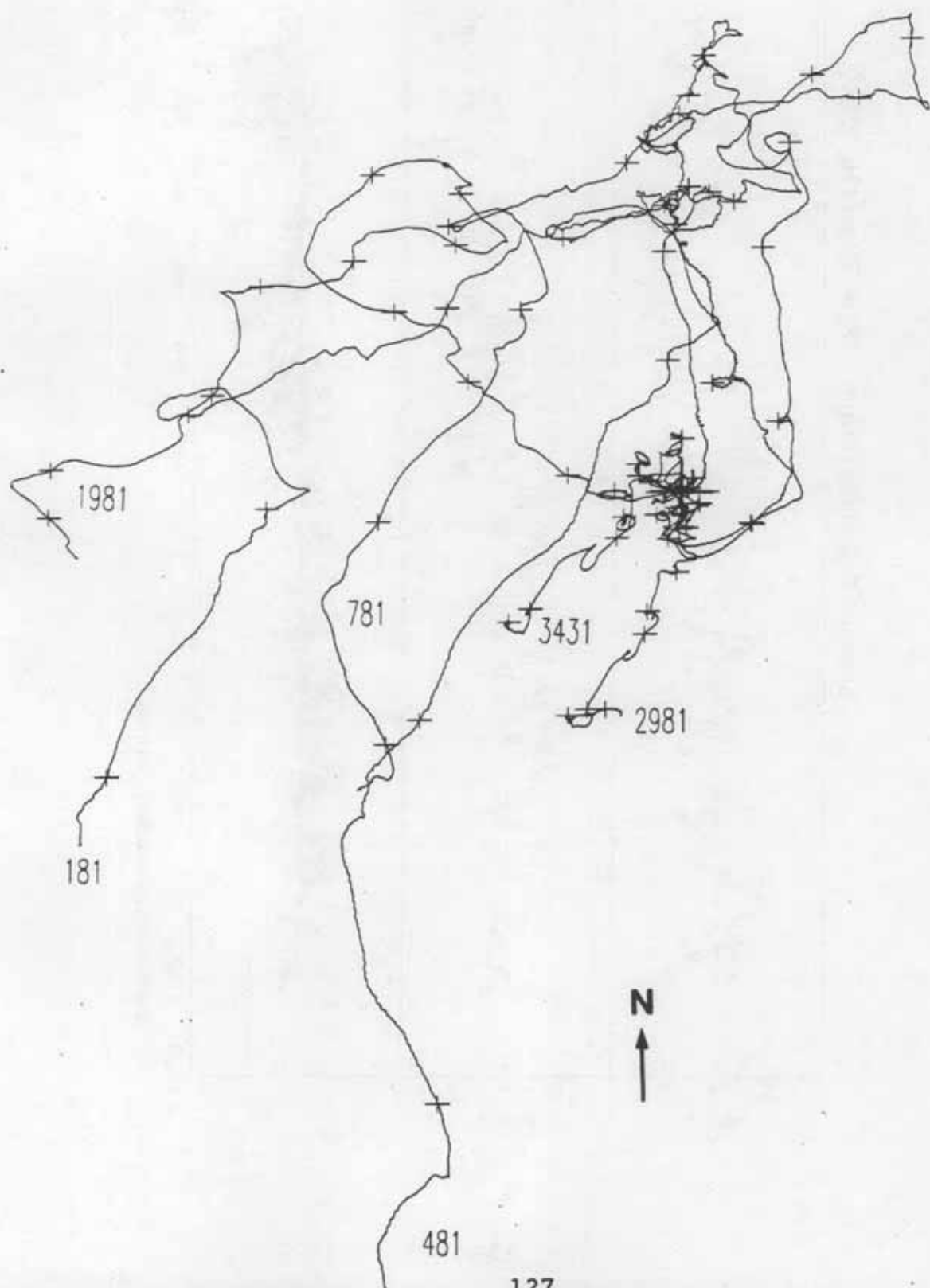
Power Spectral Density N-S comp.



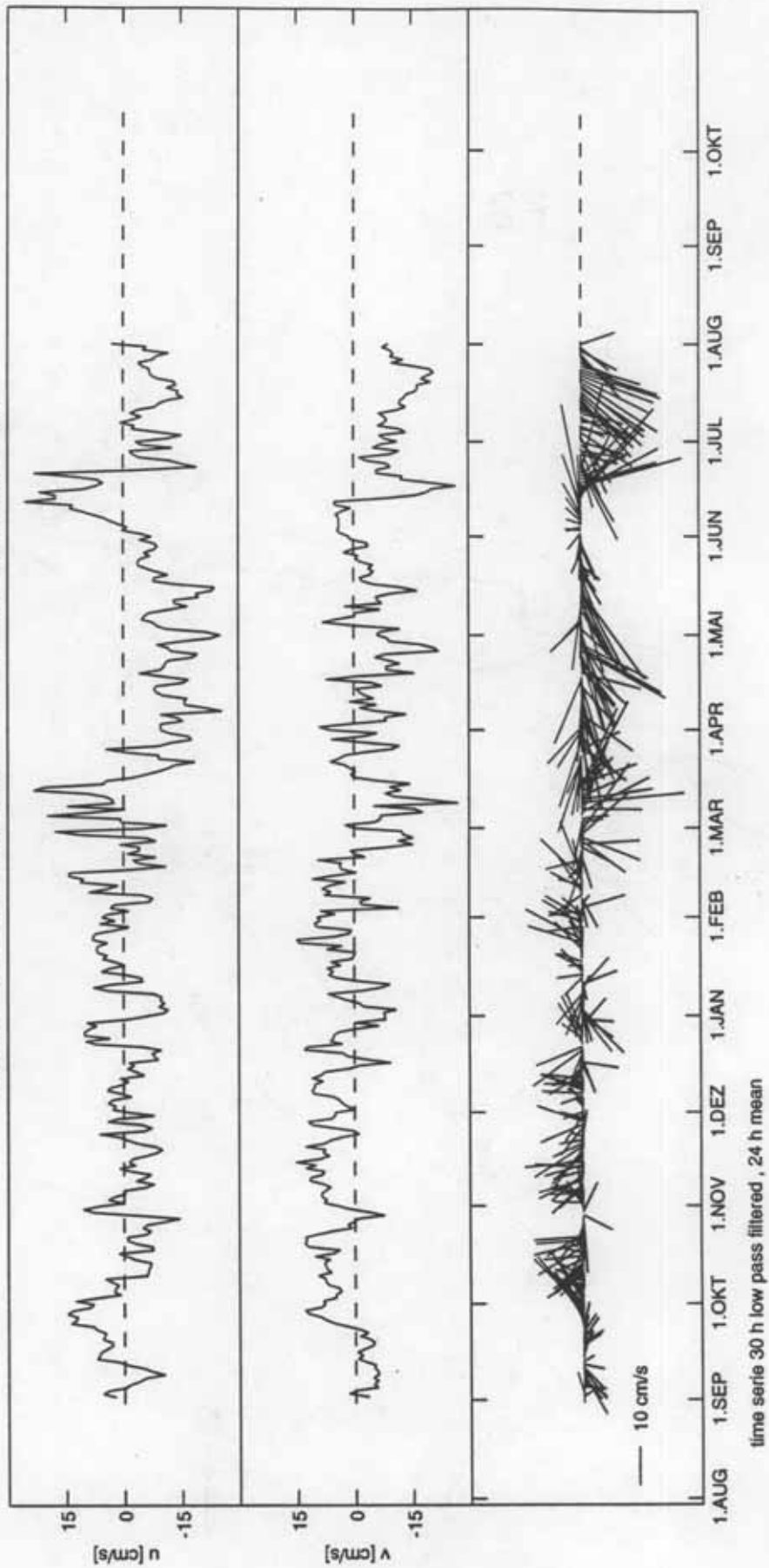


100 km

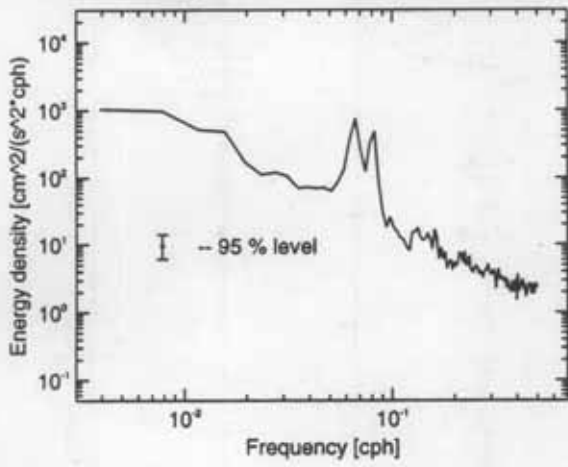
F2



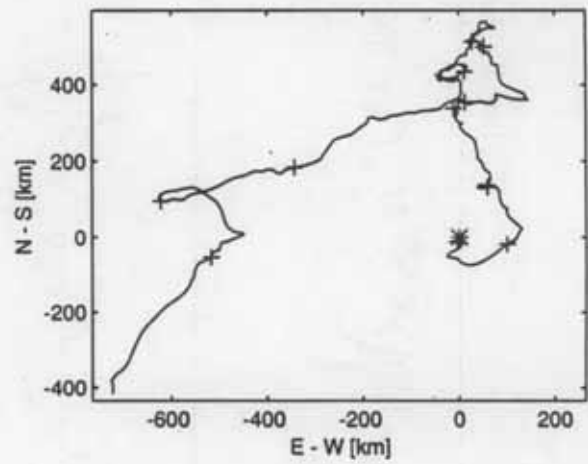
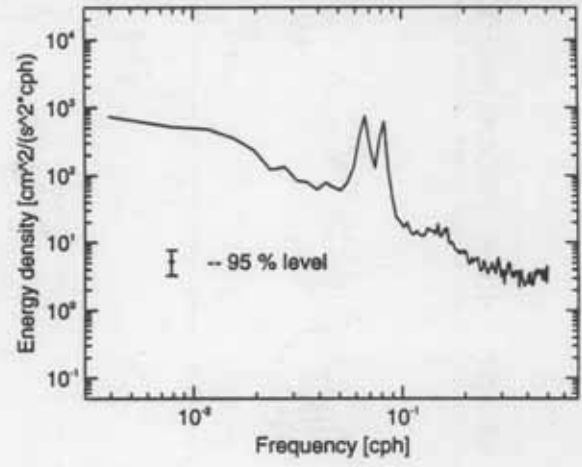
Station F2 Sampling Depth : 181m Record Nr. 93049



