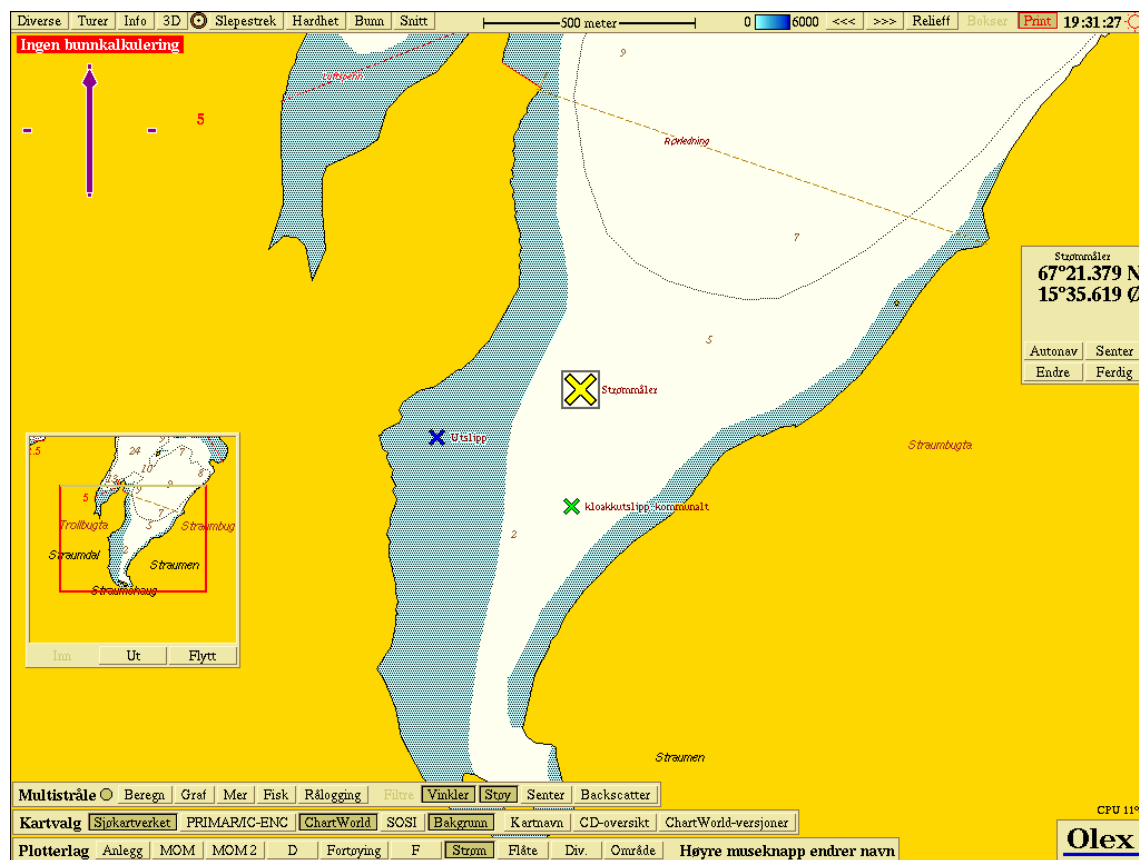


Rapport etter strømmålinger i to dyp med rotormåler (Sensordata SD 6000) i perioden 27.10.2009-26.11.2009

Sisomar AS

Lokalitet: Trollbukta, Sørfold



Figur 1: Plassering av strømmålere. Posisjon angitt på kartet. Kilde: Olex™

Tabell 1: Kort oppsummering av resultatene

Dyp (m)	Gjennomsnitt	Maks	% 0-1 cm/s
3	1,7 cm/s	14,0 cm/s	45,9
4,5	0,9 cm/s	3,8 cm/s	83,3

Rapportnr: 112-12-9S	Deres referanse: Jon Meisfjord	Firma: Sisomar AS	Lokalitet: Trollbukta
Dato: 1.12.09			
Utarbeidet av: Anders Waldemar Olsen	Aqua Kompetanse AS	Kvalitetssikret av: Gyda Arnkværn	

Innledning

I forbindelse med søknad om utvidelse på settefiskanlegget Trollbukta i Sørfold kommune, har Aqua Kompetanse AS blitt bedt om å gjennomføre miljøundersøkelse (MOM B) samt strømmålinger ved utslippet til settefiskanlegget. Strømmålingene ble gjennomført i perioden 27.10 – 26.12.09. Det ble målt strøm ved bruk av to rotormålere av typen Sensordata SD 6000. Målerne ble satt ut i en og samme rigg, forankret til bunnen vha et lodd og holdt oppe ved bruk av ei blåse ca en meter under vann. Den øverste måleren ble satt ut på ca 3 meters dyp, mens den nederste ble satt ut på ca 4,5 meters dyp. Dybden på stedet var ca 5 meter. I løpet av måleperioden ble det så sterk strøm at strømmålerne ble dratt med ca 60m utover fjorden. Omtrent på dette tidspunktet ble det også dårligere bunnstrøm.

Oppsummering fra målingene

På 3 meters dyp hadde strømmen en gjennomsnittlig hastighet på 1,7 cm/s. Maksimum hastighet ble i perioden målt til 14,0 cm/s, og andelen målinger i området 0-1 cm/s var 45,9 %. Størst vannutskiftning var det i sørlig retning (180 – 195 grader). Strømmen var i perioden meget ensrettet (Neumanns parameter = 0,812).

På 4,5 meters dyp hadde strømmen en gjennomsnittlig hastighet på 0,9 cm/s. Maksimum hastighet var 3,8 cm/s, og andelen målinger i området 0-1 cm/s var 83,3 %. Det var størst vannutskiftning i nordvestlig retning (315 – 330 grader). Strømmen var meget ensrettet i perioden (Neumanns parameter = 0,851).

Vår vurdering

Resultatene viser en noe svak strøm på 3 meters dyp. Innimellom er det ganske sterke strømstøt, som ser ut til å følge tidevannsamplituden. På 4,5 meters dyp avtar hastigheten noe etter ca 14 dager. Dette skyldes etter all sannsynlighet at målerne ble dratt med til et annet område i fjorden på grunn av veldig sterk strøm en periode. Vi vurderer strømmen nedover i vannsøylen til å være noe svak, men med periodevis sterke strømstøt. Vi observerte under feltarbeidet at hastigheten i overflatelaget var meget høy. Elva bidrar til å skape en overflatestrøm med god hastighet ut av fjorden. Dette skaper en sjiktning i vannmassene. På 3 meters dyp går strømmen motsatt vei av overflatestrømmen, innover i fjorden. På 4,5 meters dyp går strømmen utover i fjorden. Mesteparten av utslippet fra settefiskanlegget vil etter all sannsynlighet følge ferskvannlaget utover og spres i fjorden. Dette kan bekreftes av MOM B-undersøkelse fra samme tidsrom, som viser lite spor av organisk materiale.

