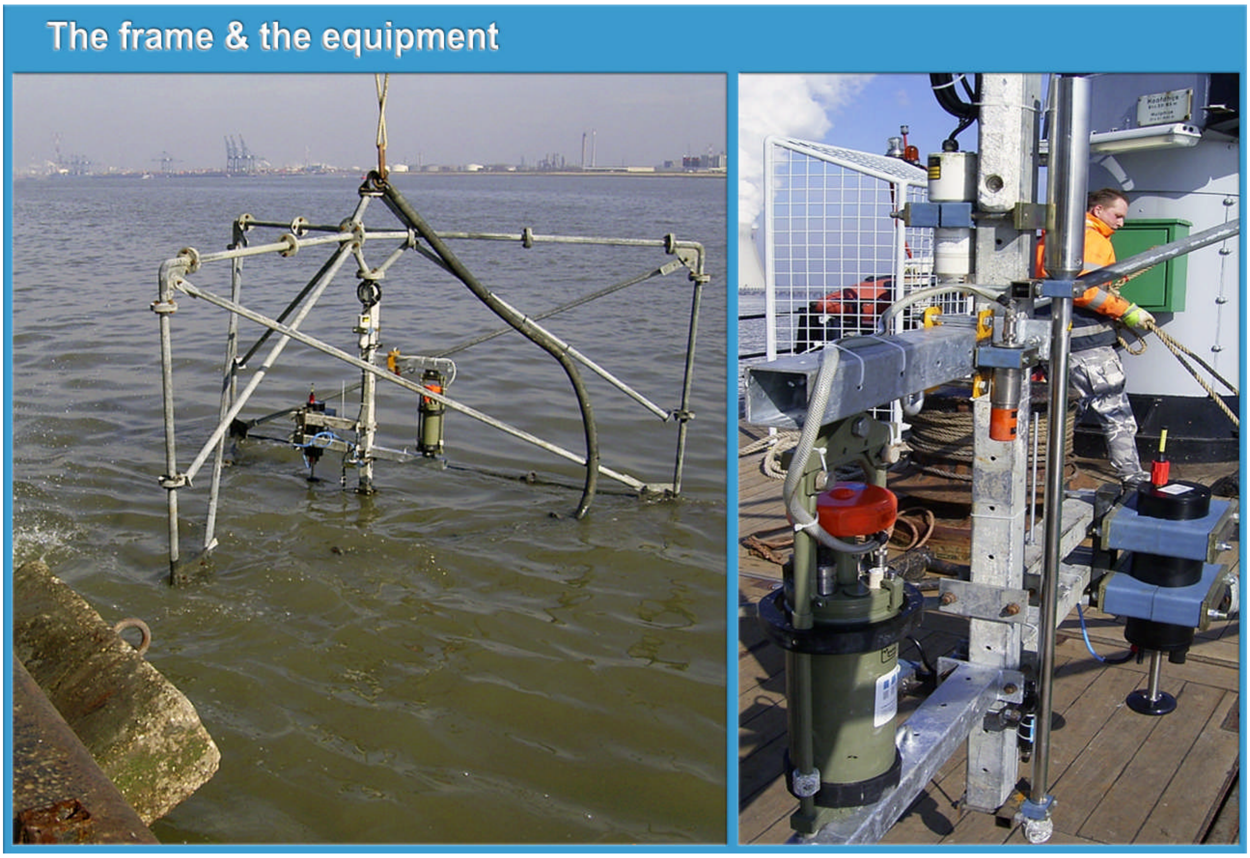
VLAAMSE OVERHEID

DEPARTEMENT MOBILITEIT EN OPENBARE WERKEN
WATERBOUWKUNDIG LABORATORIUM

Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing

Bestek 16EB/05/04



Deelrapport 2.18: Zout – en slibverdeling Deurganckdok & frame metingen februari – april 2008

Report 2.18: Salt – Silt distribution & frame measurements Deurganckdok February – April 2008

25 November 2008

I/RA/11283/07.094/MSA

IMDC i.s.m. wl | delft hydraulics & GEMS International

International Marine and Dredging Consultants (IMDC)
Wilrijkstraat 37-45 Bus 4 - 2140 Antwerpen – België
tel: +32.3.270.92.95 - fax: +32.3.235.67.11
E-mail : info@imdc.be

Document Control Sheet

Document Identification

Title:	Report 2.18 : Salt-Silt distribution & frame measurements Deurganckdok winter
Project:	Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing
Client	Waterbouwkundig Laboratorium
File reference	I/RA/11283/07.094/MSA
File Name	K:\PROJECTS\11\11283 - Opvolging aanslibbing dgd\10-Rap\DGD2\2_18_RA07094_Salt_silt_winter08\2_18_Ra07094_Salt_Silt_winter08_2.0.doc

Revisions

Version	**Date**	**Author**	**Description**
2.0	25/11/2008	YDK	Final report
1.0	25/09/2008	BOB/YDK	Concept

Distribution list

Name	**# ex.**	**Company/authorities**	**Position in reference to the project**
Joris Vanlede	7	Waterbouwkundig Laboratorium	client
Frederik Roose	3	Maritieme toegang	client

Approval

Version	**Date**	**Author**	**Project manager**	**Commissioner**
2.0	25/11/2008	YDK	MSA	MSA
1.0	25/09/2008	BOB/YDK	MSA	MSA

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

1.1. The assignment

This report is part of the set of reports describing the results of the long-term measurements conducted in Deurganckdok aiming at the monitoring and analysis of silt accretion. This measurement campaign is an extension of the study "Extension of the study about density currents in the Beneden Zeeschelde" as part of the Long Term Vision for the Scheldt estuary. It is complementary to the study 'Field measurements high-concentration benthic suspensions (HCBS 2)'.

The terms of reference for this study were prepared by the 'Departement Mobiliteit en Openbare Werken van de Vlaamse Overheid, Afdeling Waterbouwkundig Laboratorium' (16EB/05/04). The repetition of this study was awarded to International Marine and Dredging Consultants NV in association with WL|Delft Hydraulics and Gems International on 10/01/2006. The project term was prolonged with an extra year from April 2007 till March 2008, 'Opvolging aanslibbing Deurganckdok'.

Waterbouwkundig Laboratorium– Cel Hydrometrie Schelde provided data on discharge, tide, salinity and turbidity along the river Scheldt and provided survey vessels for the long term and through tide measurements. Afdeling Maritieme Toegang provided maintenance dredging data. Agentschap voor Maritieme Dienstverlening en Kust – Afdeling Kust and Port of Antwerp provided depth sounding measurements.

The execution of the study involves a twofold assignment:

- Part 1: Setting up a sediment balance of Deurganckdok covering a period of one year, i.e. 04/2007 – 03/2008
- Part 2: An analysis of the parameters contributing to siltation in Deurganckdok

1.2. Purpose of the study

The Lower Sea Scheldt (Beneden Zeeschelde) is the stretch of the Scheldt estuary between the Belgium-Dutch border and Rupelmonde, where the entrance channels to the Antwerp sea locks are located. The navigation channel has a sandy bed, whereas the shallower areas (intertidal areas, mud flats, salt marshes) consist of sandy clay or even pure mud sometimes. This part of the Scheldt is characterized by large horizontal salinity gradients and the presence of a turbidity maximum with depth-averaged concentrations ranging from 50 to 500 mg/l at grain sizes of 60 - 100 μm. The salinity gradients generate significant density currents between the river and the entrance channels to the locks, causing large siltation rates. It is to be expected that in the near future also the Deurganckdok will suffer from such large siltation rates, which may double the amount of dredging material to be dumped in the Lower Sea Scheldt.

Results from the study may be interpreted by comparison with results from the HCBS and HCBS2 studies covering the whole Lower Sea Scheldt. These studies included through-tide measurement campaigns in the vicinity of Deurganckdok and long term measurements of turbidity and salinity in and near Deurganckdok.

The first part of the study focuses on obtaining a sediment balance of Deurganckdok. Aside from natural sedimentation, the sediment balance is influenced by the maintenance and capital dredging works. This involves sediment influx from capital dredging works in the Deurganckdok, and internal relocation and removal of sediment by maintenance dredging works. To compute a sediment balance an inventory of bathymetric data (depth soundings), density measurements of the deposited material and detailed information of capital and maintenance dredging works will be made up.

The second part of the study is to gain insight in the mechanisms causing siltation in Deurganckdok, it is important to follow the evolution of the parameters involved, and this on a long and short term basis (long term & through-tide measurements). Previous research has shown the importance of water exchange at the entrance of Deurganckdok as essential for understanding sediment transport between the dock and the Scheldt river.

1.3. Overview of the Reports

Reports of the project 'Opvolging aanslibbing Deurganckdok' for the period April 2006 – March 2008 are summarized in Table 1-1.

Reports of the measurement campaign HCBS2 for which the winter and summer campaign has been carried out simultaneously with measurements in this report are listed in APPENDIX G.

Table 1-1: Overview of Deurganckdok Reports

Report	Description
Sediment Balance: Bathymetry surveys, Density measurements, Maintenance and construction dredging activities	
1.1	Sediment Balance: Three monthly report 1/4/2006 – 30/06/2006 (I/RA/11283/06.113/MSA)
1.2	Sediment Balance: Three monthly report 1/7/2006 – 30/09/2006 (I/RA/11283/06.114/MSA)
1.3	Sediment Balance: Three monthly report 1/10/2006 – 31/12/2006 (I/RA/11283/06.115/MSA)
1.4	Sediment Balance: Three monthly report 1/1/2007 – 31/03/2007 (I/RA/11283/06.116/MSA)
1.5	Annual Sediment Balance (I/RA/11283/06.117/MSA)
1.6	Sediment balance Bathymetry: 2005 – 3/2006 (I/RA/11283/06.118/MSA)
1.10	Sediment Balance: Three monthly report 1/4/2007 - 30/06/2007(I/RA/11283/07.081/MSA)
1.11	Sediment Balance: Two monthly report 1/7/2007 – 31/08/2007 (I/RA/11283/07.082/MSA)
1.12	Sediment Balance: Four monthly report 1/09/2007 – 31/12/2007 (I/RA/11283/07.083/MSA)
1.13	Sediment Balance: Three monthly report 1/1/2007 – 31/03/2007 (I/RA/11283/07.084/MSA)
1.14	Annual Sediment Balance (I/RA/11283/07.085/MSA)
Factors contributing to salt and sediment distribution in Deurganckdok: Salt-Silt (OBS3A) & Frame measurements, Through tide measurements (SiltProfiling & ADCP) & Calibrations	

Report	Description
2.1	Through tide measurement Siltprofiler 21/03/2006 Laure Marie (I/RA/11283/06.087/WGO)
2.2	Through tide measurement Siltprofiler 26/09/2006 Stream (I/RA/11283/06.068/MSA)
2.3	Through tide measurement Sediview average tide 22/03/2006 Veremans (I/RA/11283/06.110/BDC)
2.4	Through tide measurement Sediview average tide 27/09/2006 Parel 2 (I/RA/11283/06.119/MSA)
2.5	Through tide measurement Sediview average tide 24/10/2007 Parel 2 (I/RA/11283/06.120/MSA)
2.6	Salinity-Silt distribution & Frame Measurements Deurganckdok 13/3/2006 – 31/05/2006 (I/RA/11283/06.121/MSA)
2.7	Salinity-Silt distribution & Frame Measurements Deurganckdok 15/07/2006 – 31/10/2006 (I/RA/11283/06.122/MSA)
2.8	Salinity-Silt distribution & Frame Measurements Deurganckdok 15/01/2007 – 15/03/2007 (I/RA/11283/06.123/MSA)
2.9	Calibration stationary equipment autumn (I/RA/11283/07.095/MSA)
2.10	Through tide measurement Siltprofiler winter (I/RA/11283/07.086/MSA)
2.11	Through tide measurement Salinity Profiling winter (I/RA/11283/07.087/MSA)
2.12	Through tide measurement Sediview winter (I/RA/11283/07.088/MSA)
2.13	Through tide measurement Sediview winter (I/RA/11283/07.089/MSA)
2.14	Through tide measurement Sediview winter (I/RA/11283/07.090/MSA)
2.15	Through tide measurement Siltprofiler (to be scheduled) (I/RA/11283/07.091/MSA)
2.16	Salt-Silt distribution Deurganckdok summer (21/6/2007 – 30/07/2007) (I/RA/11283/07.092/MSA)
2.17	Salt-Silt distribution & Frame Measurements Deurganckdok autumn (17/09/2007 - 10/12/2007) (I/RA/11283/07.093/MSA)
2.18	Salt-Silt distribution & Frame Measurements Deurganckdok winter (18/02/2008 - 31/3/2008) (I/RA/11283/07.094/MSA)
2.20	Calibration stationary & mobile equipment winter (I/RA/11283/07.096/MSA)
Boundary Conditions: Upriver Discharge, Salt concentration Scheldt, Bathymetric evolution in access channels, dredging activities in Lower Sea Scheldt and access channels	
3.1	Boundary conditions: Three monthly report 1/1/2007 – 31/03/2007 (I/RA/11283/06.127/MSA)
3.10	Boundary conditions: Three monthly report 1/4/2007 – 30/06/2007 (I/RA/11283/07.097/MSA)
3.11	Boundary conditions: Three monthly report 1/7/2007 – 30/09/2007 (I/RA/11283/07.098/MSA)

Report	Description
3.12	Boundary conditions: Three monthly report 1/10/2007 – 31/12/2007 (I/RA/11283/07.099/MSA)
3.13	Boundary conditions: Three monthly report 1/1/2008 – 31/03/2008 (I/RA/11283/07.100/MSA)
3.14	Boundary conditions: Annual report (I/RA/11283/07.101/MSA)
Analysis	
4.1	Analysis of Siltation Processes and Factors (I/RA/11283/06.129/MSA)
4.10	Analysis of Siltation Processes and Factors (I/RA/11283/07.102/MSA)

1.3.1. Measurement actions

Following measurements have been carried out during the course of this project:

1. Monitoring upstream discharge in the Scheldt river
2. Monitoring Salt and sediment concentration in the Lower Sea Scheldt taken from on permanent data acquisition sites at Lillo, Oosterweel and up- and downstream of the Deurganckdok.
3. Long term measurement of salt distribution in Deurganckdok.
4. Long term measurement of sediment concentration in Deurganckdok
5. Monitoring near-bed processes in the central trench in the dock, near the entrance as well as near the landward end: near-bed turbidity, near-bed current velocity and bed elevation variations are measured from a fixed frame placed on the dock's bed.
6. Measurement of current, salt and sediment transport at the entrance of Deurganckdok for which ADCP backscatter intensity over a full cross section are calibrated with the Sediview procedure and vertical sediment and salt profiles are recorded with the SiltProfiler equipment
7. Through tide measurements of vertical sediment concentration profiles -including near bed highly concentrated suspensions- with the SiltProfiler equipment. Executed over a grid of points near the entrance of Deurganckdok.
8. Monitoring dredging activities at entrance channels towards the Kallo, Zandvliet and Berendrecht locks
9. Monitoring dredging and dumping activities in the Lower Sea Scheldt

In situ calibrations were conducted on several dates to calibrate all turbidity and conductivity sensors (IMDC, 2006a & IMDC, 2007a).

1.4. Structure of this report

This report is the factual data report for two measurement campaigns:

- Long term salt/silt measurements in the Deurganckdok: 21 February – 28 April 2008
- Near bed frame measurements in the vicinity of Deurganckdok from 20 February until 9 April 2008.

The first chapter comprises an introduction. The second chapter describes the project. Chapter 3 describes the measurement campaign, equipment and the course of the actual measurements. The measurement results and processed data are presented in Chapter 4, whereas chapter 5 gives a preliminary analysis of the data.

2. SEDIMENTATION IN DEURGANCKDOK

2.1. Project Area: Deurganckdok

Deurganckdok is a tidal dock situated at the left bank in the Lower Sea Scheldt, between Liefkenshoek and Doel. Deurganckdok has the following characteristics:

1. the dock has a total length of 2750 m and is 450 m wide at the Scheldt end and 400 m wide at the inward end of the dock
2. the bottom of Deurganckdok is provided at a depth of –17m TAW in the transition zones between the quay walls and the central trench and of –19m TAW in the central trench.
3. the quay walls reach up to +9m TAW

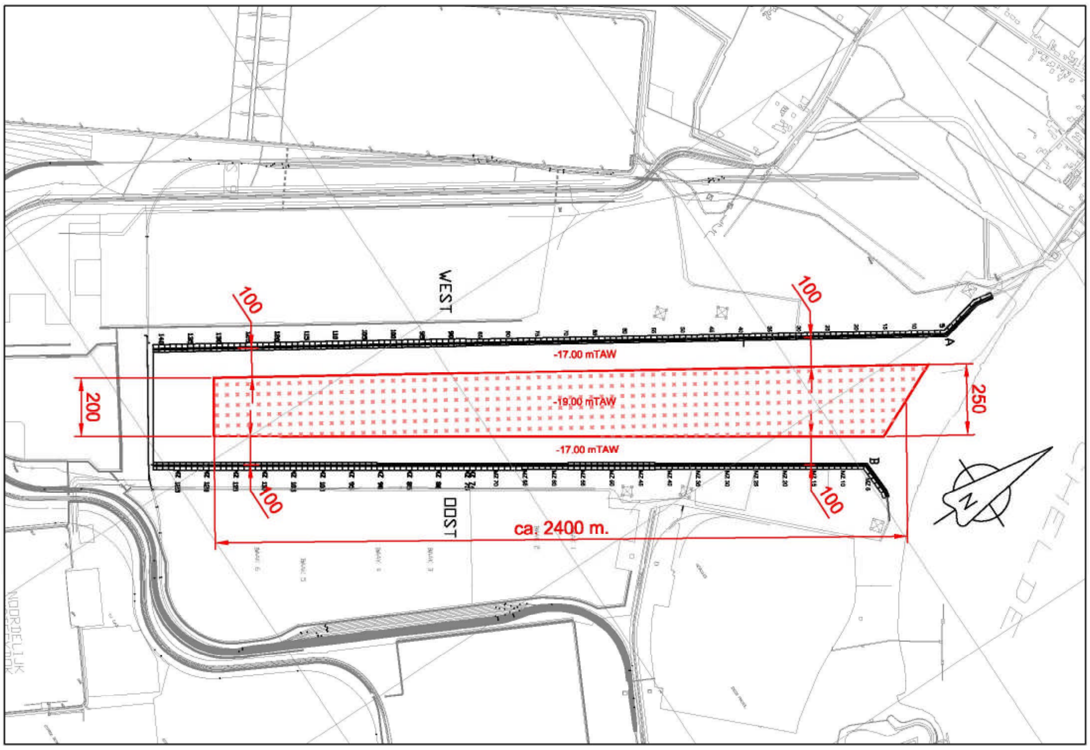


Figure 2-1: Overview of Deurganckdok

The dredging of the dock is performed in 3 phases. On 18 February 2005 the dike between the Scheldt and the Deurganckdok was breached. On 6 July 2005 Deurganckdok was officially opened. The second dredging phase was finalized a few weeks later. The first terminal operations have started since. In February 2007, the third dredging phase started and is finalised by February 2008.

2.2. Overview of the studied parameters

The first part of the study aims at determining a sediment balance of Deurganckdok and the net influx of sediment. The sediment balance comprises a number of sediment transport modes:

deposition, influx from capital dredging works, internal replacement and removal of sediments due to maintenance dredging (Figure 2-2).

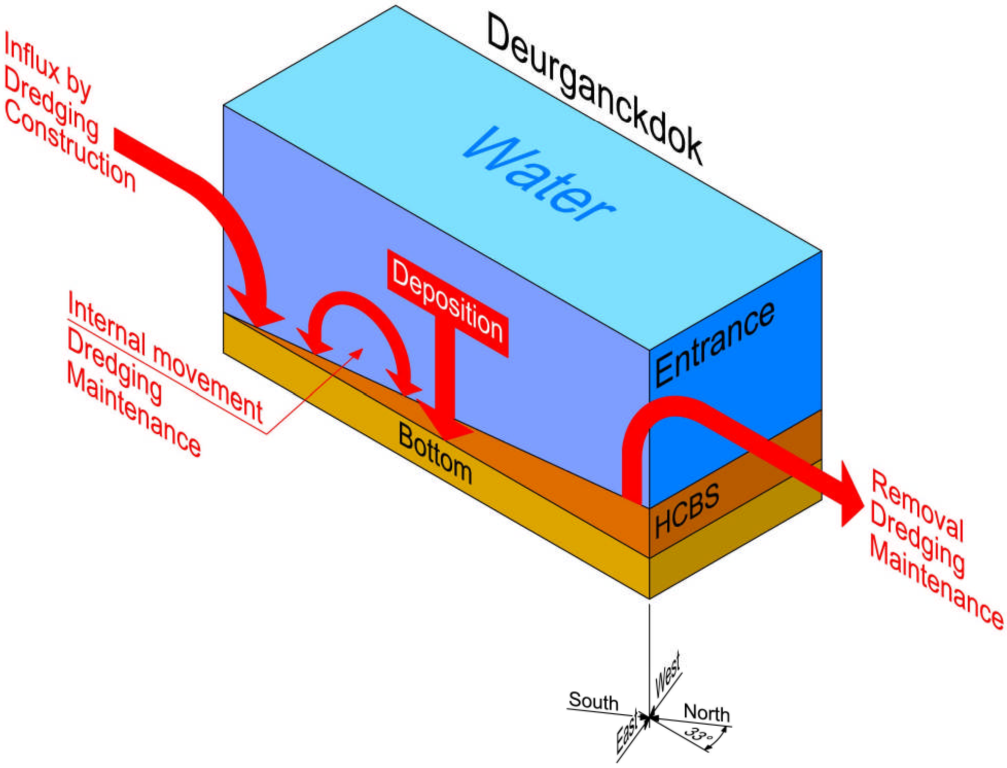


Figure 2-2: Elements of the sediment balance

A net deposition can be calculated from a comparison with a chosen initial condition t_0 (Figure 2-3). The mass of deposited sediment is determined from the integration of bed density profiles recorded at grid points covering the dock. Subtracting bed sediment mass at t_0 leads to the change in mass of sediments present in the dock (mass growth). Adding cumulated dry matter mass of dredged material removed since t_0 and subtracting any sediment influx due to capital dredging works leads to the total cumulated mass entered from the Scheldt river since t_0.

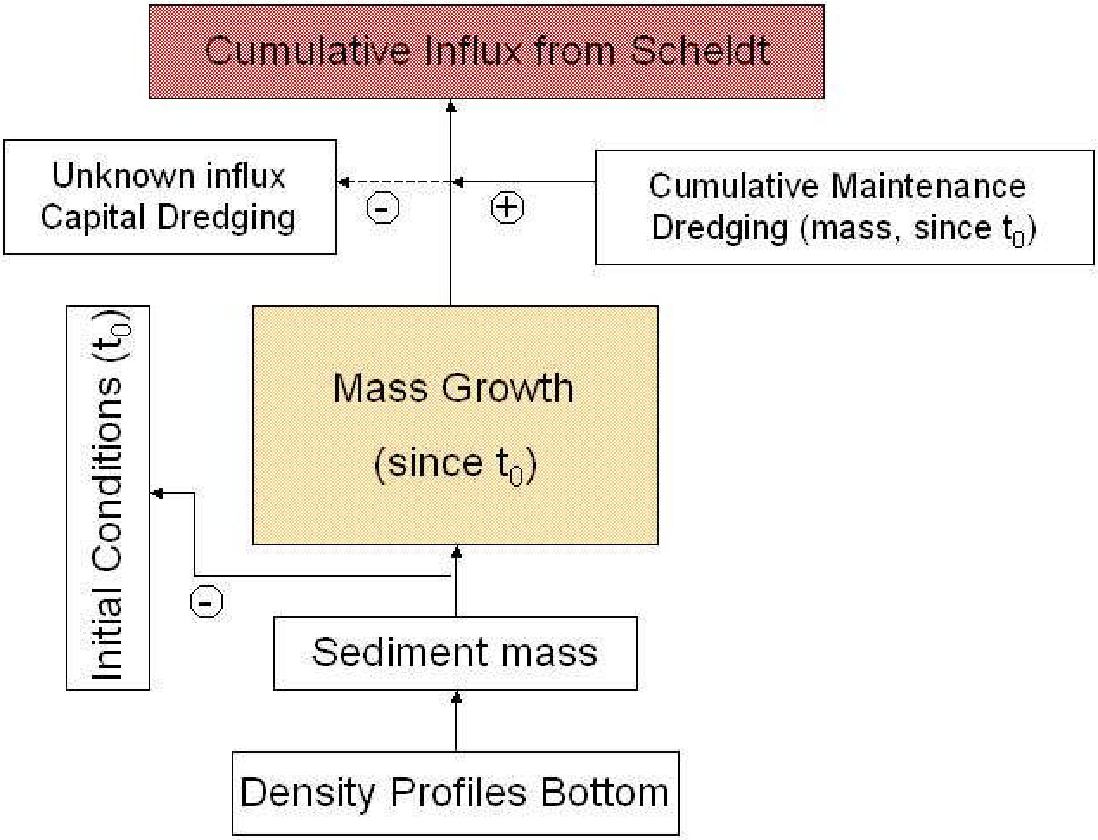


Figure 2-3: Determining a sediment balance

The main purpose of the second part of the study is to gain insight in the mechanisms causing siltation in Deurganckdok. The following mechanisms will be aimed at in this part of the study:

- Tidal prism, i.e. the extra volume in a water body due to high tide
- Vortex patterns due to passing tidal current
- Density currents due to salt gradient between the Scheldt river and the dock
- Density currents due to highly concentrated benthic suspensions

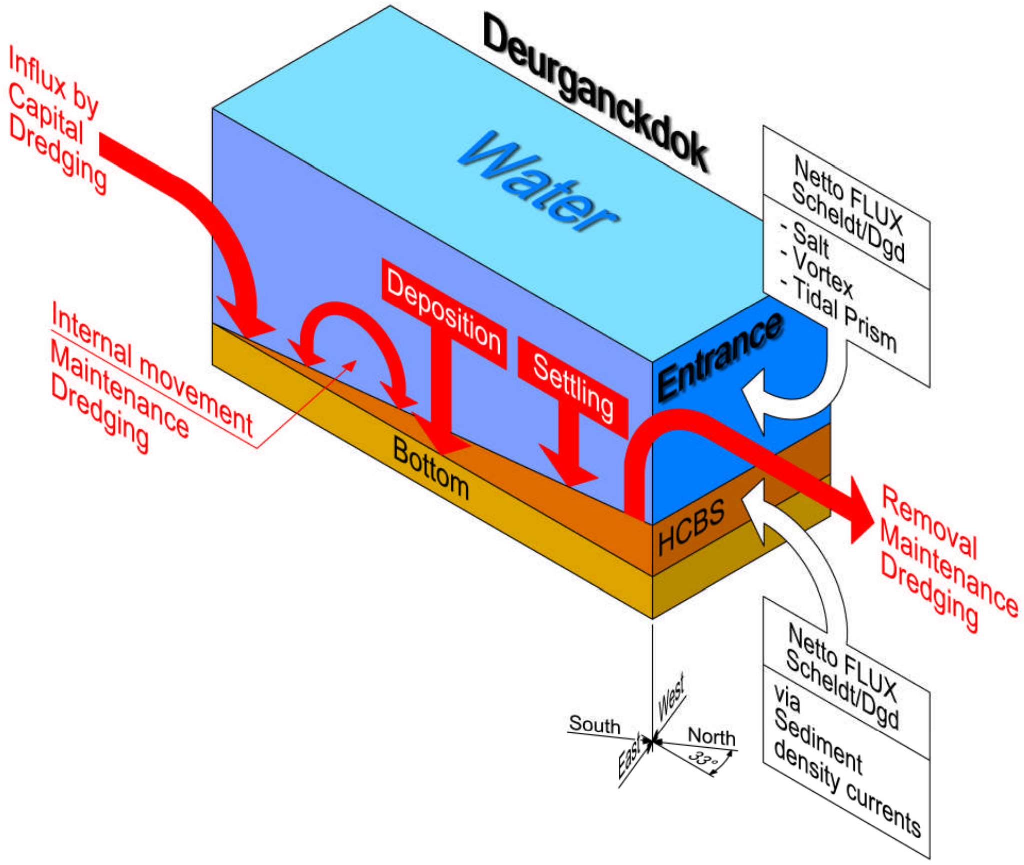


Figure 2-4: Transport mechanisms

These aspects of hydrodynamics and sediment transport have been landmark in determining the parameters to be measured during the project. Measurements will be focused on three types of time scales: one tidal cycle, one neap-spring cycle and seasonal variation within one year.

Following data are being collected to understand these mechanisms:

- Monitoring upstream discharge in the Scheldt river.
- Monitoring Salt and sediment concentration in the Lower Sea Scheldt at permanent measurement locations at Oosterweel, up- and downstream of the Deurganckdok.
- Long term measurement of salt and suspended sediment distribution in Deurganckdok.
- Monitoring near-bed processes (current velocity, turbidity, and bed elevation variations) in the central trench in the dock, near the entrance as well as near the current deflecting wall location.
- Dynamic measurements of current, salt and sediment transport at the entrance of Deurganckdok.
- Through tide measurements of vertical sediment concentration profiles -including near bed high concentrated benthic suspensions.
- Monitoring dredging activities at entrance channels towards the Kallo, Zandvliet and Berendrecht locks as well as dredging and dumping activities in the Lower Sea Scheldt.
- In situ calibrations were conducted on several dates to calibrate all turbidity and conductivity sensors.

2.3. Measurement objectives

2.3.1. Objective of the near bed continuous monitoring

The purpose of the deployment of the anchored measuring frame/rig is to monitor the detailed vertical structure of flow and suspended sediment concentration within a few decimeters from the bed. This frame measures at one location only, by definition, and is difficult to reposition. Therefore, it should be positioned at a location where near-bed HCBS are most likely, and with a vertical resolution of the instruments that matches the concentration gradients in suspension. The vertical flow and sediment structure assessed with the preliminary 3D mud transport model allows for an optimization of the layout of the anchored measuring frame with respect to the instrumentation.

2.3.2. Objective of the long term measurements near the quay walls

The goal of the survey is to monitor the spatial distribution of salt and silt in the Deurganckdok. Longitudinal, vertical and horizontal (from north to south quay) distribution is surveyed in this set up. The entrance of the dock is a favoured location because of the dynamics caused by the river-dock interaction. One deeper location in the dock is necessary to sample the longitudinal distribution of salt and silt along the dock.

3. THE MEASUREMENT CAMPAIGNS

3.1. Description of the long term suspended sediment-salinity measurements 21/02/2008 – 28/04/2008

3.1.1. Measurement location

During the period from 21/02/2008 till 28/04/2008, 6 multi parameter probes were placed on 3 fixed locations hanging from the quay wall in Deurganckdok at fixed depths.

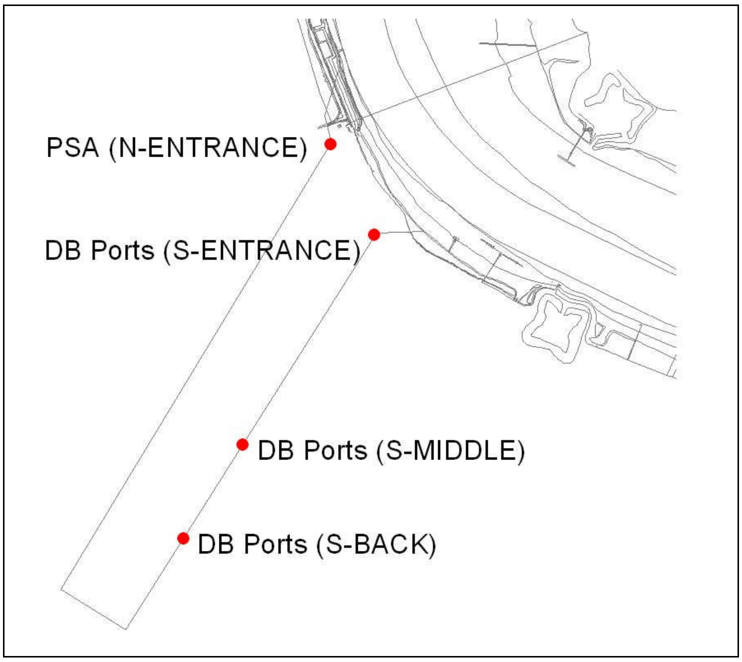


Figure 3-1: Map of the measurement locations for long term salt-silt measurements in Deurganckdok

Table 3-1: Measurement locations in UTM ED50

Location	***EASTING***	***NORTHING***	***Boulder***	***Operator***
DB Ports (S-back)	587760	5682449	Moot 101	DB Ports
DB Ports (S-middle)	588074	5682942	Moot 72	DB Ports
DB Ports (S-entrance)	588767	5684045	Moot 7	DB Ports
PSA (N-entrance)	588536	5684523	Moot 5 (boulder 286)	PSA HNN

Table 3-2: Deployment depths of all instruments for the measurement period

Salt Silt Measurements Deurganckdok				
Location	*Easting (UTM ED 50)*	*Northing (UTM ED 50)*	*Depth of instrument [m TAW]*	*Period*
S-back top	587760	5682449	-2.47	28/02/2008 – 28/04/2008
S-back bottom	587760	5682449	-12.37	28/02/2008 – 28/04/2008
S-middle top	588074	5682942	-2.34	21/02/2008 – 28/04/2008
S-middle bottom	588074	5682942	-12.23	5/03/2008 – 28/04/2008
S-entrance top	588767	5684045	-2.18	21/02/2008 – 28/04/2008
S-entrance bottom	588767	5684045	-13.51	21/02/2008 – 28/04/2008
N-entrance top	588536	5684523	-2.34	21/02/2008 – 28/04/2008
N-entrance bottom	588536	5684523	-12.26	21/02/2008 – 28/04/2008

3.1.2. The equipment

3.1.2.1. Quay Frame set up

A simple rectangular measurement frame was conceived for suspending the instruments from the quay wall down into the Deurganckdok. Two frames rest against the dock wall and are suspended by stainless steel cables hanging from a rawlplug, secured on top of the quay wall.

Using a guiding system and a winch, it was possible to recover these instruments without the help of a survey vessel.

Figure 3-2: Guiding system and chain suspended from the rawlplug (left), frame with RCM-9 and steel cables (right)

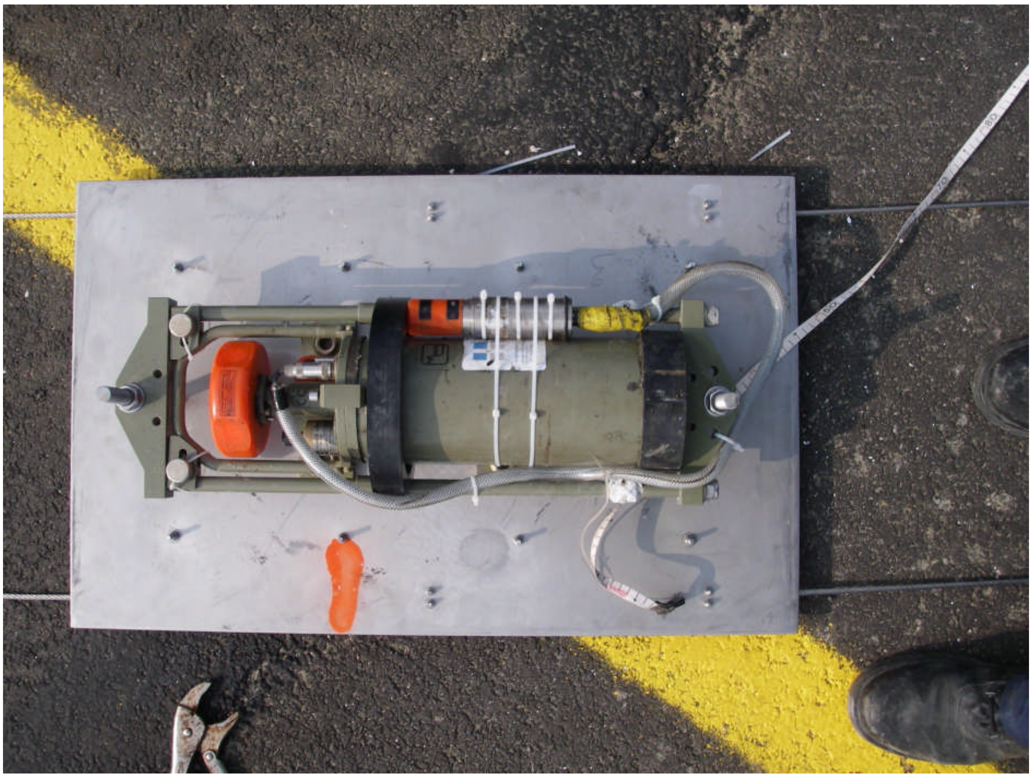


Figure 3-3: frame design

3.1.2.2. Aanderaa RCM-9

The Aanderaa Recording Current Meter RCM-9 MkII is a multi-parameter instrument that consists of a CTD probe, Doppler Current Sensors and a Turbidity Sensor. It was set up to measure an average of a number of pings spread over an interval of 10 minutes for conductivity, depth, temperature and turbidity.