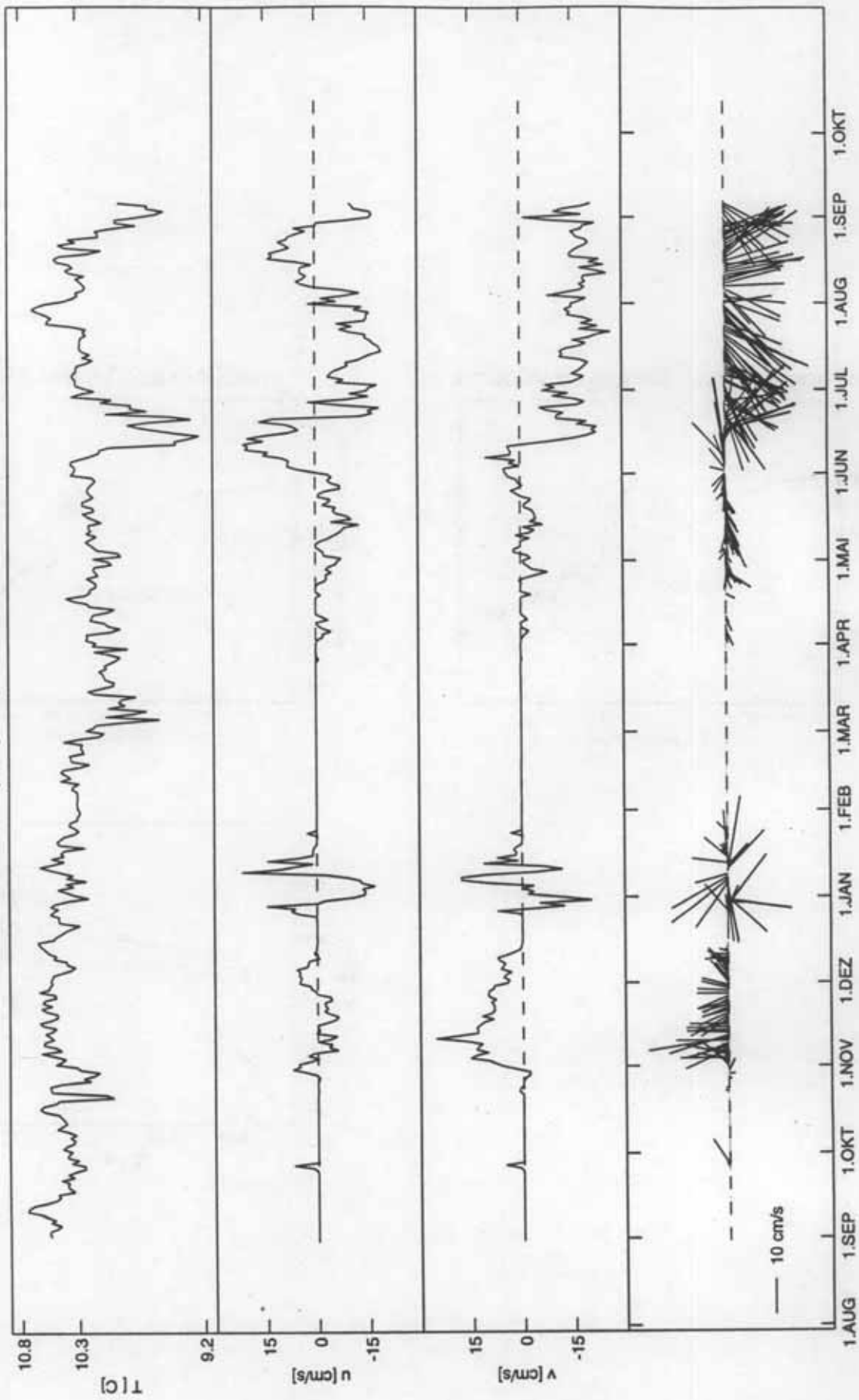
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

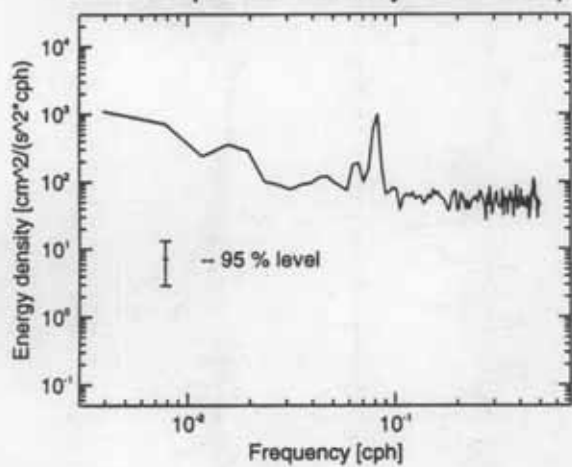


Station F2 Sampling Depth : 481m Record Nr. 93048

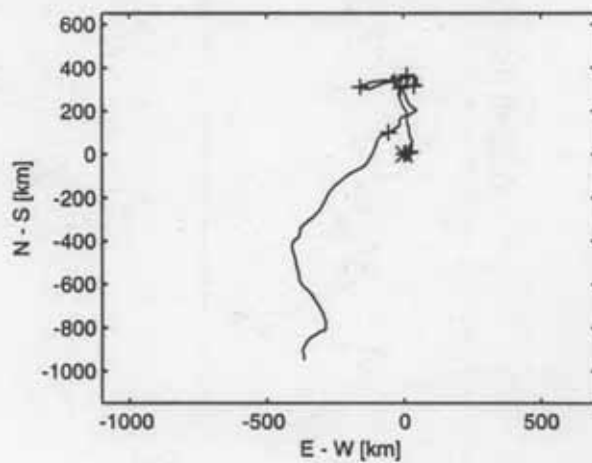
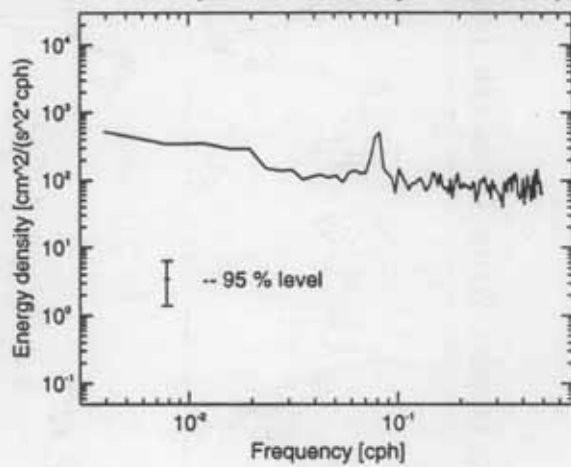