Med hilsen:

Anders W. Olsen

Anders Waldemar Olsen
Marinbiolog

Kvalitetssikret av:



Gyda Arnkværn
Marinbiolog

Vedlegg:

Spesifikasjons- og resultatoversikt
Statistisk sammendrag av data

SPESIFIKASJONS- OG RESULTATOVERSIKT.

Firma: Sisomar AS

Lokalitet: Trollbukta, Sørfold kommune.

Generelle spesifikasjoner, periode, frekvens og resultater.

Tekst	3 meters dyp	4,5 meters dyp
Tidsrom for registreringer	27.10.2009-26.11.2009	27.10.2009-26.11.2009
Dybde på målestedet. Ca.	5	5
Dybde for registreringer (meter). Ca.	3	4,5
Måler type - nummer	SD6000 - nr1122	SD6000 - nr1173
Type måling	Kontinuerlig	Kontinuerlig
Frekvens – varighet*4	6 min/30 min - 30 døgn	6 min/30 min - 30 døgn
Adresse for arkiv (data)	67° 21.379N 15° 35.619Ø	67° 21.379N 15° 35.619Ø
% strøm mindre enn 1 cm/sek.(ca)	45,9 %	83,3 %
Gjennomsnittsstrøm	1,7	0,9
Rest strøm	1,4	0,8
Neumanns parameter	0,812	0,851
De 4 hyppigst forekommende retningene strømmen beveger seg mot (grader) *1	180, 225, 165, 210	315, 300, 330, 345
De 4 hyppigst forekommende strømhastighetene (cm /sek) *1	0-1, 1-3, 3-4, 4-5	0-1, 1-3, 3-4, 75-100
Mest vannutskiftning / retning / 15 graders sektor.*2	11405m ³ ved 180-195 grader. 380m ³ /m ² /døgn	10836m ³ ved 315-330 grader. 361m ³ /m ² /døgn
Minst vannutskiftning / retning / 15 graders sektor.*2	0m ³ ved 0-15 grader. 0m ³ /m ² /døgn	0m ³ ved 105-120 grader. 0m ³ /m ² /døgn
Gjennomsnittlig total vannutskiftning pr. døgn. Alle retninger	1485m ³ /døgn	788m ³ /døgn
Maksimum strøm – signifikant maksimum strøm (cm/sek) *3	14,0 - 2.9	3,8 - 1.2

*1: gruppert i synkende rekkefølge *2: vann som passerer gjennom hver loddrett plassert kvadratmeter.*3: gjennomsnittet av 1/3 målingene som viser høyest verdi. *4: måleren registrerer hvert 6. min og gir gjennomsnitt hvert 30. min