IMDC (2006a) gives more technical details on the RCM-9.

3.1.2.3. D& A Instruments OBS 3A

The D & A Instruments OBS 3A is a multiparameter instruments that consists of a CTD probe and a turbidity sensor. The instrument was set up to measure every ten minutes for a minute at a frequency of 1 Hz and output the average.

IMDC (2006a) gives more technical details on the OBS 3A.

3.1.3. Course of the measurements

After deployment on 21/02/2008, the instruments were recovered, cleaned and read out every two weeks. Table 3-3 lists the measurement periods and possible issues. Only OBS 3A instruments were deployed during this measurement period

Table 3-3: Overview of measurement periods and data gaps

S-BACK (DB Ports): -12.4 m TAW			
Period	*No data*	*Faulty data*	*Comments*
21 Feb 2008			Start measurement period
21 Feb – 17 Mar 2008		X	Faulty SSC data (buried sensor)
17-18, 30 Mar 2008	X		Gaps in data
28 Apr 2008			End measurement period
S-BACK (DB Ports): -2.5 m TAW			
Period	*No data*	*Faulty data*	*Comments*
21 Feb 2008			Start measurement period
21 Feb – 18 Mar 2008		X	Faulty data (temperature was too low)
17 Mar – 28 Apr 2008		X	Faulty data
28 Apr 2008			End measurement period
S-MIDDLE (DB Ports): -12.23 m TAW			
Period	*No data*	*Faulty data*	*Comments*
21 Feb 2008			Start measurement period
21 Feb – 5 Mar 2008 7 – 9, 11 – 12, 30 Mar 2008	X		Gaps in data (buried sensor)
28 Apr 2008			End measurement period
S-MIDDLE (DB Ports): -2.34 m TAW			
Period	*No data*	*Faulty data*	*Comments*
21 Feb 2008			Start measurement period
10, 30 Mar 2008	X		Gaps in data
28 Apr 2008			End measurement period
S-ENTRANCE (DB Ports): -13.51 m TAW			
Period	*No data*	*Faulty data*	*Comments*
21 Feb 2008			Start measurement period
30 Mar 2008	X		Gaps in data

28 Apr 2008			End measurement period
S-ENTRANCE (DB Ports): -2.18 m TAW			
Period	*No data*	*Faulty data*	*Comments*
21 Feb 2008			Start measurement period
21 Feb – 9 Apr 2008 8 – 9 Apr 2008	X	 X	Gaps in Salinity data Faulty SSC and temperature data
28 Apr 2008			End measurement period
N-ENTRANCE (PSA HNN): -12.26 m TAW			
Period	*No data*	*Faulty data*	*Comments*
21 Feb 2008			Start measurement period
14 Mar, 27 Apr 2007	X		Gaps in data
28 Apr 2008			End measurement period
N-ENTRANCE (PSA HNN): -2.34 m TAW			
Period	*No data*	*Faulty data*	*Comments*
21 Feb 2008			Start measurement period
30 Mar 2008	X		Gaps in data
28 Apr 2008			End measurement period

3.2. Description of the near bed continuous monitoring 20/02/2008 – 09/04/2008

3.2.1. Measurement location

During the period 20/02/2008 till 09/04/2008, two frames were placed in the vicinity of the entrance of Deurganckdok. The first one was placed at the upstream edge of the Deurganckdock, on the sill. The depth at the location of the frame is –14m TAW roughly. Placement of the frame occurred on the 27th of February at 14h00; the removal of the frame happened on the 9th of April at 10h50. The second frame was placed at the downstream edge of the dock. This location is situated nearby the future CDW (Current Deflecting Wall) location, near the left bank of the Scheldt. The frame was placed at a depth of –15m TAW roughly. The placement of this frame occurred on the 20th of February at 15h20, the removal of the frame happened on the 2nd of April at 10h50. To signal the presence of the frames, buoys were placed near the frames.

Spring tides occurred around the 11th of March 2008, the 21st of March 2008 and the 8th of April 2008. Time is always given in MET.

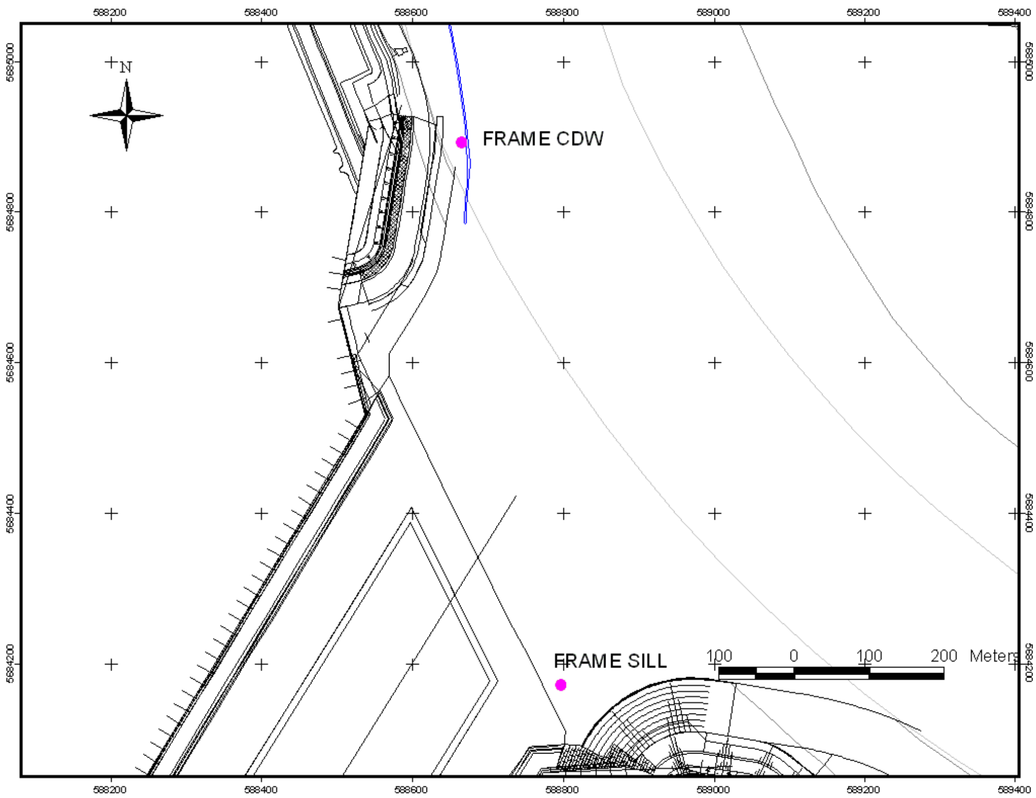


Figure 3-4: Map of the measurement location

3.2.2. The equipment

3.2.2.1. The frames

Two new frames were developed for autonomous measurement of sediment transport phenomena. The frames are equipped with an ARGUS ASM-IV high-resolution turbidity array, an ALTUS precision echosounder and two multiprobes: a Valeport MIDAS and an Aanderaa RCM-9. On the CDW-frame during the first measurement period an Aanderaa RCM-Seaguard replaced the Aanderaa RCM-9 as a test of this new instrument. With these different instruments, proper instrumentation in the near bed zone was ensured. Data about the orientation, pitch and roll of the frames are obtained from a magnetic compass (orientation, Valeport MIDAS) and a tilt sensor (pitch and roll, ARGUS ASM-IV / Aanderaa RCM-9).

The set-up of the CDW frame is as follows:

- The RCM 9 was installed at 0.98m above the bottom, with the following sensors: a CTD probe, Doppler Current Sensors and a Turbidity Sensor. The RCM Seaguard has another OBS3+ sensor.
- The Valeport Midas was installed at 0.16m above the bottom, with the following sensors: a CTD- probe, an Electromagnetic Current Meter (ECM) and an OBS3+ turbidity sensor
- The ALTUS was installed at 0.41m above the bottom
- The ARGUS ASM-IV was installed in such a way that the lowest turbidity sensor was placed at 0.30m above the bottom

Since the Sill frame penetrated considerably during previous measurements, the supporting surface was enlarged. Further set up of the Sill frame is as follows:

- The RCM 9 was installed at 0.83m above the bottom, with the following sensors: a CTD probe, Doppler Current Sensors and a Turbidity Sensor
- The Valeport Midas was installed at 0.1m above the bottom, with the following sensors: a CTD-probe, an electromagnetic Current Meter (ECM) and an OBS3+ turbidity sensor
- The ALTUS was installed at 0.49m above the bottom
- The ARGUS ASM-IV was installed in such a way that the lowest turbidity sensor was placed at 0.33m above the bottom

This is anticipated to allow a proper measurement of the lower current profile and give additional information on the suspended sediment concentration structure. Figure 3-5 shows the CDW frame with all the sensors and Figure 3-6 the Sill frame where the Seaguard is shown.

Each sensor has its own data logger and power supply from internal batteries.

The frames were designed for easy transport and installation. The sensor positions, in particular sensor height above the bed, can be adjusted to specific requirements over a wide range. The structure of the frames consists of a tripod with a separation of about 4 metres between the legs. The height is about 2.3 m. Several girders give the frames the required sturdiness. The sensors can be clamped to adjustable supports. Hoisting support facilities are attached to the top of the frames.

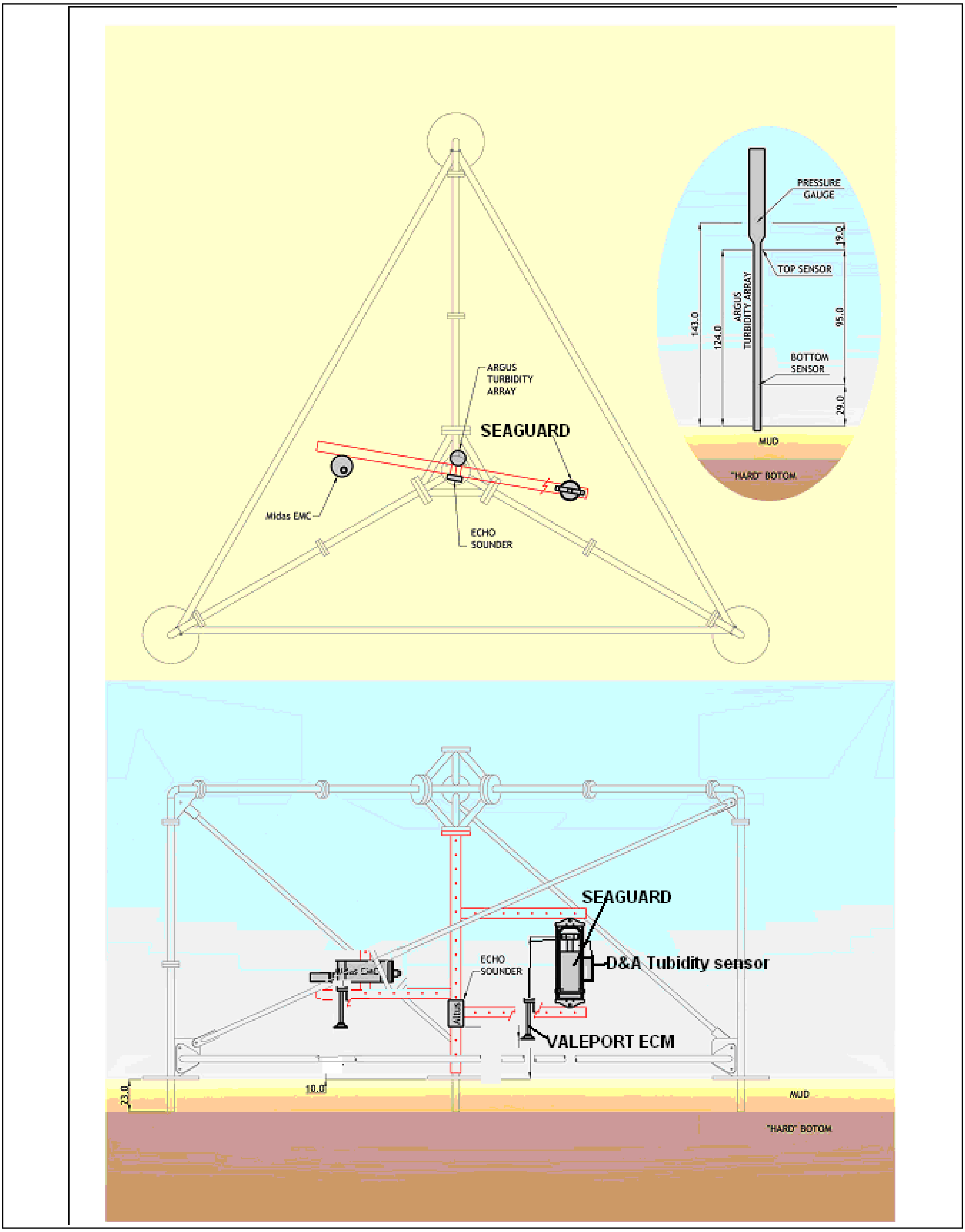


Figure 3-5: Sketch of the CDW frame with all the sensors (dimensions in [cm])

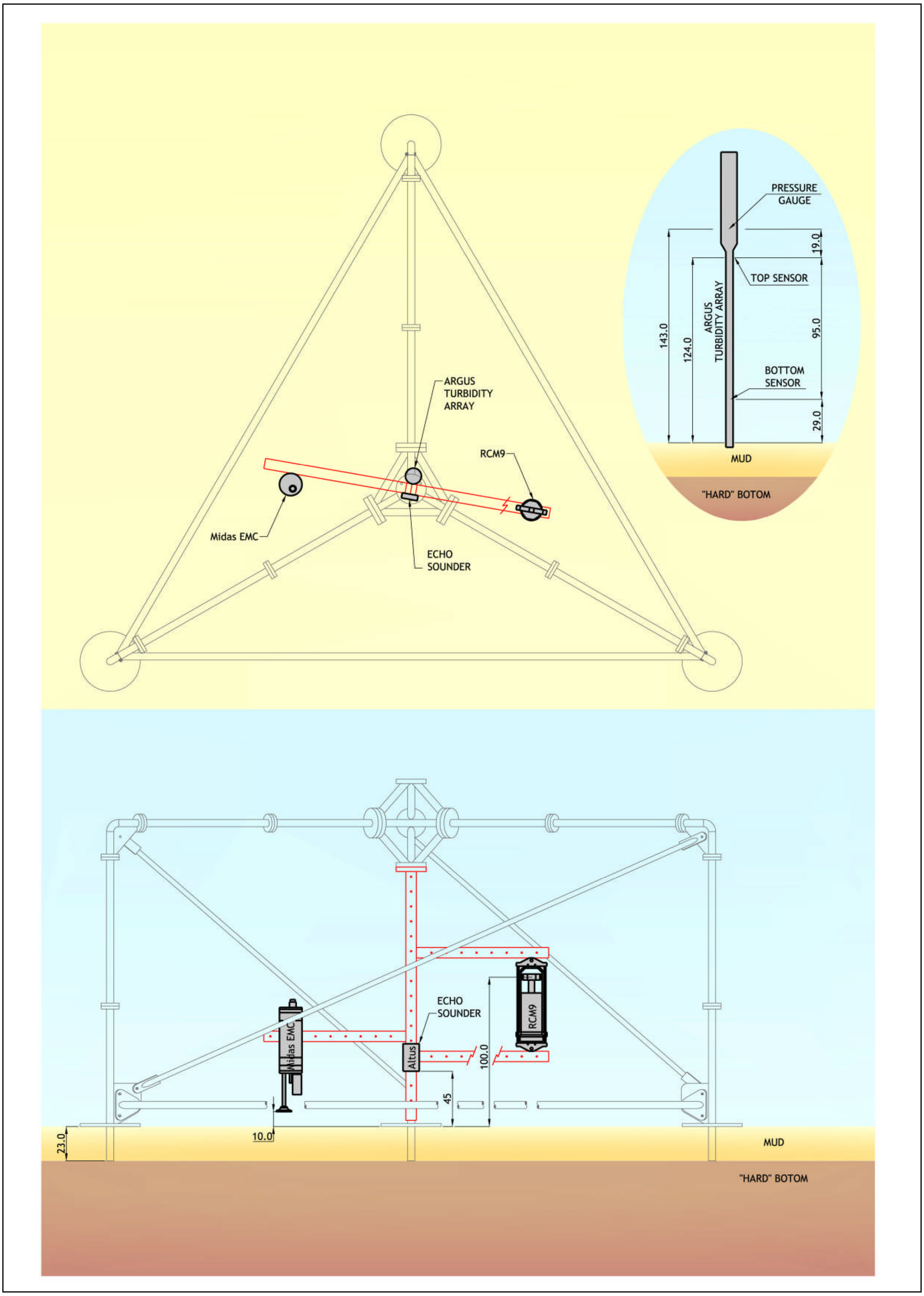


Figure 3-6: S ketch of the Sill frame with all the sensors (dimensions in [cm])

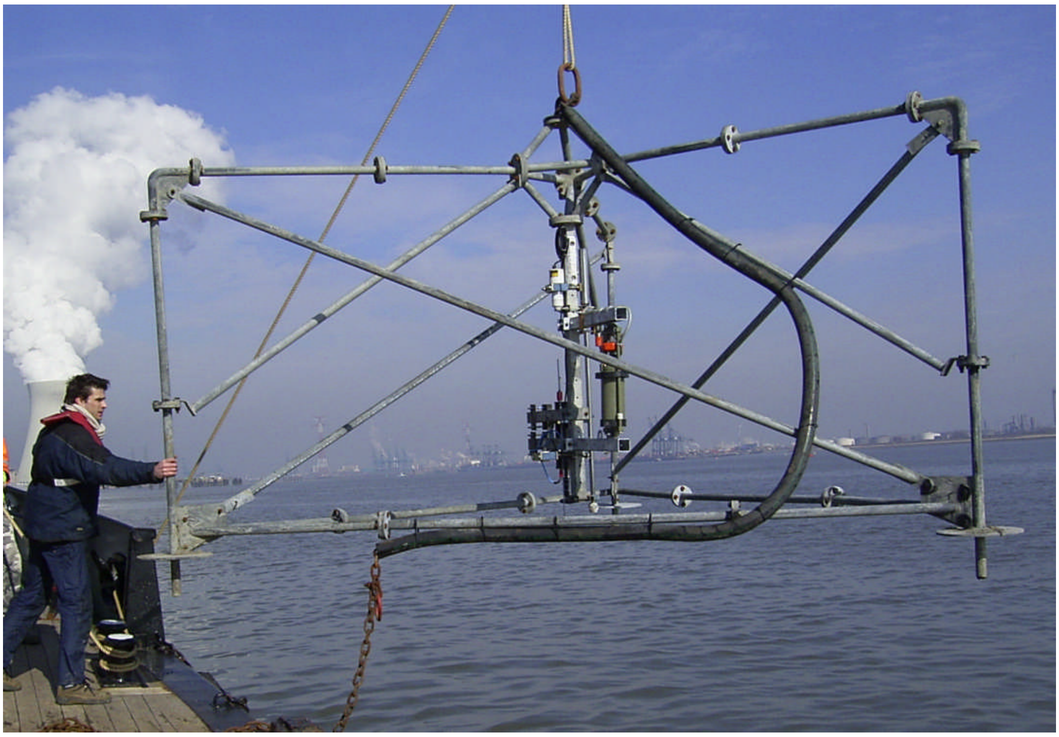


Figure 3-7: Installation of the CDW frame

3.2.2.2. ARGUS ASM-IV

The ARGUS ASM-IV was used to detect the vertical structure of the suspended sediment concentration in the zone of 1 meter above the bed.

The ARGUS ASM-IV was developed for high resolution measuring of accretion and erosion of the riverbed. (ARGUS UMWELT-MEATECHNIK, 2005). The instrument operates with backscatter infrared laser sensors embedded in a stainless steel rod. The 96 sensors are placed on an active board at a distance of 0.01m of each other. There are three additional sensors: an inclinometer, a pressure gauge and a on board temperature sensor.

A battery powered central unit in the head of the instrument controls activation and power supply of the sensors as well as the transmission of the signals. The sealed in unit consists of a microprocessor, a data memory, the additional sensors and the energy supply.

The ARGUS ASM-IV has a sampling interval of 5 seconds and every cycle there are 20 samples taken. The break range between each burst (i.e. pause) is set at 500 seconds. This means that the total cycle time is 600 seconds.

The measurement range of the ARGUS ASM-IV is from 0 to 5000mg/l.

More details on the ARGUS ASM-IV can be found in the February Survey Reports of the HCBS 1 measurement campaign (IMDC, 2005h)

Figure 3-8: ARGUS ASM-IV

3.2.2.3. ALTUS

The ALTUS is specially designed for mainly muddy environments to precisely quantify changes of bottom elevation. It is a high frequency acoustic submersible recording altimeter and is based on a 2 MHz echo sounder which transducer is located at a given distance from the bed. The echosounder was attached to the frame such that (looking downward) it can measure bottom variations with an accuracy of about 2mm. A separate container includes altimeter electronics, data logger, pressure sensor and energy.

The logging cadence was 600 seconds.

The technical details on the Altus are described in the February Survey Reports of the HCBS 1 measurement campaign (IMDC, 2005h).

3.2.2.4. Valeport MIDAS OBS3+

The Valeport MIDAS is a multiparameter instrument that has a CTD- probe, an electromagnetic Current Meter (EMC) and an OBS3+ turbidity sensor with a range of 0-1500 FTU. The instrument was set to measure in cycles of 10 minutes, divided into 100 samples at a rate of 1Hz and a pause of 500 seconds.

The principle of the electromagnetic current meter enables velocity measurements at very large suspended sediment concentrations (in comparison to measurement techniques based on the Doppler principle). Further technical details on the Valeport MIDAS OBS3+ are described in the Report 6.1 Winter calibration (IMDC, 2006a) of the HCBS2 Measurement campaign.

Figure 3-9: Valeport MIDAS EMC and OBS3+

3.2.2.5. Aanderaa RCM-9

There can be referred to § 3.1.2.2. All sensors (temperature, pressure, conductivity, turbidity, tilting) except the Doppler Current Sensor were set to record once every 10 minutes. The Doppler Current Sensor sent 600 pings during every 10 minute-interval and calculated the average value for current speed and direction over this interval. Data storage units in the instruments logged all the measured values.

3.2.2.6. Aanderaa RCM-Seaguard

Aanderaa has developed a new version of the RCM-9. The advantage of this RCM-Seaguard is the ability to connect with other analogue sensors as the OBS, Valeport et al. As a testcase a Seaguard has been installed on the CDW-frame during the first measuring period of 20 February until 13 March.

3.2.3. Course of the measurements

At the entrance of Deurganckdok the two frames were set to measure, the CDW frame from the 20^{th} of February until the 2^{nd} of April 2008 and the Sill frame from the 27^{th} of February until the 9^{th} of April 2008. Every week one of the two frames was recovered, the data of all equipment was downloaded and batteries were replaced, whereupon the frame was deployed again.

The location at the sill of Deurganckdok is known as a very silty area. Measures were taken to prevent the frame from penetrating into the bottom, but the possibility of slight penetration still exists. On 26/03 the bottom plates, which prevented the frame to penetrate in the bottom, were unscrewed because they had splintered.

Just before deployment the Argus failed to start measuring so it was removed from the frame and sent to the manufacturer. Three weeks later after removal of the frame, data of all equipment (except Argus) was tested. The direction sensor on the Valeport did not work, so no comparison with the RCM9 could be made. After the second recovery the Valeport could not communicate with the pc, so it was not possible to retrieve data. For the last sample period there has been decided to replug the Valeport for a better connection. The later attached Argus only showed a few hours of data. After a second attempt it was even impossible to retrieve data. There has been decided to get the Argus off the frame and test at the office. During the last period (26/03 – 09/04) it was still impossible to get Valeport data, The Argus was not on the frame and the Altus echosounder gave erroneous data. The Aanderaa RCM9 and the Altus echosounder (except for the last period), both with a measurement frequency of 10 minutes, worked properly.

Concerning the frame at the downstream edge of Deurganckdok (CDW), the instruments measured with the same tuning as the Sill frame. The Aanderaa RCM9 and the Aanderaa Seahorse worked properly. A bad connection of the Valeport occurred after the first deployment (20/02). The Valeport only displayed 3 days of measurement so besides new batteres the interval has changed. One measurement cycle of the Valeport still took 10 minutes but 10 instead of 30 samples were taken at a rate of 1 sample per second and a pause of 590 s instead of 570 s. At the final recovery (02/04), only the Aanderaa RCM9 returned data; the other instruments failed.

An overview of the measurement locations is given in Table 3-4, while a chronological overview of measured data with an explanation can be found in Table 3-5.

Table 3-4: Overview of the measurement locations (UTM50) and periods

Near bed continuous monitoring			
Location	*Easting (UTM ED 50)*	*Northing (UTM ED 50)*	*Period*
Deurganckdok CDW	588573	5684677	20/02/2008 – 02/04/2008
Deurganckdok Sill	588697	5683941	27/02/2008 – 09/04/2008

Table 3-5: Chronological overview of missing and faulty data

Deurganckdok CDW			
Period	***No data***	***Faulty data***	***Comment***
20/02/2008			Deployment
20/02/2008 – 13/03/2008	MIDAS OBS 3+		Bad connection
13/03/2008			Recovery/Deployment
13/03/2008 – 20/03/2008	ALTUS		Instrument failure
13/03/2008 – 15/03/2008		MIDAS OBS 3+	No current data
15/03/2008 – 20/03/2008	MIDAS OBS 3+		No battery
20/03/2008			Recovery/Deployment
20/03/2008 – 02/04/2008	ALTUS		Instrument failure
20/03/2008 – 02/04/2008	MIDAS OBS 3+		Instrument failure
20/03/2008 – 02/04/2008	ARGUS		Instrument failure
02/04/2008			Recovery

Deurganckdok Sill			
Period	***No data***	***Faulty data***	***Comment***
27/02/2008			Deployment
27/02/2008 – 05/03/2008		MIDAS OBS 3+	No current data
27/02/2008 – 05/03/2008	ARGUS		Instrument failure
05/03/2008			Recovery/Deployment
05/03/2008 – 26/03/2008	MIDAS OBS 3+		No connection
05/03/2008 – 26/03/2008	ARGUS		Instrument failure
26/03/2008			Recovery/Deployment
26/03/2008 – 09/04/2008		ALTUS	Instrument failure
26/03/2008 – 09/04/2008	MIDAS OBS 3+		No connection
26/03/2008 – 09/04/2008	ARGUS		Instrument failure
09/04/2008			Recovery

4. PROCESSING OF DATASETS

4.1. Calibration of the sensors

A crucial aspect of the accuracy and reliability of the data concerns the calibration of the instruments before the measurement campaign. The calibration procedures and results are described in report 6.1 Winter calibration of the HCBS2 measurements (IMDC, 2006a), report 6.2 Summer calibration of the HCBS2 measurements (IMDC, 2007a) and report 2.20 winter 2008 calibration of the Long Term Deurganckdok measurements (IMDC, 2008b).

4.2. Long term measurements near quay wall

A second period of the long term measurements executed at two depths (on average -2.3 m TAW and –12.6 m TAW) at four locations on the quay walls of Deurganckdok lasted from 21 February until 28 April 2008. Depth, temperature, salinity and suspended sediment concentration have been logged. All gathered time series have been converted to appropriate engineering units and combined to form series covering the complete period. During validation erroneous data due to mid term recovery, sensor malfunction and buried equipment has been removed. In this form the data is ready for processing.

4.2.1. Factual data: Weekseries

Measurements are visualized per instrument, location and per week in APPENDIX C.

- The title shows the week number followed by the year
- The second graph depicts the salinity and temperature
- The third and last graph shows the water level at the nearest tidal gauge and the suspended sediment concentration

Faulty data is omitted from these graphs.

4.2.2. Average tidal cycle of local parameters

For all parameters measured at one location data has been organised in separate series per tidal cycle (low water to next low water). High water moments were placed on a fixed position in the series, low water moments differ in time relative to high water due to variation in flood and ebb length with neap-spring phases. In this way a time series with time relative to high water is produced for each tide. When tidal elevation data showed substantial gaps data from pressure gauges was used to divide the long series into tidal series.

By defining average tidal amplitude A for neap, average and spring tides, it becomes possible to classify tidal cycles in three categories in the following way:

$$Neap : A \leq \alpha(A_{neap} + A_{aver})$$
$$Spring : A \geq \alpha(A_{spring} + A_{aver})$$
$$Average : \alpha(A_{neap} + A_{aver}) < A < \alpha(A_{spring} + A_{aver})$$

where: A_{neap} , A_{aver} and A_{spring} are average amplitudes

α is a factor to decide where to distinguish between categories (here taken as 0.5)

Using such categorisation the tidal series can be grouped in neap, average and spring tides. Within these groups an average is made per parameter per tidal phase relative to high water (Figure 4-1). In this way an average neap tidal cycle, an average middle tidal cycle and an average spring tidal cycle is obtained for all parameters.

The same exercise is repeated for relative values, which are the measured values divided by the tidal average (the average parameter value for that particular tidal cycle). All three types are shown in one plot with a plot for salinity, sediment concentration and temperature per page in APPENDIX H1.

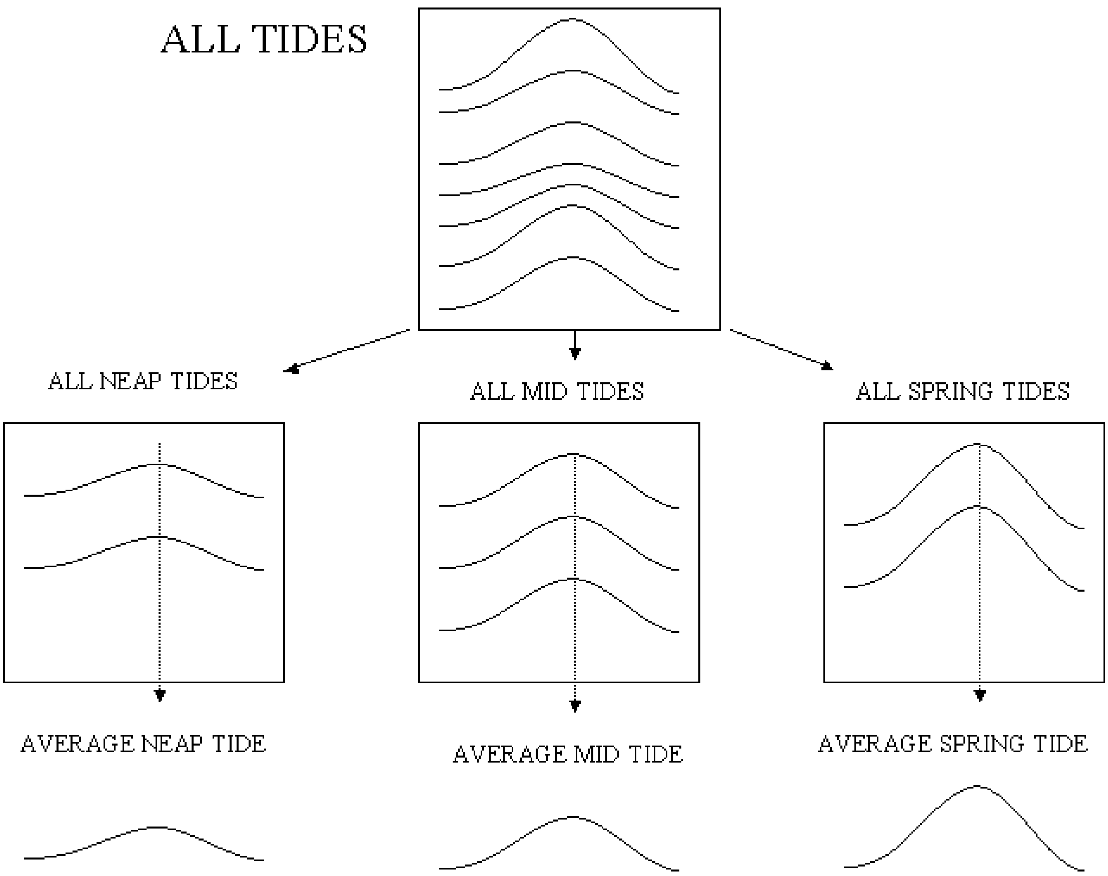


Figure 4-1: Categorisation of tidal tidal cycles

4.2.3. Average tidal cycle of gradients

For each of the three parameters being processed, six horizontal gradients (along dock's axis and cross dock, each at two depths) and four vertical gradients (one per location) have been calculated. The gradient along Deurganckdok was calculated over the two halves of the dock's length, and was obtained by the difference of measurements between the different locations, i.e. S-BACK minus S-MIDDLE, and S-MIDDLE minus S-ENTRANCE. Further, the gradient across Deurganckdok was calculated as the difference between locations S-ENTRANCE and N-ENTRANCE; the distance between these locations measured 530.89 m. For each of the locations a vertical gradient has been calculated from the difference between the measurements at approximately –2.3 m TAW and the measurements at approximately –12.6 m TAW (-12.6 m data minus –2.3 m data).

The time series of gradients obtained as such have then been processed following exactly the same tidal separation technique as for the local parameters (described in §4.2.2). The results are shown in APPENDIX H2.

4.3. Near bed continuous monitoring

4.3.1. Methodology of processing the ARGUS ASM-IV data

The data gathered by the ARGUS ASM-IV during the measurements was processed with the ASMA 3.11 software (provided by ARGUS UMWELT-MEATECHNIK).

Raw data files are loaded in combination with the appropriate calibration file. This file is set up during the calibration. Finally only the data at the beginning and the end of the time series (apparatus not submerged) needed to be removed.

Time series, which show the sedimentation profile measured by the 96 sensors, can be found in APPENDIX D. In these plots the time axis shows MET-time. Also a table showing average values for SS concentration per tidal phase is shown. All sensors are organized per 10 (except top 6 are together) and averaged over flood and ebb phases. An average tidal phase (i.e. tidal phase with an average tidal difference) is also shown for every deployment period in APPENDIX D.

4.3.2. Methodology of processing the Altus data

The Altus data were validated and processed. Outliers were screened and removed.

The ALTUS gathers echo-signals at 4 different threshold values. The maximal echo value is used as a reference value for the hardness of the bottom. When the echo signal exceeds certain percentage of this emitted signal strength, a high percentage (70%) threshold will give an indication of the hard bottom, lower percentage threshold values (11%, 23%, 39%) indicate various levels in the soft bottom with a decreasing 'density'. Increasing distances indicate a net erosion, decreasing distances a net sedimentation. The differences between the 4 signals at one given time and measurement give an indication on the 'firmness or solidity' of the soft bottom. These differences are hard to quantify and are more to be analysed qualitatively. Table 4-1 shows the threshold values used and their colour in the graphs.

Week series are shown in APPENDIX D together with the ARGUS week series. Altus datasheets show values for all measured signals including the tide at a nearby tidal station (Liefkenshoek).

A table is added with the Altus Echosounder-Bottom distances of every signal for each High Water (HW) and Low Water (LW). An average tidal phase is also shown for every deployment period in APPENDIX D.

Table 4-1: Overview of the used threshold values for the Altus Echosounder

Legend name used	***Threshold value [% of Signal]***	***Colour in the graph***
Signal 1	11%	Red
Signal 2	23%	Green
Signal 3	39%	Blue
Signal 4	70%	Black

4.3.3. Multiprobes: RCM9 and Valeport data

RCM9 and Valeport MIDAS OBS3+ data were validated and processed. Outliers were screened and removed.

Velocities were computed with a reference to the magnetic North.

Datasheets in APPENDIX E give the ‘2 days’-series of RCM9 and Valeport data:

- Velocity Magnitude and Direction of UP sensors (RCM9)
- Velocity Magnitude and Direction of DOWN sensors (Valeport)
- Suspended Sediment Concentration of UP (blue) and DOWN (red) sensors. Tidal height is included together with these parameters from the nearest tidal station (Liefkenshoek)
- Absolute Suspended Sediment Flux of UP (blue) and DOWN (red) sensors. Tidal height is included together with these parameters from the nearest tidal station (Liefkenshoek)

The Absolute Suspended Sediment Flux is not defined for a defined cross-section. It is an absolute flux (Velocity Magnitude x SS Concentration).

In APPENDIX E tables are showing average values for Velocity Magnitude, Direction, SS Concentrations and Absolute Fluxes for both UP and DOWN sensors per tidal phase (ebb/flood).. An average tidal phase is also shown in APPENDIX E.

In APPENDIX F the suspended sediment concentration measured by the RCM9 and Valeport sensors (blue) was compared to the suspended sediment concentration measured by the ARGUS sensors (red) at the same height (when data was available):

- For the CDW frame, the UP sensor was located at 0.99 m above the bottom and was compared to the ARGUS sensor 28, which resided at the same depth.
- For the CDW frame, the DOWN-sensor was located at 0.18 m above the bottom and was compared to the lowest ARGUS sensor 96, which was located at 0.28 m above the bottom.

Tidal height is included together with these parameters from the nearest tidal station (Liefkenshoek).