time serie 30 h low pass filtered , 24 h mean

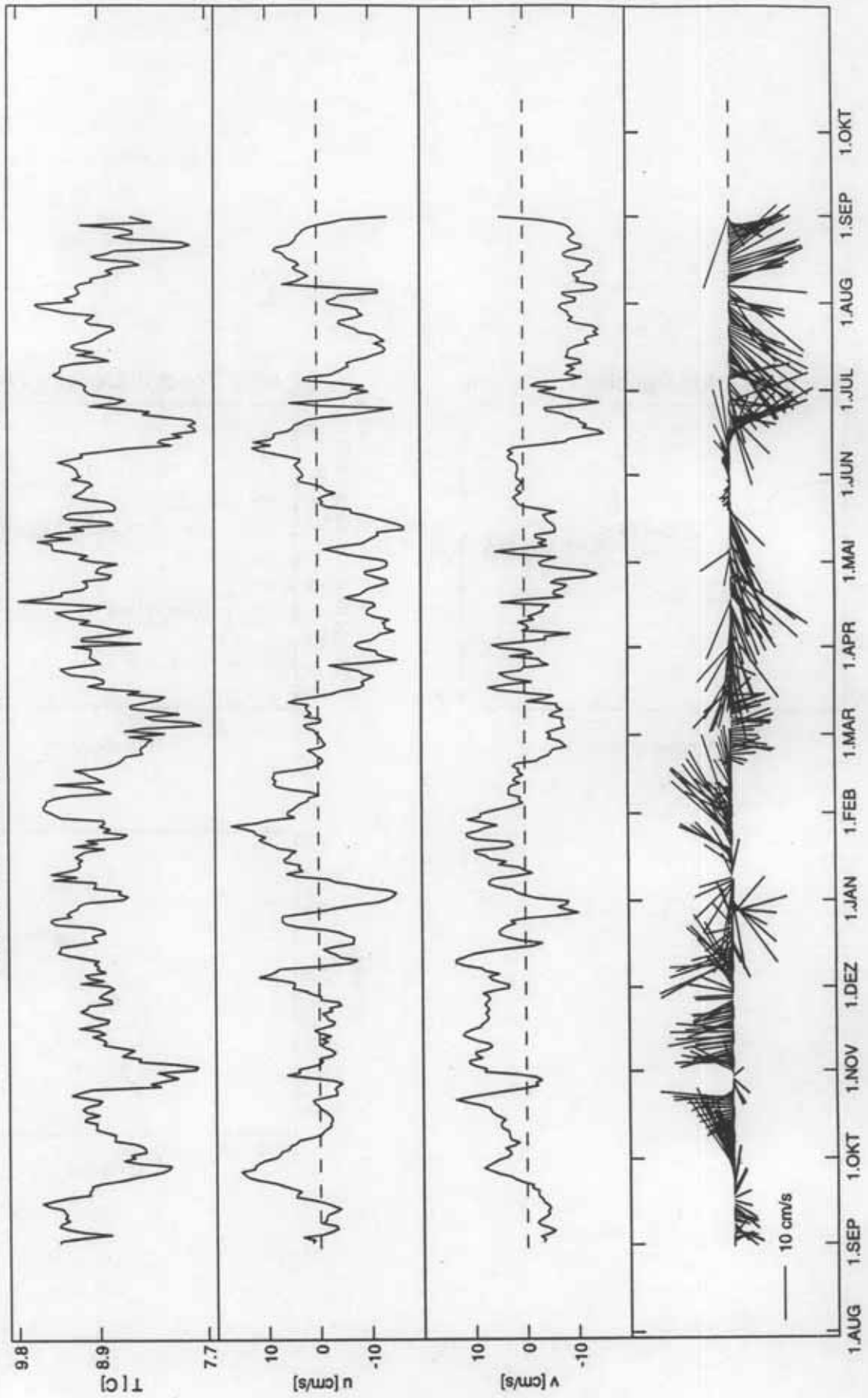
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

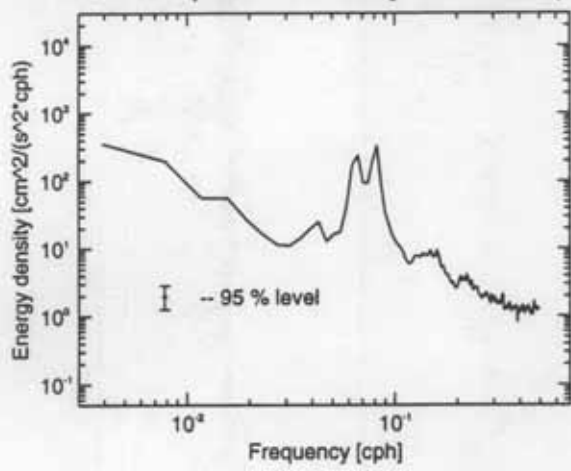


Station F2 Sampling Depth : 781m Record Nr. 93047

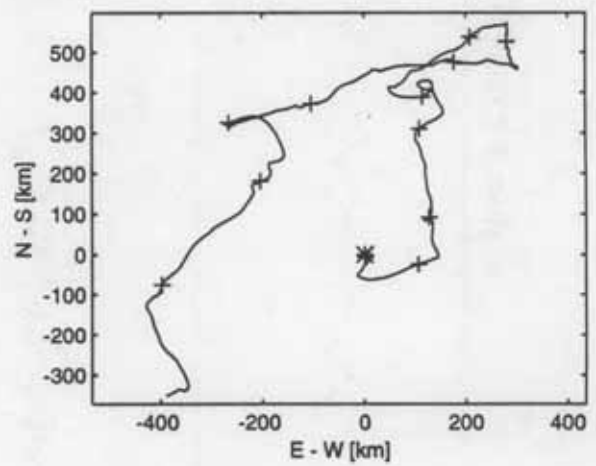
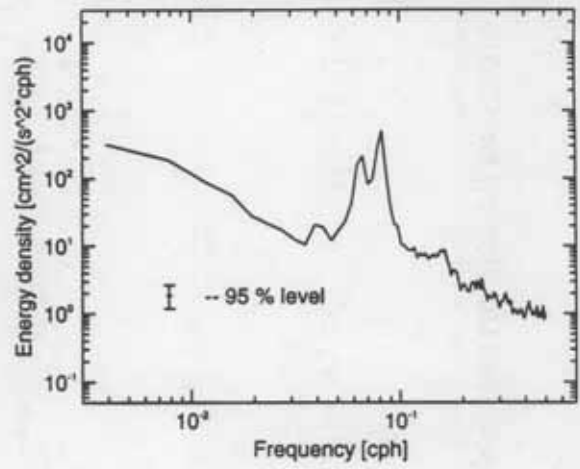


time serie 30 h low pass filtered , 24 h mean

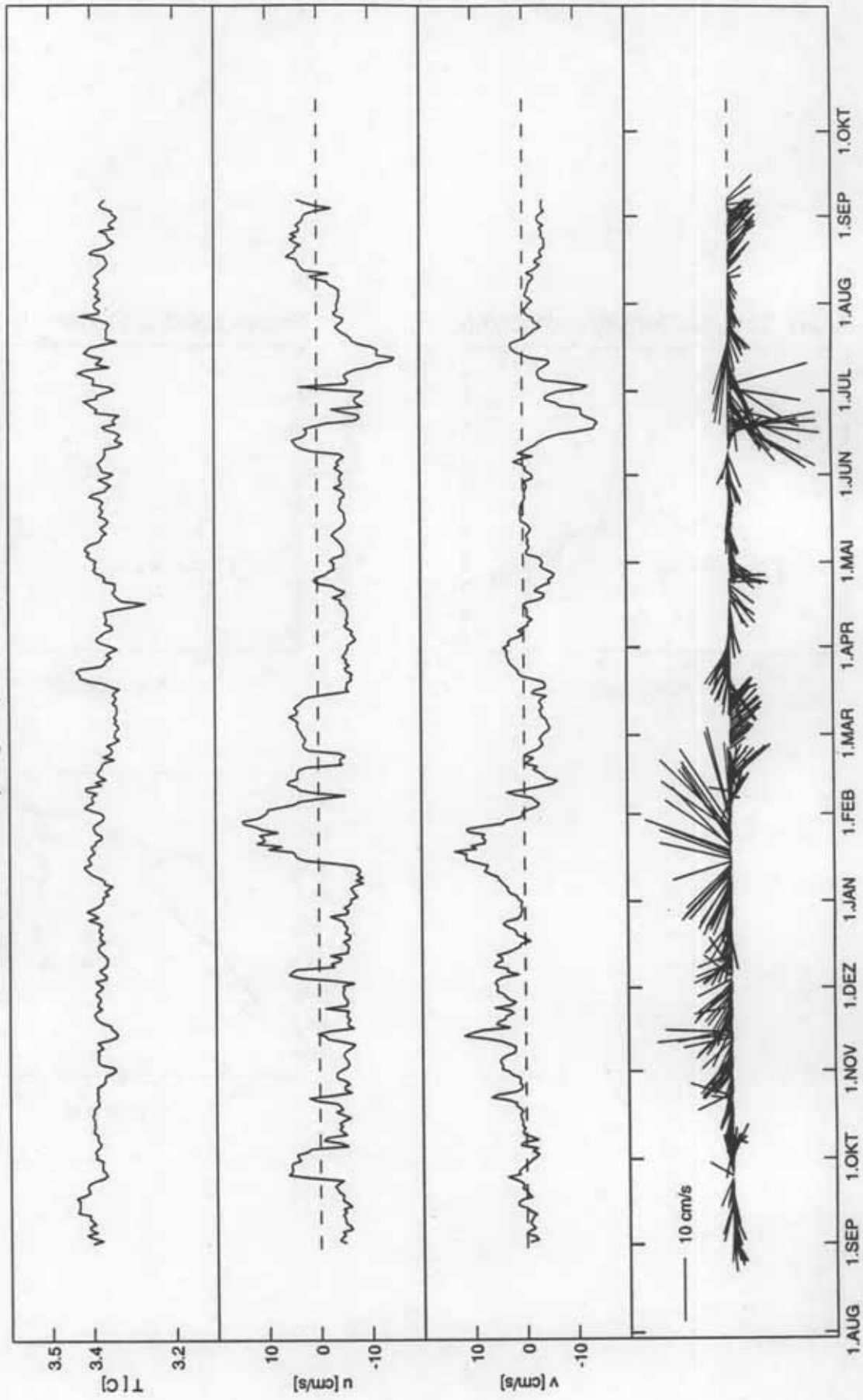
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