3 meters dyp

TEMPERATURE

File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6

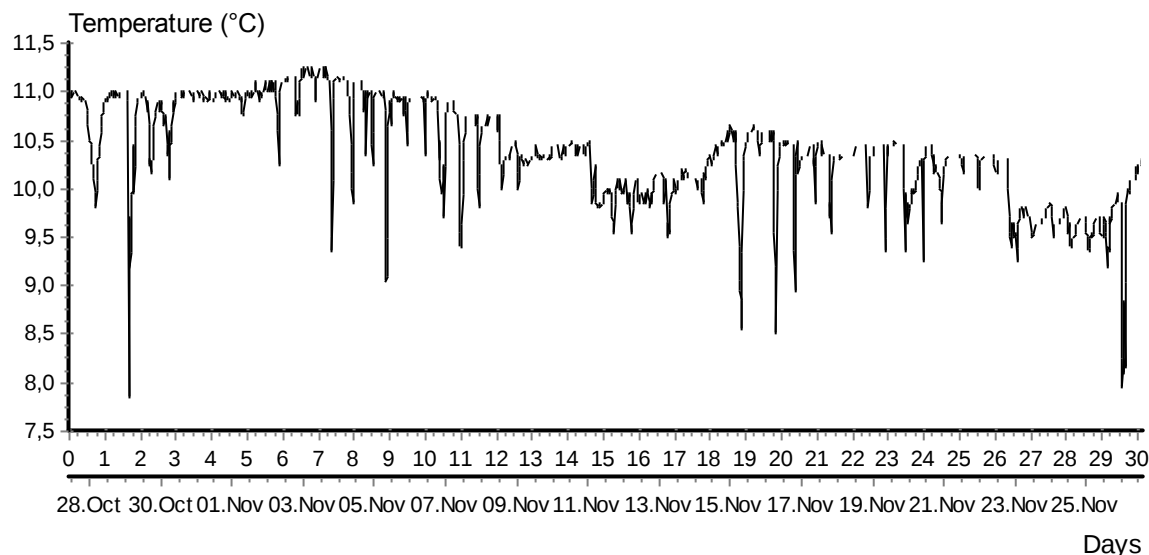
Series number: 1

Ref. number: 1122

Number of measurements in data set: 1449

Interval time: 30 Minutes

Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09



CURRENT SPEED

File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6

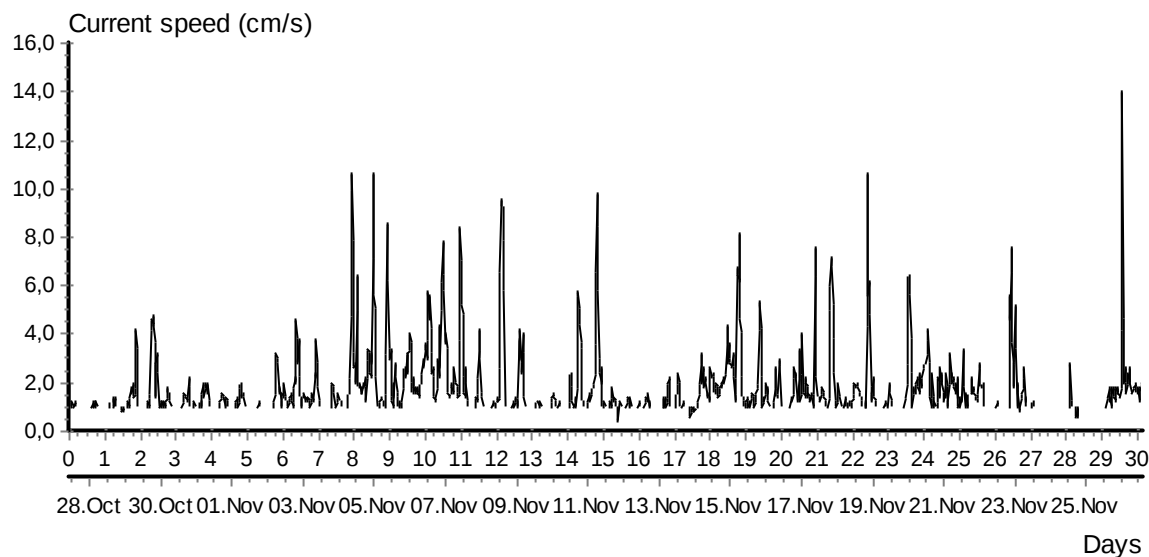
Series number: 1

Ref. number: 1122

Number of measurements in data set: 1449

Interval time: 30 Minutes

Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09



CURRENT SPEED BAR CHART

File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6

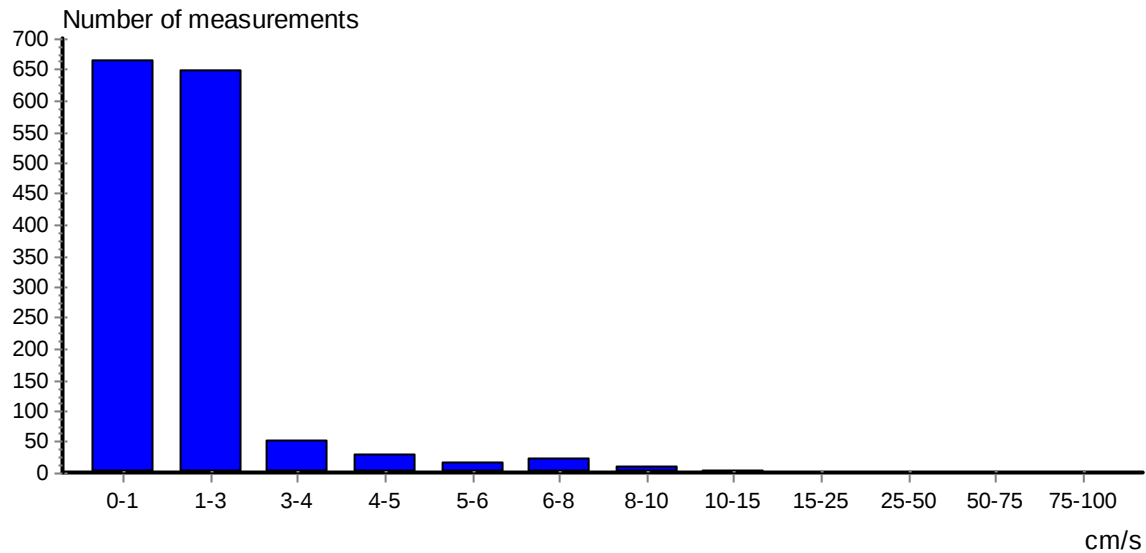
Series number: 1

Ref. number: 1122

Number of measurements in data set: 1449

Interval time: 30 Minutes

Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09



CURRENT DIRECTION BAR CHART

File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6

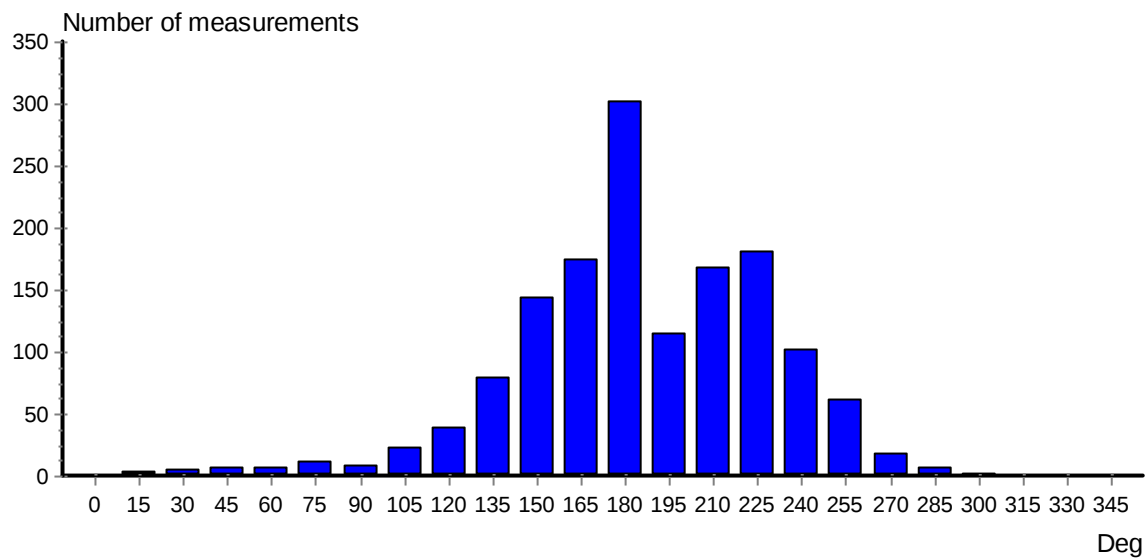
Series number: 1

Ref. number: 1122

Number of measurements in data set: 1449

Interval time: 30 Minutes

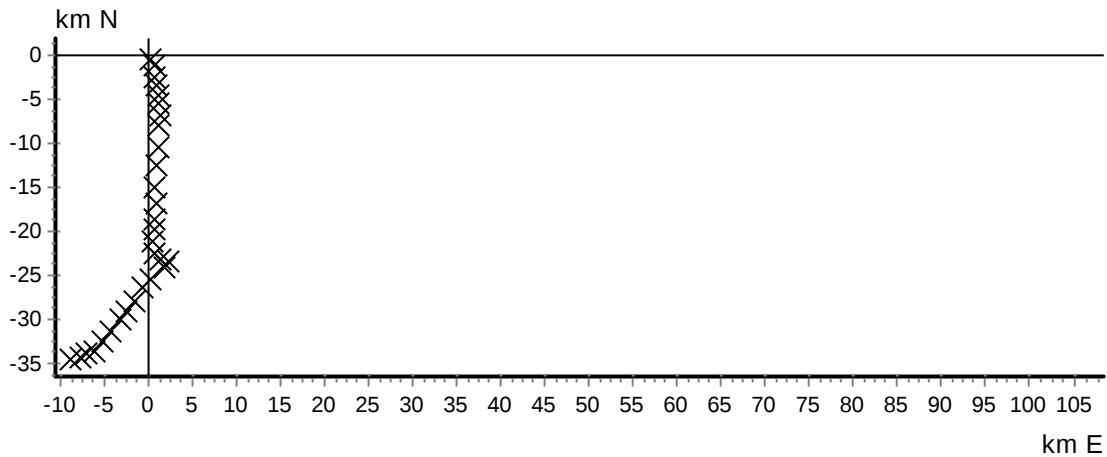
Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09



PROGRESSIVE VECTOR

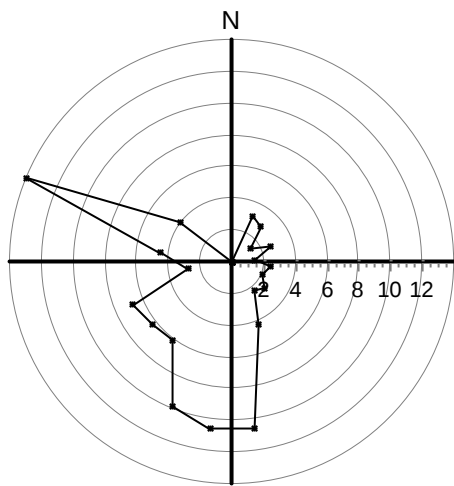
File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6
Series number: 1 Ref. number: 1122
Number of measurements in data set: 1449 Interval time: 30 Minutes
Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09

Neumann parameter: 0.812 Rest speed: 1.4 cm/s
Average speed: 1.7 cm/s Rest direction: 196 deg.