In APPENDIX F tables are showing average values for SS Concentrations of both Argus and RCM9 and Valeport sensors per tidal phase (ebb/flood). An average tidal phase is also shown. Until March 13 the UP sensor of CDW-frame was part of the Seaguard, afterwards an RCM9 is used. The 2 measuring instruments have a different range: Seaguard only detects values until 250 NTU while RCM9 goes until 500 NTU. This is the reason why a maximum ceiling can be detected in the first period.

5. PRELIMINARY ANALYSIS

5.1. Long term salinity measurements 20/02/2008 – 28/04/2008

For each of the four locations salinity, sediment concentration and temperature have been logged at two depths. Apart from week series of every parameter, average tidal cycles have been determined for each parameter. This was done for absolute and relative values, as well as for horizontal gradients along and across the dock, and vertical gradients (APPENDIX H). All of these results are discussed below.

5.1.1. Week series

5.1.1.1. N-ENTRANCE

The water temperature close to the surface measured around 7-8 °C. It increased from 5 April on to a value of 13 °C by the end of the measurement period. Closer to the bottom, temperatures varied in the same range of values. However, temperature steadily increased till 3 March after which it remained steady at 8-9 °C until 14 March. It then finally further increased to 13 °C.

Salinity initially measured 7-8 ppt near the bottom of the water column and steadily decreased to a minimum of 2-3 ppt between 29 March and 3 April. It then increased again to 7 ppt by the end of the campaign. Near the top of the water column, a tidal variation between 5 and 8 ppt was measured. Both the value and the tidal variation lowered from mid-March on. A minimal value was obtained between 27 March and 3 April 2008.

With respect to suspended solids concentrations, low bottom concentrations were observed at low water (~50 mg/l). Instead, peaks of up to 1000 mg/l occurred during flooding. Hardly any peaks were present in the following periods: 28 March – 1 April, 12-14 April and 24-28 April. Near the surface, peaks only went up to 600 mg/l. In this case, peaks could hardly be seen in the periods of 15-21 March, 23 March – 7 April and 12-28 April.

5.1.1.2. S-BACK

The water temperature near the surface was slightly higher than the temperature at the bottom, and measured between 7 and 9 °C at the start of the measurement campaign. In the first week of April, the water temperature increased to around 13 °C.

The salinity at the surface dropped from a value of 8 ppt at the start of the measurements to 2-3 ppt by 28 March. Then, it increased again to a final value of 7-8 ppt at the end of the campaign. A significant tidal variation in salinity could be observed too. Near the bottom, salinities measured 1-2 ppt higher in comparison to surface values.

Near the bottom, suspended solids concentrations between 100 and 200 mg/l were measured. Peaks were damped but concentrations may go up to 600 mg/l for very short times. Note also that there was a time delay in appearance, i.e. the peaks appeared after high water and later in time compared to N-ENTRANCE.

5.1.1.3. S-MIDDLE

The water temperature at both the top and bottom of the water column slowly varied in the range of 7-9 °C.From 9 April on, temperature increased to a value of 13 °C by the end of the measurements at location S-MIDDLE.

At the start of the campaign, salinity measured around 7-9 ppt at both the bottom and top. It decreased to 2 and 4 ppt at the top and bottom respectively by early April. It then increased again to values of 7-8 ppt by 28 April. Near the top of the water column, a clear tidal variation could be observed in the period between 1 March and 26 March.

The suspended solids concentrations were generally low (~6 mg/l) near the water surface with peaks mostly occurring in the period of 1-14 March. Close to the dock's bottom, concentration peaks of up to 800 mg/l could be seen. However, no peaks occurred in the next periods: 24 March – 2 April and 17-28 April.

5.1.1.4. S-ENTRANCE

The measurement location near the water surface showed a slowly varying temperature between 7 and 9 °C. From 9 April 2008 on, temperature increased to 13 °C by the end of the measurement period. A similar trend could be observed near the bottom. However, temperatures were slightly lower.

Bottom salinities initially measured 8 ppt and decreased to 2-3 ppt from 14 March on. They increased again to 8 ppt after 2 April. Measurements near the surface were only available from 9 April 2008 on. A small tidal variation could be observed. Salinities varied between 4 and 7 to 8 ppt.

Near the bottom, a 'background' suspended solids concentration of 25-50 mg/l was observed. Distinct peaks of up to 800 mg/l were seen at times of high water. Periods without any concentration peaks were also identified: 29 March – 1 April, 12-15 April and 16-28 April. Near the water surface, solids concentrations only peaked to values of up to 200-400 mg/l. A tidal variation was clearly present. After 16 March, only few concentration peaks occurred.

5.1.2. Average tidal cycles

Plots of averaged tidal cycles can be found in APPENDIX H.

5.1.2.1. Local Parameters

Water temperature did not show a tidal variation and remained relatively constant; values varied between 8 and 11 °C. It was observed that neap tide always returned the lowest temperature.

Similarly, salinity remained rather constant over the tidal cycle and measured 4-6 ppt; 7 ppt was only observed at the bottom of location S-ENTRANCE at neap tide.

Again, no tidal variation of suspended solids concentration was observed for S-BACK and S-MIDDLE. The other locations, i.e. measurement locations near the dock entrance, showed a peak at high water during spring tide. Instead, this peak was more spread in time when neap tides occurred, i.e. solids concentration was less dependent on the water level. Results for an average tide were in between those of spring and neap tides. The observation of large suspended solids concentrations at high water was clearer near the bottom of the water column. There, values of up to 250 and 550 mg/l for S-ENTRANCE and N-ENTRANCE were detected.

5.1.2.2. Gradients

Cross-dock gradients from DB Ports (S-ENTRANCE) towards PSA HNN (N-ENTRANCE) have been calculated at both -2.3 m TAW and -12.3 m TAW. In general, calculated gradients were low and close to zero.
The cross-section gradient of salinity near the top of the water column was negative between low and high water, whereas a positive gradient existed between high and low water. This indicated that during flooding the water salinity was lower at N-ENTRANCE in comparison to S-ENTRANCE. At flooding time, a maximum gradient occurred between 0 and 2 hours after low water, whereas

the maximum gradient during ebbing time occurred at 0-3 hours after high water. All gradients near the bottom of the dock were negative.
With respect to suspended solids concentration, a maximum positive gradient appeared 0-2 hours after high water near the surface, indicating that the concentration at the south of the dock entrance is smaller than at the northern side.
Similarly as for solids concentration, a maximum positive gradient for temperature occurred around high water close to the water surface. It was also observed that the large positive gradients at neap tide persisted for the entire ebbing period whereas only a peak was seen at high water for spring tide.

Along-dock gradients run from the entrance towards the inland end of the dock. Near the water surface, salinity gradients were negative between 3 hours before and after high water in the first half of the dock. Further inside the dock, positive gradients prevailed, indicating that salinity increased when going to the dock's inland end. A gradient peak occurred in the period between 3-4 hours before and after high water. The largest magnitude could be observed during neap tide. When bottom salinity gradients were considered, negative gradients always prevailed in the first part of the dock. Instead, it remained positive in the second, inland part of the dock. Also near the bottom, the largest gradients could be observed during neap tide.
Calculated sediment concentrations always appeared negative near the surface, i.e. the suspended solids concentration was larger near the dock entrance in comparison to locations inside the dock. A clear maximum in concentration gradient only occurred in the first half of the dock during spring tide. This also accounted for the bottom gradient. Positive gradients were seen in the second half (inland side) of the dock.
With respect to temperature gradients, a real trend could only be observed in the first half of the dock. There, negative gradients were calculated from 3 hours before to 5 hours after high water. A distinct peak was seen in the period 0-2 hours before high water. Closer to the bottom, a clear impact of tidal magnitude was observed; the larger the tidal magnitude, the larger (positive) the temperature gradient became. This effect was less pronounced at the landside of the dock.

Vertical gradients were computed between the bottom and top locations. With respect to salinity, its gradient was positive at S-ENTRANCE, except for neap tide. In comparison to S-ENTRANCE, gradients remained positive at all times at N-ENTRANCE. A vertical gradient peak for suspended solids concentration occurred between 1 hour before and 2 hours after high water with the largest peak at spring tide.The same could be observed at S-ENTRANCE but the peak was less pronounced. The concentration gradient at N-ENTRANCE measured 4 mg/l/m whereas 1.25 mg/l/m was computed for S-ENTRANCE. When looking at the vertical temperature gradient, it was negative between 1 and 4 hours before high water. In contradiction to the suspended solids concentration, the largest vertical temperature gradients occurred at neap tide.
It could be concluded that no significant trend existed for salinity when investigating the along-dock trend of the vertical gradients. For suspended solids concentration, vertical gradients remained positive for all locations at the southern quay, except for the entrance location (S-ENTRANCE) at spring tide where the vertical concentration gradient was negative before high water. Whereas a gradient peak occurred near the entrance, no real trend could be detected for the other locations in the dock. Also for the vertical temperature gradients, no tidal variation was observed, except for S-ENTRANCE. At the latter location, negative gradients prevailed from 0 to 3 hours before high water, with a maximum gradient at spring tide.

5.1.3. Comparison with previous measurements

Because this measurement campaign occurred in autumn, its outcome is expected to be similar to the previous winter campaign. In comparison to the February-March 2007 measurement campaign (see IMDC (2007j), Appendices), the range of measured parameters was very similar.

Temperatures did however exceed the maximum values as observed in 2007. Peaks of suspended solids concentrations could be observed as well; the actual peaks at S-BACK were lower though and valued 600 mg/l instead of 1000 mg/l. Tidal variations for both salinity and solids concentration occurred in both time series, i.e. the 2007 and 2008 measurements. Interesting to note is the fact that for both measurement campaigns periods existed without any or hardly any solids concentration peaks.

With respect to the cross-dock gradients, salinities at the southern entrance were larger than its northern counterpart. This conclusion was valid for both campaigns. Similarly, the cross-dock gradients were mostly pronounced at spring tides. When the horizontal bottom gradients are considered, less variation during the tidal cycle was observed for both salinity and temperature. There was a distinct difference for temperature with the winter 2007 situation though; much larger horizontal temperature gradients were measured in 2008 at spring tides in comparison with winter 2007. Near the water surface, a very similar behaviour of all horizontal gradients could be observed.

The vertical gradients for both measurement campaigns were very similar for all parameters at the locations N-ENTRANCE and S-ENTRANCE. The latter only deviated from the winter 2007 situation in terms of suspended solids concentration gradient; a negative vertical gradient existed during spring tide before high water occurred. This was in contradiction to winter 2007 where a positive gradient prevailed.

5.2. Near bed continuous monitoring 20/02/2008 – 09/04/2008

5.2.1. CDW frame data

Average concentrations per tidal phase in layers of 10 cm, measured by the ARGUS, vary between 3.7 to 621 mg/l. Higher concentrations occur in the lowest centimetres of the water column, but concentrations are generally alike over the whole length of the measuring rod. During flood, suspended sediment concentrations are higher than those measured during ebb.

It appears from the recorded data that the bottom is situated about 55 cm below the Altus sensor for the first deployment (see week series in APPENDIX D). During the second and third deployment, the Altus did not work properly.

When comparing the SS concentration measured by these sensors with the ARGUS sensors at the same height, it seems that the ARGUS gives the same trend as the Seaguard (for SS concentrations up to approximately 300 mg/l, corresponding to the maximum turbidity of the Seaguard turbidity sensor (see Figure 5-1). From 13 March 2008 on, The RCM9 was used instead of the Seaguard. In this respect, Figure 5-2 shows that the RCM9 underestimates the suspended solids concentration in comparison with the ARGUS. Notice that the ARGUS shows extremely large values, which can be attributed to SSC peaks predominantly occurring during flood periods. No analysis can be done between the lower sensors (Midas ECM and the lowest sensors of the Argus) because the Midas ECM failed to measure. Previous measurements showed the same trend for the upper ARGUS sensor. Post-calibration of the ARGUS is hard to do, but it is good to keep this conclusion in mind when analysing the ARGUS-data.

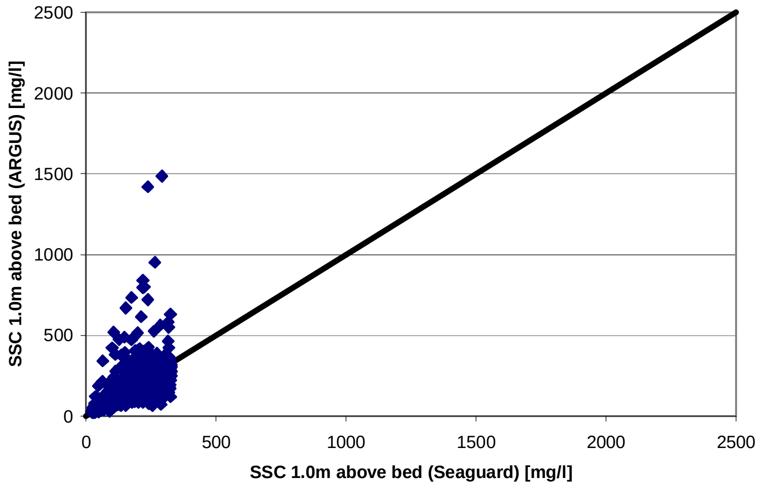


Figure 5-1: ARGUS vs. Aanderaa Seaguard -1m above bed (20/02/2008 – 13/03/2008) CDW Frame

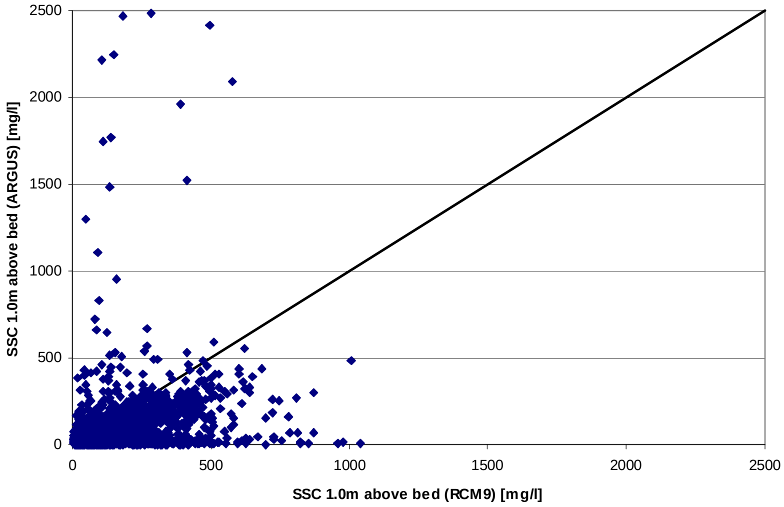


Figure 5-2:ARGUS vs. Aanderaa RCM9 -1m above bed (13/03/2008 – 02/04/2008) CDW Frame

5.2.2. Sill frame data

It appears from the recorded data that the bottom is situated between 15 cm and 60 cm below the Altus sensor. Depending on the deployment, this can vary a little (see week series APPENDIX D).

Average velocities per tidal phase (ebb/flood) at 1 m above the bed vary from 0.1 up to 0.3 m/s. Average SS concentrations measured by the RCM-9 turbidity sensor are smaller than those measured by the lower sensor (Valeport MIDAS) (Figure 5-3).

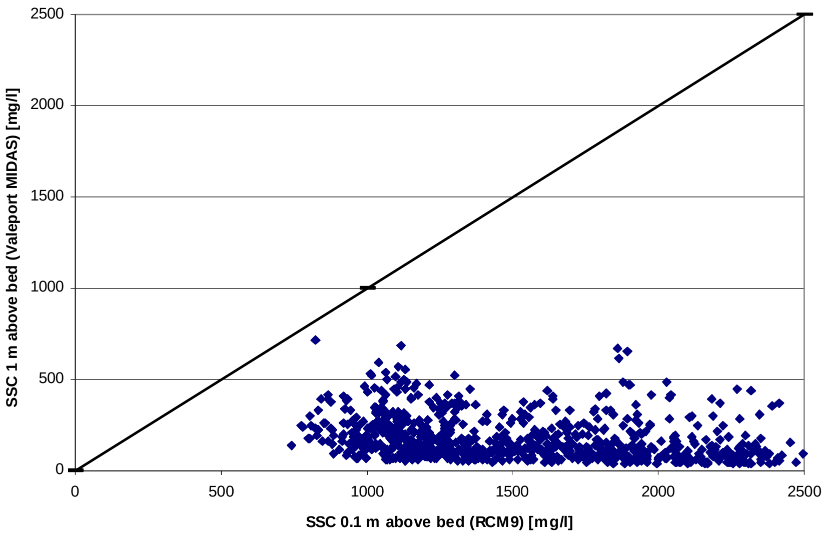


Figure 5-3: Comparison of near bed SS concentrations between RCM9 and valeport MIDAS (27/02/2008 – 09/04/2008)

5.2.3. Comparison with previous measurements

Previous measurements at the same locations were executed as part of the HCBS project (17/02/2005 – 03/03/2005, 14/03/2006 – 05/04/2006) and as part of the first part of this project (spring: 19/04/2006 – 23/05/2006; summer: 18/07/2006 – 11/10/2006; winter: 09/02/2007 – 18/04/2007; autumn: 20/09/2007 – 18/12/2007). The frame measurements of this winter measurement campaign will be compared to the previous DGD measurement campaigns. Comparison will be made for a period of comparable tidal amplitudes, i.e. 27/4/06-7/5/06, 12/8/06-22/8/06, 19/2/07-1/3/07, 25/10/07-4/11/07, 9/3/08-19/3/08 for sill measurements and 27/4/06-6/5/06, 11/8/06-21/8/06, 19/3/07-30/3/07, 27/9/07-7/10/07, 8/3/08-18/3/08 for CDW measurements. Table 5-1 gives an overview of the abbreviations used in the figures for the comparison of the measurement campaigns of the Deurganckdok project. Also the complete measurement period is given.

Table 5-1: Measurement period and abbreviations used for the comparison of the frame measurements of the Deurganckdok project

Measurement campaign	***Period***	***Abbreviation***
Spring measurement 2006	19/04/2006 – 23/05/2006	Spring'06
Summer measurement 2006	18/07/2006 – 11/10/2006	Summer'06
Winter measurements 2007	09/02/2007 – 18/04/2007	Winter'07
Autumn measurements 2007	20/09/2007 – 18/12/2007	Autumn'07
Winter measurements 2008	20/02/2008 – 09/04/2008	Winter'08

5.2.3.1. CDW frame

Comparing the average suspended sediment concentrations measured at 1m above the bed (RCM9), during a period of comparable tidal amplitudes, it seems that slightly lower values are measured during this winter measurement campaign in comparison to the winter of 2007 (Figure 5-4). Further, the highest concentrations at 1m above the bottom were mainly measured during winter and spring and the lowest during summer and autumn. This trend seems to be confirmed by the Midas ECM measurements at 10 cm above the bottom (Figure 5-4). During the period of comparable tidal amplitudes, the MIDAS ECM mounted on the CDW frame obtained no data during the Summer '06 and Winter '08 measurements. Averaged concentrations at 10 cm above the bed are generally higher than averaged concentrations at 1m and can become up to 3 times as big.

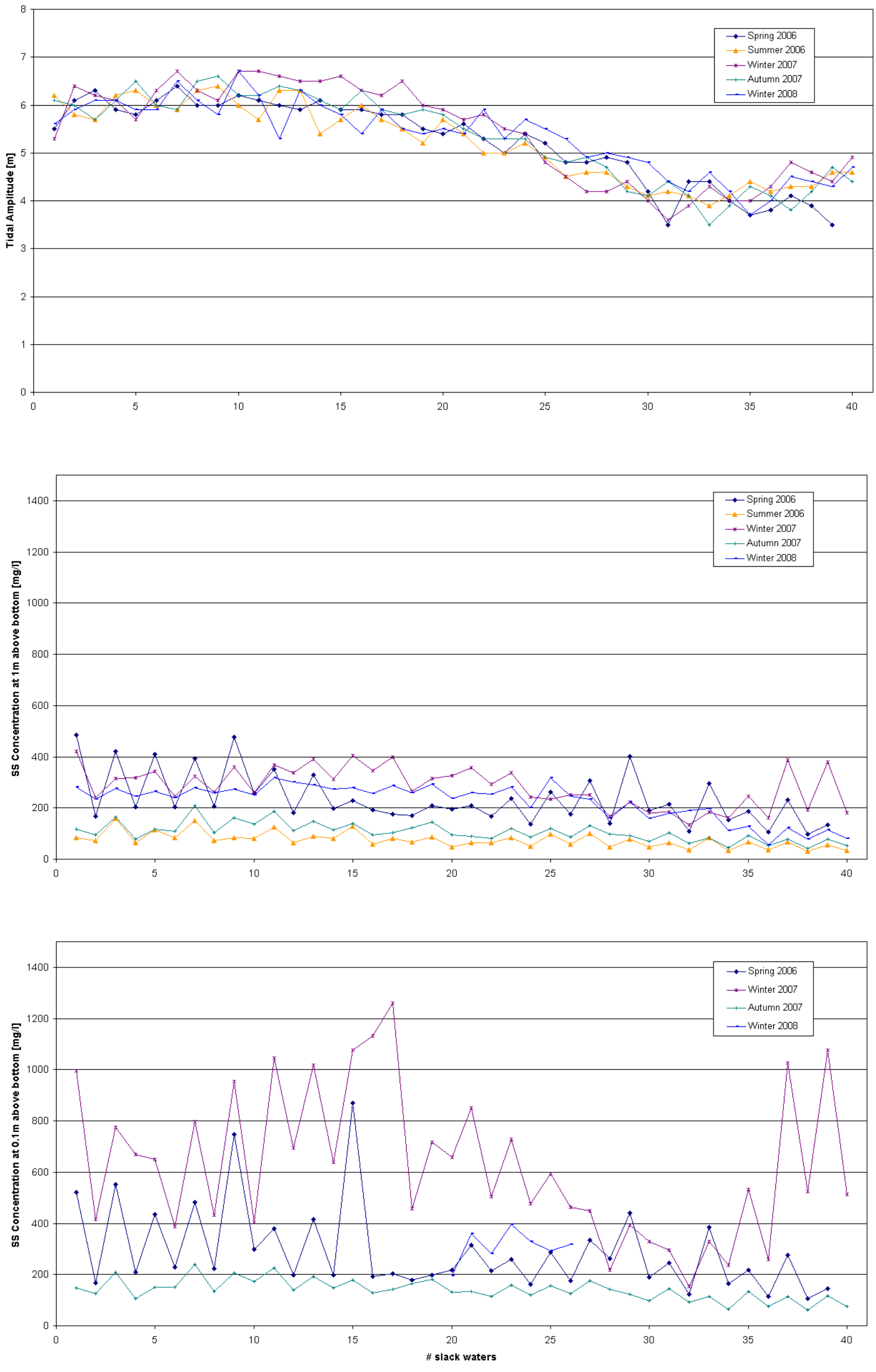


Figure 5-4: Average concentration per tidal phase 1.0m and 0.1m above the bed [CDW frame]

5.2.3.2. Sill frame

Concerning the Sill frame, a different period of comparable tidal amplitudes is considered (27/4/06-7/5/06, 12/8/06-22/8/06, 19/2/07-1/3/07, 25/10/07-4/11/07, 9/3/08-19/3/08).

When comparing average suspended sediment concentrations measured 1m above the bed (RCM9), during a period of comparable tidal amplitudes, both winter measurements seem similar (Figure 5-5). Variations are also similar. Further, the highest concentrations at 1m above the bottom were mainly measured during winter and spring and the lowest during summer and autumn. During the period of comparable tidal amplitudes, the MIDAS ECM mounted on the Sill frame obtained no data during the Spring ‘06 and little data during the Winter ‘08 measurements. Near the bottom, larger tidal variation exist for SS in comparison to the measurement location at 1m above the bed.

When comparing averaged concentrations at 1m above the bed on locations Sill and CDW, both locations seem similar.

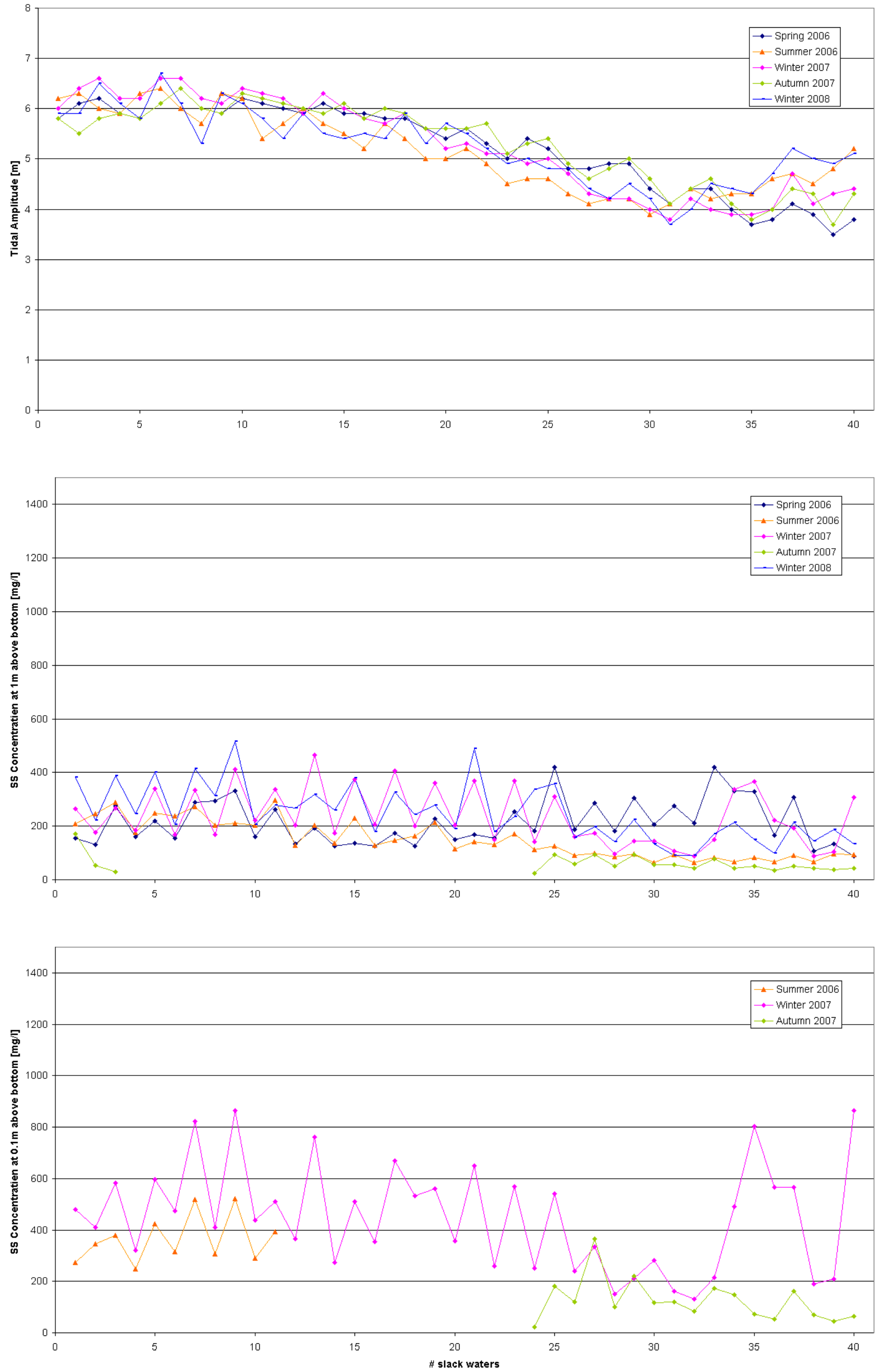


Figure 5-5 Average concentration per tidal phase 1.0m and 0.1m above the bed [Sill frame]

6. REFERENCES

ARGUS UMWELT-MEATECHNIK (2005), ASM-IV-laser, ARGUS surface meter manual, 31p.

IMDC (2005a). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 1: Test survey 17/02/2005, I/RA/11265/05.008/MSA.

IMDC (2005b). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.1: Deurganckdok 17/02/2005, I/RA/11265/05.009/MSA.

IMDC (2005c). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.2: Zandvliet 17/02/2005, I/RA/11265/05.010/MSA.

IMDC (2005d). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.3: Liefkenshoek 17/02/2005, I/RA/11265/05.0011/MSA.

IMDC (2005e). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.4: Schelle 17/02/2005, I/RA/11265/05.0012/MSA.

IMDC (2005f). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.5: Deurganckdok 16/02/2005, I/RA/11265/05.013/MSA.

IMDC (2005g). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.6: Kallosluis 18/02/2005, I/RA/11265/05.014/MSA.

IMDC (2005h). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.7: Near bed continious monitoring: february 2005, I/RA/11265/05.015/MSA.

IMDC (2005i). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 3: Settling velocity INSSEV february 2005, I/RA/11265/05.016/MSA.

IMDC (2005j). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 4: Cohesive sediment properties february 2005, I/RA/11265/05.017/MSA.

IMDC (2005k). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 5.1: Overview of ambient conditions in the river Scheldt January-June 2005, I/RA/11265/05.018/MSA.

IMDC (2005l). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 5.2: Overview of ambient conditions in the river Scheldt July-December 2005, I/RA/11265/05.019/MSA.

IMDC (2006a) Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 6.1 Calibration Winter 15 March & 14 April 2006 (I/RA/11291/06.092/MSA).

IMDC (2006b) Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 7.1 21 March 2006 Scheldewacht – Deurganckdok (I/RA/11291/06.094/MSA).

IMDC (2006c) Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 7.2 22 March 2006 Parel 2 – Deurganckdok (downstream) (I/RA/11291/06.095/MSA).

IMDC (2006d) Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 7.3 22 March 2006 Laure Marie – Liefkenshoek (I/RA/11291/06.096/MSA).

IMDC (2006e) Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 7.4 23 March 2006 Parel 2 – Schelle (I/RA/11291/06.097/MSA).

IMDC (2006f) Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 7.5 23 March 2006 Laure Marie – Deurganckdok (downstream) (I/RA/11291/06.098/MSA).

IMDC (2006g) Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 7.6 23 March 2006 Veremans – Waarde (I/RA/11291/06.099/MSA).

IMDC(2006h) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 2.1 Opmeting stroming en zout- en sedimentbeweging aan de ingang van het Deurganckdok (SiltProfiler) (I/RA/11283/06.087/WGO).

IMDC(2006i) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 2.3. Opmeting stroming en zout-en sedimentbeweging aan de ingang van het Deurganckdok (ADCP) (I/RA/11283/06.110/BDC)

IMDC(2006j): Studie van de stromingsvelden en sedimentuitwisseling aan de ingang van Deurganckdok. Current and Sediment flux measurements November 17th 2005 (I/RA/15030/06.021/BDC).

IMDC (2006j). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 9: Valsnelheid slib – INSSEV, I/RA/11291/06.102/MSA, in opdracht van AWZ.

IMDC (2006k). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 8.1: Near bed continuously monitoring – winter 2006, I/RA/11291/06.100/MSA.

IMDC (2006l). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 9: Calibration summer 23 June & 18 September 2006. (I/RA/11291/06.093/MSA).

IMDC (2006m). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.6: Silt distribution and frame measurements 17/03/2006 – 23/05/2006. (I/RA/11291/06.121/MSA).

IMDC (2006n). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 2.7: Silt distribution and frame measurements 15/07/2006 – 31/10/2006. (I/RA/11291/06.122/MSA).

IMDC (2007a). Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies Deelrapport 6.2 Summer Calibration and Final Report (I/RA/11291/06.093/MSA), in opdracht van AWZ.

IMDC (2007b) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 1.1 Sediment Balance: Three monthly report 1/4/2006 – 30/06/2006 (I/RA/11283/06.113/MSA)

IMDC (2007c) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 1.2 Sediment Balance: Three monthly report 1/7/2006 – 30/09/2006 (I/RA/11283/06.114/MSA)

IMDC (2007d) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 1.3 Sediment Balance: Three monthly report 1/10/2006 – 31/12/2006 (I/RA/11283/06.115/MSA)

IMDC (2007e) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 1.4 Sediment Balance: Three monthly report 1/1/2007 – 31/03/2007 (I/RA/11283/06.116/MSA)

IMDC (2007f) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 1.5 Annual Sediment Balance (I/RA/11283/06.117/MSA)

IMDC (2007g) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 2.2 Through tide measurement SiltProfiler 26/09/2006 Stream (I/RA/11283/06.068/MSA)

IMDC (2007h) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 2.5 Through tide measurement Sediview neap tide (to be scheduled) (I/RA/11283/06.120/MSA)

IMDC (2007i) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 2.7 Salt-Silt distribution & Frame Measurements Deurganckdok 15/07/2006 – 31/10/2006 (I/RA/11283/06.122/MSA)

IMDC (2007j) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 2.8 Salt-Silt distribution & Frame Measurements Deurganckdok 15/01/2007 – 15/03/2007 (I/RA/11283/06.123/MSA)

IMDC (2007k) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 3.1 Boundary conditions: Three monthly report 1/1/2007 – 31/03/2007 (I/RA/11283/06.127/MSA)

IMDC (2007l) Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 3.2 Boundary condtions: Annual report (I/RA/11283/06.128/MSA)

IMDC (2008a). Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 2.09. Calibration stationary equipment Autumn, 10 September 2007 (I/RA/11283/07.095/MSA).

IMDC (2008b). Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing. Deelrapport 2.09. Calibration stationary & mobile equipment winter (I/RA/11283/07.096/MSA).

APPENDIX A.

TECHNICAL DETAILS OF SEAGUARD RCM

SEAGUARD RCM®
Recording Current Meter

D368 - July 2007

SEAGUARD® Recording Current Meter

The SEAGUARD® RCM series is a completely new generation of current meters based on the SEAGUARD® datalogger platform and the ZPulse™ Doppler Current Sensor[1]. Modern computer technology combined with advanced digital signal processing provides accurate and detailed measurements with almost unlimited resolution. Optional parameters are available through a new range of smart sensors that include temperature, pressure and conductivity. The new SEAGUARD® RCM series come in 300m, 2000m and 6000m depth ranges.

SEAGUARD® RCM advantages:

- *Large storage capacity on SD card*
- *Broadband ZPulse™ multi-frequency technology reduces power consumption and improves quality*
- *Down to 2 seconds recording interval*
- *Low current drain*
- *Smart sensor topology based on a reliable semi-high speed CANbus interface (AiCaP)*
- *Windows CE based datalogger with TFT based color touch panel for local configuration*
- *SEAGUARD Studio visualization software*
- *For use in sea and fresh water*

1 Patent Pending

The new SEAGUARD® RCM series replaces the industry standard RCM 9 and RCM 11 series. It has been completely redesigned from bottom up and employs modern technology in the datalogger section and in the different sensor solutions.

The SEAGUARD® architecture is based on a general datalogger unit and a set of autonomous smart sensors. The datalogger and the smart sensors are interfaced by means of a reliable CANbus interface using an XML based protocol (AiCaP). During power-up, each of the sensors that are connected to the bus will report their capabilities and specifications to the datalogger. The datalogger then assembles the information and provides the user with the possibility to configure the instrument based on the present nodes. The solution provides for great flexibility in both use and design of the different elements within the system.

The autonomous sensor topology also gives the sensor designer flexibility and opportunities where each sensor type may be optimized with regard to its operation, each sensor may now provide several parameters without increasing the total system load.

Data storage takes place on a Secure Digital (SD) card. The current capacity for this card type is up to 1000 MBytes, which is far adequate for most applications.

Sensor Capability

The SEAGUARD® RCM comes standard with the ZPulse™ multi-frequency Doppler current sensor. The new current sensor employs acoustic pulses comprising several frequency components to lower the statistical variance in the Doppler shift estimate. The advantage of this is reduced statistical error with fewer pings, hence increased sampling speed and less power consumption. The new Doppler Current Sensor also incorporates a robust fully electronic compass and a tilt sensor.

The SEAGUARD® RCM may also be delivered with new smart sensor solutions for temperature, pressure and conductivity. All sensors have increased resolution compared with the older models. The temperature sensor also has decreased settling time to utilize the increased sampling speed provided by the SEAGUARD® platform. AiCaP Turbidity Sensor and Oxygen Optode will follow.