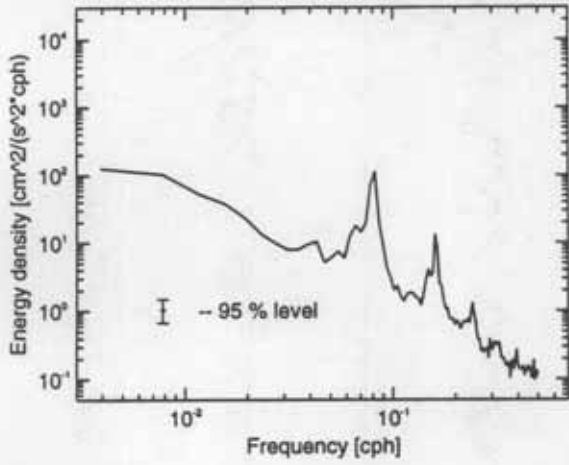


Station F2 Sampling Depth : 1981m Record Nr. 93046

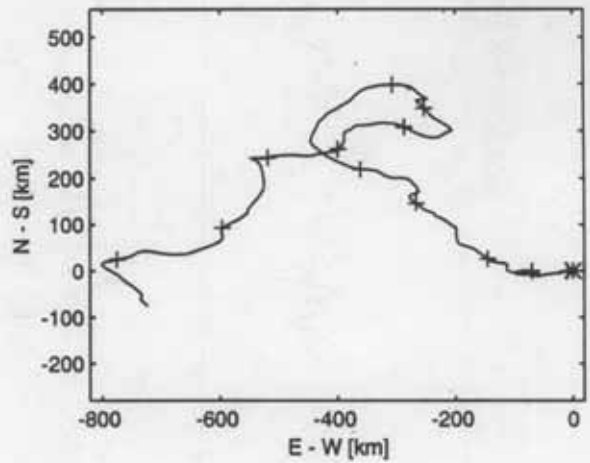
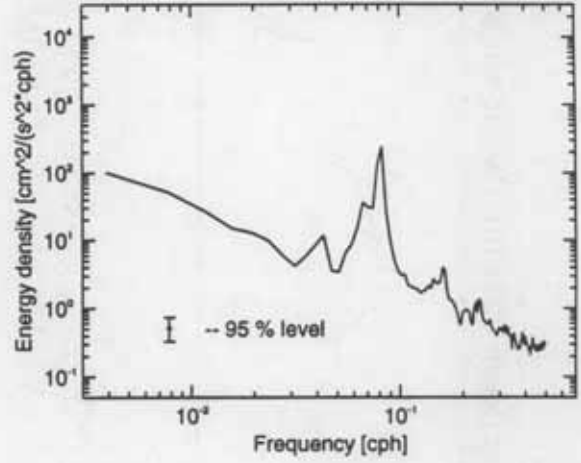


time serie 30 h low pass filtered , 24 h mean

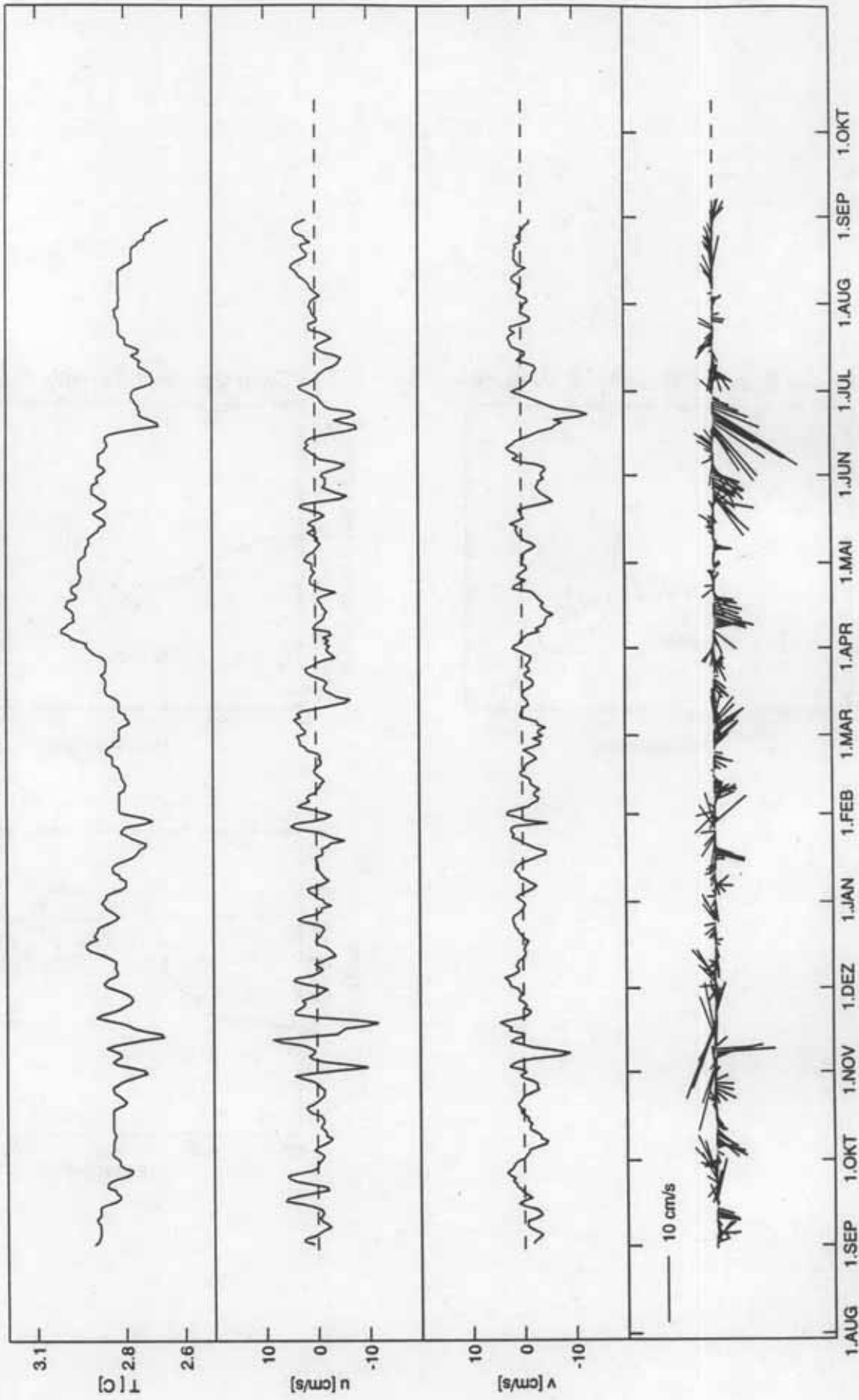
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

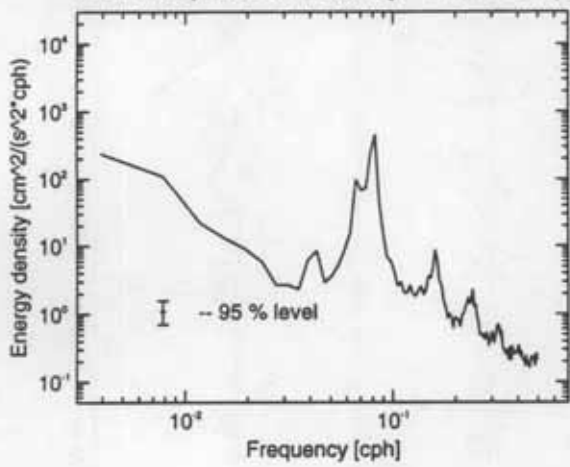


Station F2 Sampling Depth : 2981m Record Nr. 93045

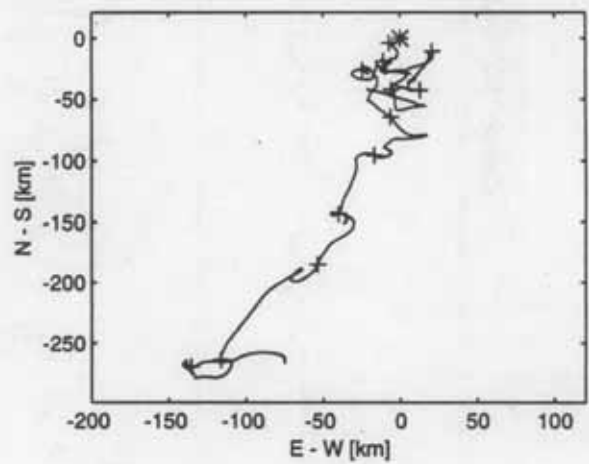
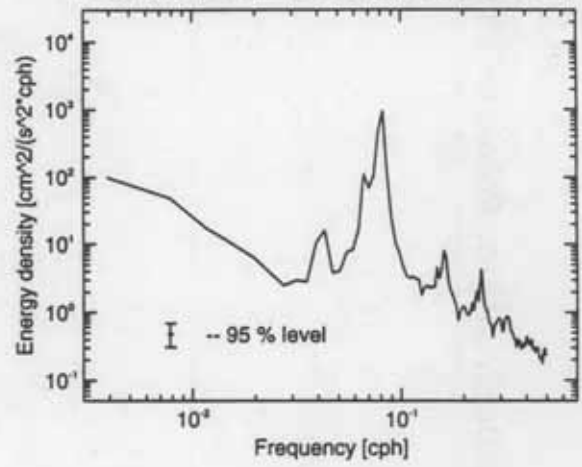