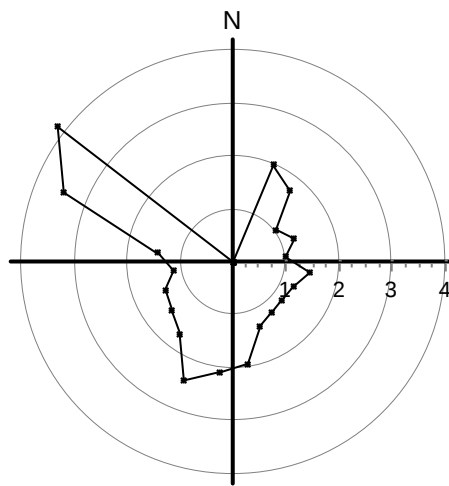


CURRENT VELOCITY DISTRIBUTION DIAGRAM

File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6
Series number: 1 Ref. number: 1122
Number of measurements in data set: 1449 Interval time: 30 Minutes
Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09



Maximum velocity (cm/s)
per 15 deg sector



Mean velocity (cm/s)
per 15 deg sector

CURRENT VELOCITY DISTRIBUTION DIAGRAM

File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6

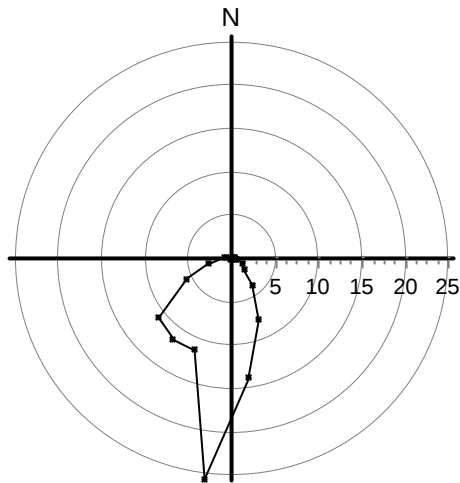
Series number: 1

Ref. number: 1122

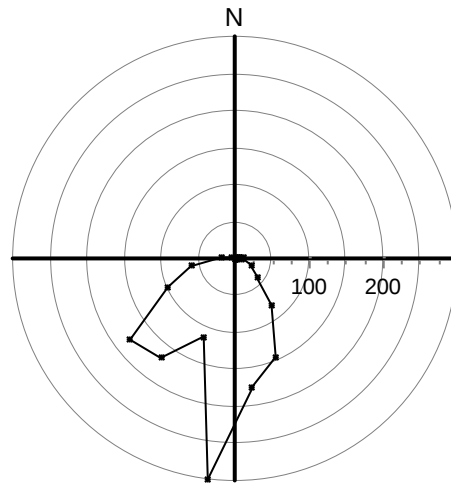
Number of measurements in data set: 1449

Interval time: 30 Minutes

Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09



Relative water flux (%)
per 15 deg sector



Number of measurements
per 15 deg sector

STICK DIAGRAM

File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6

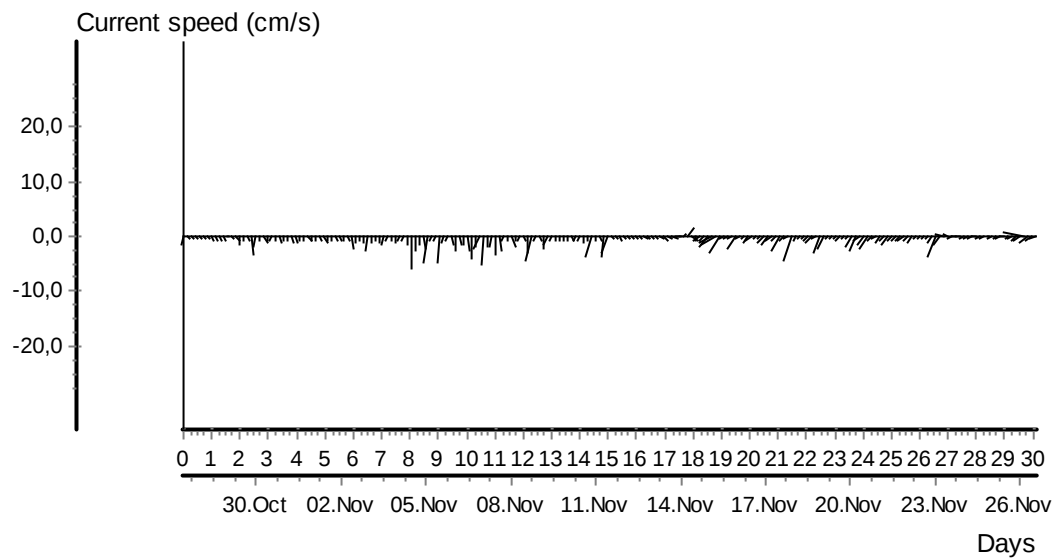
Series number: 1

Ref. number: 1122

Number of measurements in data set: 1449

Interval time: 30 Minutes

Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09



CURRENT SPEED / DIRECTION MATRIX

File name: Trollbuktam00011449nov0967213791535619oT30M3Mnr03.SD6

Series number: 1

Ref. number: 1122

Number of measurements in data set: 1449

Interval time: 30 Minutes

Data displayed from: 10:36 - 27.Oct-09 To: 14:36 - 26.Nov-09

	Current speed groups													Total flow		Max curr
	1	3	4	5	6	8	10	15	25	50	75	100	Sum%	m ³ /m ²	%	
0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0	0.0
15	1	1	1	0	0	0	0	0	0	0	0	0	0.2	108	0.2	3.2
30	1	4	0	0	0	0	0	0	0	0	0	0	0.3	155	0.3	2.8
45	5	1	0	0	0	0	0	0	0	0	0	0	0.4	108	0.2	1.4
60	5	1	0	0	0	0	0	0	0	0	0	0	0.4	133	0.3	2.6
75	10	2	0	0	0	0	0	0	0	0	0	0	0.8	212	0.5	1.4
90	3	5	0	0	0	0	0	0	0	0	0	0	0.6	209	0.5	2.4
105	11	12	0	0	0	0	0	0	0	0	0	0	1.6	504	1.1	2.0
120	26	13	0	0	0	0	0	0	0	0	0	0	2.7	817	1.8	2.6
135	50	29	0	0	0	0	0	0	0	0	0	0	5.5	1681	3.8	2.2
150	68	73	2	1	0	0	0	0	0	0	0	0	9.9	3362	7.5	4.2
165	50	101	10	7	1	2	2	1	0	0	0	0	12.0	6138	13.8	10.6
180	154	87	21	12	10	9	6	2	0	0	0	0	20.8	11405	25.6	10.6
195	41	45	10	4	4	9	2	0	0	0	0	0	7.9	5018	11.3	9.8
210	56	100	5	3	2	1	0	0	0	0	0	0	11.5	5116	11.5	6.2
225	65	112	1	1	0	1	0	0	0	0	0	0	12.4	4831	10.8	6.4
240	58	40	2	0	0	1	0	0	0	0	0	0	7.0	2567	5.8	6.8
255	48	13	0	0	0	0	0	0	0	0	0	0	4.2	1278	2.9	2.8
270	11	6	0	1	0	0	0	0	0	0	0	0	1.2	464	1.0	4.6
285	2	3	0	0	0	0	0	1	0	0	0	0	0.4	378	0.8	14.0
300	0	0	0	1	0	0	0	0	0	0	0	0	0.1	76	0.2	4.2
315	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0	0.0
330	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0	0.0
345	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0	0.0
Sum%	45.9	44.7	3.6	2.1	1.2	1.6	0.7	0.3	0.0	0.0	0.0	0.0		44561		14.0