AADI SEAGUARD®
AANDERAA DATA INSTRUMENTS • www.aadi.no

Reliable Solutions 1

Specifications

D368 - July 2007

SEAGUARD® RCM Specifications	
Top-end Plate capability: Up to 6 sensors can be fitted onto the Top-end Plate, of which 4 can be analogue sensors (0-5V)	
Recording System:	Data Storage on SD card
Storage Capacity:	512 MB
Battery Alkaline 3614: or Lithium 3677:	 9V, 15Ah (nominal 12.5Ah; 20W down to 6V at 4°C) 7.2V, 30Ah
Recording Interval:	From 2s, depending on the node configuration for each instrument
Recording settings:	Fixed interval settings Customized Sequence setting
Protocol:	AiCaP CANbus based protocol
Depth Capacity:	300m/2000m/6000m
Platform Dimensions: 300m version (SW): 2000m version (IW): 6000m version (DW):	 H: 356mm OD: 139mm H: 352mm OD: 140mm H: 368mm OD: 143mm
External Materials 300m version: 2000/6000m version:	 PET, Titanium, Stainless Steel 316, Durotong DT322 polyurethane Stainless steel 316, Titanium, OSNISIL, Durotong DT322 polyurethane
Weight:	Depends on node configuration
Packing:	Depends on node configuration
Accessories Included:	SEAGUARD Studio Alkaline Battery 3614 SD card: 512 MB Standard cable 4299 Power Calculator
Optional Accessories:	Recommended Spares In-line mooring frame 4044[1)]/3824A/3910 Lithium Battery 3677 Maintenance Kit 3813/3813B Tools kit 3986 Bottom mooring frame 3438R/3448 Base Brackets 3627 (2) for frame Protecting Rods 3783 Vane Plate 3681

1) In-line Mooring Frame 4044: breaking strength 800 kg
2) Based on 300 pings
3) Extended range available on request.
4) Available on request
5) 9600 baud, 8 data bits, 1 stop bit, No parity, Xon/Xoff Handshake
6) Dependent on flow through cell bore

ZPulse™ Doppler Current Sensor (DCS) Specifications	
Current Speed: Range: Resolution: Mean Accuracy: Relative: Statistic variance (std)	(Vector averaged) 0-300 cm/s 0.1 mm/s ± 0.15 cm/s ± 1% of reading 0.3 cm/s (ZPulse mode), 0.45 cm/s [2)]
Current Direction: Range: Resolution: Accuracy:	 0 – 360° magnetic 0.01° ±5° for 0-15° tilt ±7.5° for 15-35° tilt
Tilt Circuitry: Range: Resolution: Accuracy:	 0-35° 0.01° ±1.5°
Compass Circuitry: Resolution: Accuracy:	 0.01° ±3°
Acoustics: Frequency: Power: Beam angle (main lobe):	 1.9 to 2.0 MHz 25 Watts in 1ms pulses 2°
Installation distance: From surface: From bottom:	 0.75m 0.5m
Supply Voltage:	6– 14 Volts
Operating Temperature:	-5 to +50°C

Optional Sensors Specifications	
Temperature Sensor 4060 Range: Resolution: Accuracy: Response Time 63%):	 0-36°C (32-96.8°F) [3)] 0.001°C (0.0018°F) ±0.03°C (0.054°F) < 2 seconds
Pressure Sensor 4117A/B/C Resolution: Accuracy: 4117 A Range: 4117 B Range: 4117 C Range:	<0.002% FSO ±0.04° FSO 0-1000 kPa (0-145 psia)[4)5)] 0-4000 kPa (0-580 psia) [5)] 0-10000kPa (0-1450 psia)[4)5)]
Conductivity Sensor 4319 Range: Resolution: Accuracy 4319 A: 4319 B: Response Time:	 0-7.5 S/m 0.0002 S/m ±0.005 S/m ±0.0018 S/m <3s[6)]

AANDERAA DATA INSTRUMENTS • www.aadi.no

Reliable Solutions 2

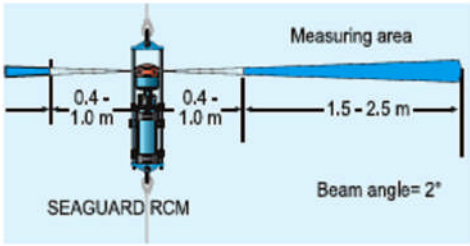
Illustrations and Descriptions

D368 - July 2007

The ZPulse™ Doppler Current Sensor (DCS) is the standard sensor on the SEAGUARD® RCM. The sensor outputs Absolute Current Speed and Direction, Speed in east and north direction, Ping count, and extensive readout of quality control parameters such as Single-ping Standard deviation, Heading, Tilt in X- and Y-direction, and Signal Strength.

The SEAGUARD® RCM utilizes the wellknown Doppler Shift principle as basis for its measurements.

Note!
If application requires breaking strength of more than 800 kg, mount the SEAGUARD® RCM SW in in-line mooring frame 3824A. Remember to change the handles.



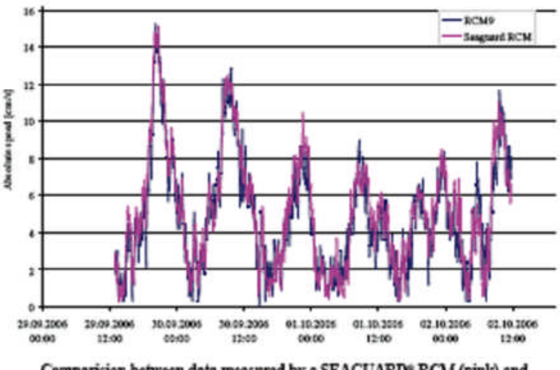
Four transducers transmit short pulses (pings) of acoustic energy along narrow beams (600, 300, 150, or 50 pings in each recording interval). The same transducers receive backscattered signals from scatteres that are present in the beams, which are used for calculation of the current speed and direction.

The scattering particles are normally plankton, gas bubbles, organisms and particles stemming from man-made activity.

To minimize the effect of marine fouling and local turbulence, the ZPulse™ DCS starts measuring the horizontal current in an area of 0.4 to 1.0 meter from the instrument, see figure above.

Comparing SEAGUARD® RCM with RCM 9

The SEAGUARD® RCM has been tested together with a RCM 9 to compare the measurement results. The deployment was performed during a weekend in a fjord outside Bergen. The graph below shows the absolute speed of both instruments. Pink graph is representing the SEAGUARD® RCM, while blue is representing the RCM 9. The SEAGUARD® was in this test set to transmit 150 ping during each recording interval, while the RCM 9 was set to transmit 300 ping. Although the SEAGUARD® only transmitted half as many pings compared to the RCM 9, the two instruments gave very similar results. Lower ping count reduces power consumption.



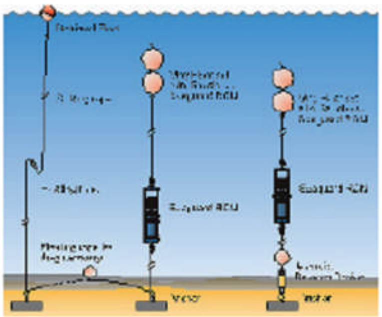
Comparision between data measured by a SEAGUARD® RCM (pink) and a RCM 9 (blue). The graph is showing absolute speed measured in a fjord outside Bergen, Norway.

AANDERAA DATA INSTRUMENTS • www.aadi.no

Reliable Solutions 3

Applications

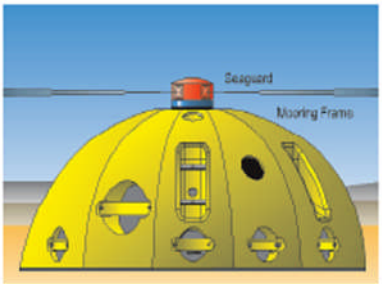
D368 - July 2007

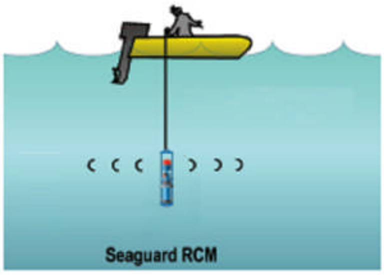


The most common way to use the SEAGUARD® RCM is in an in-line mooring configuration. As it operates under a tilt up to 35° from vertical, it has a variety of in-line mooring applications by use of surface buoy or sub surface buoy. The instrument is installed in a mooring frame that allows easy installation and removal of the instrument without disassembly of the mooring line.

Drop line is conveniently done due to its compact design, low drag force and easy handling. The instrument can be lowered into the sea from a small boat using a simple winch. Data can be stored internally and read after retrieval.

SEAGUARD® RCM can also be used in a bottom frame mooring (non-magnetic).

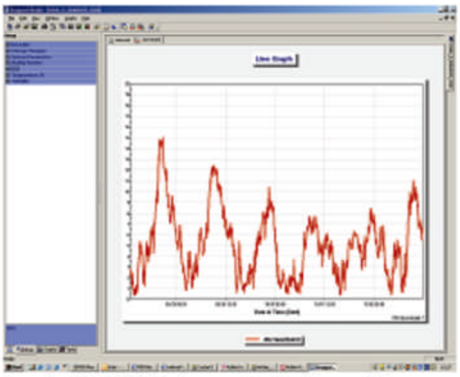




SEAGUARD Studio

With SEAGUARD Studio you can:

- Import deployment data collected by the SEAGUARD® RCM from a SD card.
- Display configuration setting used in the depoyment.
- List and edit listed data.
- Possible to show data from several instrument at the same time for comparative studies.
- Export data to Matlab.
- Export data to ASCII text files.
- Print or export graphs in different formats.
- Copy graphs to the clipboard for inclusion into other programs such as Word, Excel or similar.
- Save edited sessions.



Example of SEAGUARD Studio presenting absolute speed data measured with a SEAGUARD® RCM.

5851 BERGEN, NORWAY
TEL. +47 55 60 48 00
FAX. +47 55 60 48 01
http://www.aadi.no
e-mail: info@aadi.no

Representative's Stamp

AADI SEAGUARD®
AANDERAA DATA INSTRUMENTS • www.aadi.no

Reliable Solutions 4

APPENDIX B.

OVERVIEW OF MEASUREMENTS

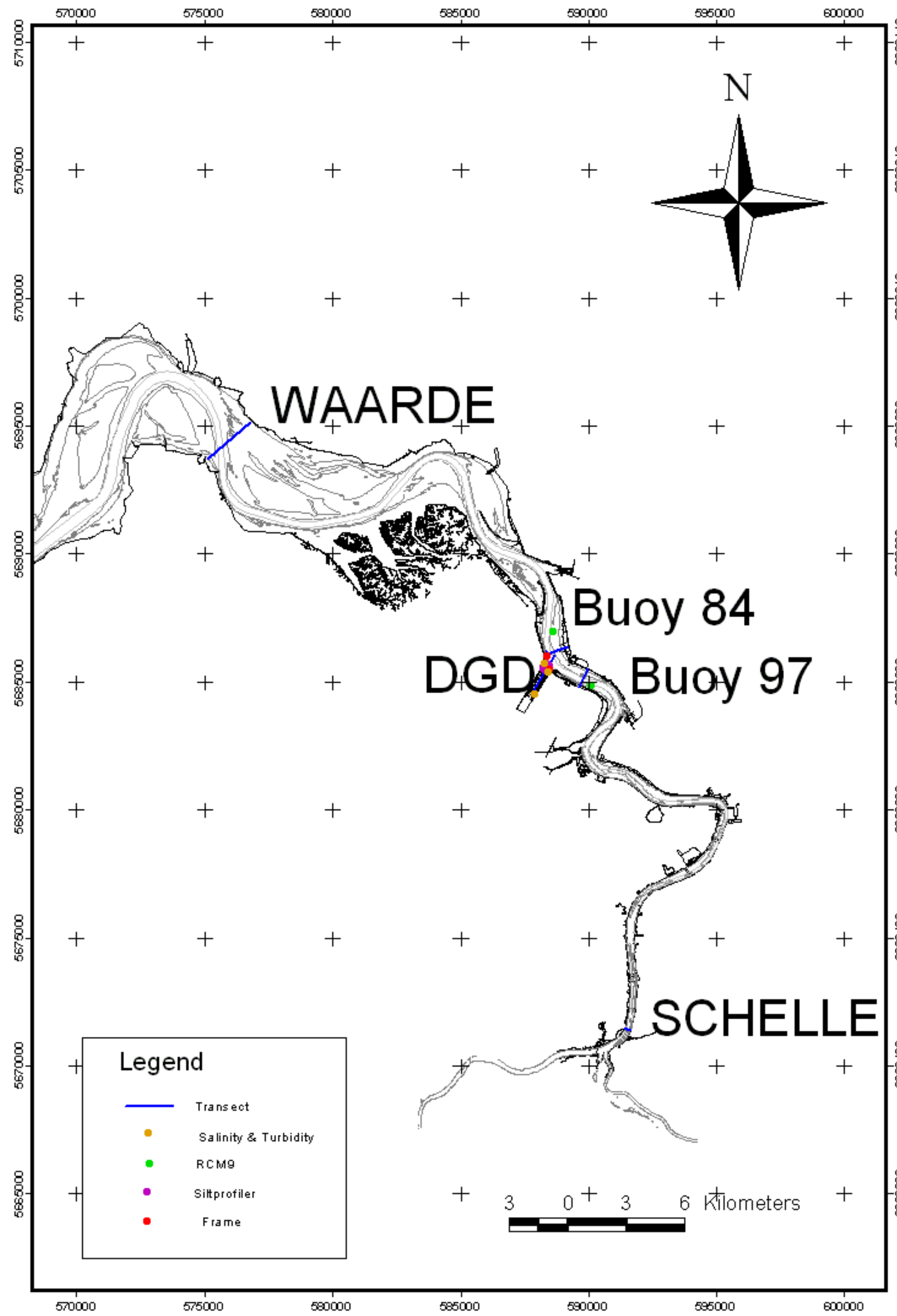
Overview of the measurement locations for the whole HCBS 2 measurement campaign & DGD measurement campaign (1 & 2)

Through tide measurements: Transects					
Location	*Easting (UTM ED 50)*		*Northing (UTM ED 50)*		*Period*
Deurganckdok (in dock)	*Left Bank*	*Right Bank*	*Left Bank*	*Right Bank*	21/03/2006 & 26/09/2006
(transect Y)	*589059*	591298	*5684948*	*5683077*	
Liefkenshoek	*Left Bank*	*Right Bank*	*Left Bank*	*Right Bank*	22/03/2006 & 27/09/2006
(transect I)	590318	590771	5684257	5683302	
Deurganckdok (downstream)	*Left Bank*	*Right Bank*	*Left Bank*	*Right Bank*	22 & 23/03/2006 & 27 & 28/09/2006
(transect K)	588484	589775	5684924	5685384	
Deurganckdok (in dock)	*Left Bank*	*Right Bank*	*Left Bank*	*Right Bank*	22/03/2006 & 27/09/2006
(transect DGD)	588765	588541	5684056	5684527	
Schelle	*Left Bank*	*Right Bank*	*Left Bank*	*Right Bank*	23/03/2006 & 28/09/2006
(transect S)	592645	592953	5665794	5665682	
Waarde	*Left Bank*	*Right Bank*	*Left Bank*	*Right Bank*	23/03/2006 & 28/09/2006
(transect W)	573541	571318	5696848	5694933	
Deurganckdok (in dock)	*Left Bank*	*Right Bank*	*Left Bank*	*Right Bank*	21/03/2006 & 26/09/2006
(transect au-bu)	588561	588682	5684369	5684113	
Deurganckdok (in dock)	*Left Bank*	*Right Bank*	*Left Bank*	*Right Bank*	24/10/2007
(transect ad-bd)	588623	588745	5684470	5684214	

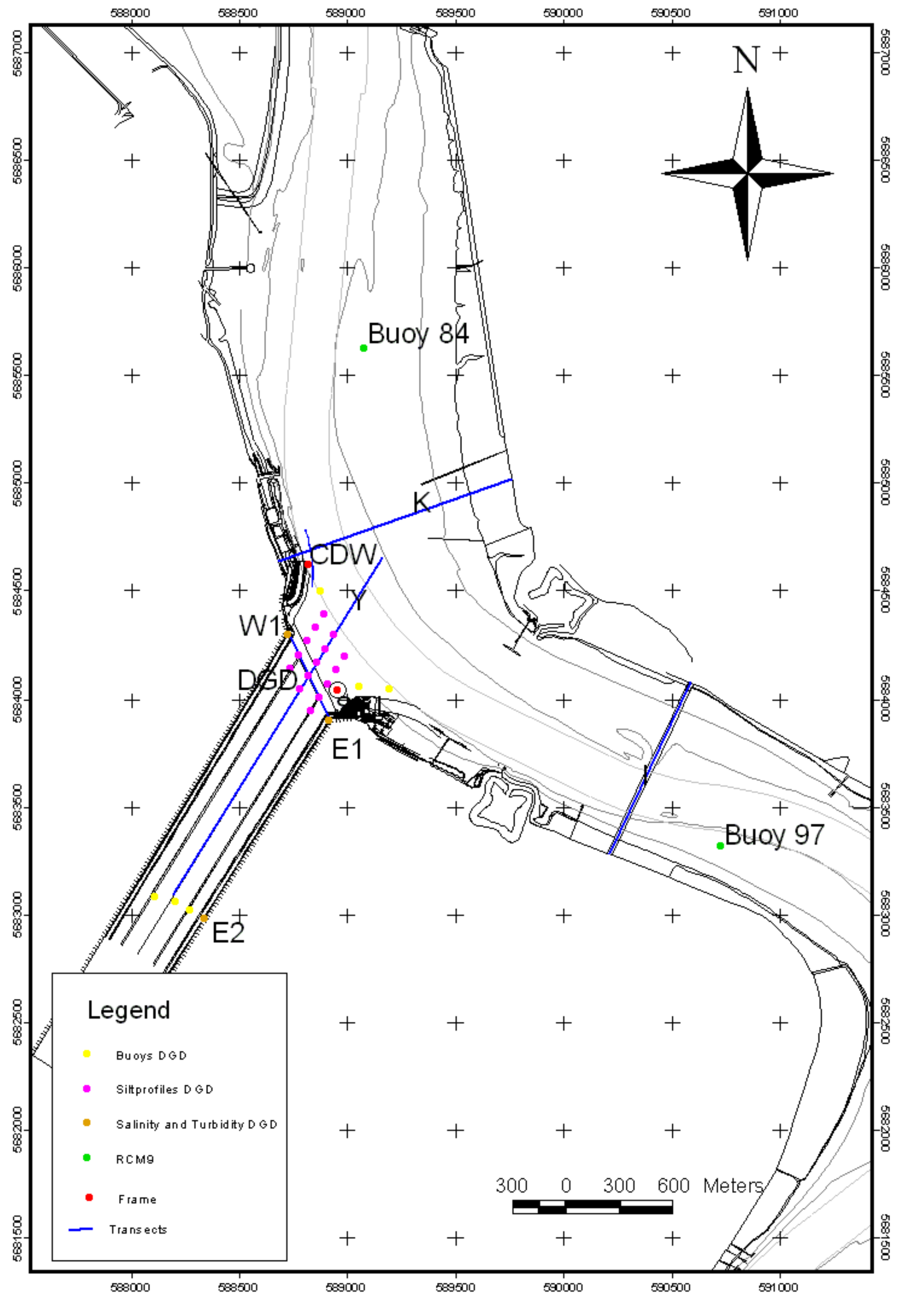
Through tide measurements: Siltprofiler gauging points			
Location	*Easting (UTM ED 50)*	*Northing (UTM ED 50)*	*Period*
Location 1: Xa	588549	5684335	21/03/2006 & 26/09/2006
Location 2: Xb	588596	5684411	

Location 3: Xc	588643	5684486	& 23/10/2007
Through tide measurements: Siltprofiler gauging points			
Location	*Easting (UTM ED 50)*	*Northing (UTM ED 50)*	*Period*
Location 4: Xd	588690	5684562	21/03/2006 & 26/09/2006 & 23/10/2007
Location 5: Xe	588737	5684638	
Location 6: Ya	588606	5684217	
Location 7: Yb	588653	5684293	
Location 8: Yc	588700	5684368	
Location 9: Yd	588747	5684444	
Location 10: Ye	588793	5684520	
Location 11: Za	588662	5684099	
Location 12: Zb	588709	5684174	
Location 13: Zc	588756	5684250	
Location 14: Zd	588803	5684326	
Location 15: Ze	588850	5684402	
Near bed continuous monitoring			
Location	*Easting (UTM ED 50)*	*Northing (UTM ED 50)*	*Period*
Deurganckdok CDW	588653	5684906	14/03/2006 – 05/04/2006
Deurganckdok CDW	588685	5684880	19/04/2006 – 23/05/2006
Deurganckdok Sill	588805	5684170	19/04/2006 – 23/05/2006
Deurganckdok CDW	588685	5684880	18/07/2006 – 11/10/2006
Deurganckdok Sill	588805	5684170	19/07/2006 – 11/10/2006
Deurganckdok CDW	588685	5684880	15/03/2007 – 12/04/2007
Deurganckdok Sill	588805	5684170	09/02/2007 – 18/04/2007
Deurganckdok CDW	588573	5684677	09/02/2007 – 02/04/2008
Deurganckdok Sill	588697	5683941	10/10/2007 – 28/11/2007
Salt Silt measurements Deurganckdok			
Location	*Easting (UTM ED 50)*	*Northing (UTM ED 50)*	*Period*

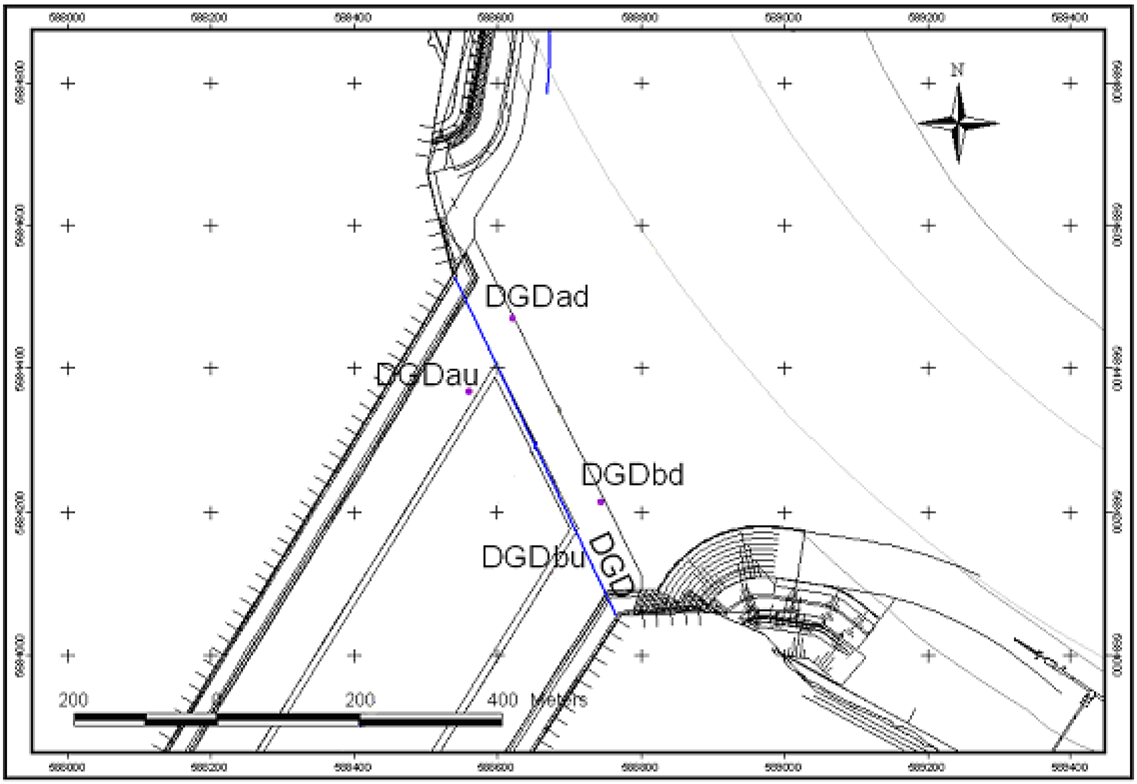
P&O 1	588074	5682942	17/03/2006 – 28/04/2006
P&O 2	588767	5684045	17/03/2006 – 28/04/2006
PSA	588536	5684523	17/03/2006 – 28/04/2006
P&O 1	588074	5682942	20/07/2006 – 12/10/2006
P&O 2	588767	5684045	20/07/2006 – 12/10/2006
PSA	588536	5684523	20/07/2006 – 12/10/2006
P&O 1	588074	5682942	12/02/2007 – 27/03/2006
P&O 2	588767	5684045	12/02/2007 – 27/03/2006
PSA	588536	5684523	12/02/2007 – 27/03/2006
P&O 1	588074	5682942	18/09/2007 – 18/12/2006
P&O 2	588767	5684045	18/09/2007 – 18/12/2006
PSA	588536	5684523	18/09/2007 – 18/12/2006
DB Ports (S-back)	587760	5682449	28/02/2008 – 28/04/2008
DB Ports (S-middle)	588074	5682942	21/02/2008 – 28/04/2008
DB Ports (S-entrance)	588767	5684045	21/02/2008 – 28/04/2008
PSA (N-entrance)	588536	5684523	21/02/2008 – 28/04/2008
Settling velocity – INSSEV			
Location	*Easting (UTM ED 50)*	*Northing (UTM ED 50)*	*Period*
Deurganckdok CDW	588717	5684898	05/09/2006
Deurganckdok SILL	588800	5684250	06/09/2006
Deurganckdok Western quay wall	588452	5684355	07/09/2006



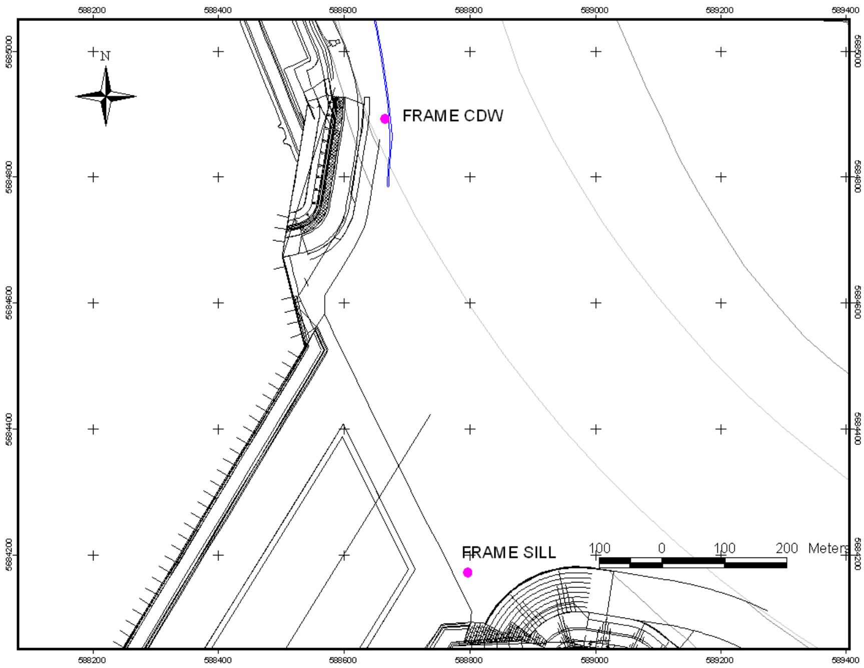
Overview of the measurement locations
21/03/2006 – 23/03/2006 & 26/09/2006 – 28/09/2006



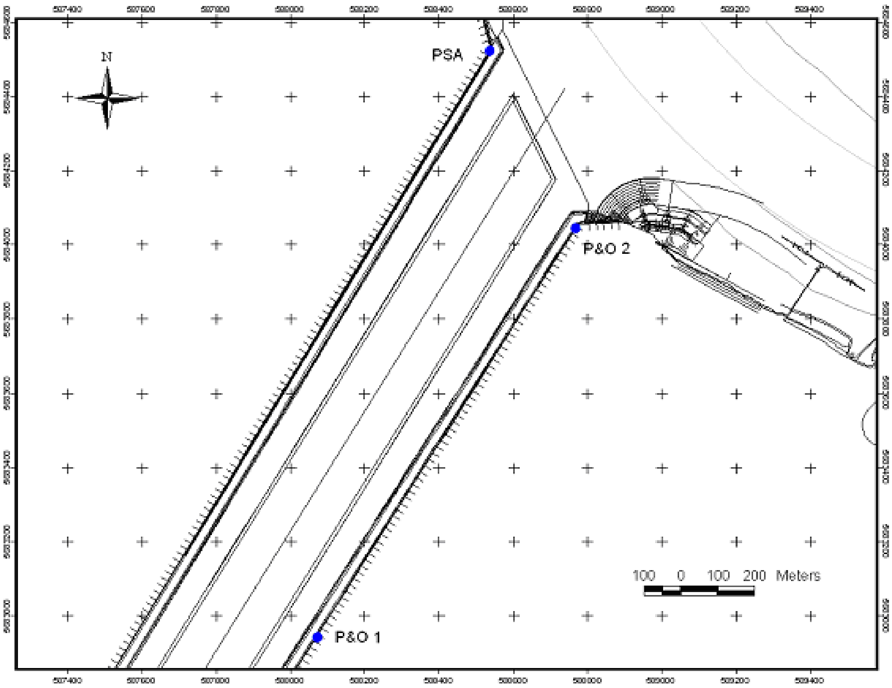
Overview of the measurement locations in Deurganckdok
21/03/2006 – 23/03/2006 & 26/09/2006 – 28/09/2006 & 23/10/2007



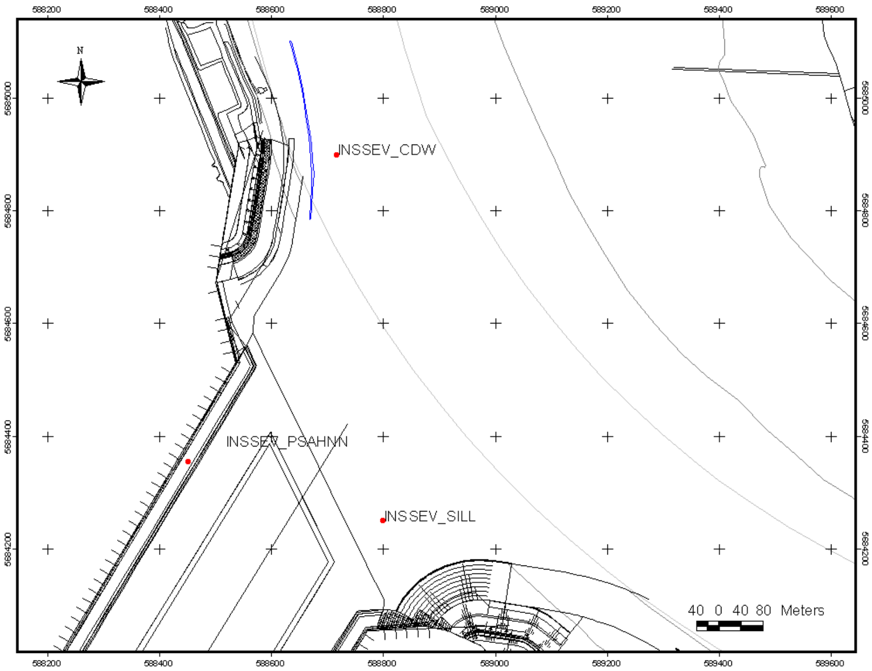
Overview measurement locations in Deurganckdok 24/10/07



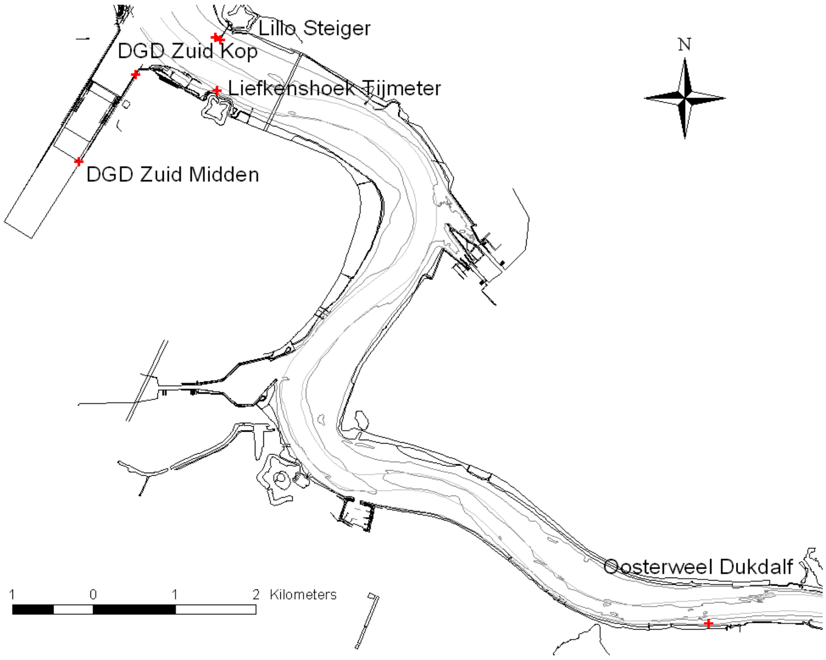
Near bed continuous monitoring
14/03/2006 – 05/04/2006 & 19/04/2006 – 23/05/2006 & 18/07/2006 – 11/10/2006
& 09/02/2007 – 18/04/2007



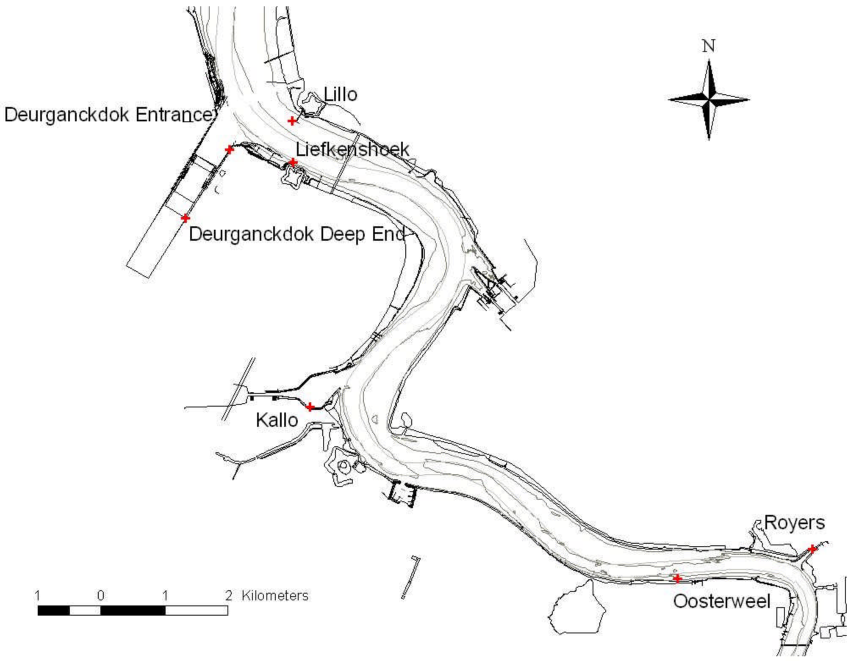
Long term salt-silt measurements in Deurganckdok
17/03/2006 – 28/04/2006 & 20/07/2006 – 12/10/2006 & 12/02/2007 – 27/03/2007



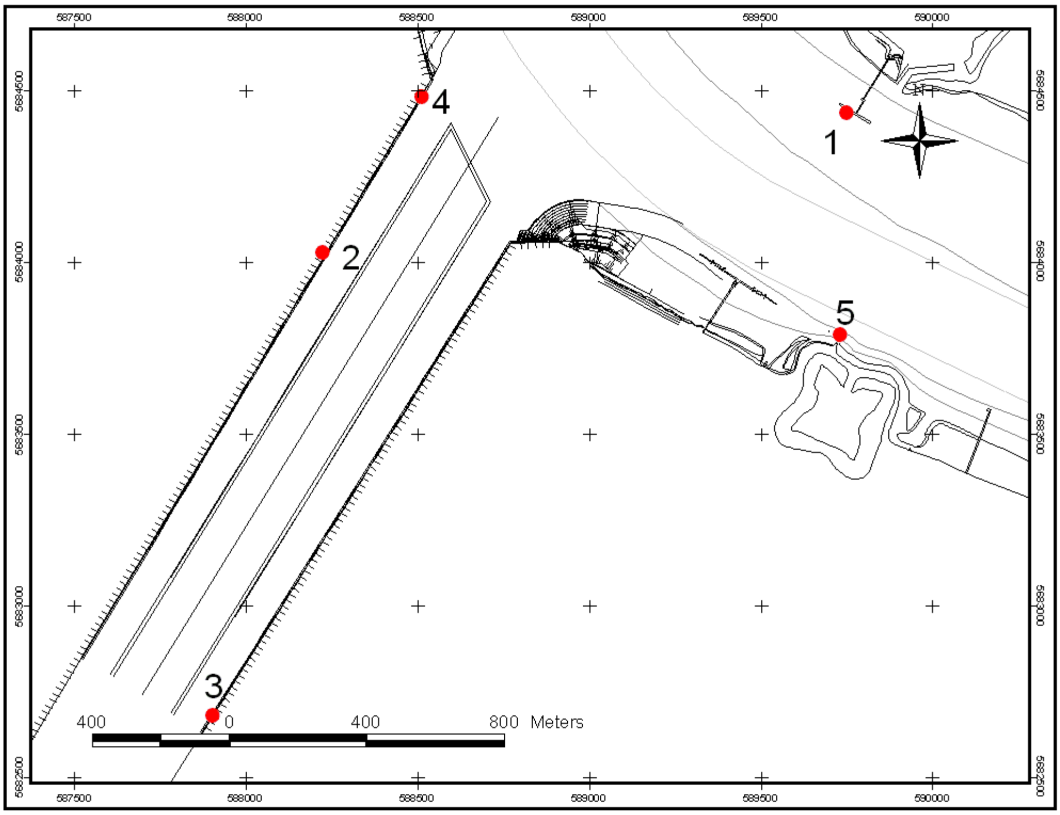
Settling velocity (INSSEV) 05/09/2006 – 07/09/2006



Calibration measurements - 15/03/2006 & 14/04/2006



Calibration measurements - 23/06/2006 & 18/09/2006



Calibration measurements 10/09/2007

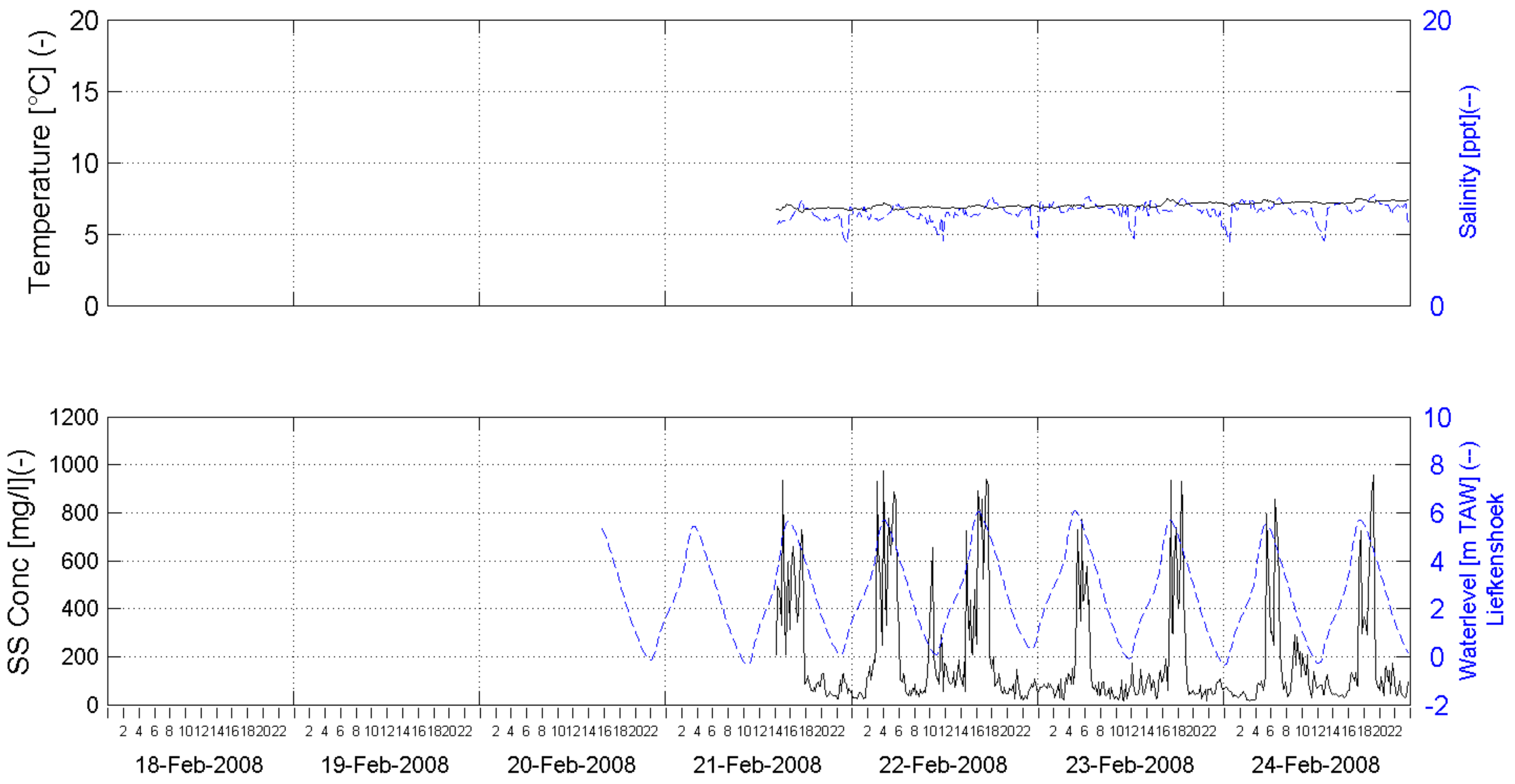
APPENDIX C.