time serie 30 h low pass filtered , 24 h mean

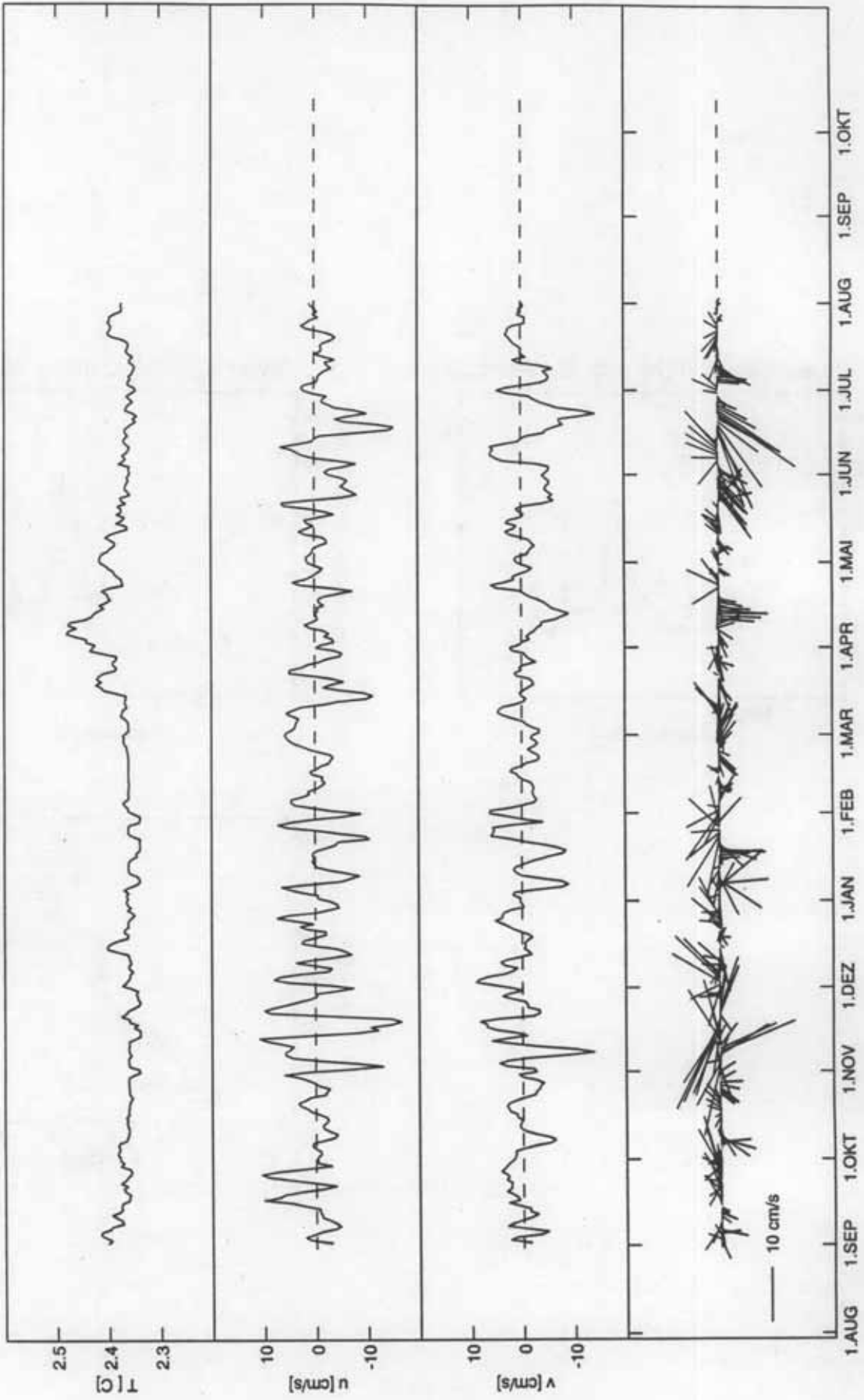
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

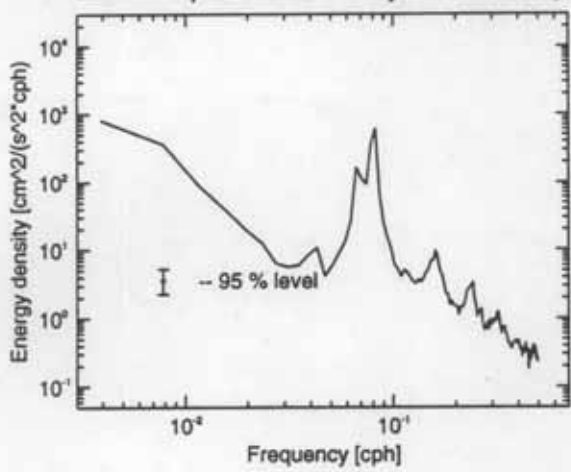


Station F2 Sampling Depth : 3431m Record Nr. 93044

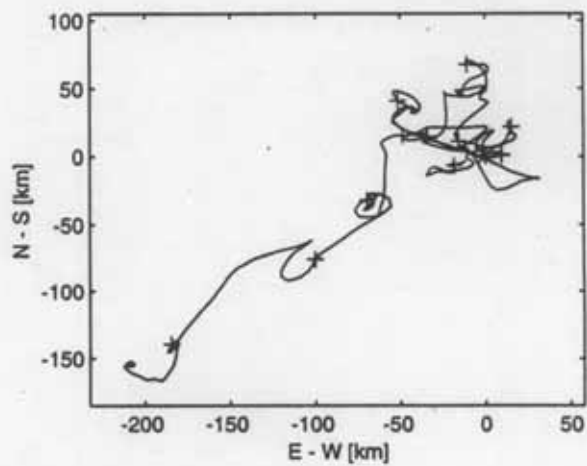
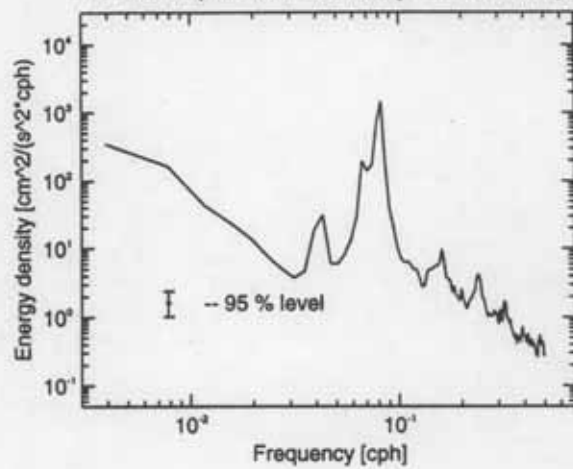



time serie 30 h low pass filtered , 24 h mean

Power Spectral Density E-W comp.

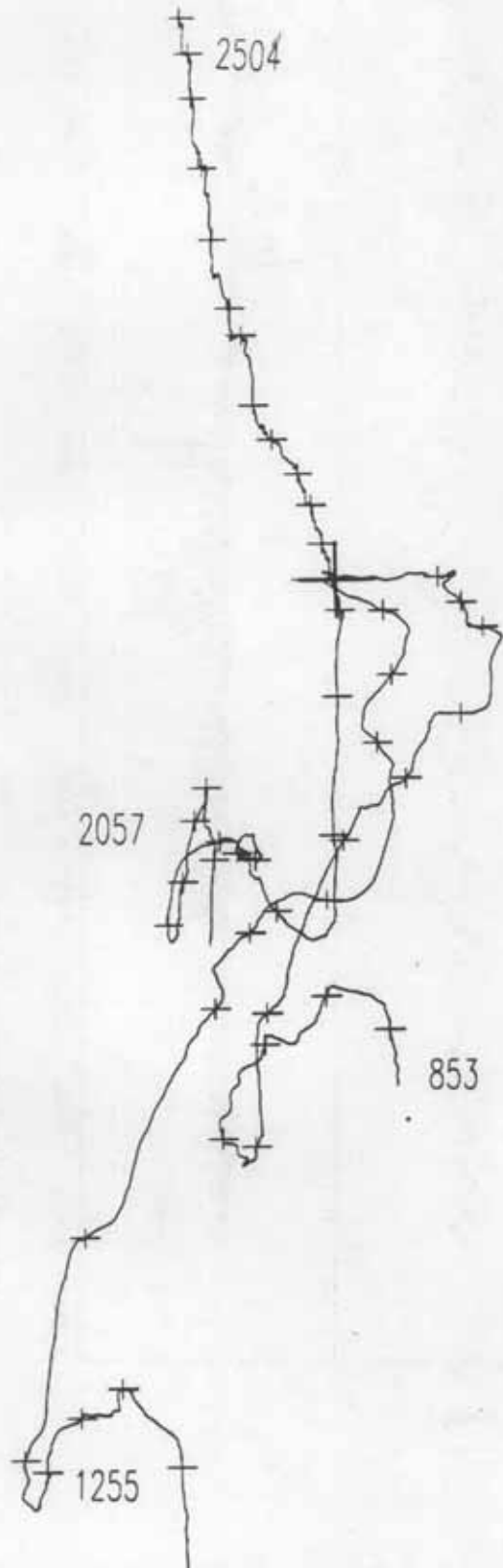


Power Spectral Density N-S comp.