STATISTICAL SUMMARY

	Total	East / west	North / south
Mean current speed (cm/s)	1,7	0,7	1,4
Variance (cm/s) ²	1,855	0,462	1,845
Standard deviation (cm/s)	1,362	0,680	1,358
Mean standard deviation	0,797	0,910	0,983
Maximum current velocity	14,0		
Minimum current velocity	0,4		
Significant max velocity	2,9		
Significant min velocity	1,0		

4,5 meters dyp

TEMPERATURE

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

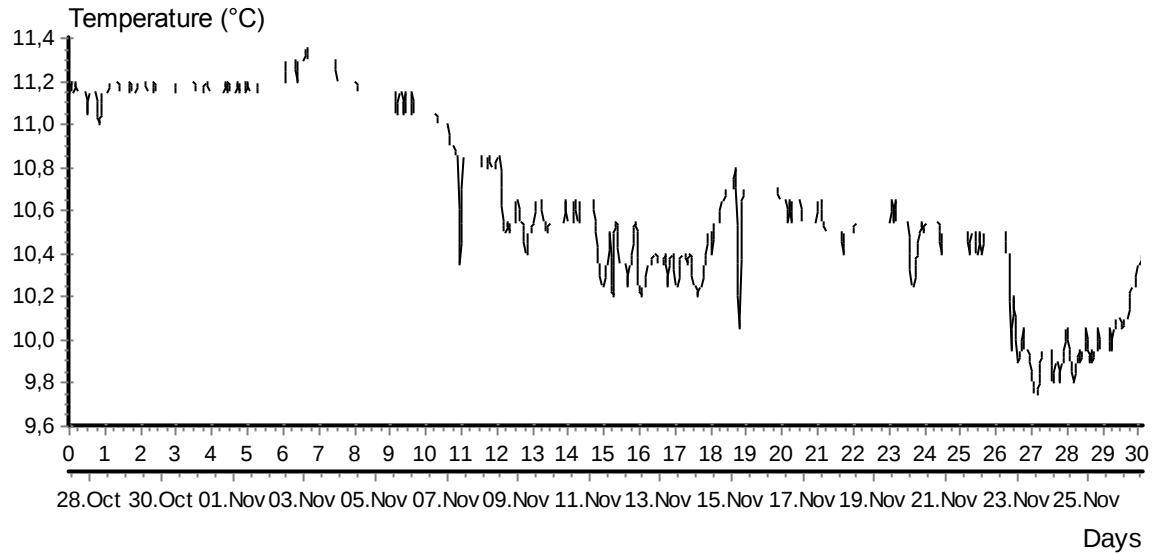
Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



CURRENT SPEED

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

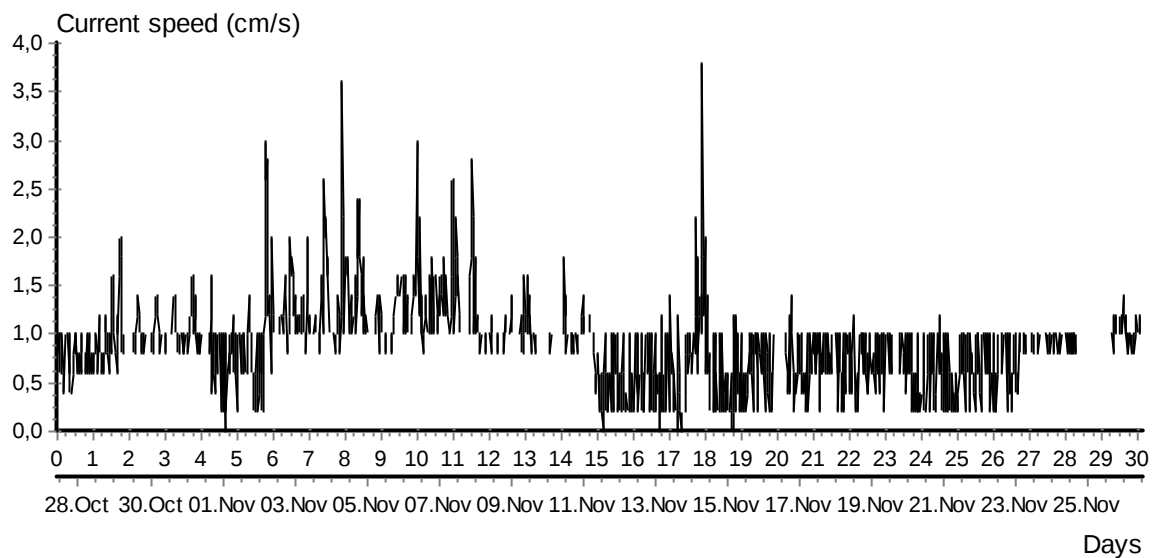
Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

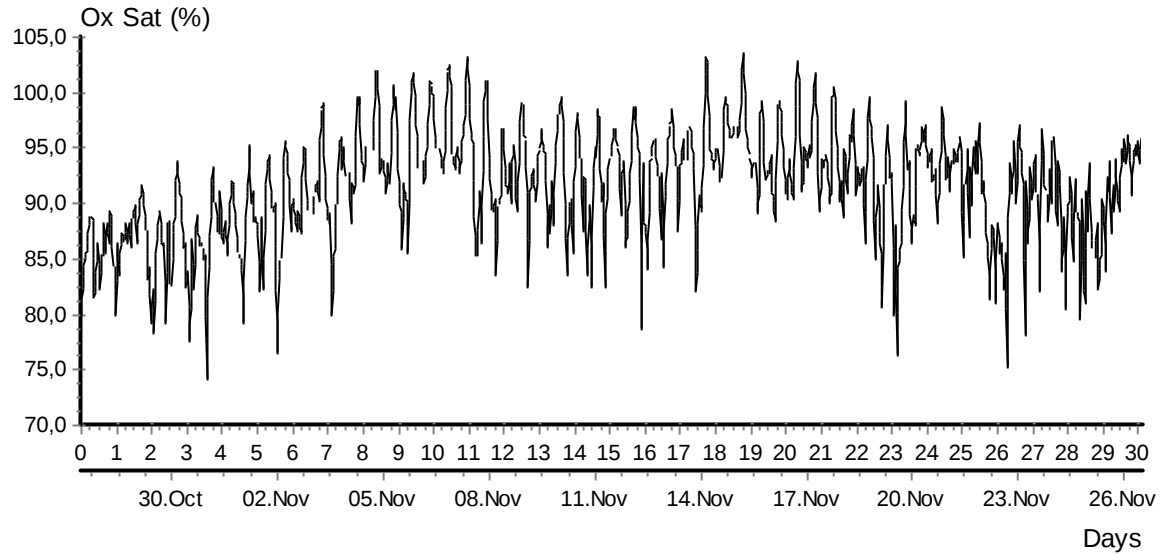
Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