WEEKSERIES SALT - SILT MEASUREMENTS DGD

C.1 N-ENTRANCE

11283 - Long-term monitoring DGD - Winter 2008

Week 7 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

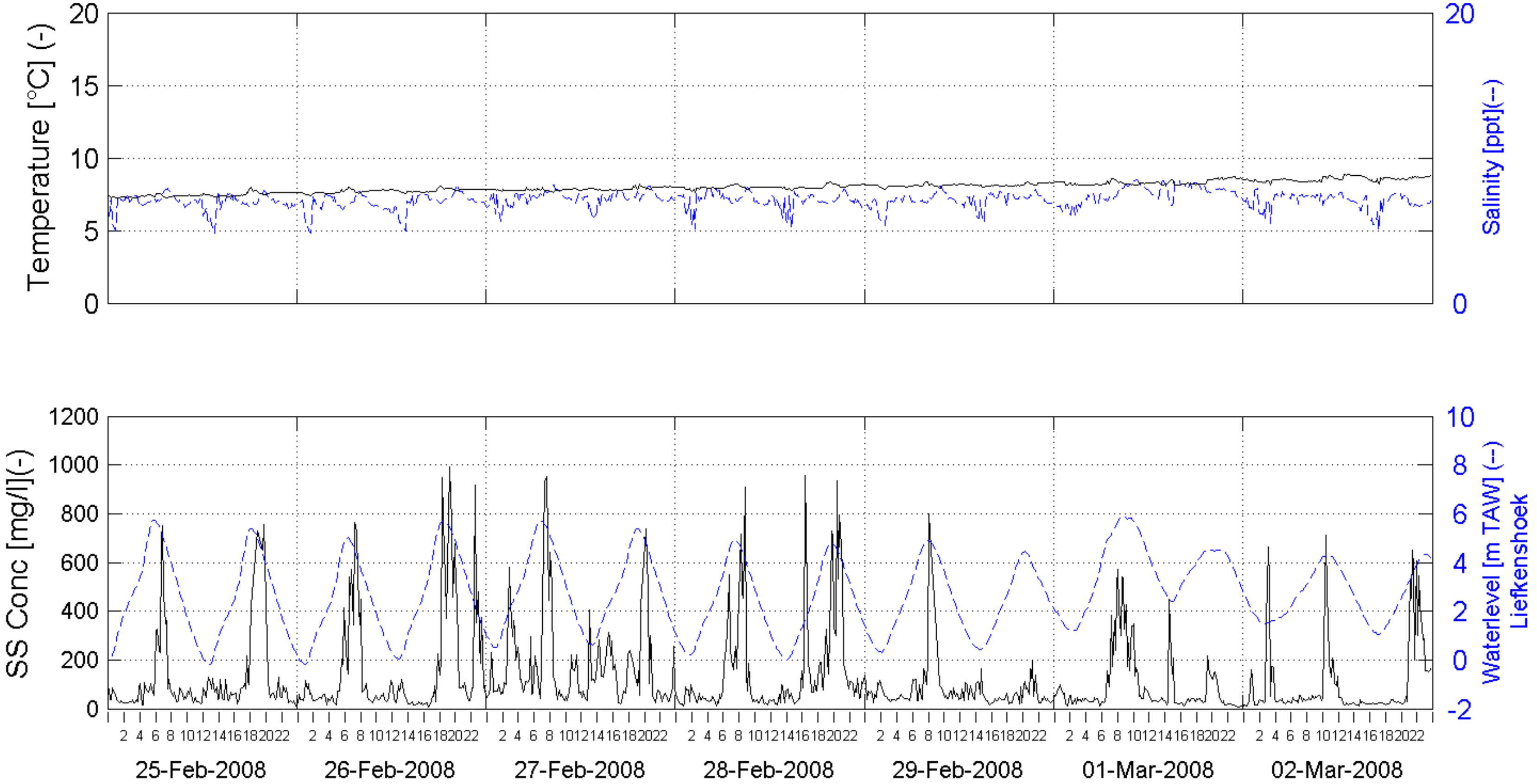
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 8 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

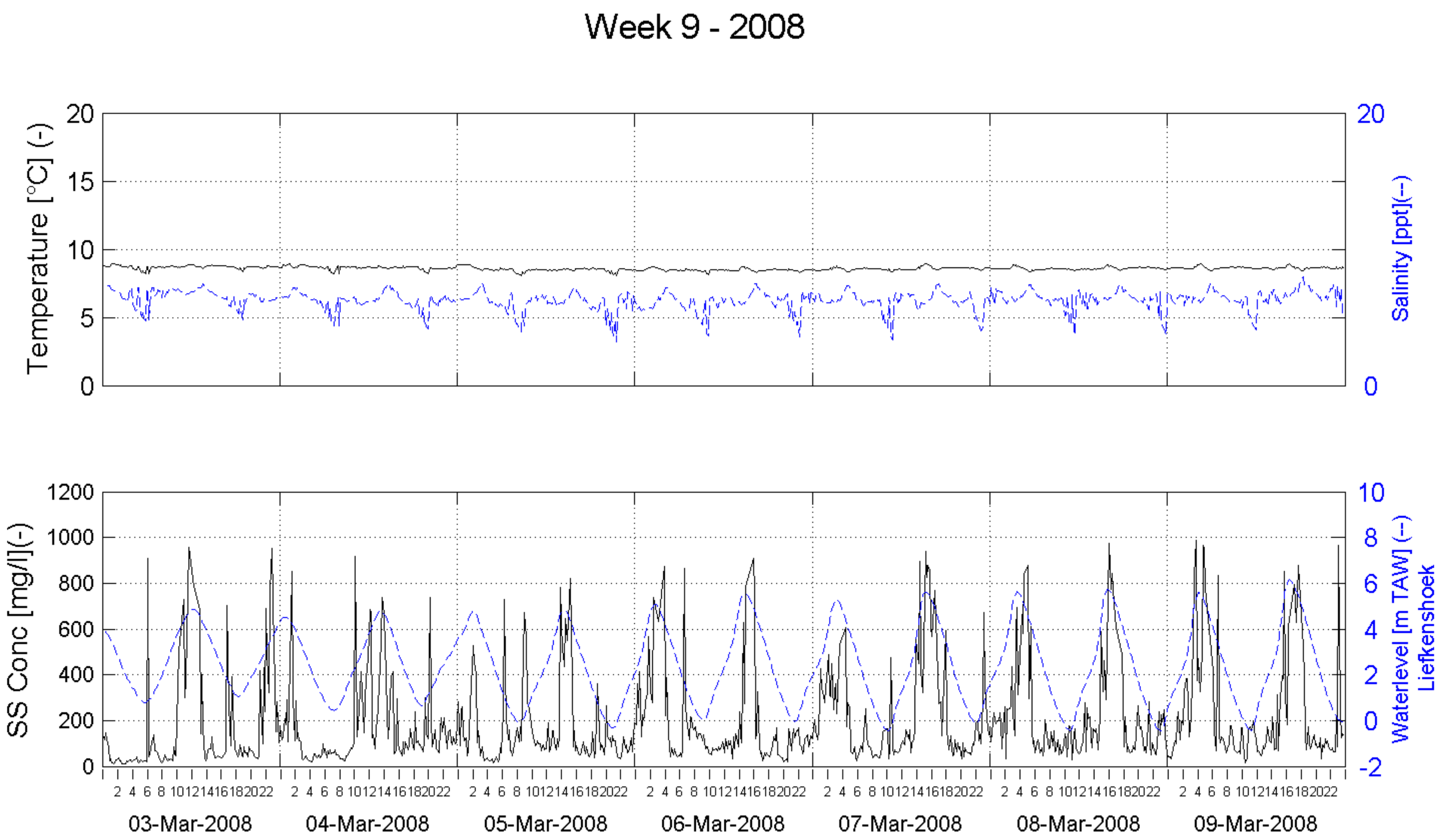
Location:
N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

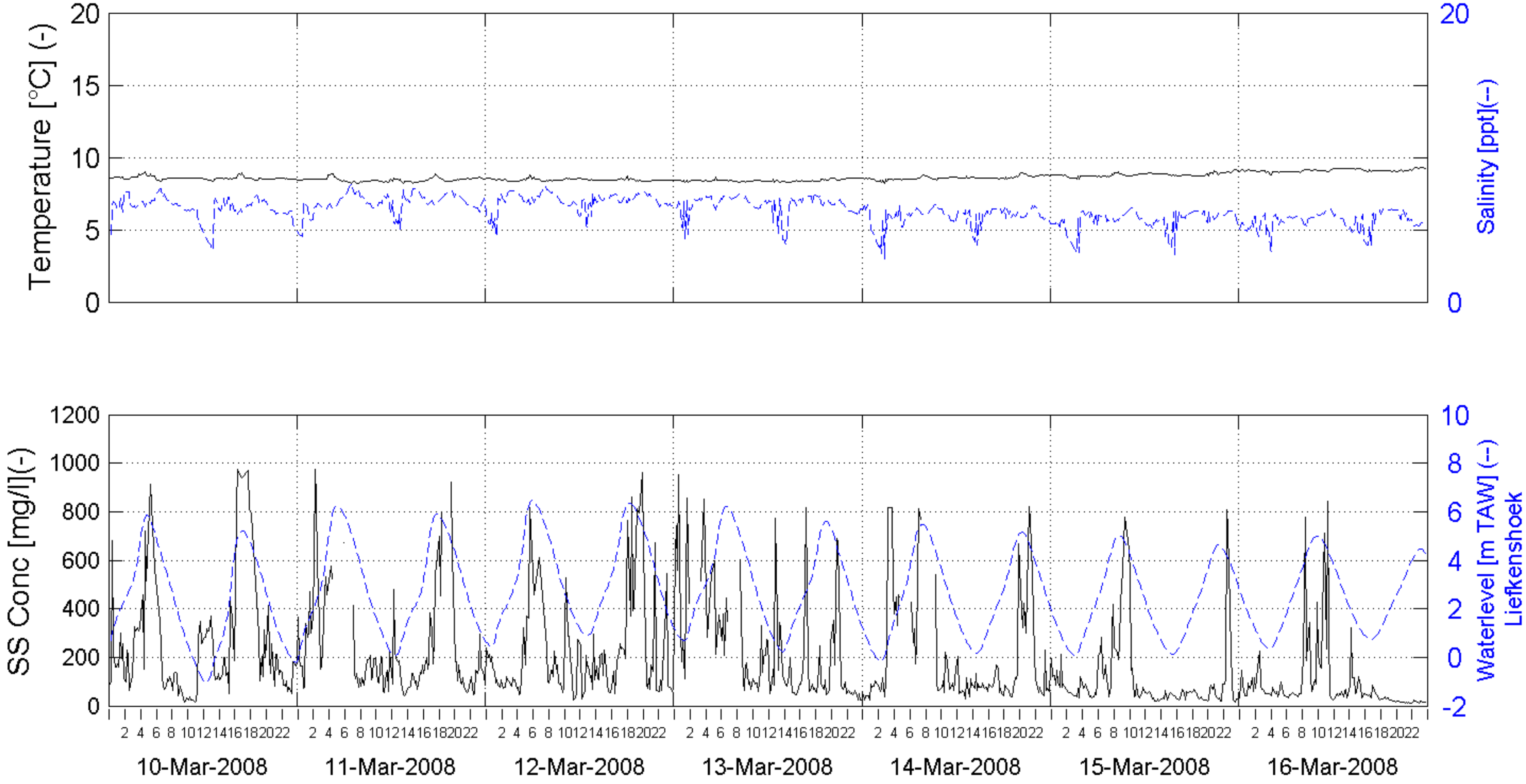
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 10 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

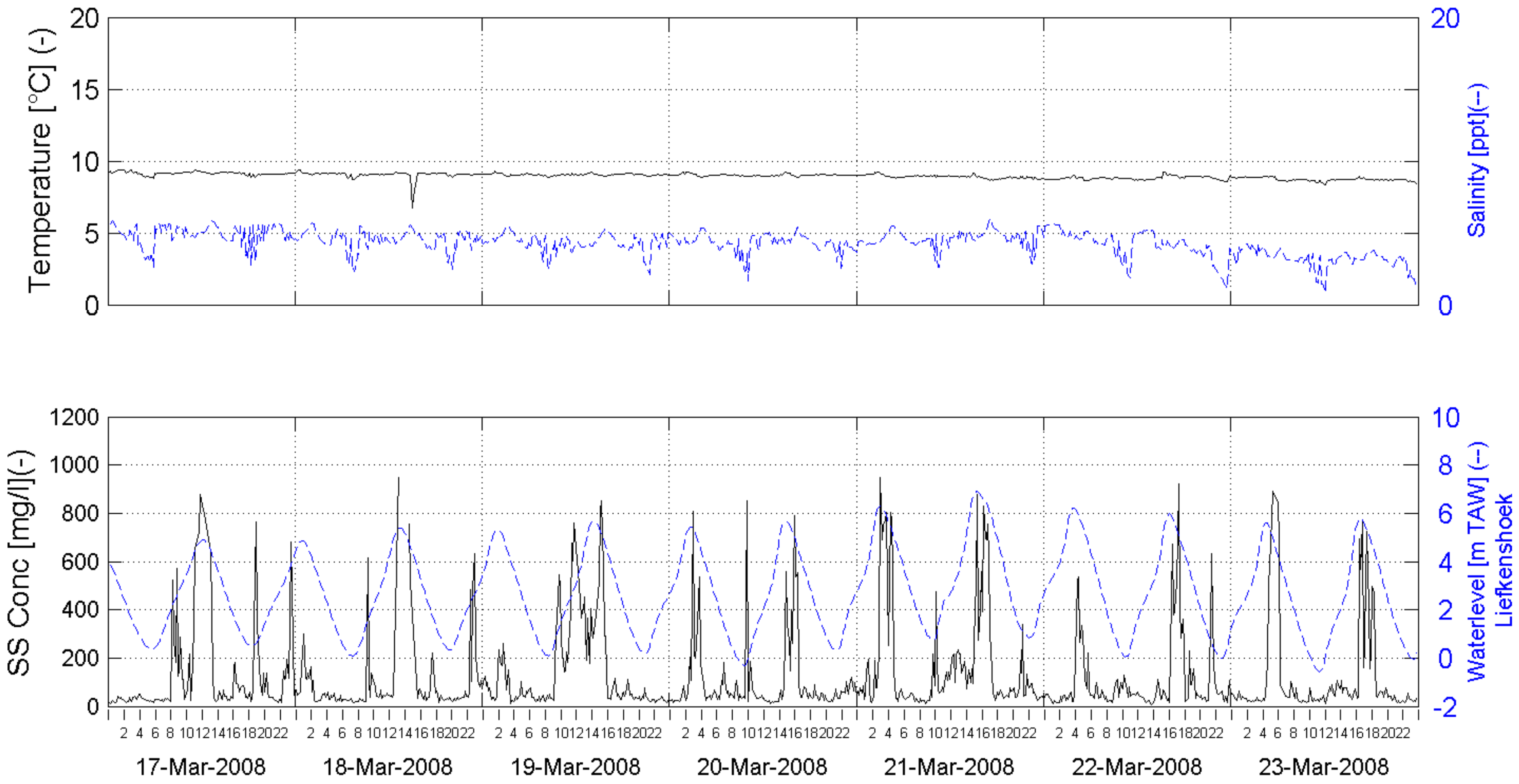
Processed by: IMDC

In Association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 11 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

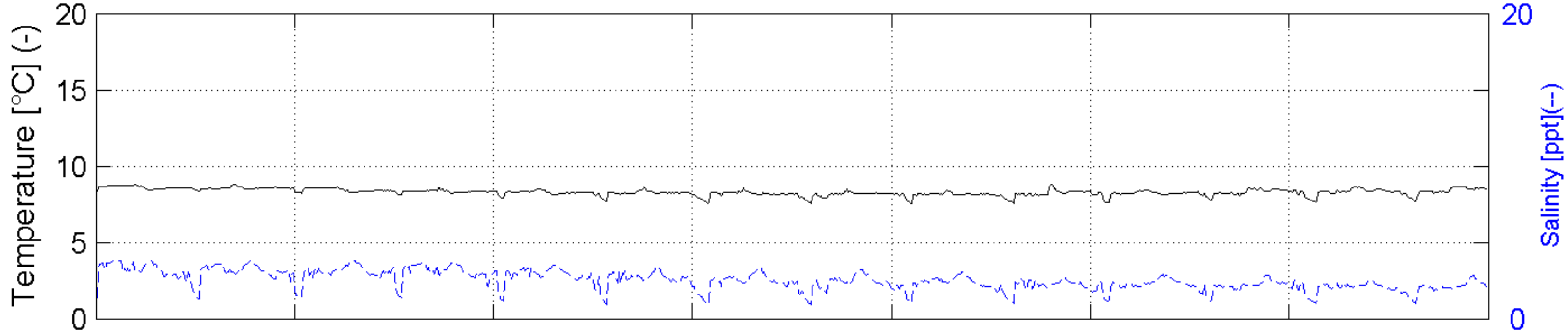
Processed by:

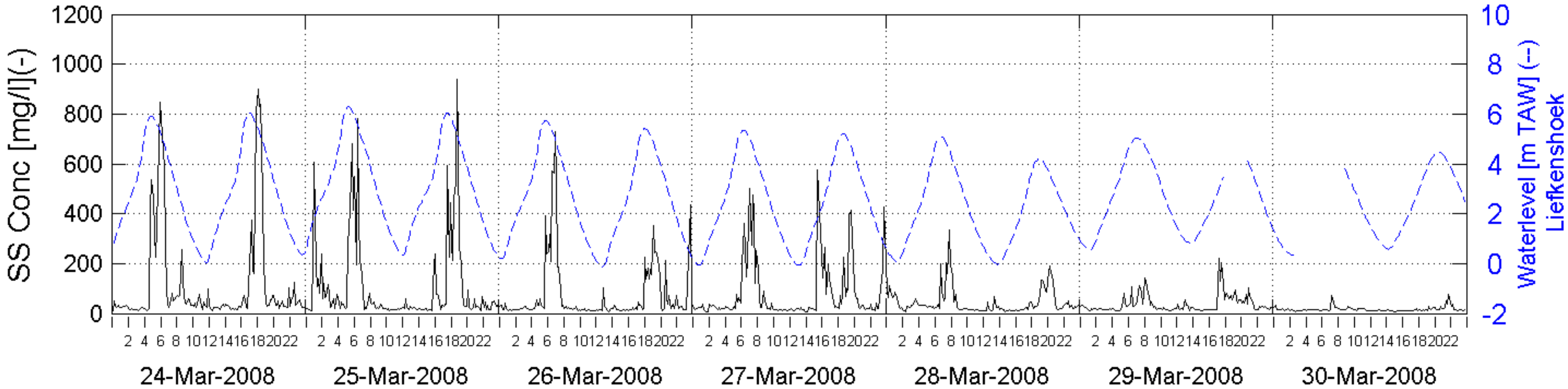
In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 12 - 2008





Week series of Salinity, Temperature, SS Concentration and Tide

Location:

N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

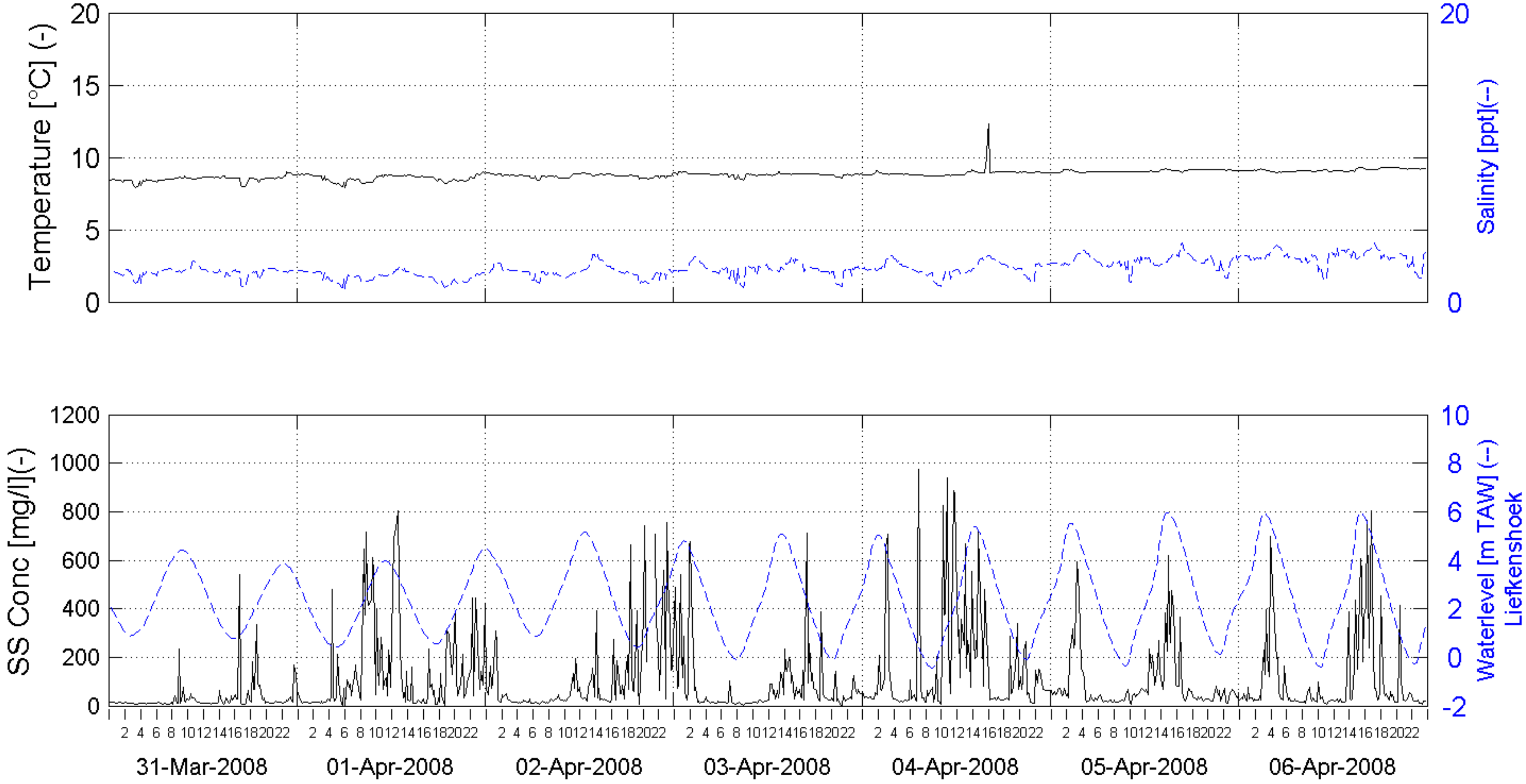
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 13 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

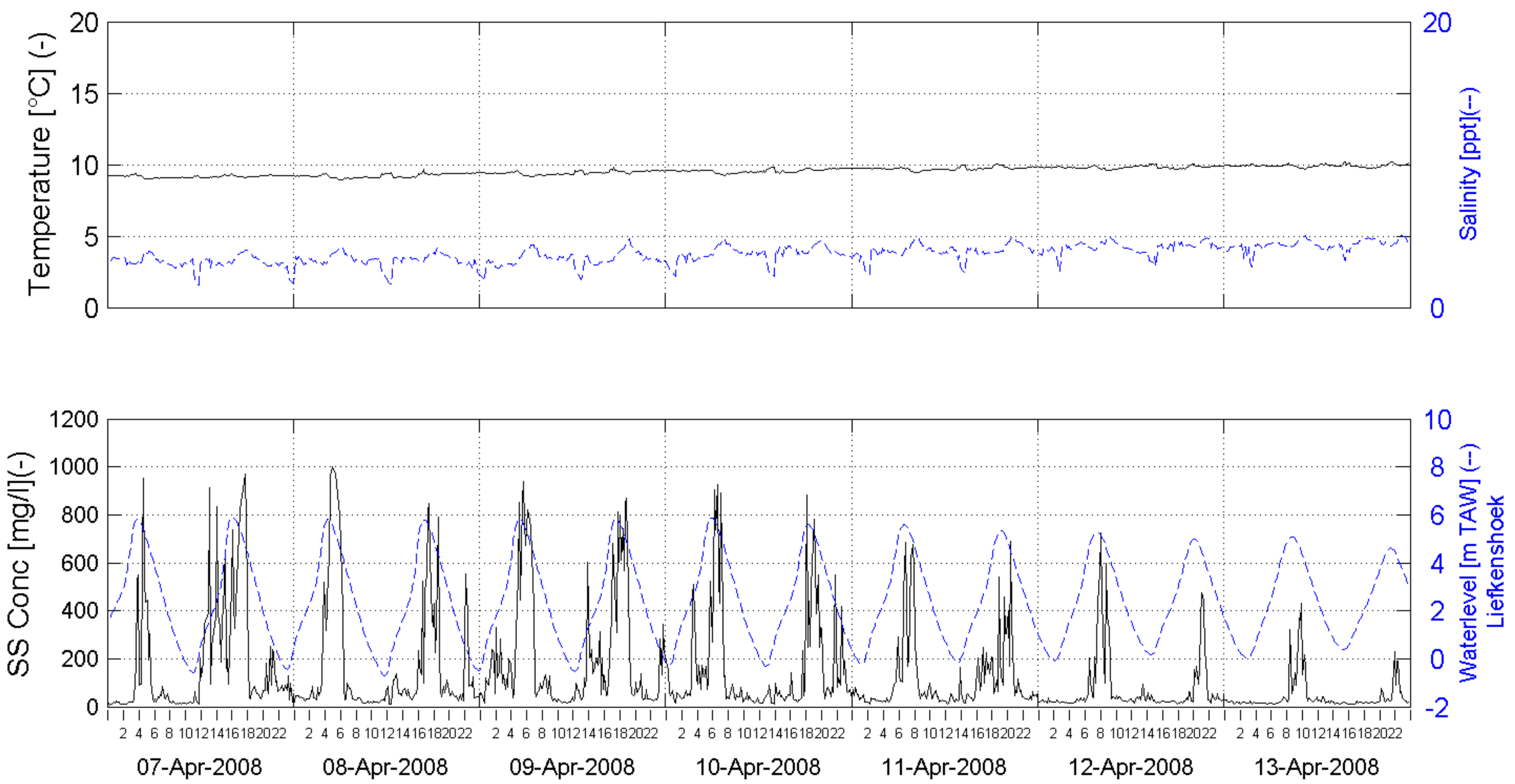
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 14 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

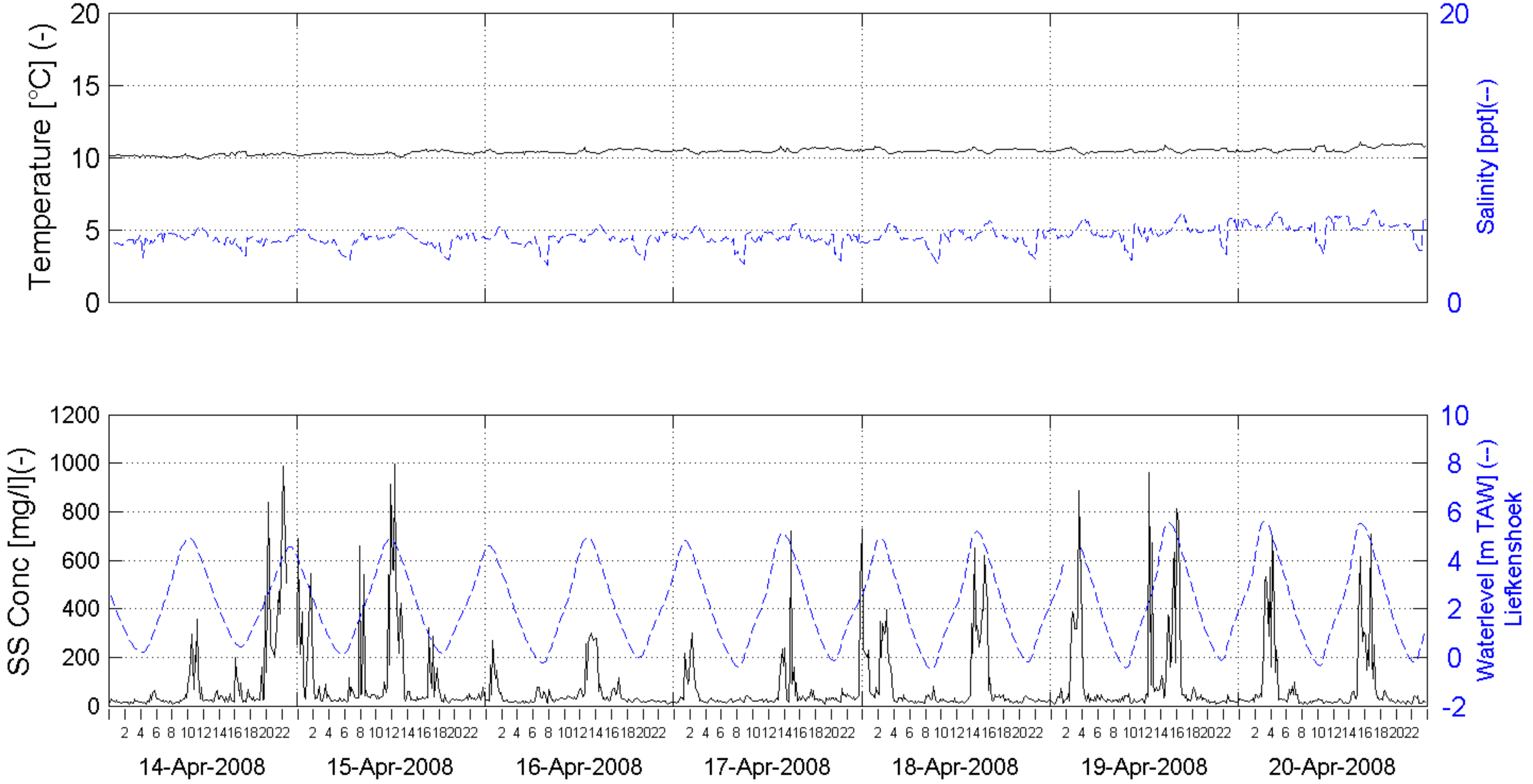
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 15 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

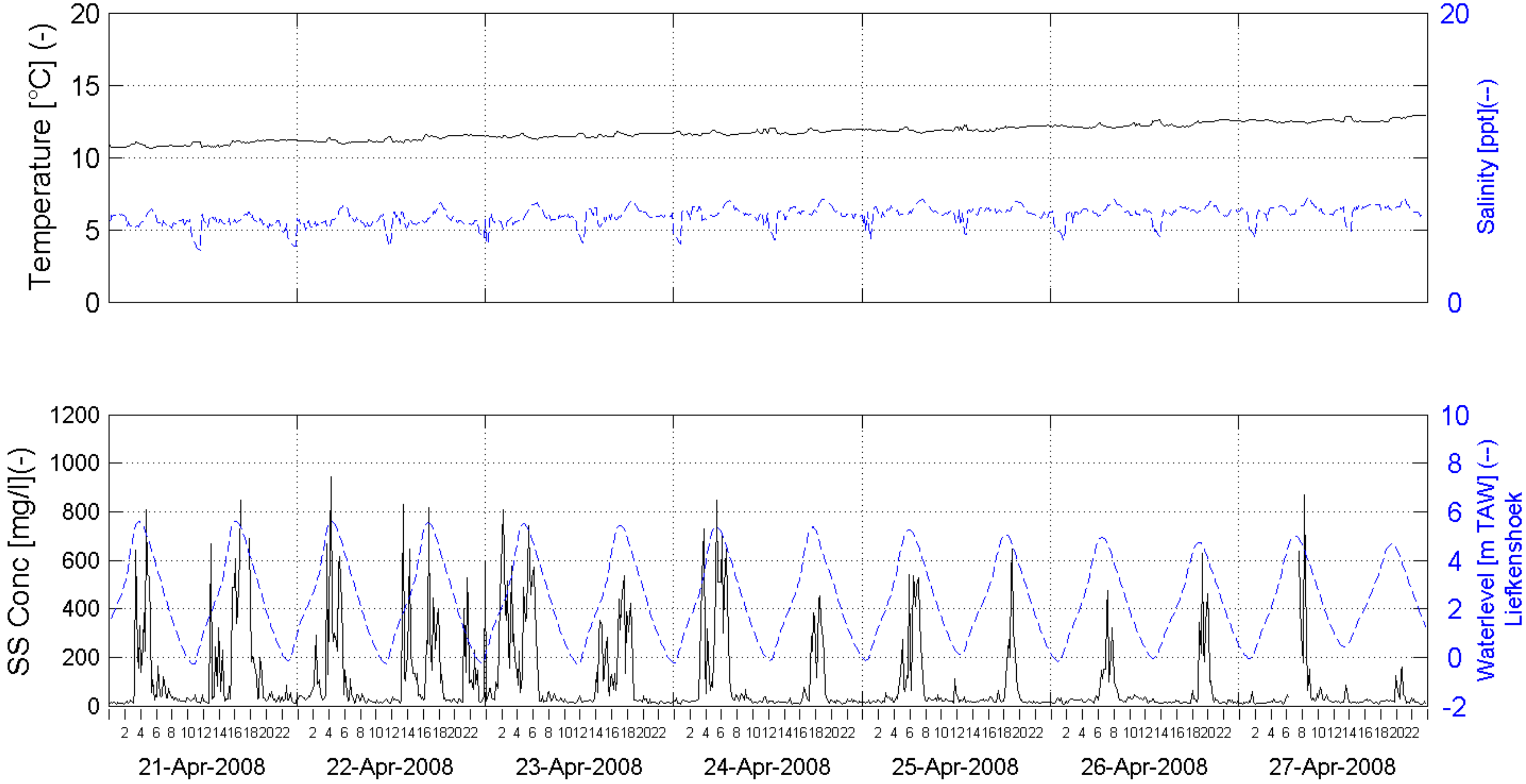
I/RA/11283/07.094/MSA

Location:

N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

11283 - Long-term monitoring DGD - Winter 2008

Week 16 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

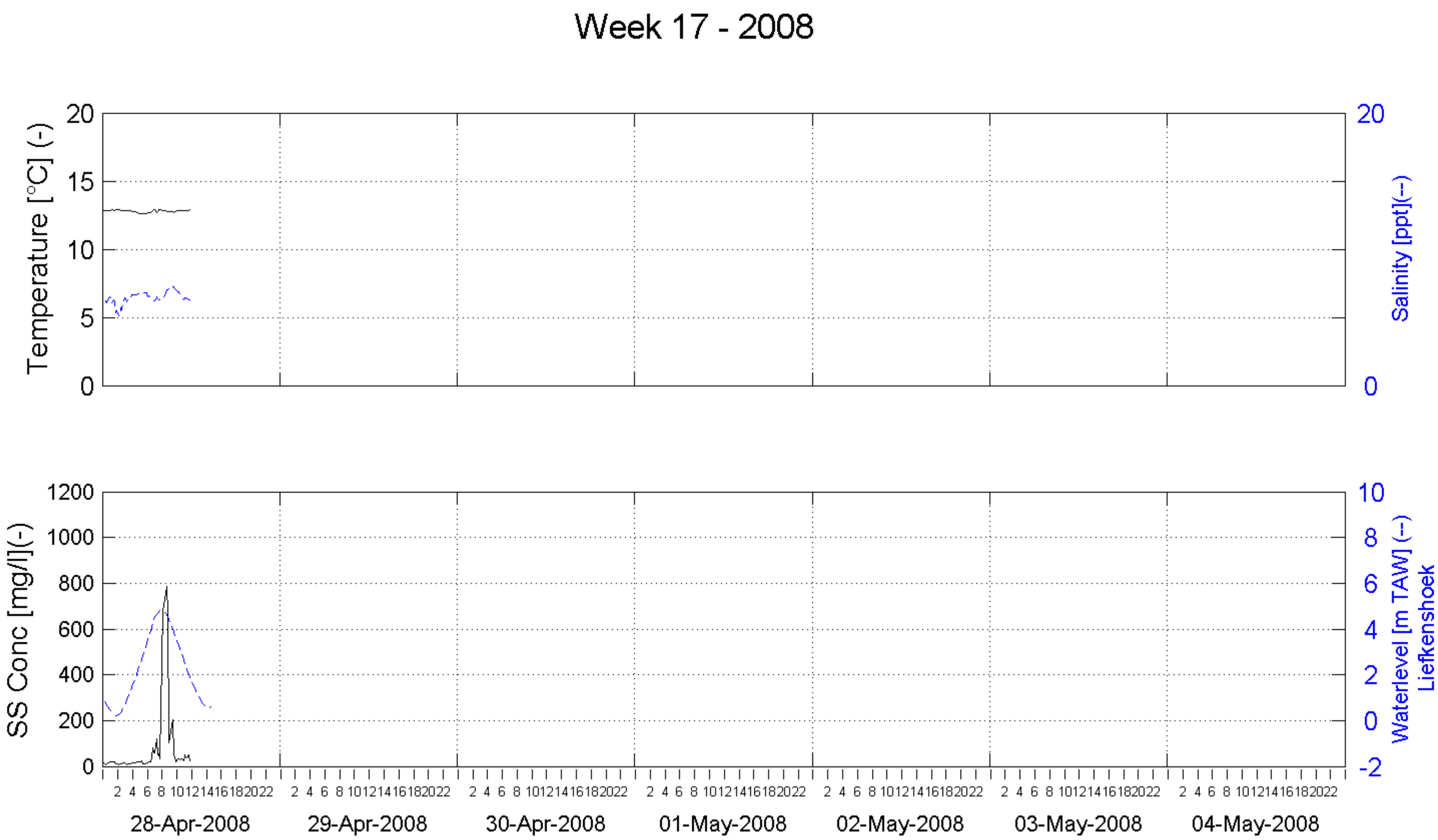
Processed by:

In Association with:

Location:
N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

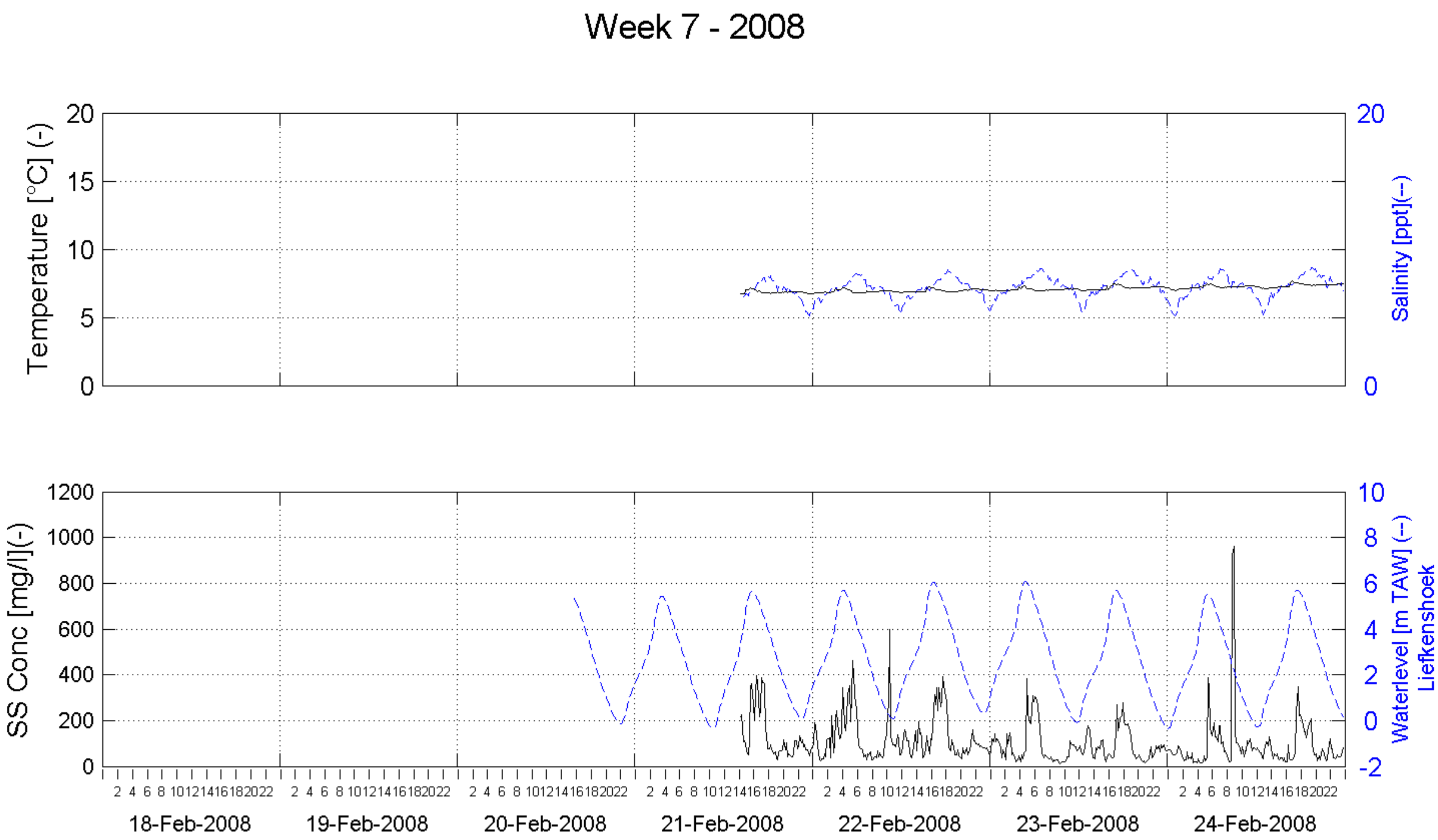
Location:
N-ENTRANCE BOTTOM 4.74m above bottom (-12.26m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

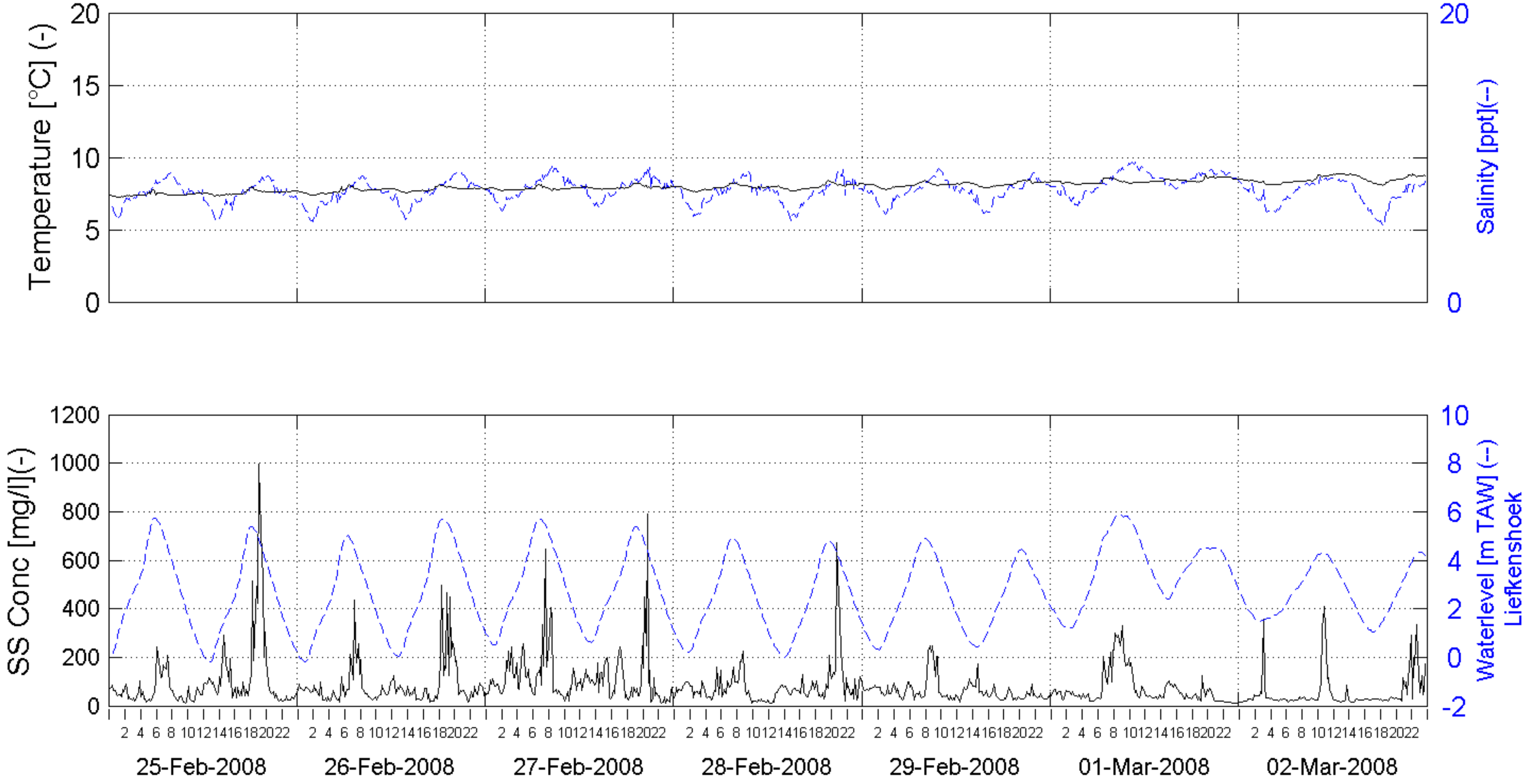
Location:

N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 8 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

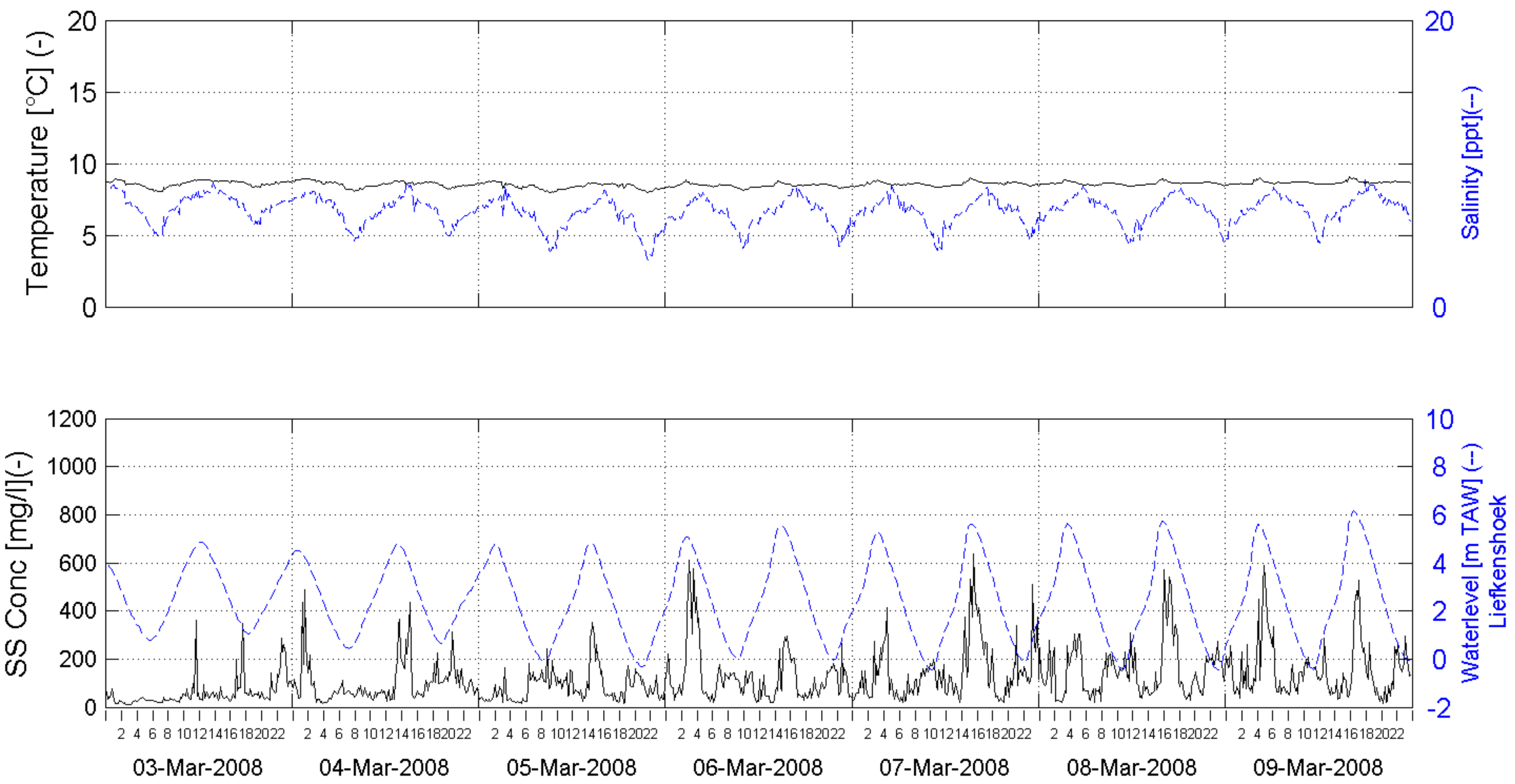
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 9 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Processed by:

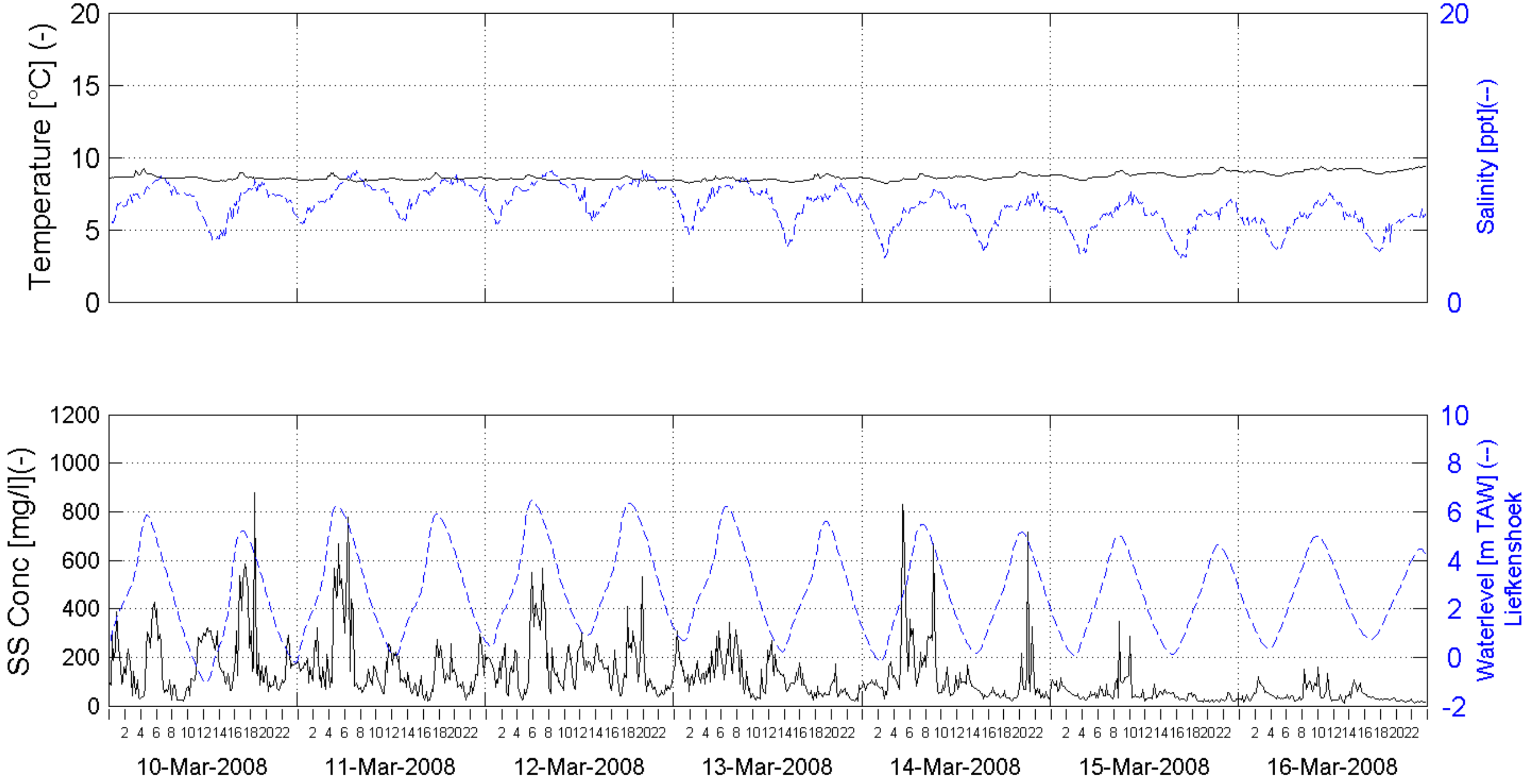
Location:
N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 10 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

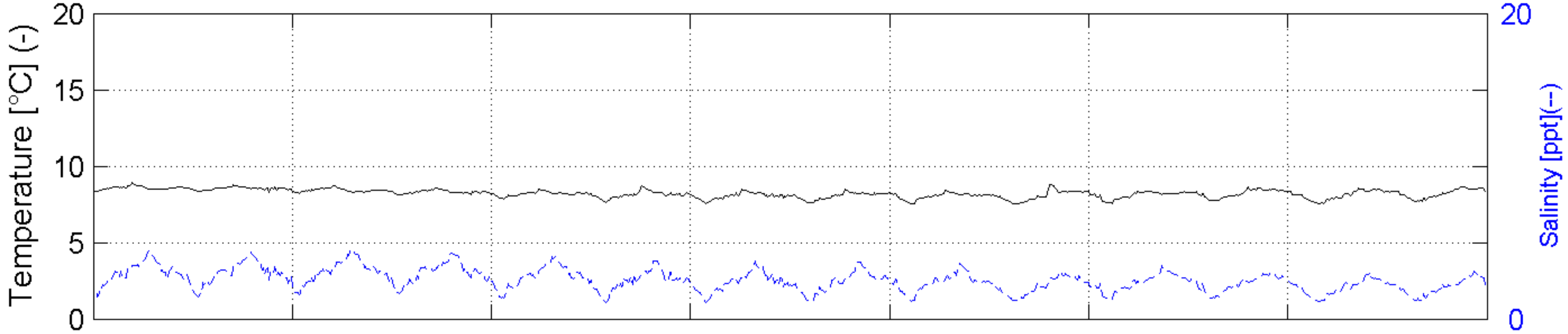
Processed by:

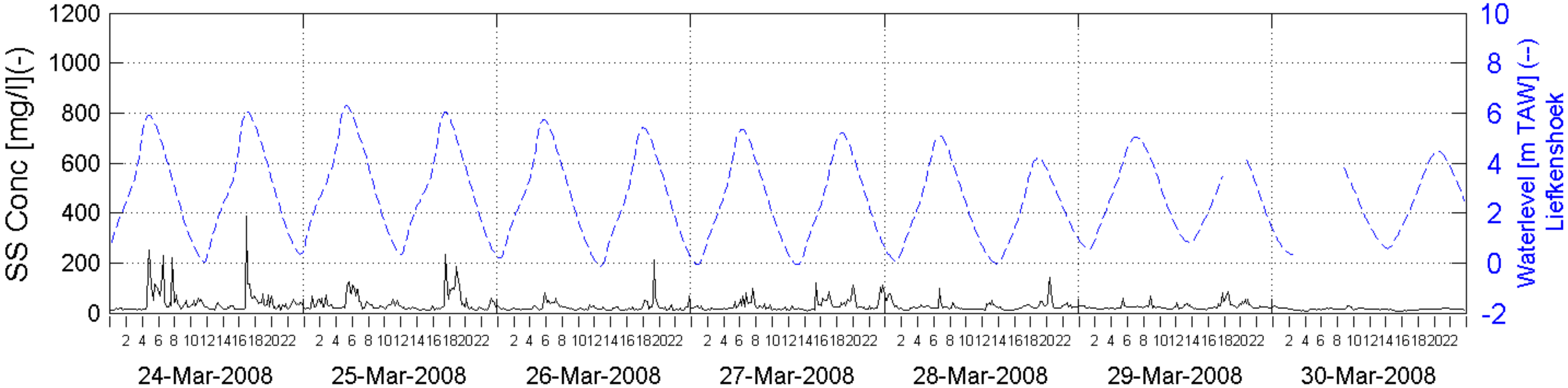
In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 12 - 2008





Week series of Salinity, Temperature, SS Concentration and Tide

Location:
N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

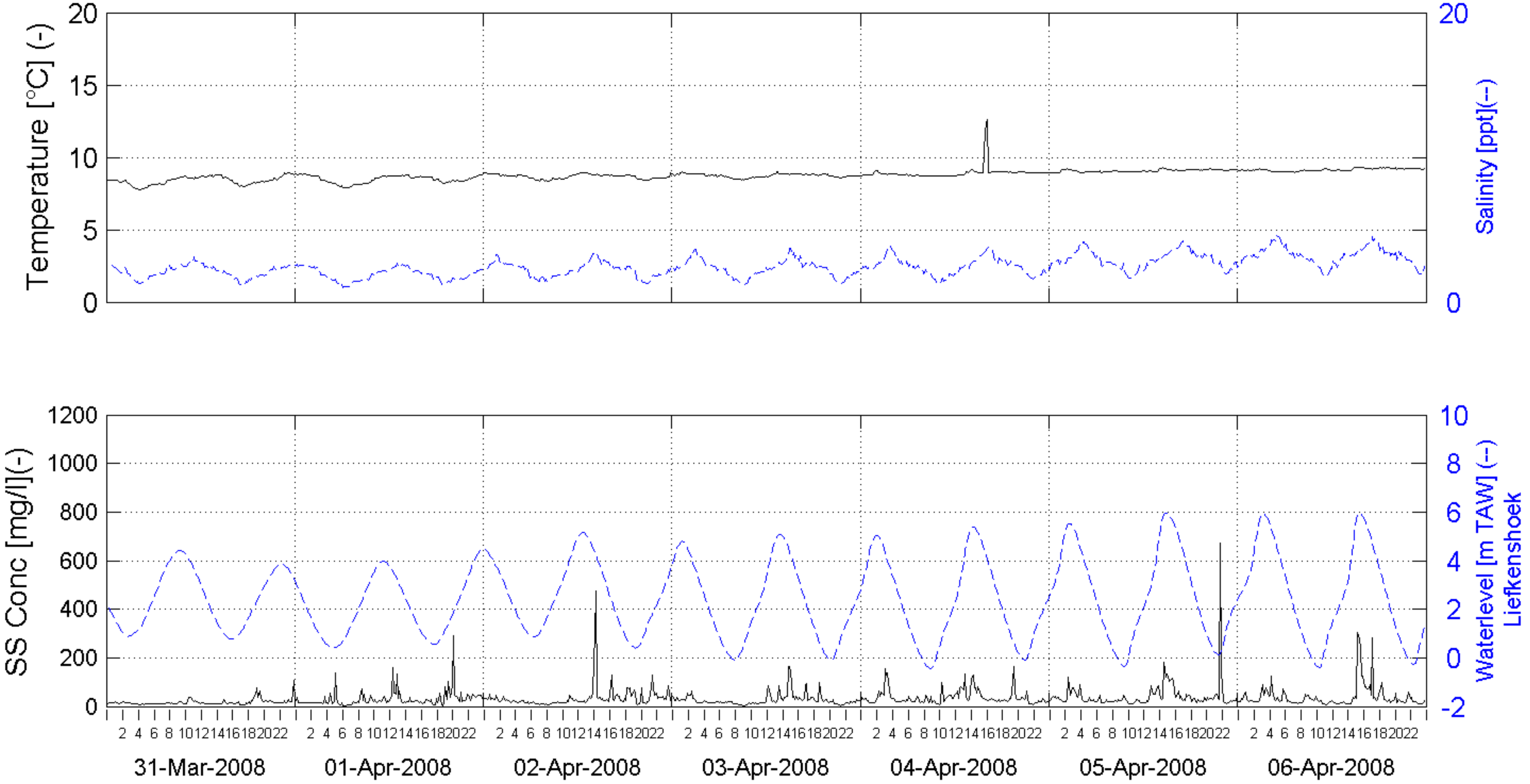
Processed by: IMDC

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 13 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

Location:

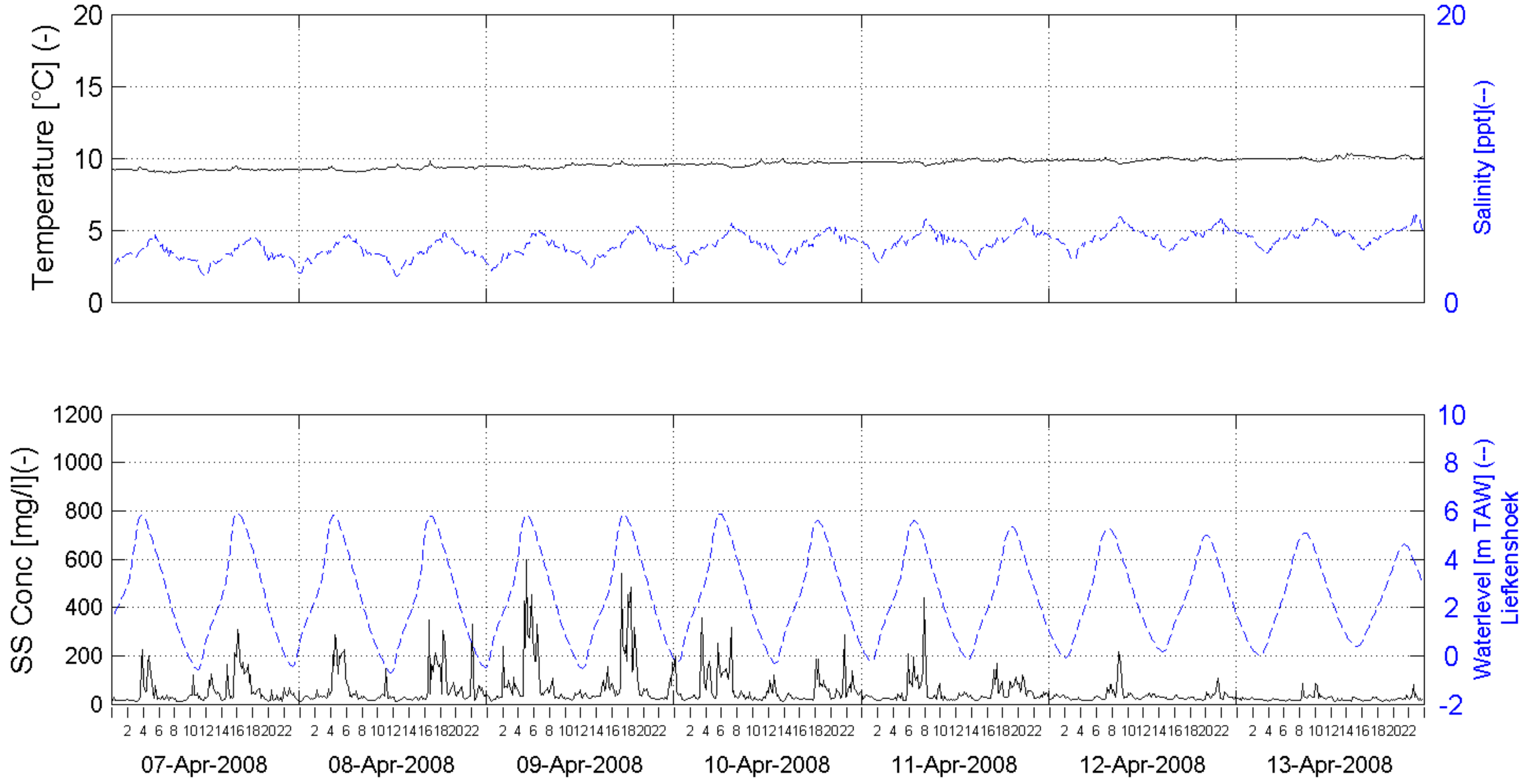
N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 14 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

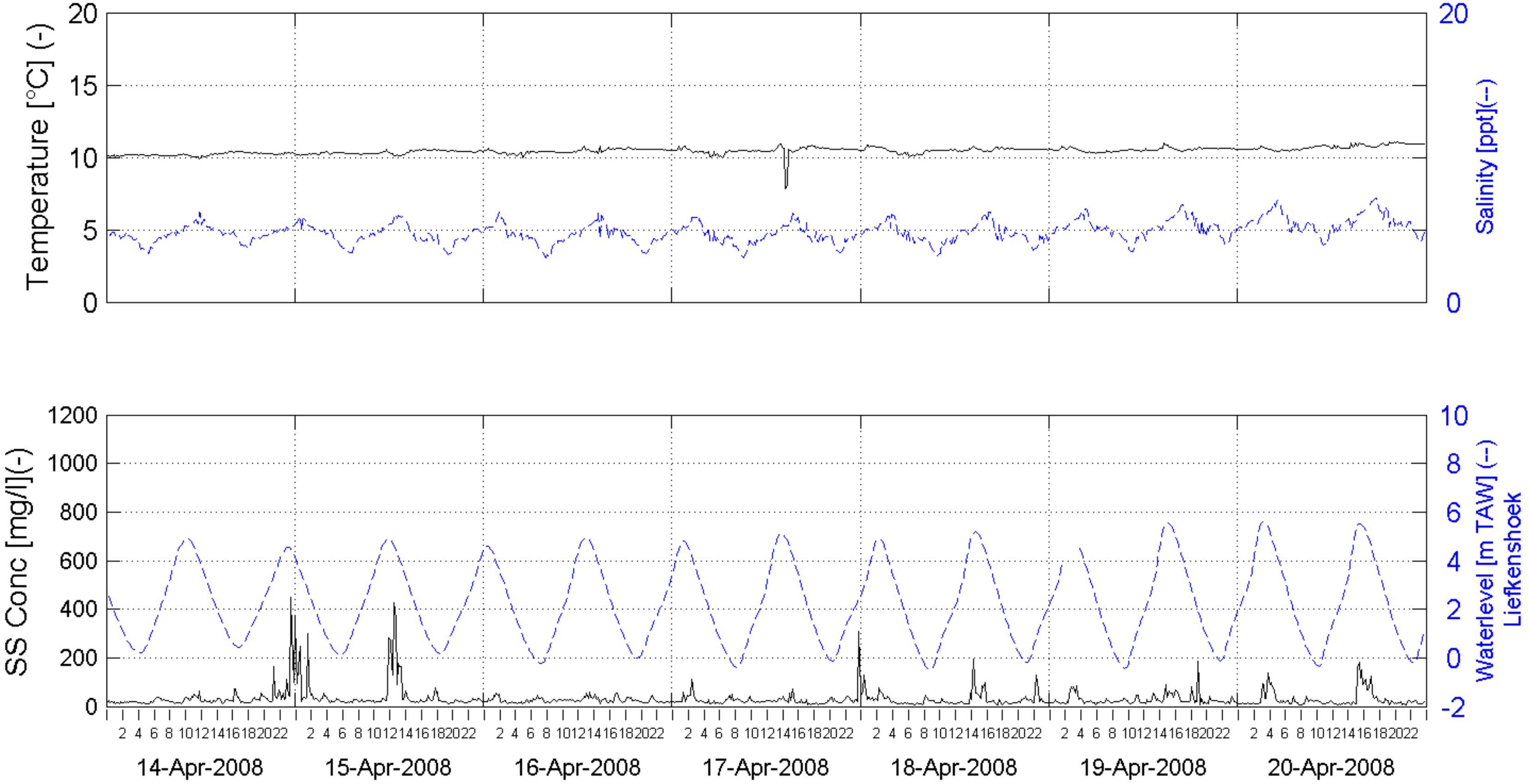
Location:

N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 15 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

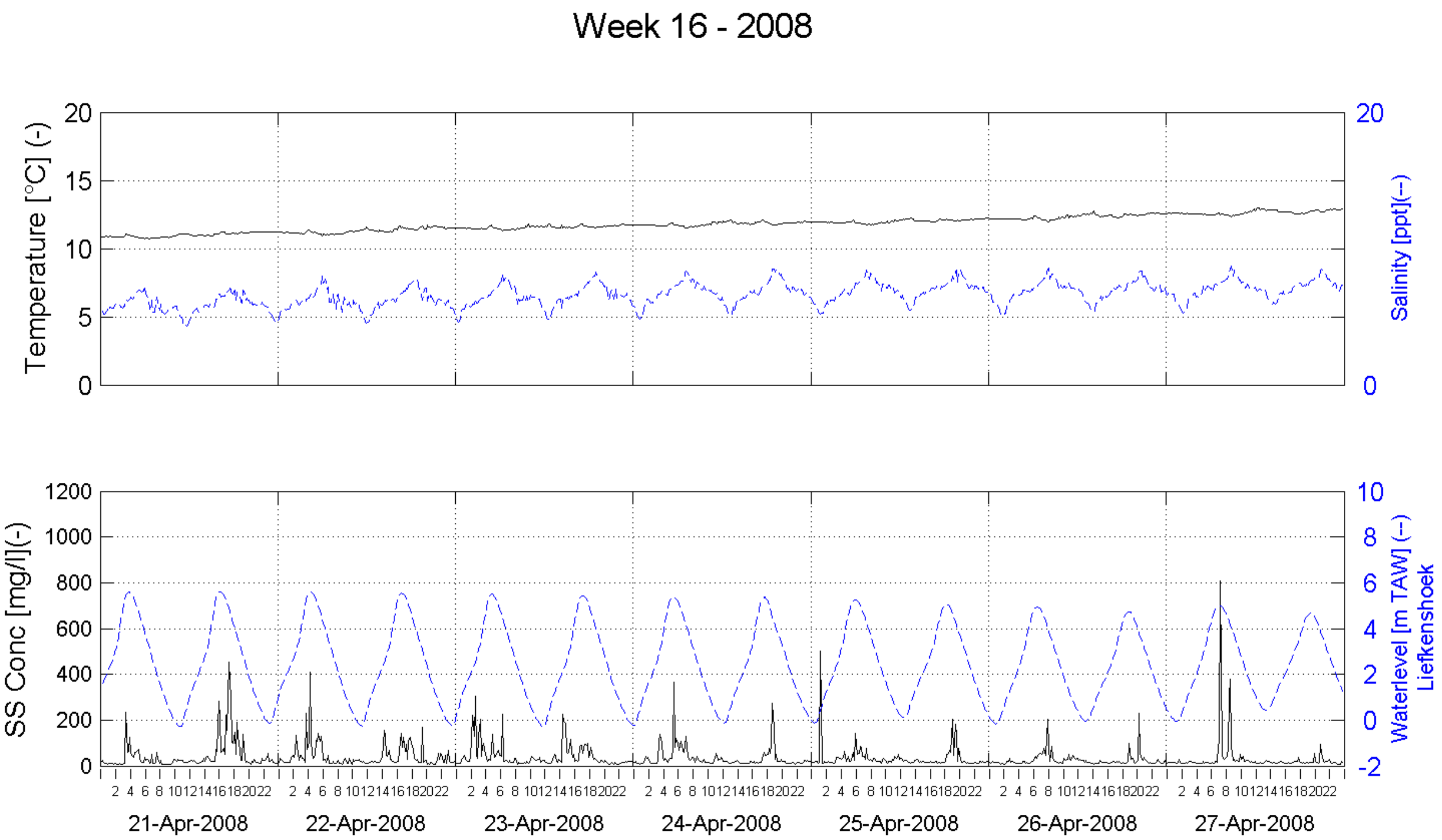
Location:
N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