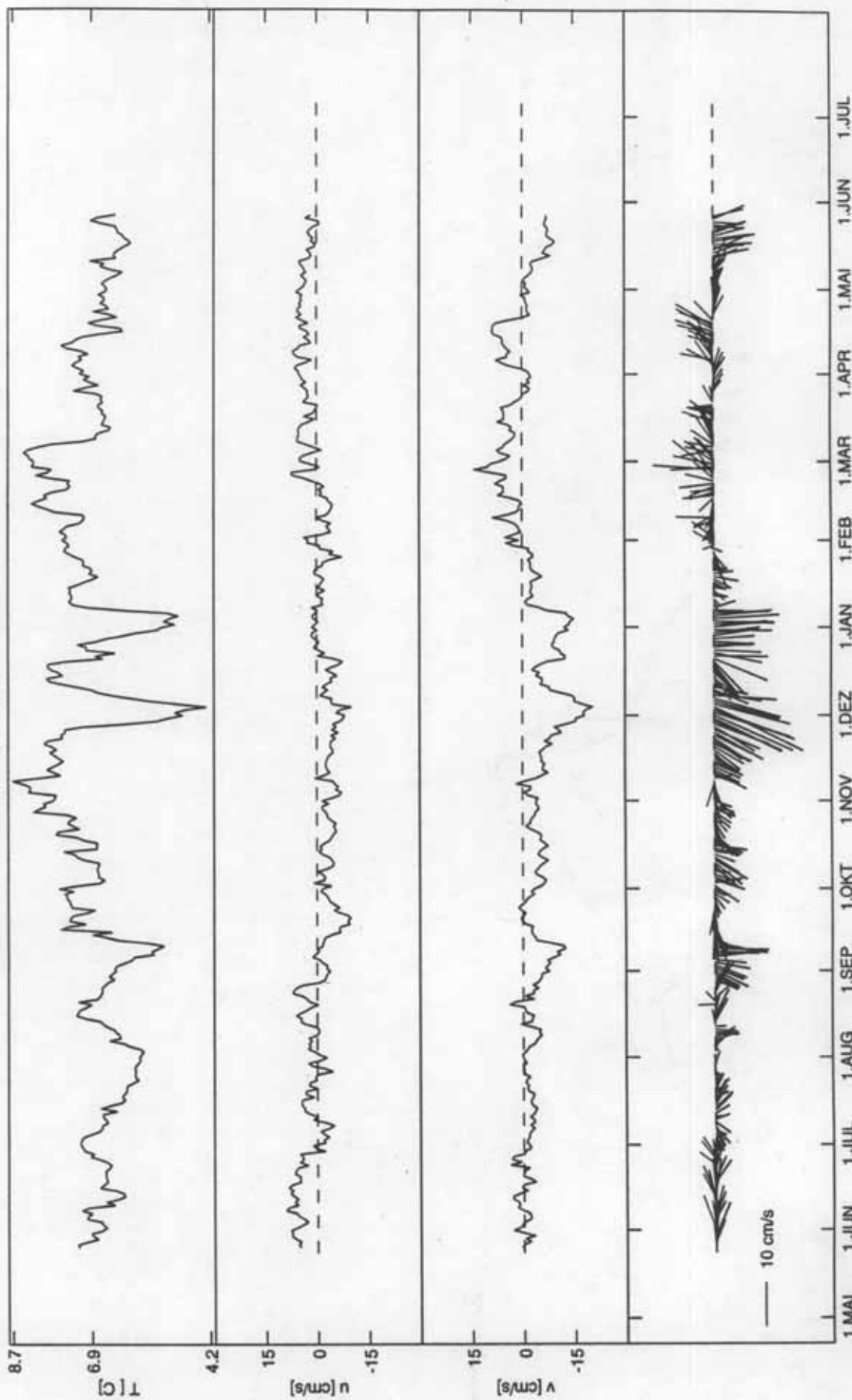



100 km

F4

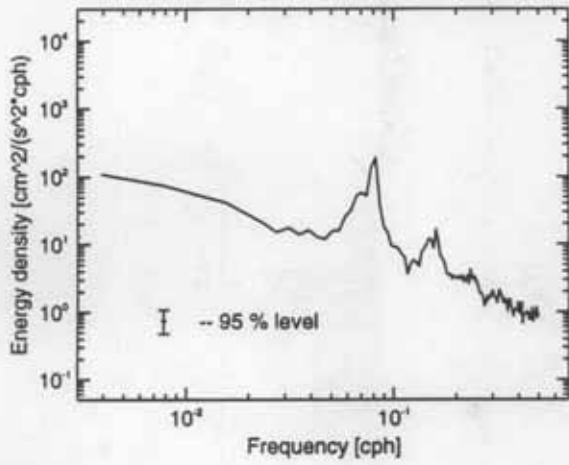


Station F4 Sampling Depth : 853m Record Nr. 95023

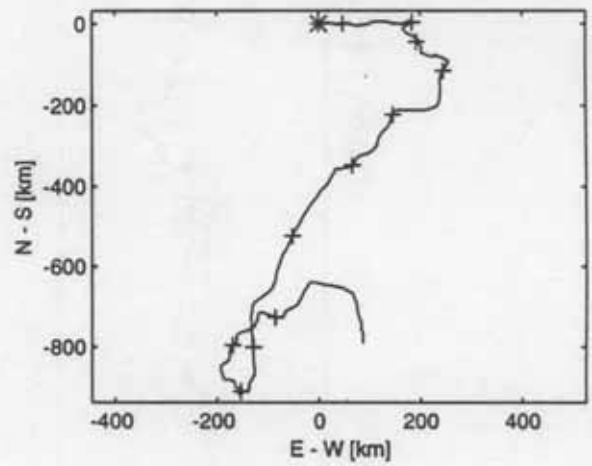
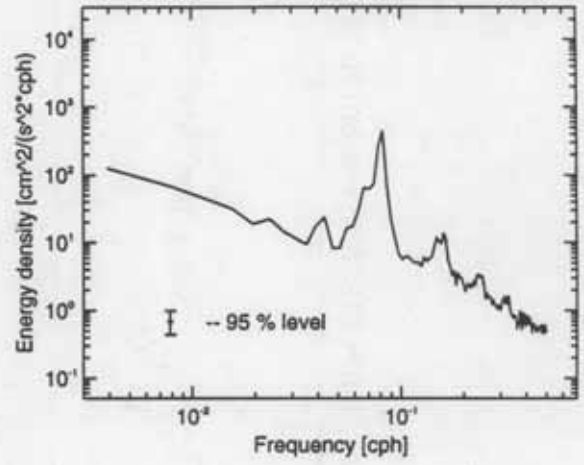


time serie 30 h low pass filtered , 24 h mean

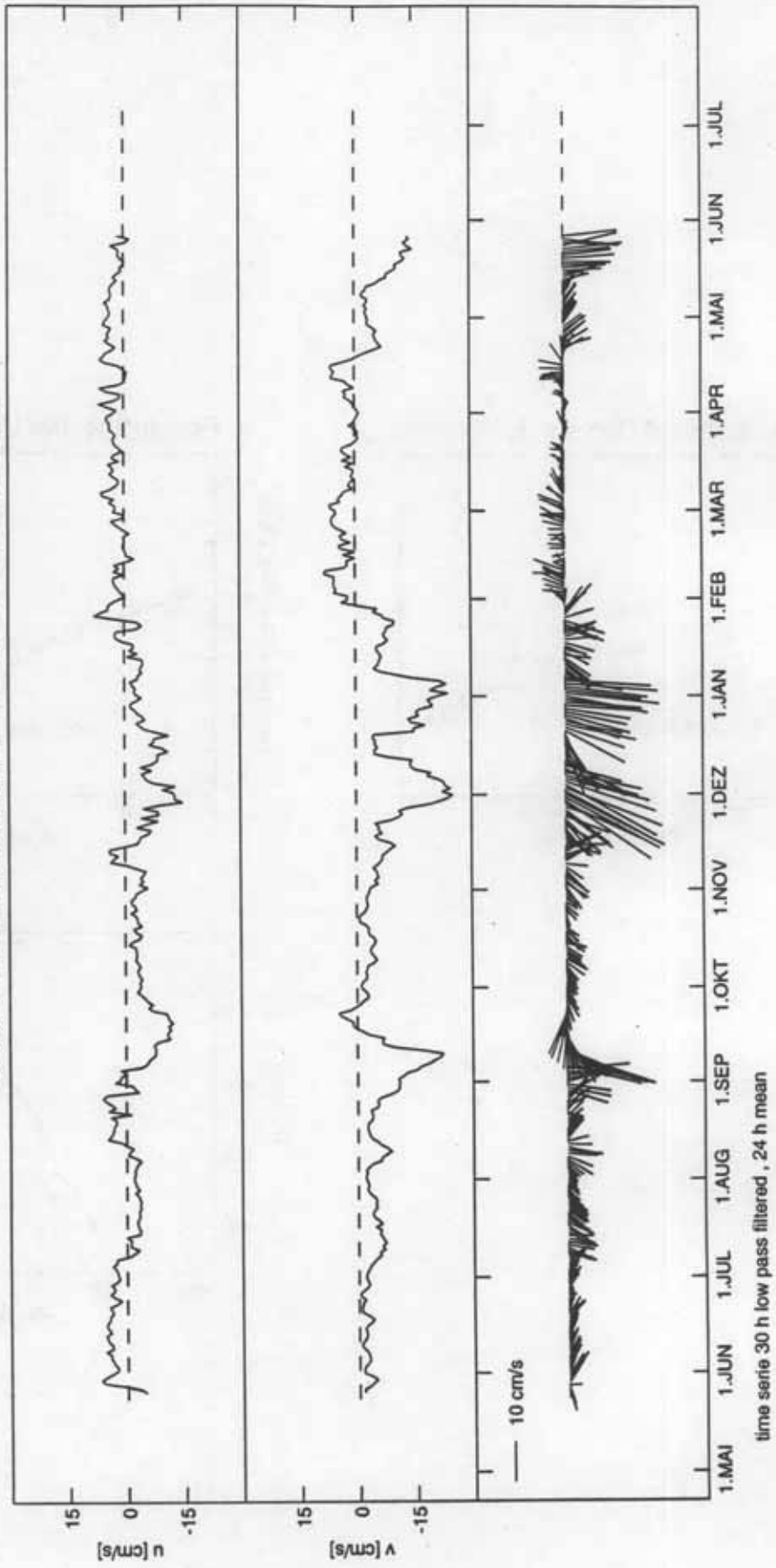
Power Spectral Density E-W comp.