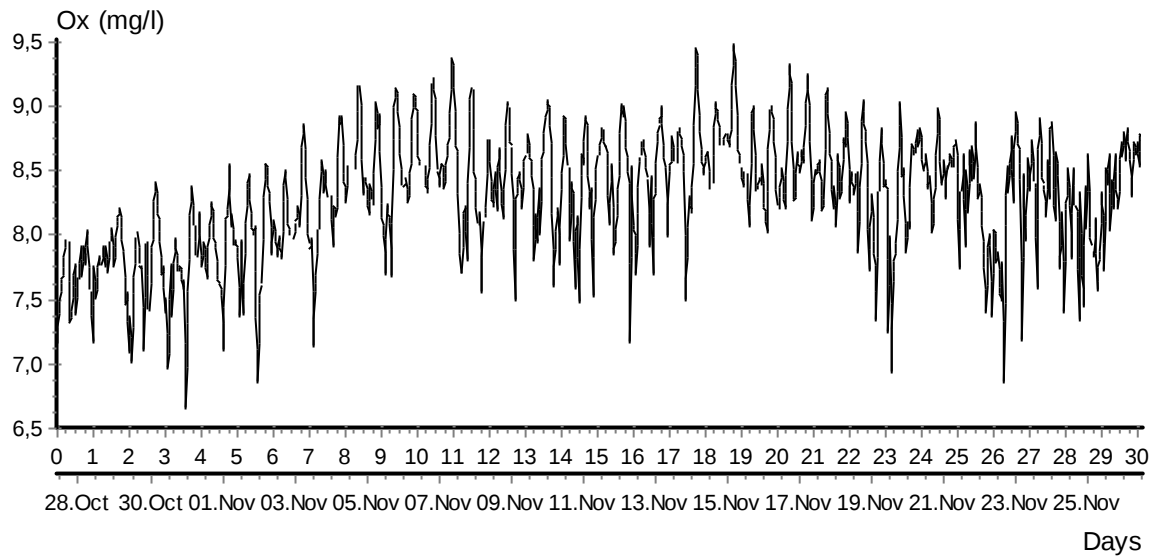
OX SAT

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6
Series number: 4 Ref. number: 1173
Number of measurements in data set: 1448 Interval time: 30 Minutes
Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



OXYGEN mg/l

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6
Series number: 4 Ref. number: 1173
Number of measurements in data set: 1448 Interval time: 30 Minutes
Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



OXYGEN FLUX

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

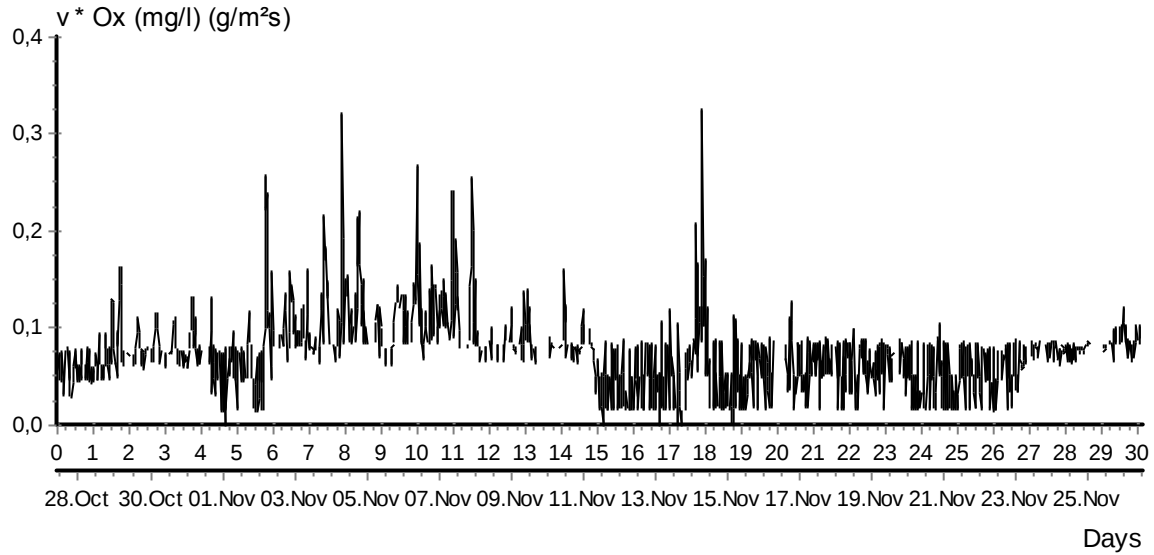
Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



CURRENT SPEED BAR CHART

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

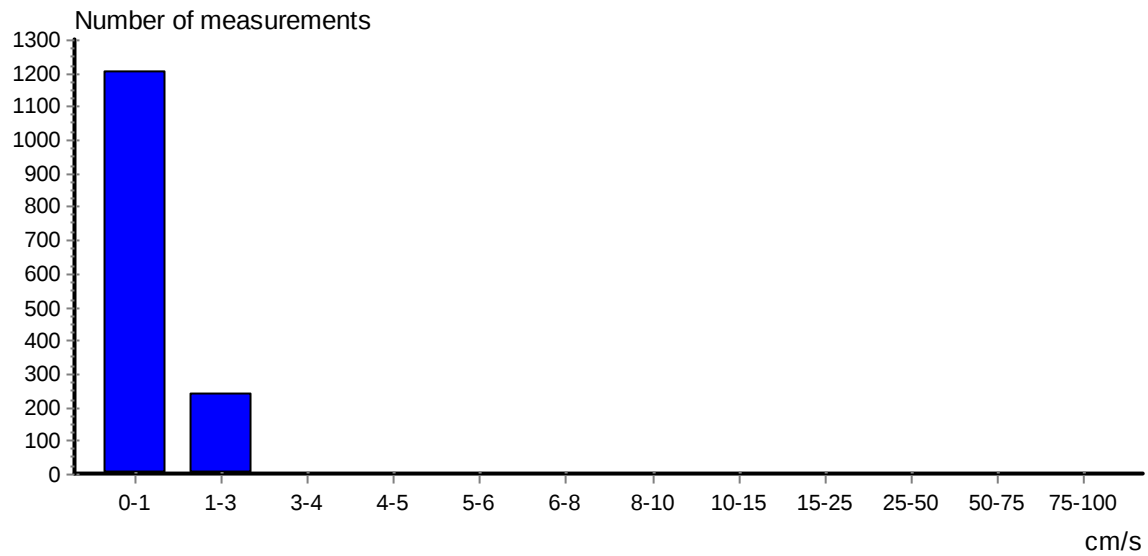
Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