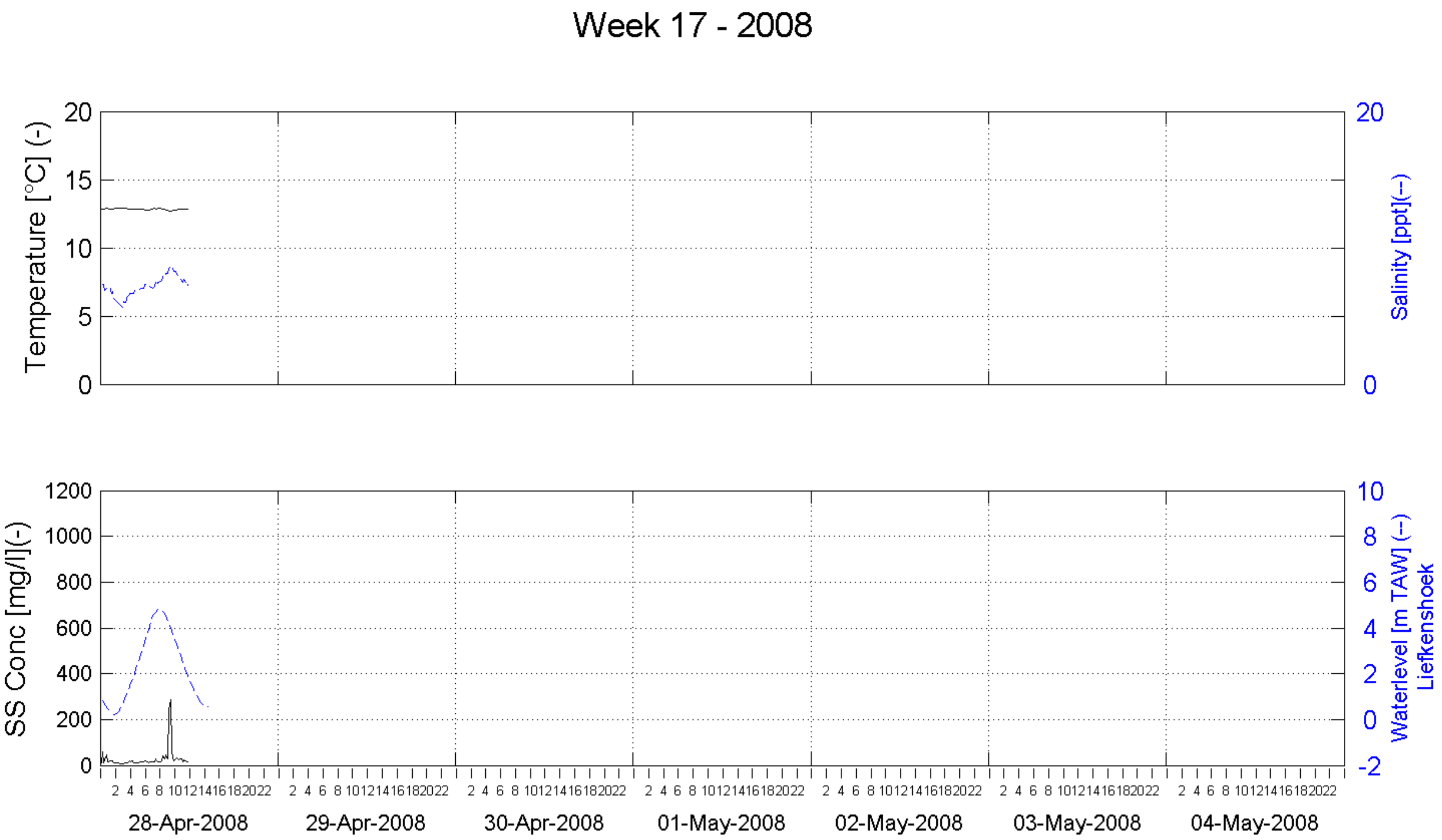
In Association with:

Location:

N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
N-ENTRANCE TOP 14.66m above bottom (-2.34m TAW)

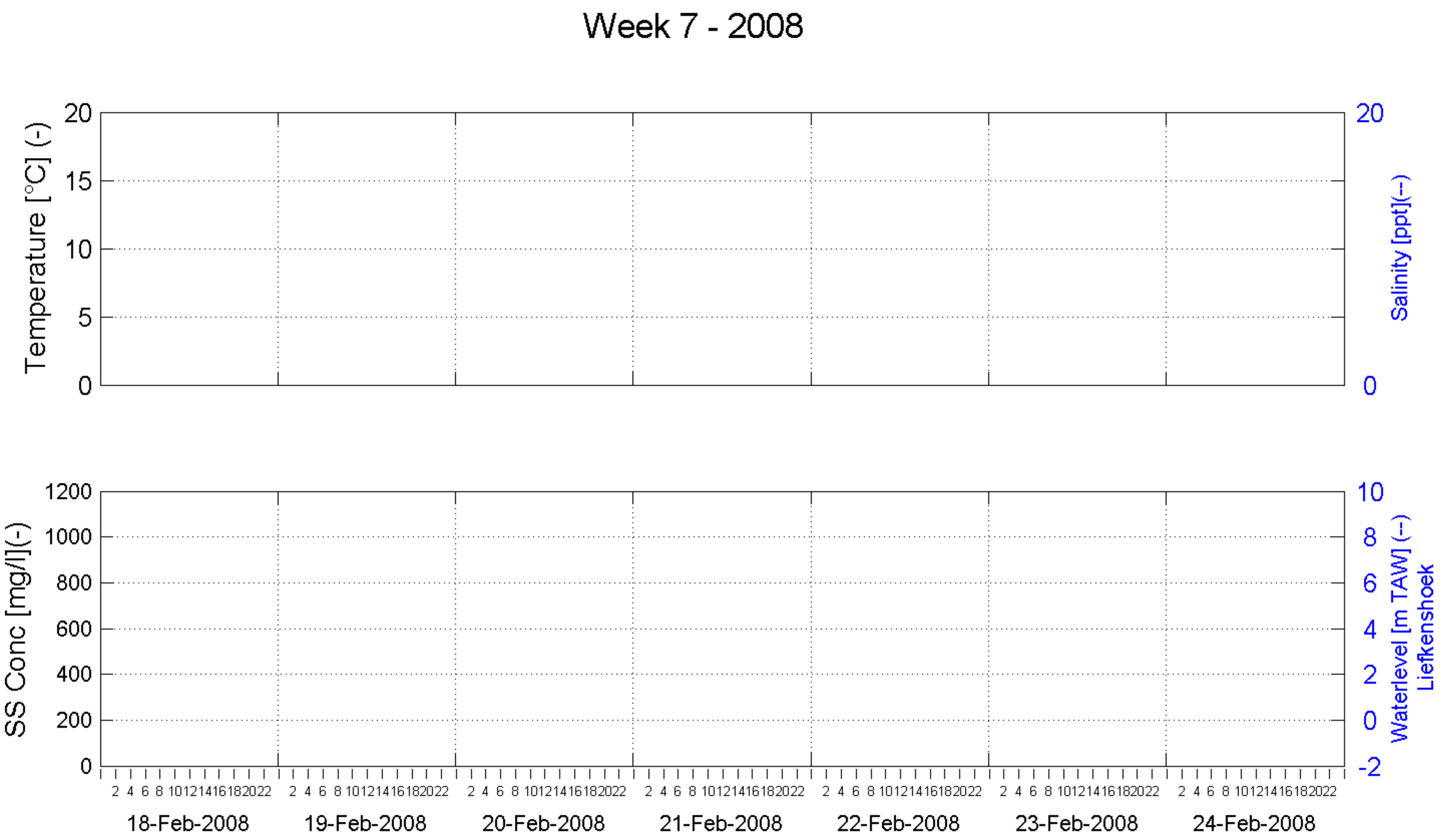
Processed by:

In Association with:

I/RA/11283/07.094/MSA

C.2 S-BACK

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

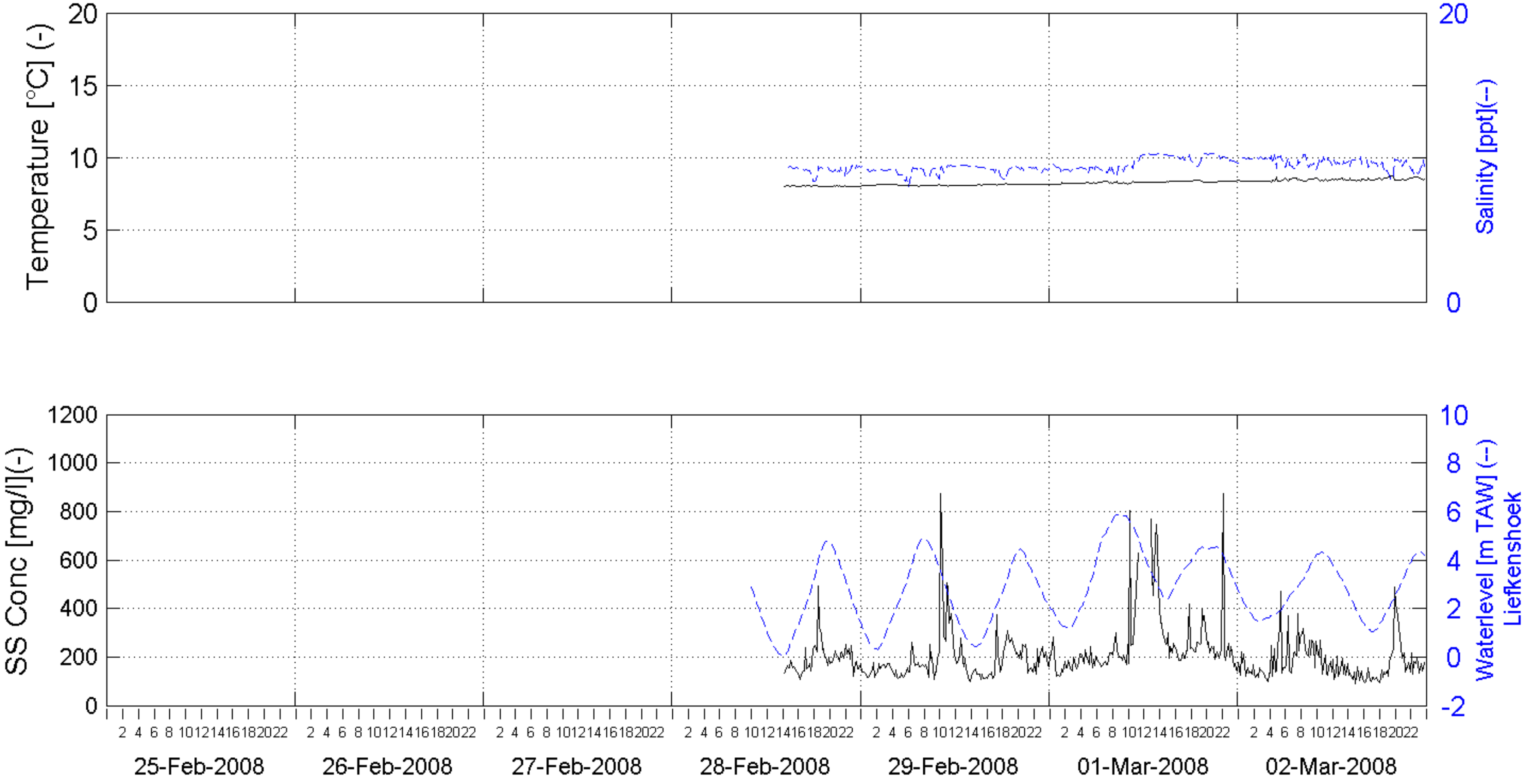
Location:

S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 8 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Processed by:

In Association with:

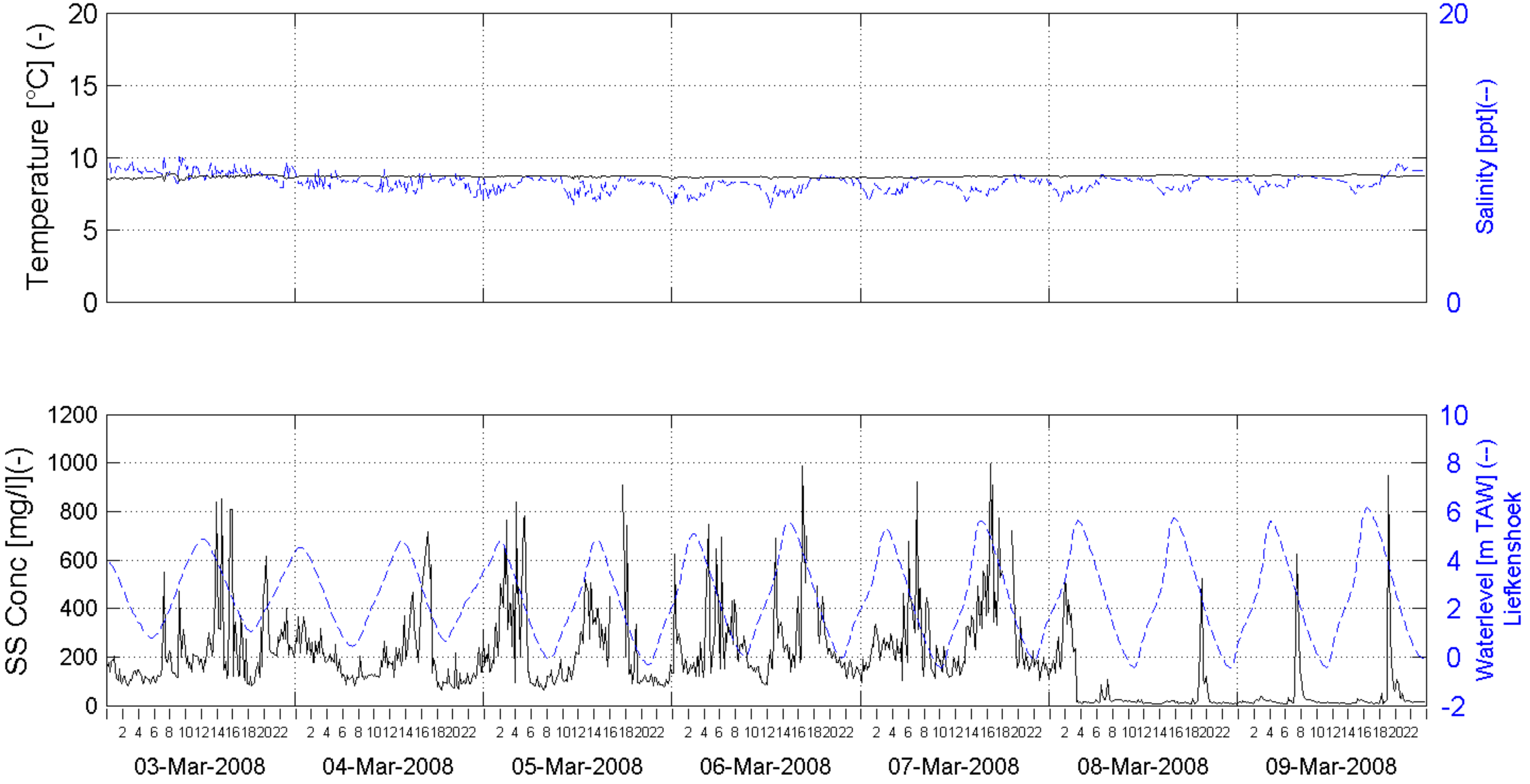
Location:

S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 9 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

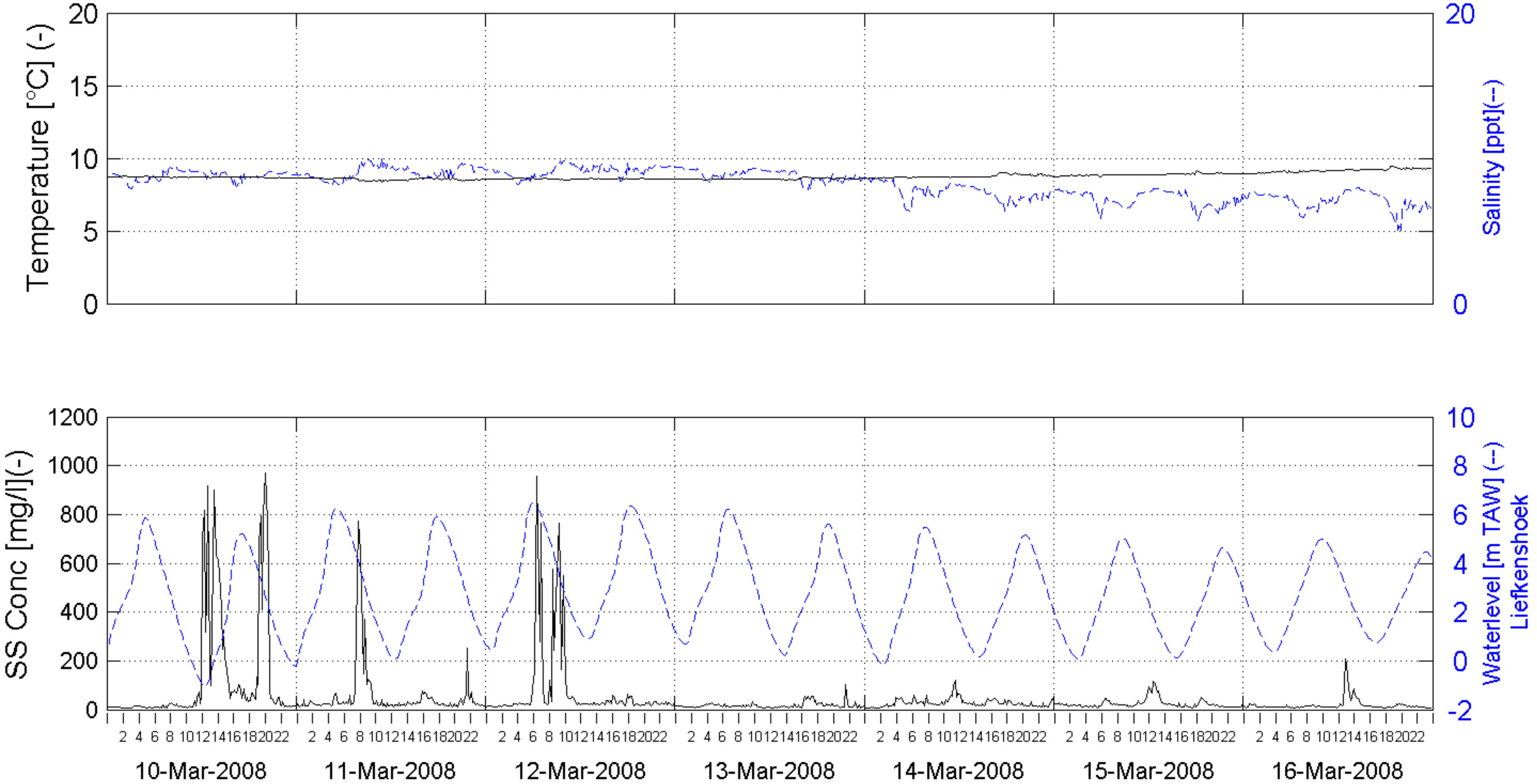
I/RA/11283/07.094/MSA

Location:

S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

11283 - Long-term monitoring DGD - Winter 2008

Week 10 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

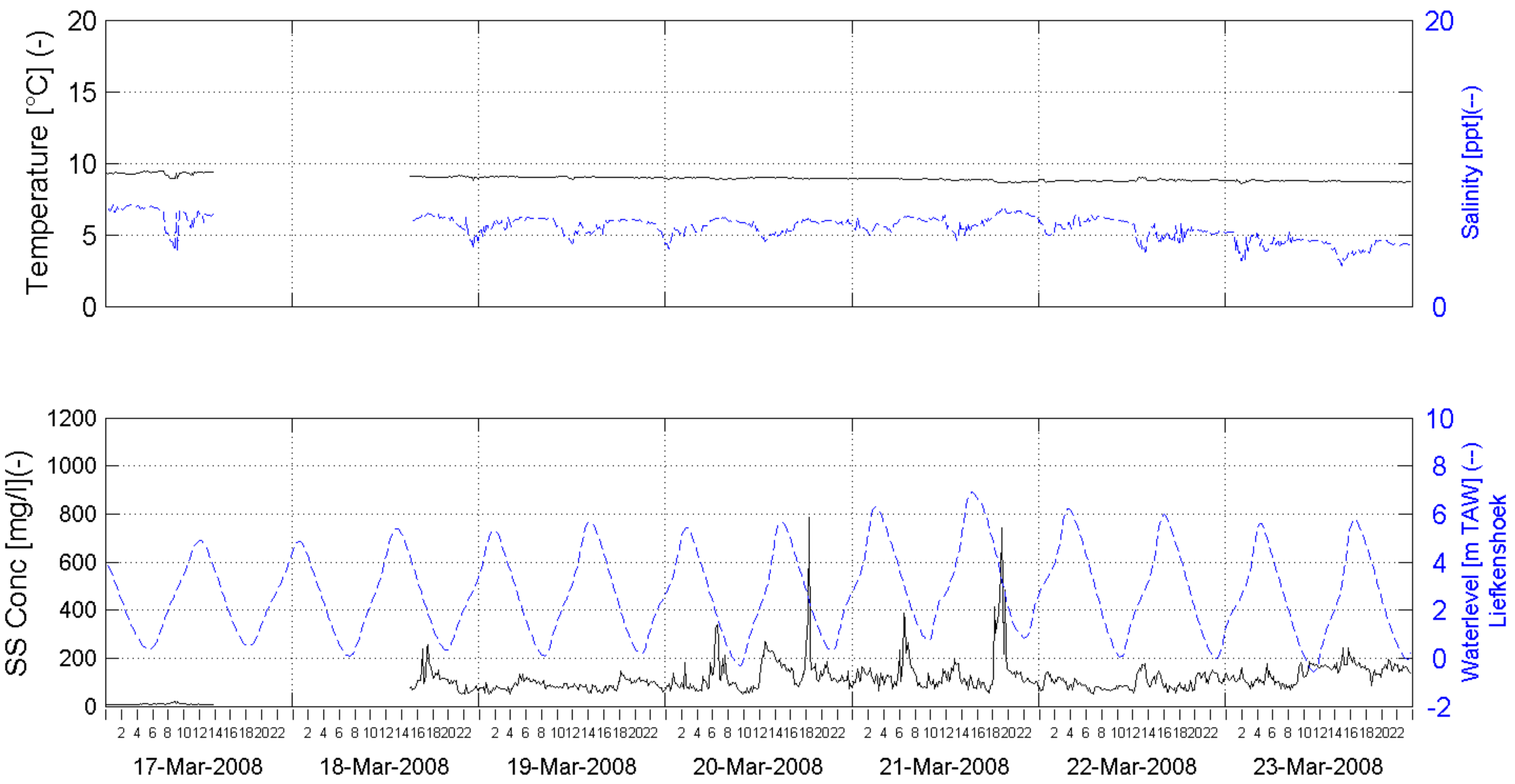
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 11 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

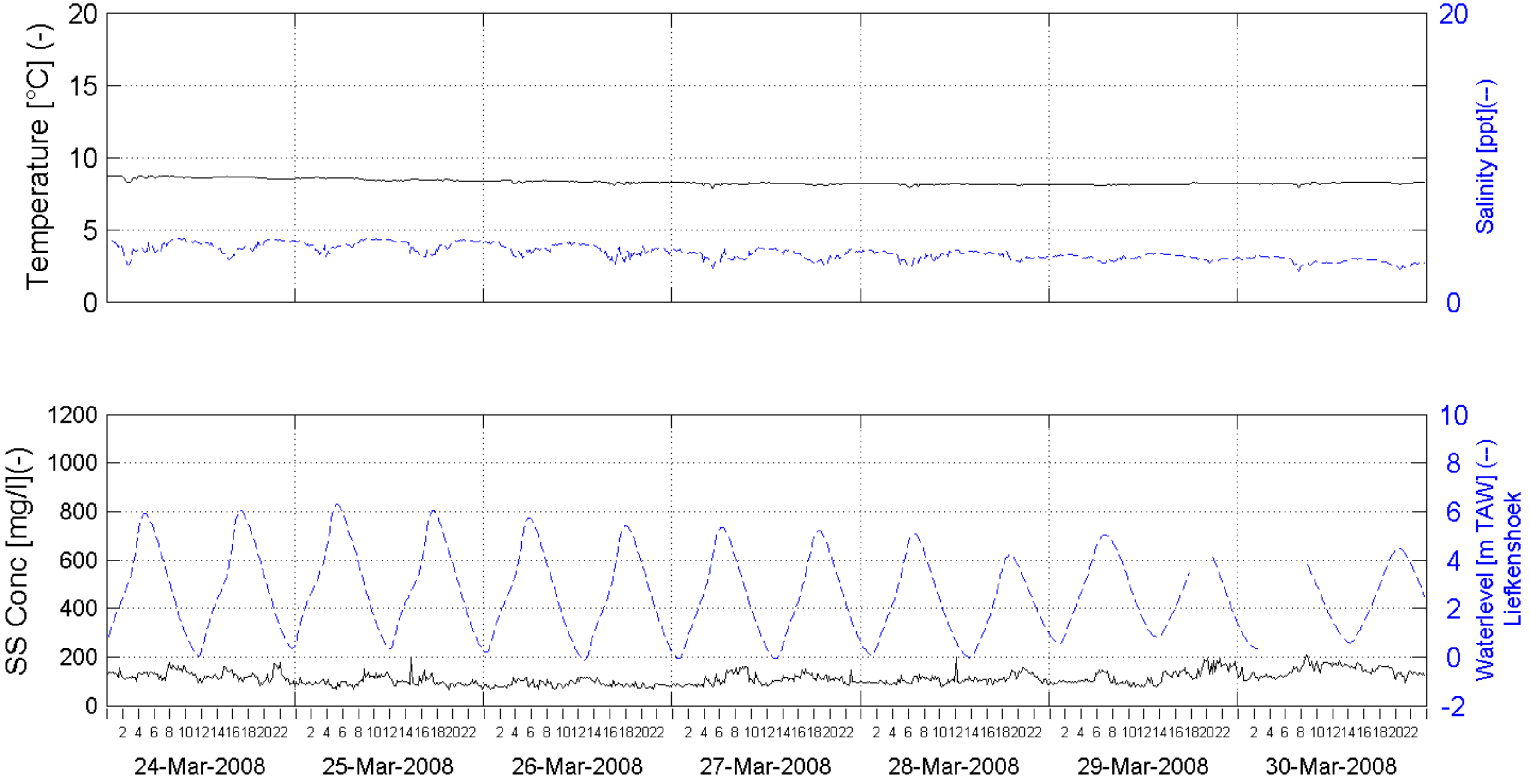
I/RA/11283/07.094/MSA

Location:

S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

11283 - Long-term monitoring DGD - Winter 2008

Week 12 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

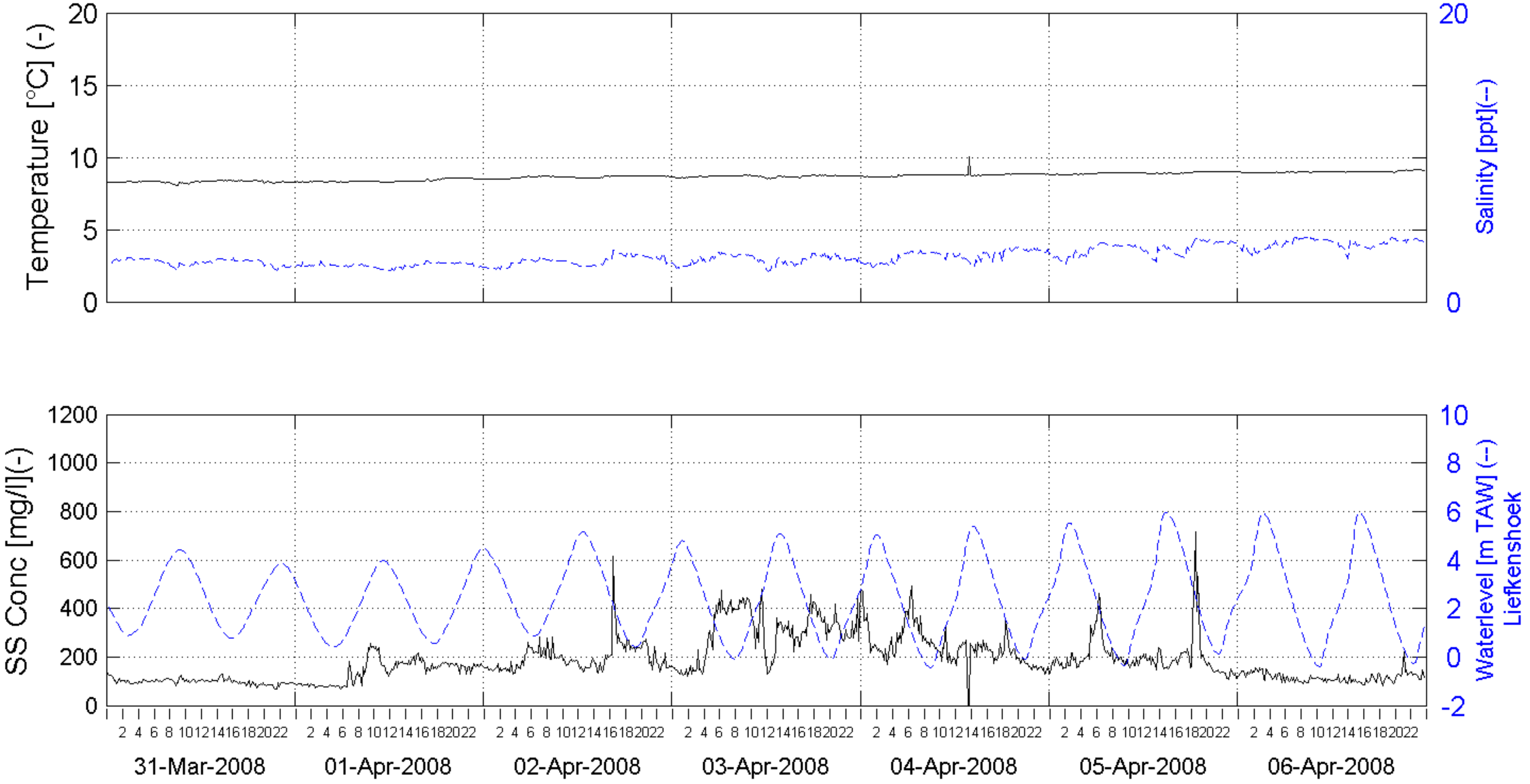
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 13 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

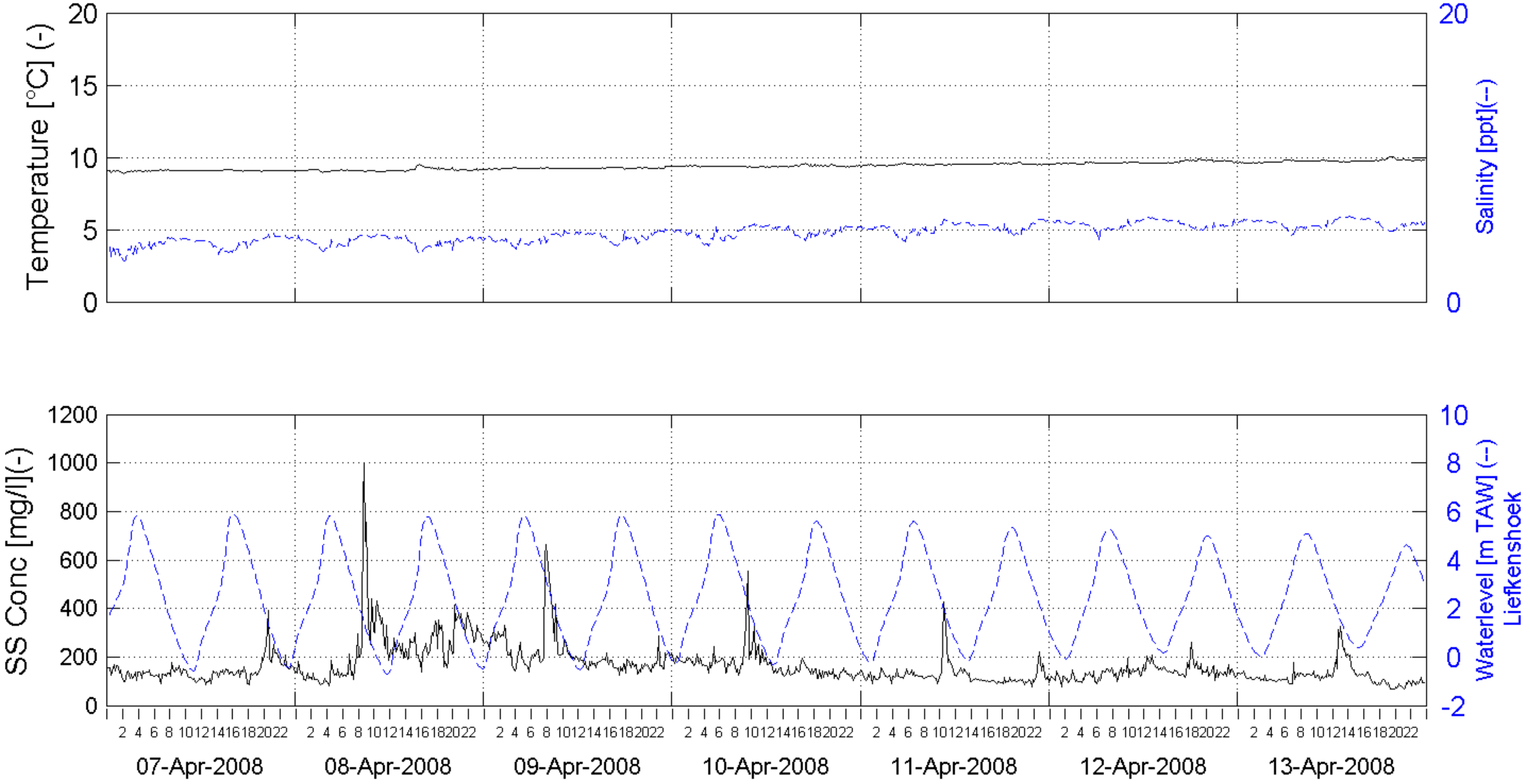
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