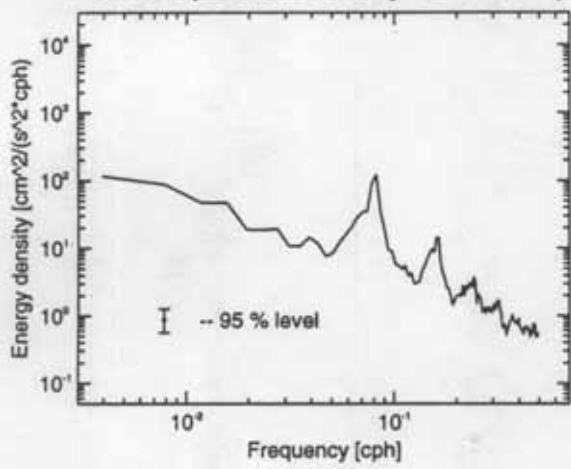
Power Spectral Density N-S comp.



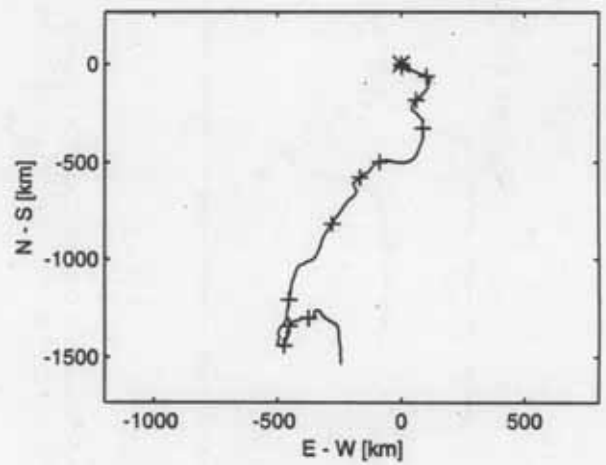
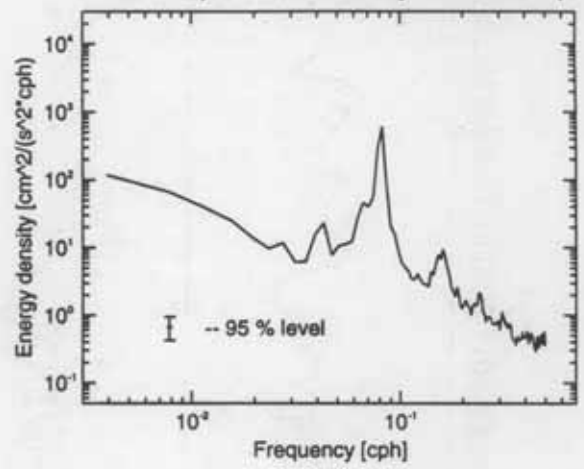
Station F4 Sampling Depth : 1255m Record Nr. 95024



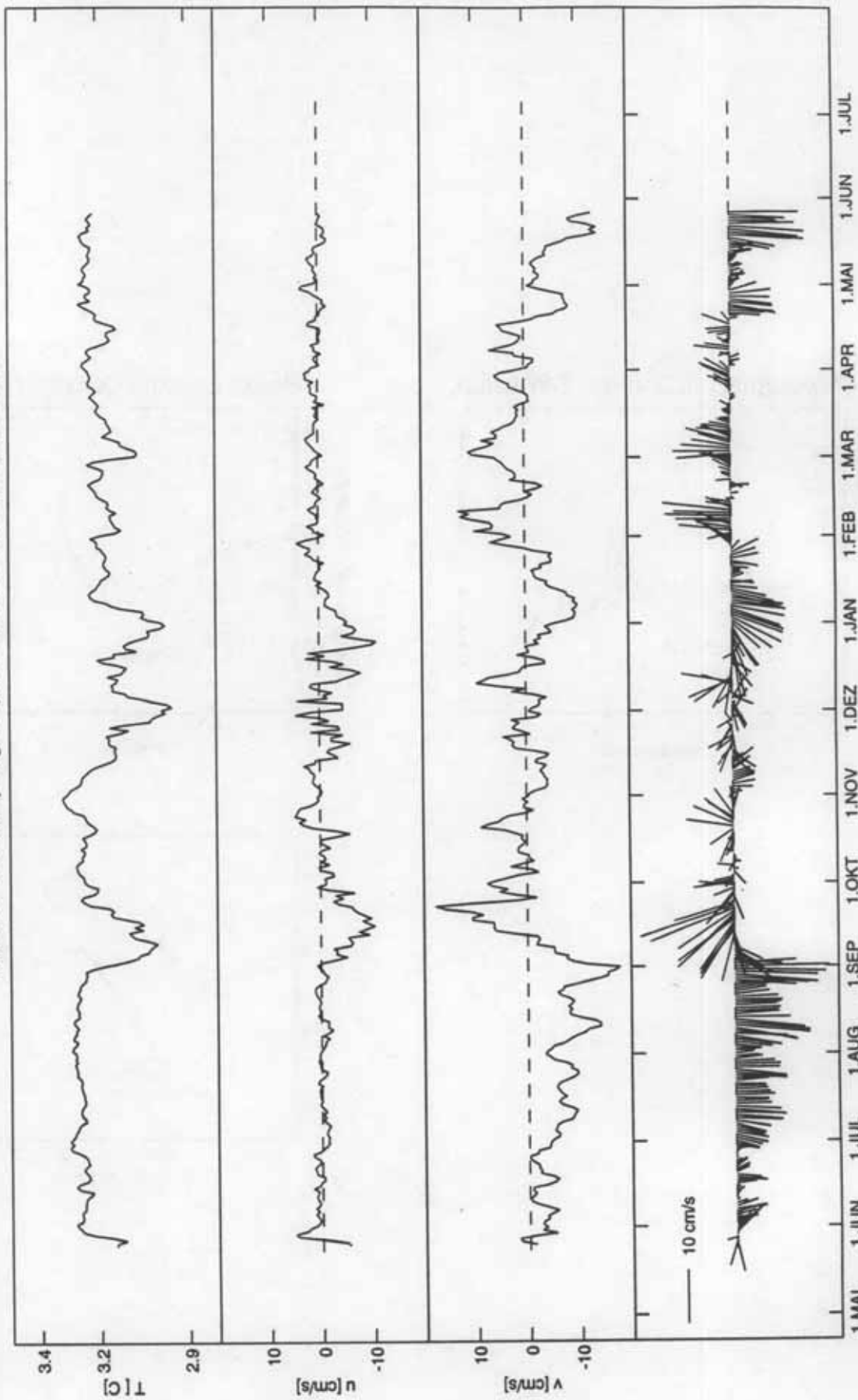
Power Spectral Density E-W comp.



Power Spectral Density N-S comp.

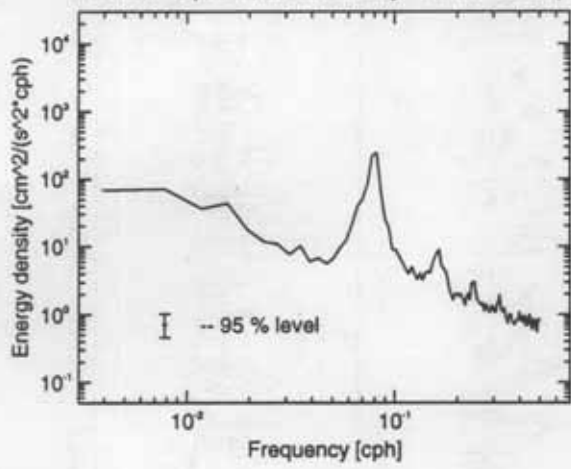


Station F4 Sampling Depth : 2057m Record Nr. 95025

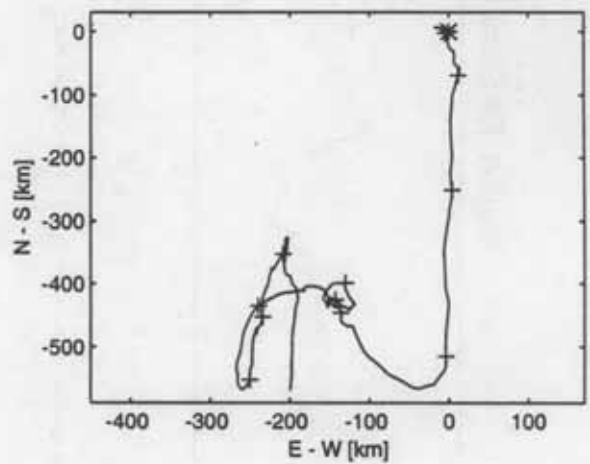
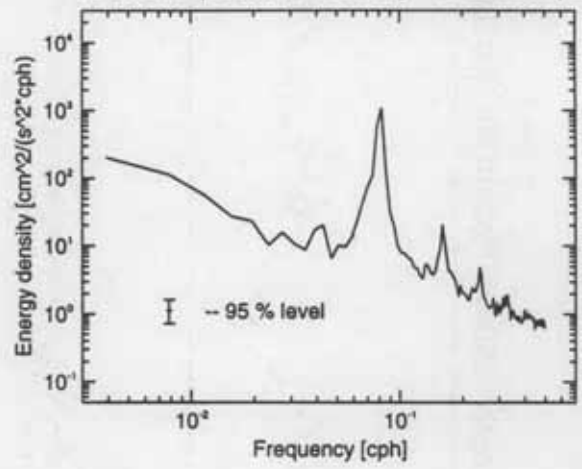