CURRENT DIRECTION BAR CHART

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

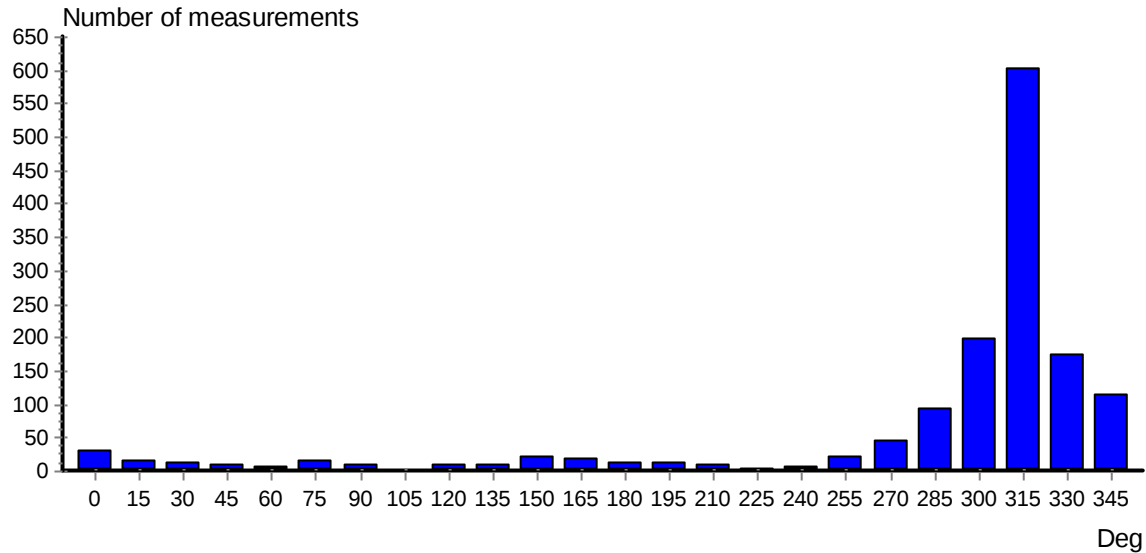
Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



PROGRESSIVE VECTOR

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

Interval time: 30 Minutes

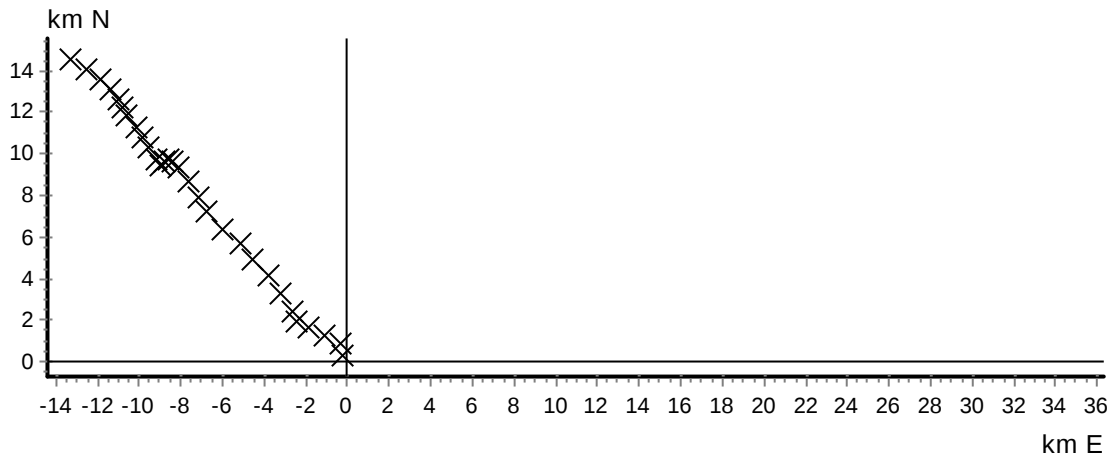
Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09

Neumann parameter: 0.851

Rest speed: 0.8 cm/s

Average speed: 0.9 cm/s

Rest direction: 317 deg.



CURRENT VELOCITY DISTRIBUTION DIAGRAM

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

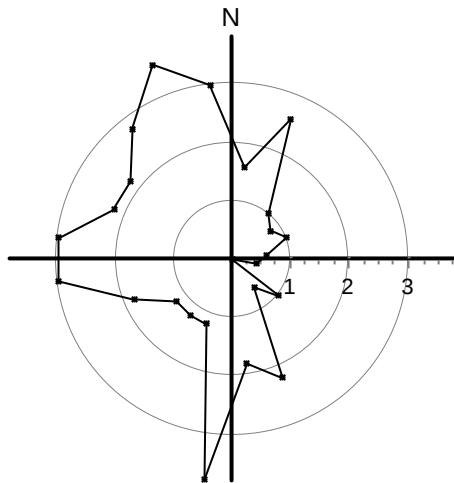
Series number: 4

Ref. number: 1173

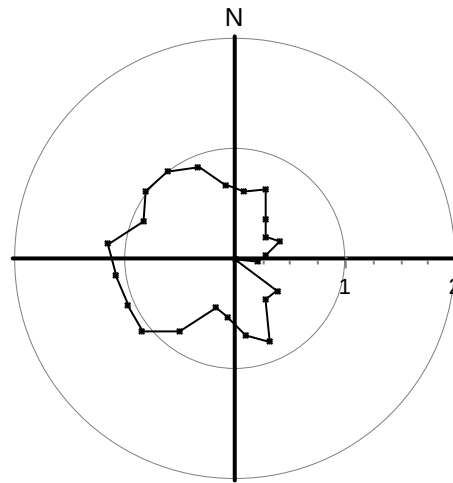
Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



Maximum velocity (cm/s)
per 15 deg sector



Mean velocity (cm/s)
per 15 deg sector

CURRENT VELOCITY DISTRIBUTION DIAGRAM

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

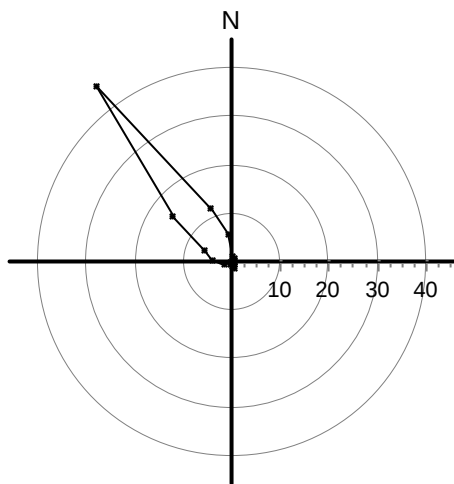
Series number: 4

Ref. number: 1173

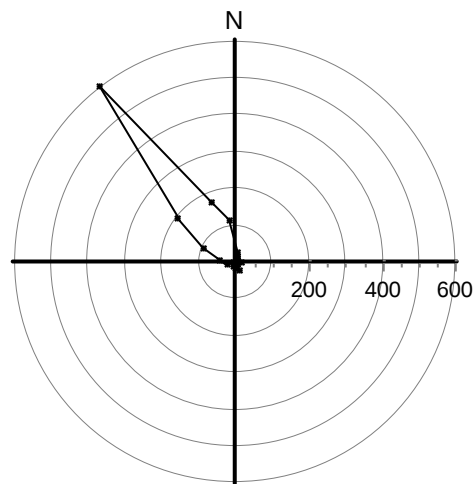
Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