time serie 30 h low pass filtered , 24 h mean

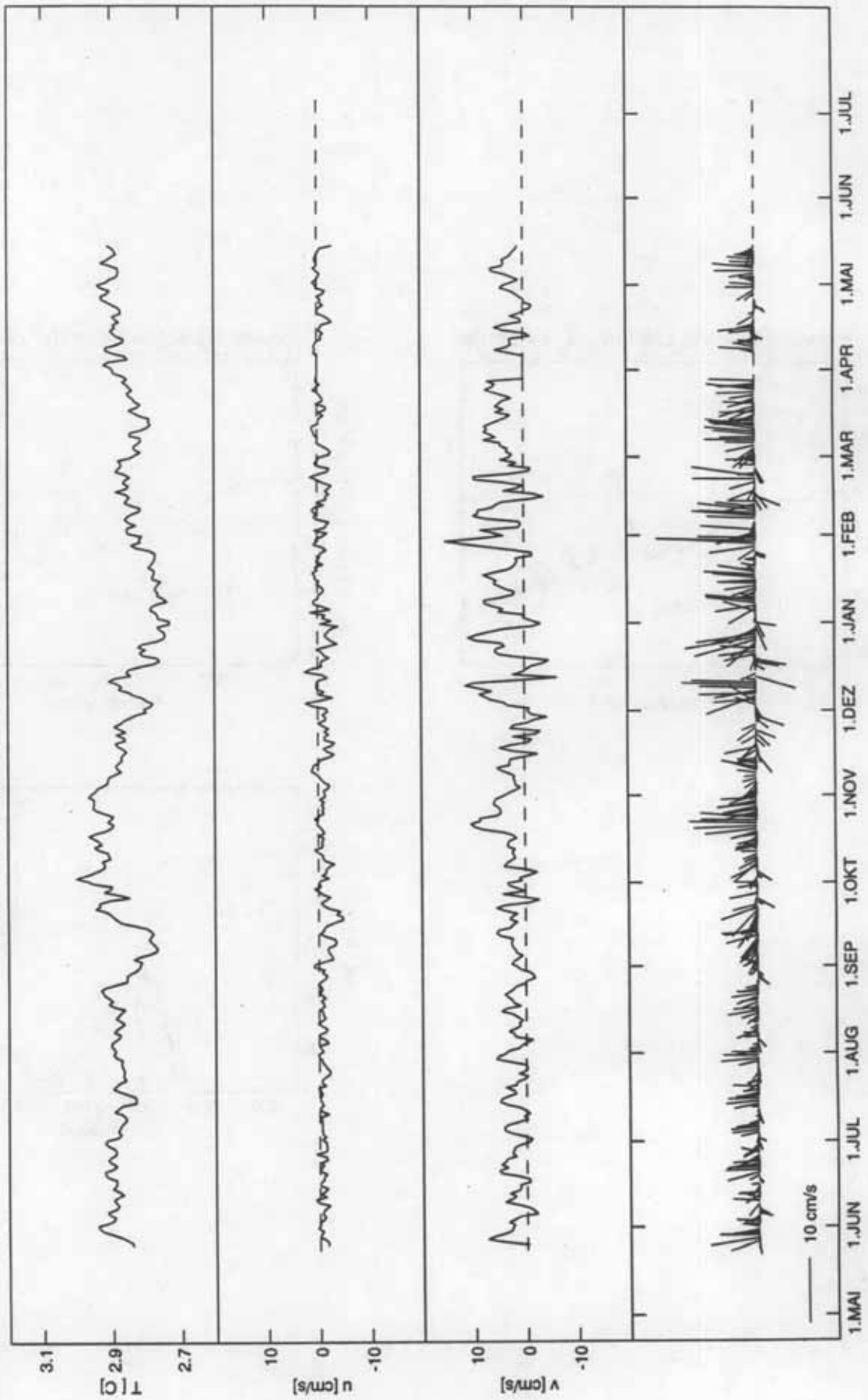
Power Spectral Density E-W comp.



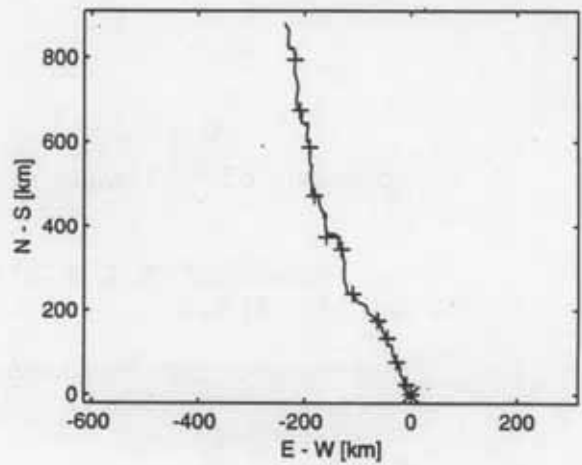
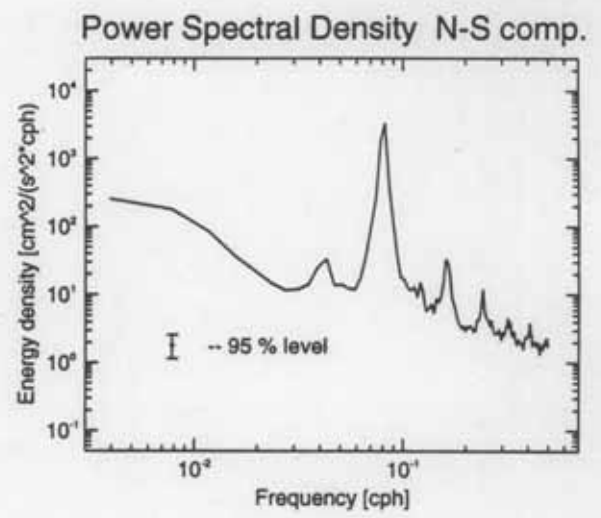
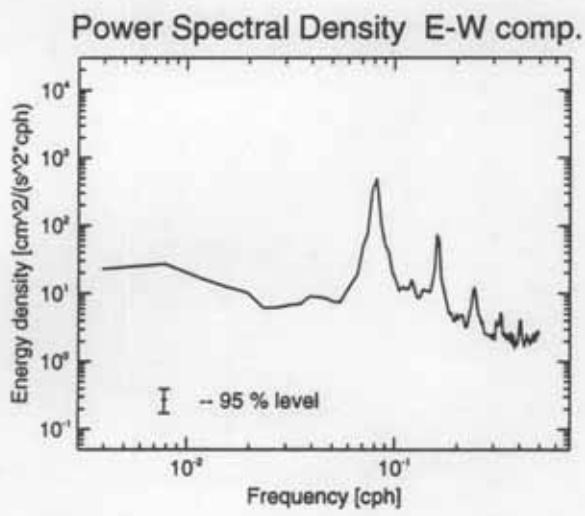
Power Spectral Density N-S comp.



Station F4 Sampling Depth : 2504m Record Nr. 95026



time serie 30 h low pass filtered , 24 h mean



Address of authors:

Dr. Ekkehard Mittelstaedt
Holger Klein

Bundesamt für Seeschifffahrt und Hydrographie
Bernhard-Nocht-Str. 78
D-20359 Hamburg
Germany

Prof. Dr. Jens Meincke

Institut für Meereskunde
der Universität Hamburg
Tropowitzstr. 7
D-22529 Hamburg
Germany

Berichte des Bundesamtes für Seeschifffahrt und Hydrographie

Verzeichnis der veröffentlichten Arbeiten

- | | | | |
|---|--------|---|---|
| 1 | (1994) | Sy, A.,
Ulrich, J. | North Atlantic Ship-of-Opportunity XBT Programme 1990
- Data Report, 134 pp. |
| 2 | (1994) | Hagen, E.
Mittelstaedt, E.
Feistel, R.
Klein, H. | Hydrographische Untersuchungen im Ostrandstromsystem vor
Portugal und Marokko 1991 - 1992, 49 pp. |
| 3 | (1994) | Oliczewski, J.
Schmidt, D. | Entwicklung einer Bestrahlungsapparatur zum photochemischen
Aufschluß von Meerwasserproben zur Bestimmung von Schwer-
metallen, 70 pp. |
| 4 | (1994) | BSH [Hrsg.] | Das UN-Seerechtsübereinkommen tritt in Kraft: Inhalte und
Konsequenzen für die Bundesrepublik Deutschland, 71 pp. |
| 5 | (1995) | BSH [Hrsg.] | Nationale Folgerungen aus dem Inkrafttreten des UN-Seerechts-
übereinkommens, 103 pp. |
| 6 | (1995) | Haffer, E.
Schmidt, D. | Entwicklung eines Probenvorbereitungsverfahrens zur Bestim-
mung von Arsen im Meerwasser mit der Totalreflexions-Rönt-
genfluoreszenzanalyse, 109 pp. |
| 7 | (1995) | BSH [Hrsg.] | Global Ocean Observing System - Statusbericht, 100 pp. |

THE UNIVERSITY OF CHICAGO

PHILOSOPHY DEPARTMENT

PHILOSOPHY 101

LECTURE NOTES

PROFESSOR [Name]

WINTER 2024

LECTURE 1

THE PHENOMENON OF CONSCIOUSNESS

1.1 THE HARD PROBLEM

1.2 THE SOFT PROBLEM

1.3 THE EASY PROBLEM

1.4 THE MEASUREMENT PROBLEM

1.5 THE INFORMATION PROBLEM

1.6 THE INTEGRATION PROBLEM

1.7 THE EXPERIMENTAL PROBLEM

1.8 THE PHILOSOPHICAL PROBLEM

1.9 THE SCIENTIFIC PROBLEM

1.10 THE FUTURE PROBLEM