Relative water flux (%)
per 15 deg sector



Number of measurements
per 15 deg sector

OXYGEN FLUX DISTRIBUTION DIAGRAM

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

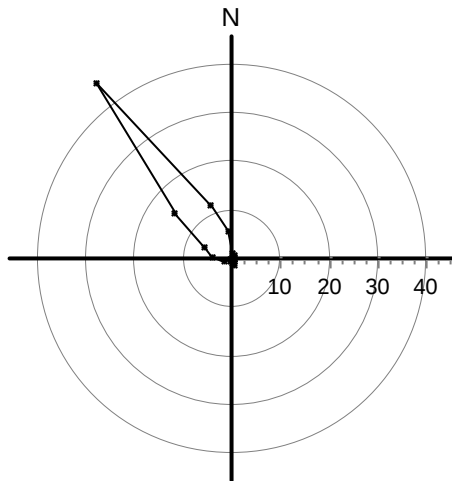
Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



Relative oxygen flux (%)
per 15 deg sector

STICK DIAGRAM

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

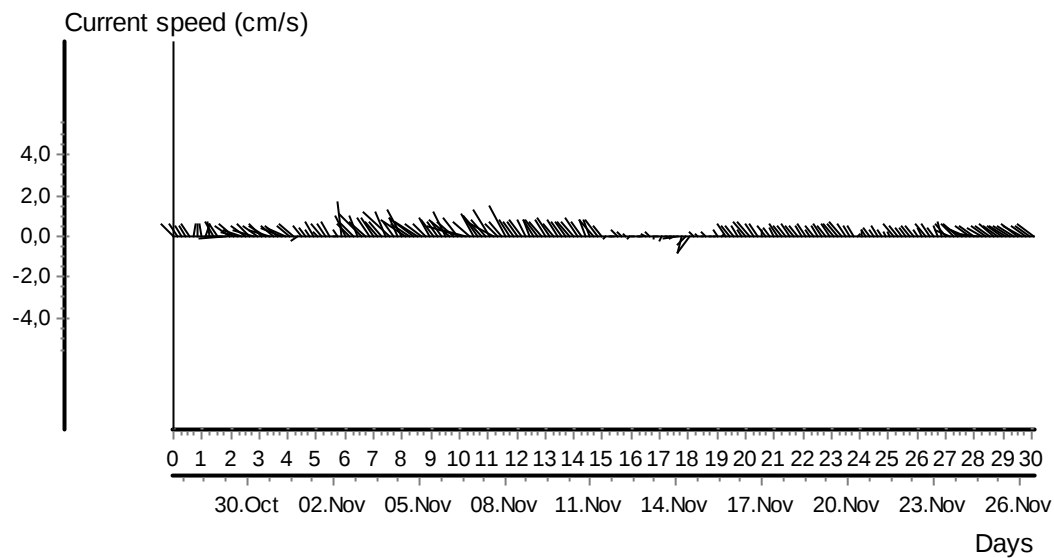
Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09



CURRENT SPEED / DIRECTION MATRIX

File name: Trollbukta37495196nov0967213791535619oT30M4,5Mnr16.SD6

Series number: 4

Ref. number: 1173

Number of measurements in data set: 1448

Interval time: 30 Minutes

Data displayed from: 10:02 - 27.Oct-09 To: 13:32 - 26.Nov-09

	Current speed groups														Total flow		Max curr	Tot. Ox. flux	
	1	3	4	5	6	8	10	15	25	50	75	100	Sum%	m ³ /m ²	%	g/m ²		%	
0	27	3	0	0	0	0	0	0	0	0	0	0	2.1	335	1.4	1.6	2734	1.4	
15	15	1	0	0	0	0	0	0	0	0	0	0	1.1	198	0.8	2.6	1615	0.8	
30	12	0	0	0	0	0	0	0	0	0	0	0	0.8	97	0.4	1.0	783	0.4	
45	10	0	0	0	0	0	0	0	0	0	0	0	0.7	61	0.3	0.8	511	0.3	
60	6	0	0	0	0	0	0	0	0	0	0	0	0.4	47	0.2	1.0	389	0.2	
75	15	0	0	0	0	0	0	0	0	0	0	0	1.0	72	0.3	0.6	612	0.3	
90	8	0	0	0	0	0	0	0	0	0	0	0	0.6	29	0.1	0.4	227	0.1	
105	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0.0	0.0	0	0.0	
120	8	0	0	0	0	0	0	0	0	0	0	0	0.6	68	0.3	1.0	546	0.3	
135	10	0	0	0	0	0	0	0	0	0	0	0	0.7	83	0.4	0.6	722	0.4	
150	18	4	0	0	0	0	0	0	0	0	0	0	1.5	317	1.3	2.2	2769	1.4	
165	15	3	0	0	0	0	0	0	0	0	0	0	1.2	227	1.0	1.8	1929	1.0	
180	10	0	1	0	0	0	0	0	0	0	0	0	0.8	104	0.4	3.8	891	0.5	
195	11	2	0	0	0	0	0	0	0	0	0	0	0.9	108	0.5	1.2	963	0.5	
210	7	2	0	0	0	0	0	0	0	0	0	0	0.6	133	0.6	1.2	1114	0.6	
225	2	1	0	0	0	0	0	0	0	0	0	0	0.2	58	0.2	1.2	471	0.2	
240	5	1	0	0	0	0	0	0	0	0	0	0	0.4	115	0.5	1.8	952	0.5	
255	17	5	0	0	0	0	0	0	0	0	0	0	1.5	432	1.8	3.0	3583	1.8	
270	23	23	0	0	0	0	0	0	0	0	0	0	3.2	972	4.1	3.0	8134	4.1	
285	75	18	0	0	0	0	0	0	0	0	0	0	6.4	1523	6.4	2.2	12519	6.4	
300	154	44	0	0	0	0	0	0	0	0	0	0	13.7	3632	15.4	2.2	29991	15.3	
315	513	90	0	0	0	0	0	0	0	0	0	0	41.6	10836	45.8	2.8	89733	45.7	
330	146	28	1	0	0	0	0	0	0	0	0	0	12.1	2822	11.9	3.6	23707	12.1	
345	99	15	0	0	0	0	0	0	0	0	0	0	7.9	1379	5.8	3.0	11543	5.9	
Sum%	83.3	16.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		23648		3.8	196439		

STATISTICAL SUMMARY

	Total	East / west	North / south
Mean current speed (cm/s)	0,9	0,6	0,6
Variance (cm/s) ²	0,166	0,123	0,121
Standard deviation (cm/s)	0,408	0,351	0,348
Mean standard deviation	0,450	0,614	0,538
Maximum current velocity	3,8		
Minimum current velocity	0,0		
Significant max velocity	1,2		
Significant min velocity	0,5		