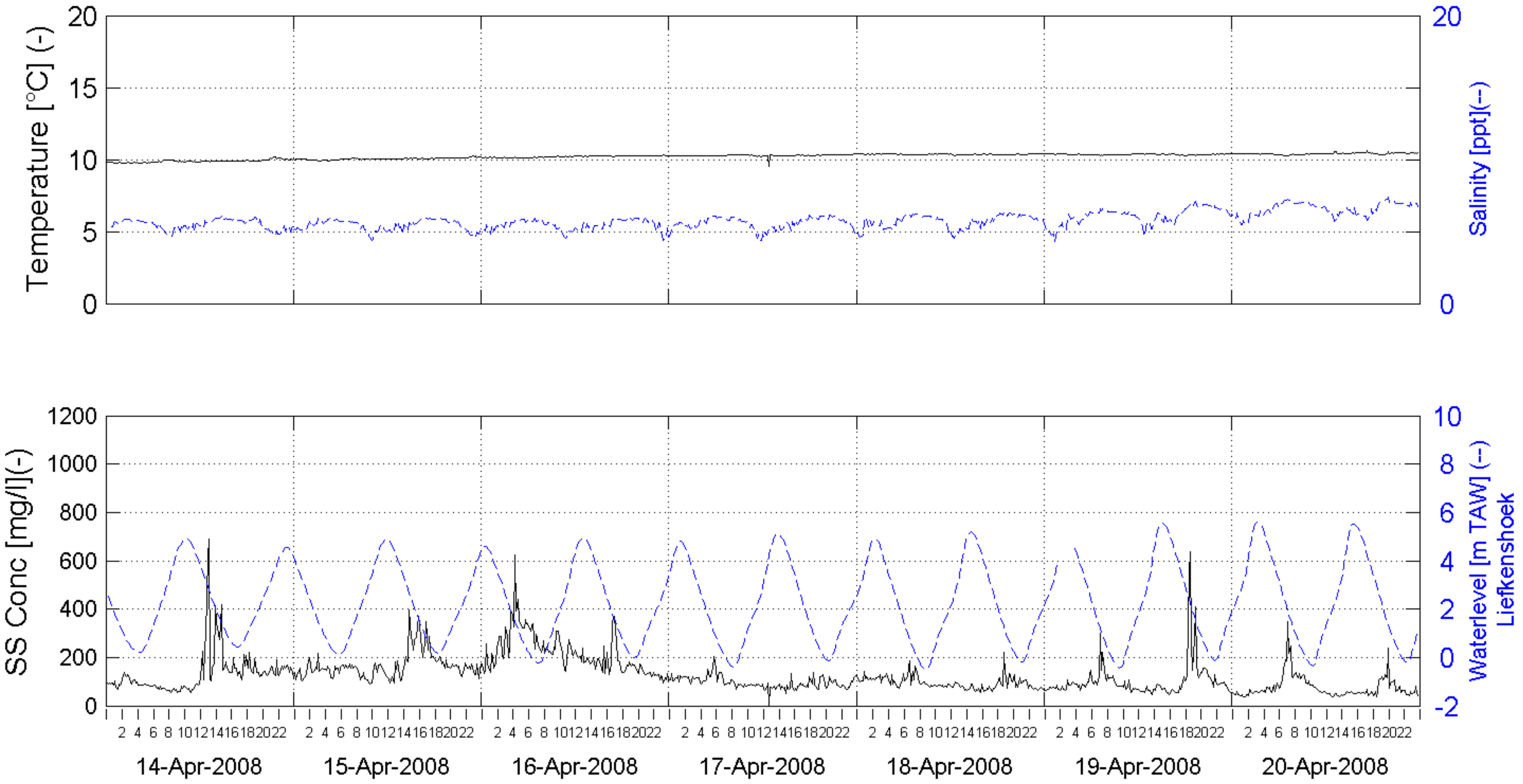
Week 14 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide	Processed by:
Location: S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)	In Association with:
	I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 15 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

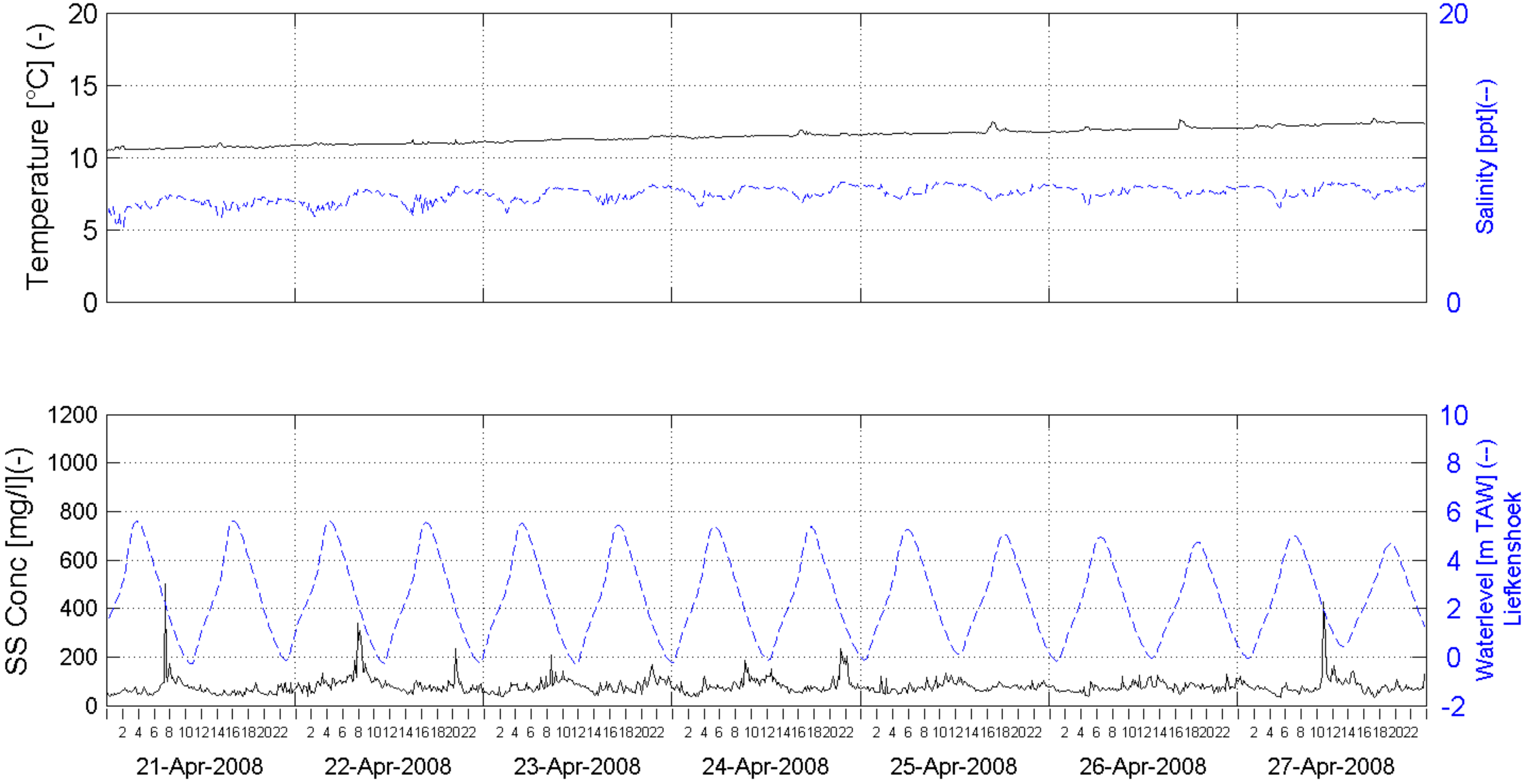
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 16 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

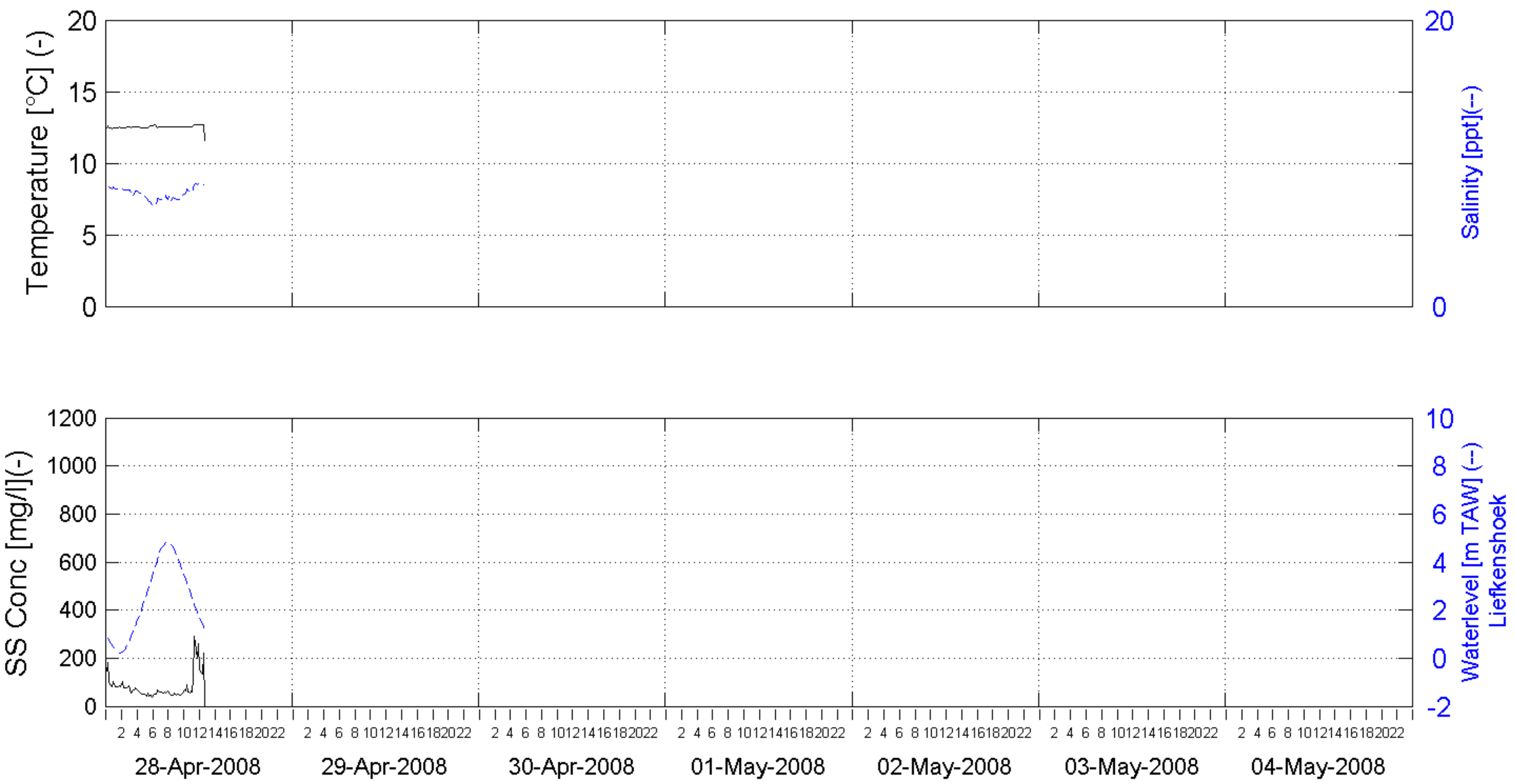
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 17 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-BACK BOTTOM 4.63m above bottom (-12.37m TAW)

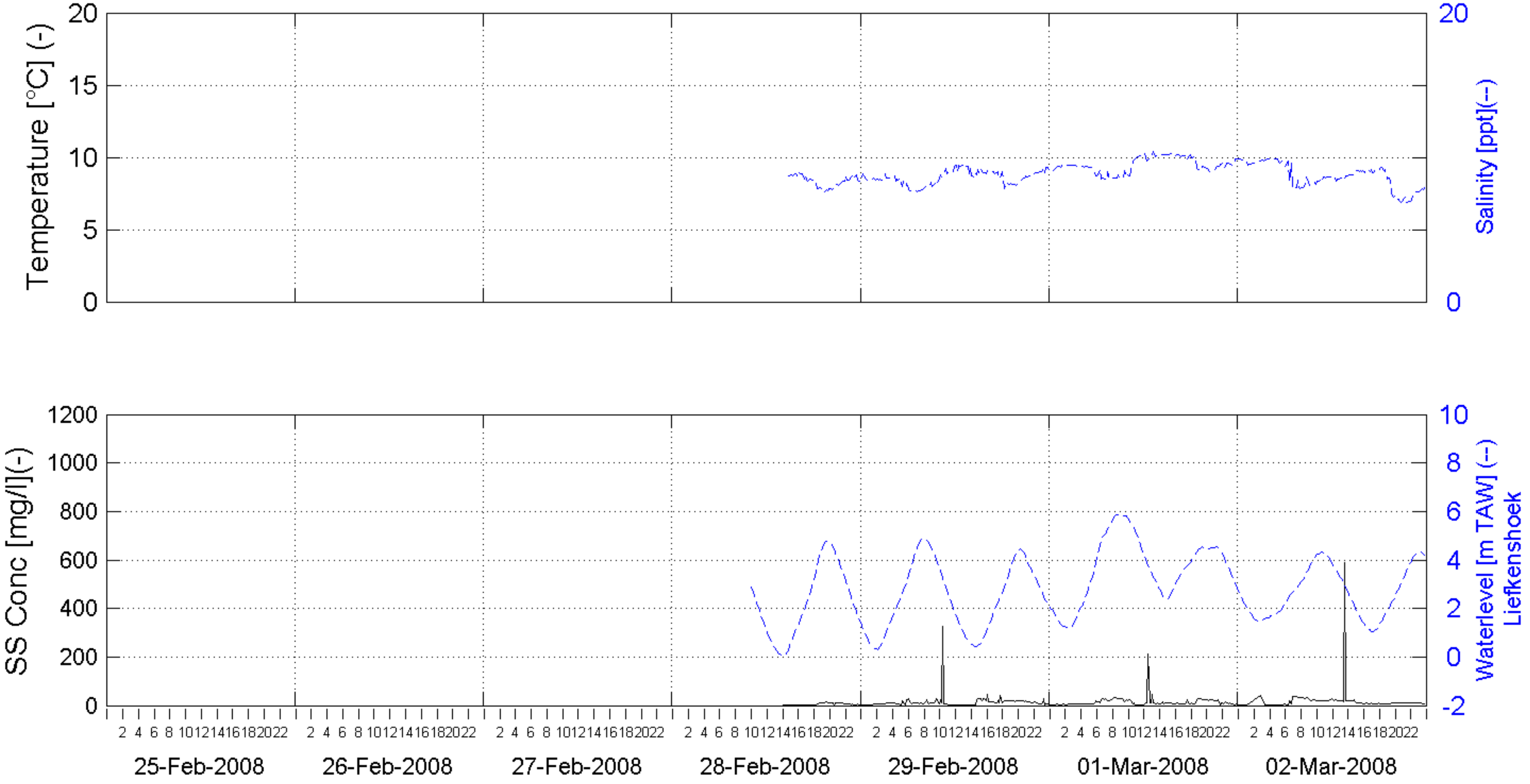
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 8 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

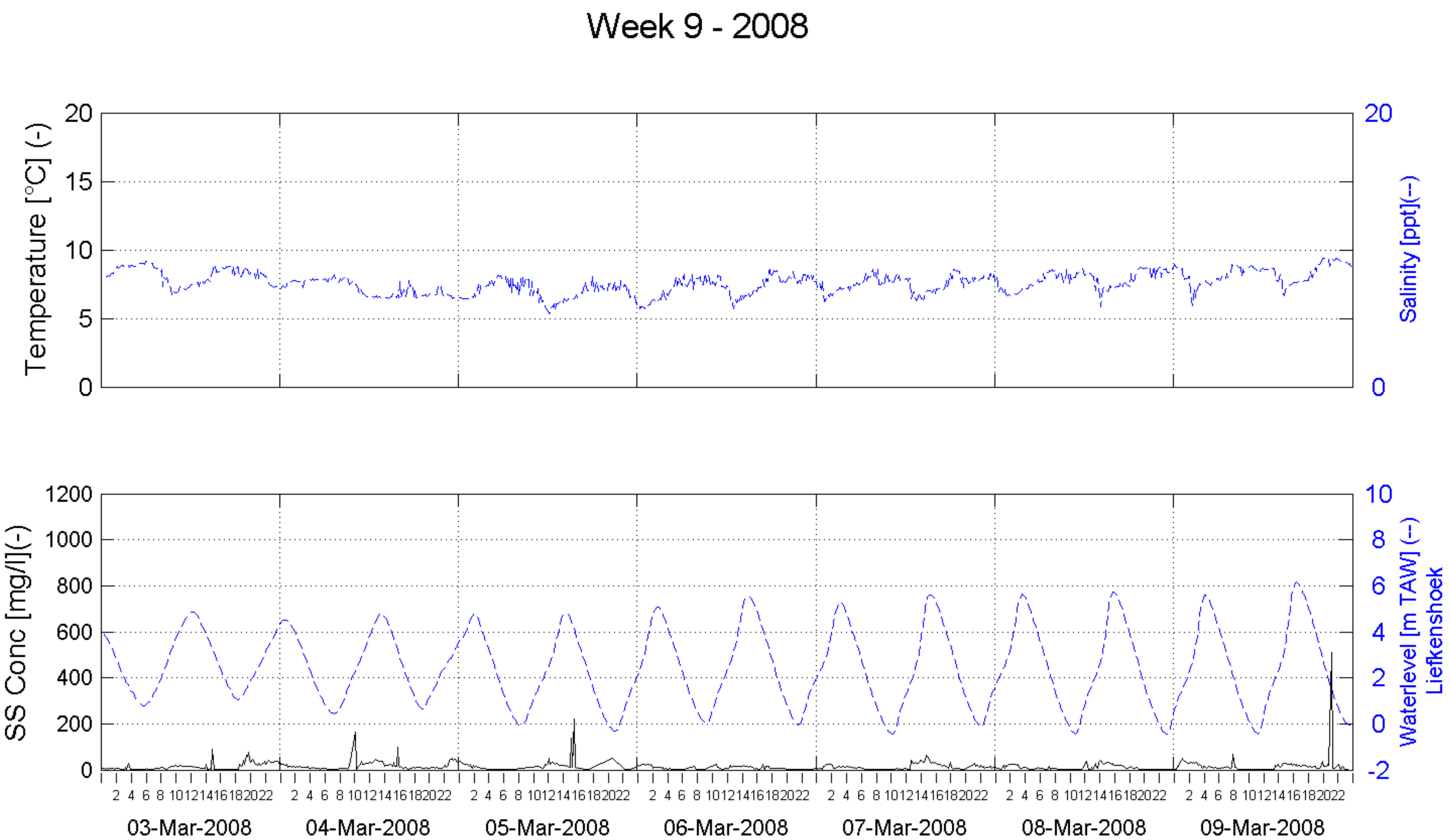
S-BACK TOP 14.53m above bottom (-2.47m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
S-BACK TOP 14.53m above bottom (-2.47m TAW)

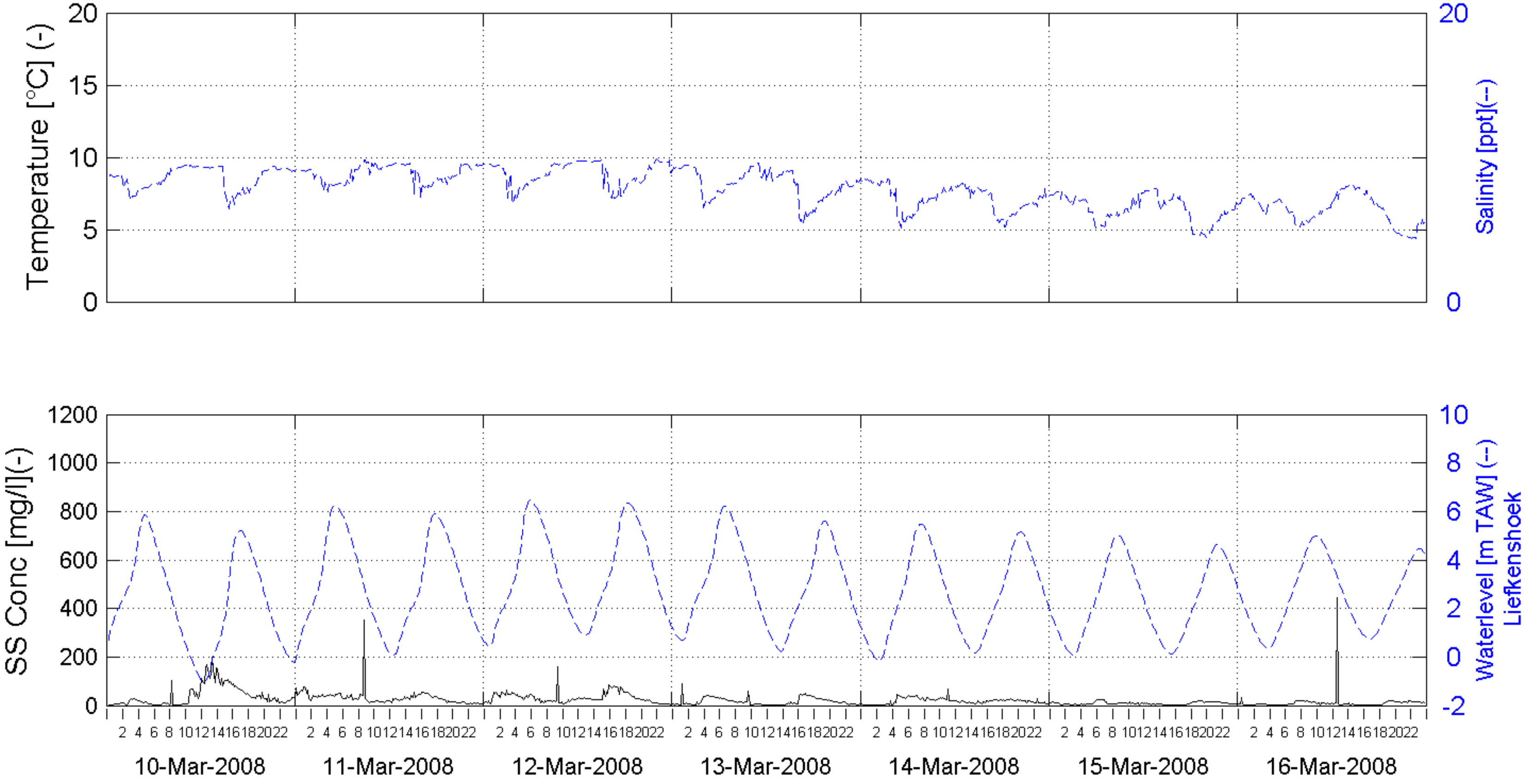
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 10 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by: IMDC

Location:

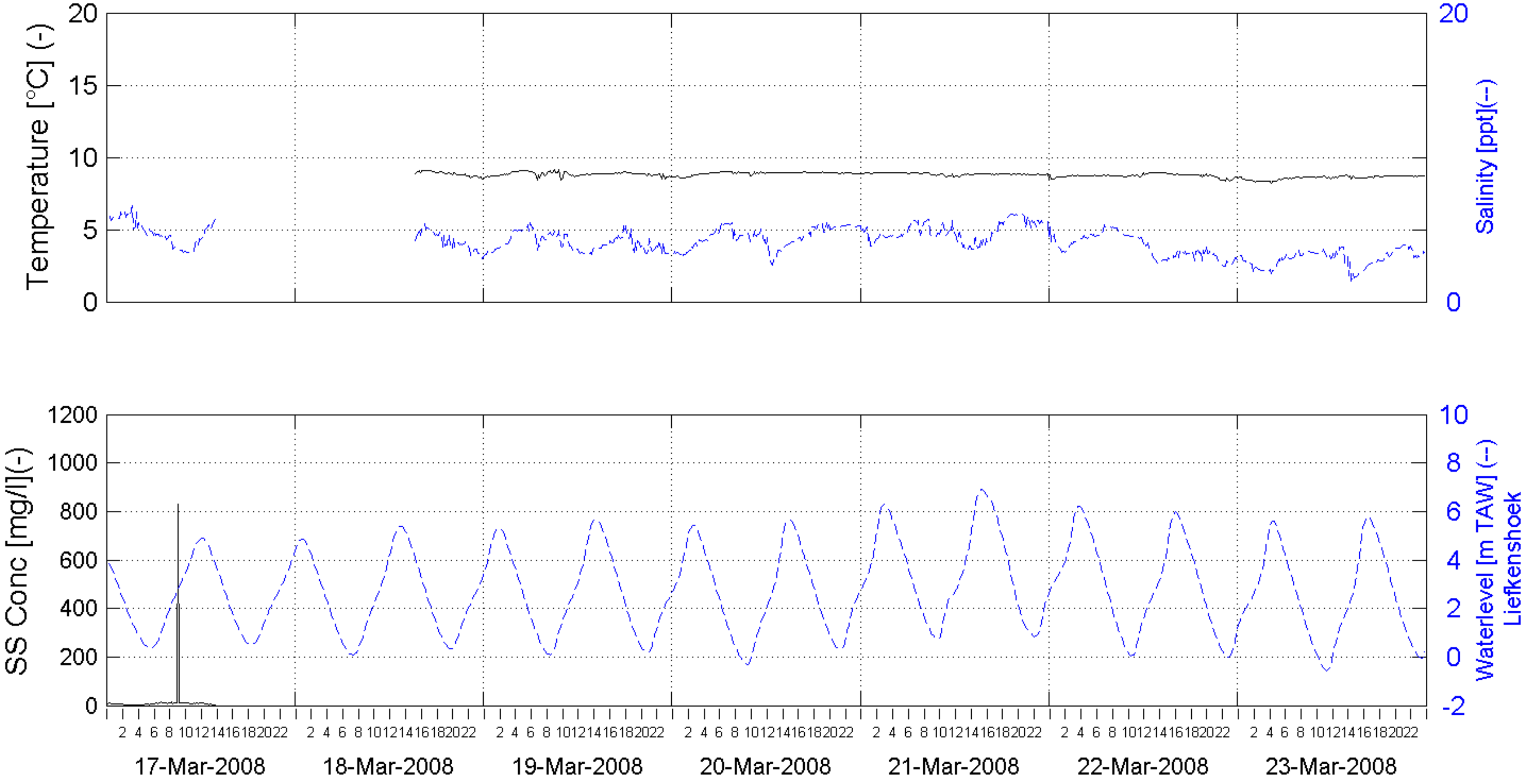
S-BACK TOP 14.53m above bottom (-2.47m TAW)

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 11 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

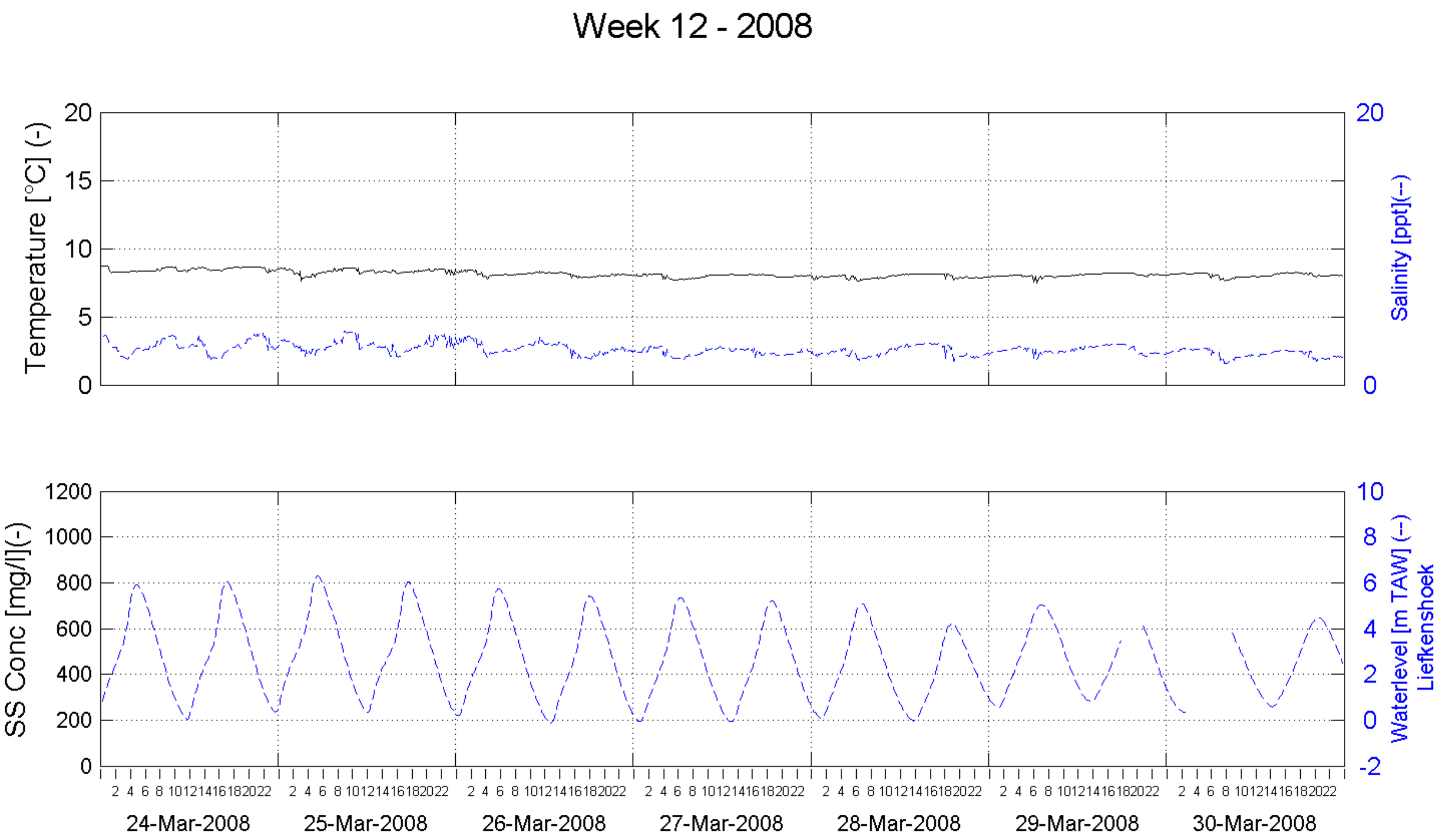
S-BACK TOP 14.53m above bottom (-2.47m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

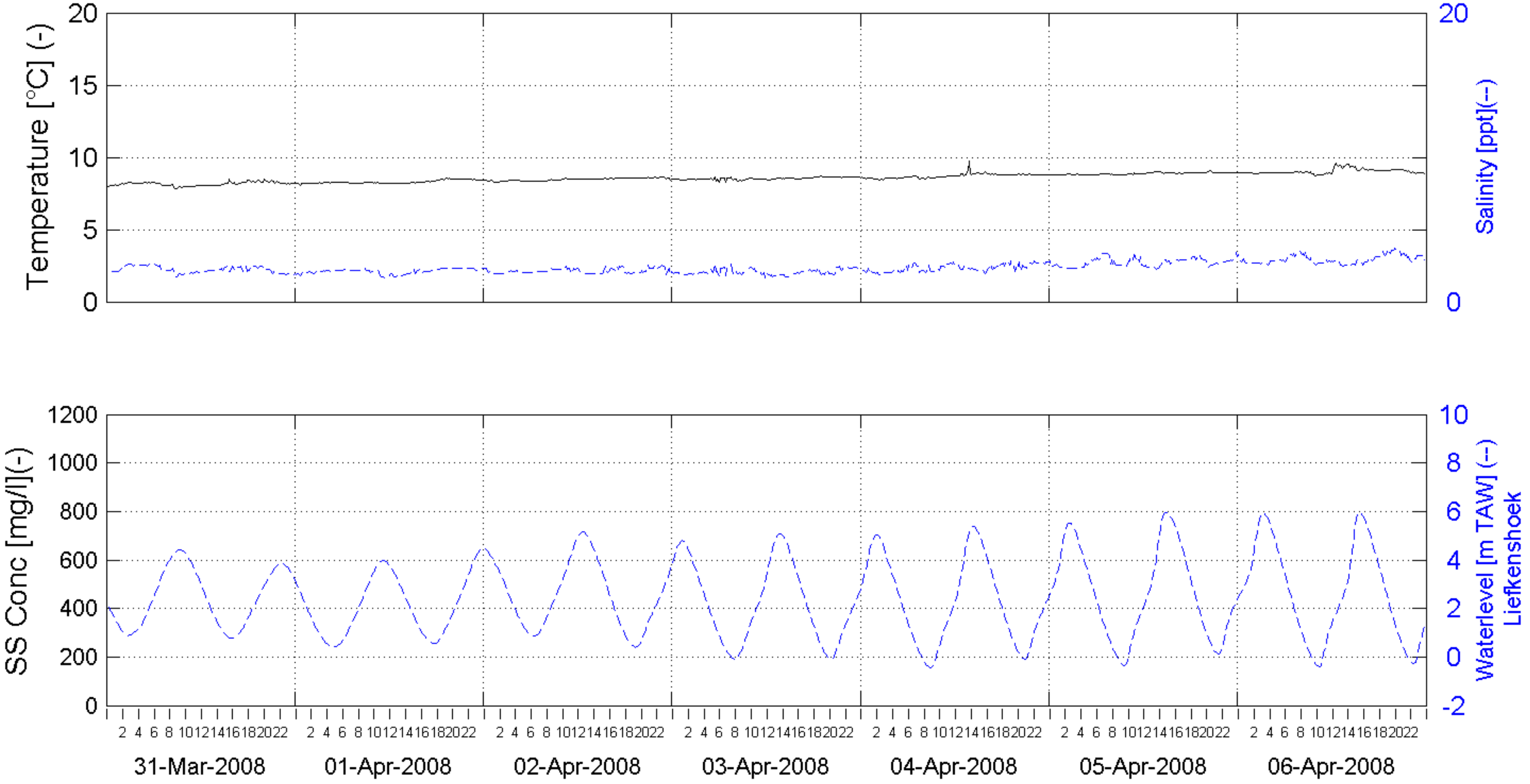
Location:

S-BACK TOP 14.53m above bottom (-2.47m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 13 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

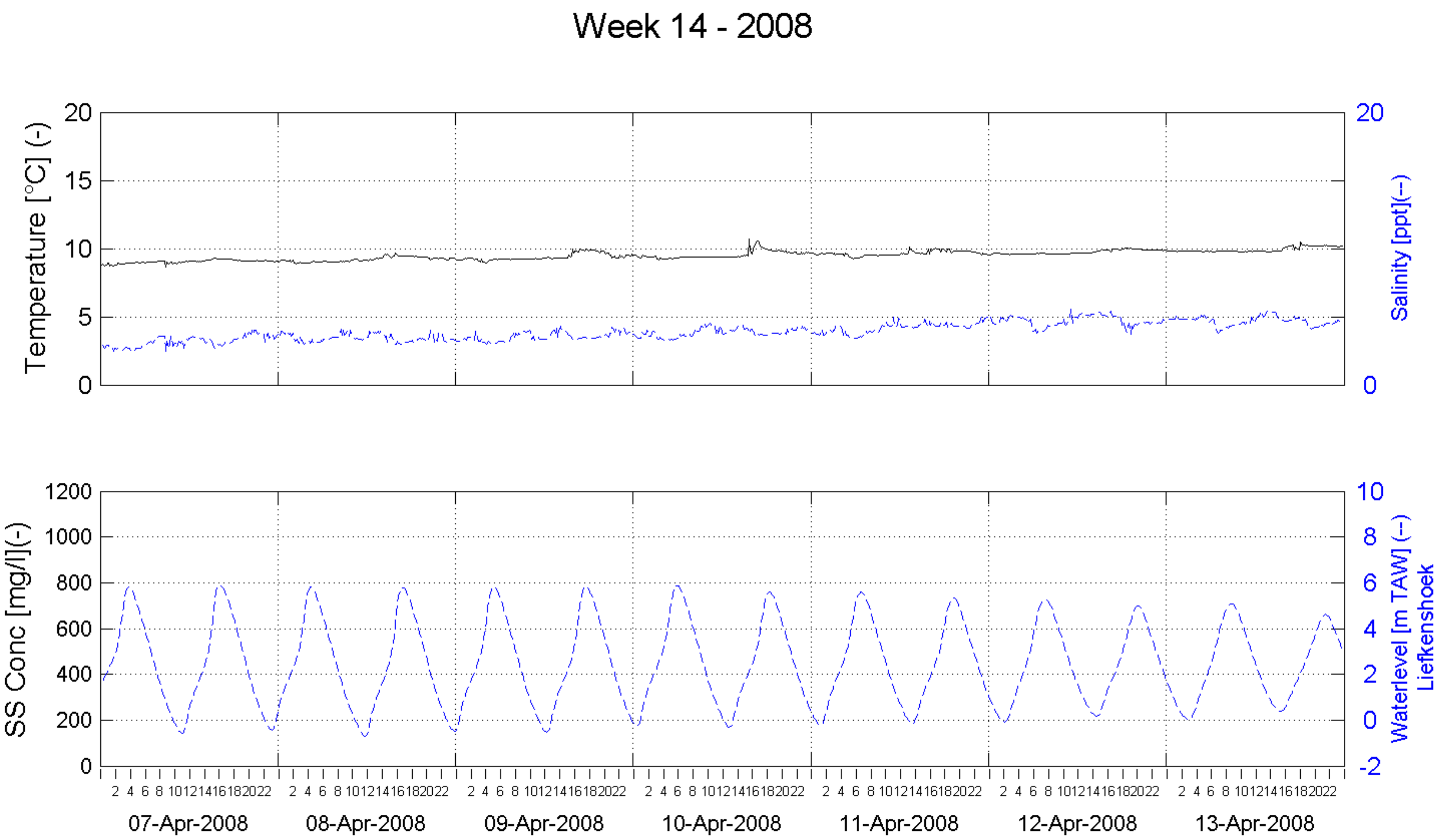
Location:
S-BACK TOP 14.53m above bottom (-2.47m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

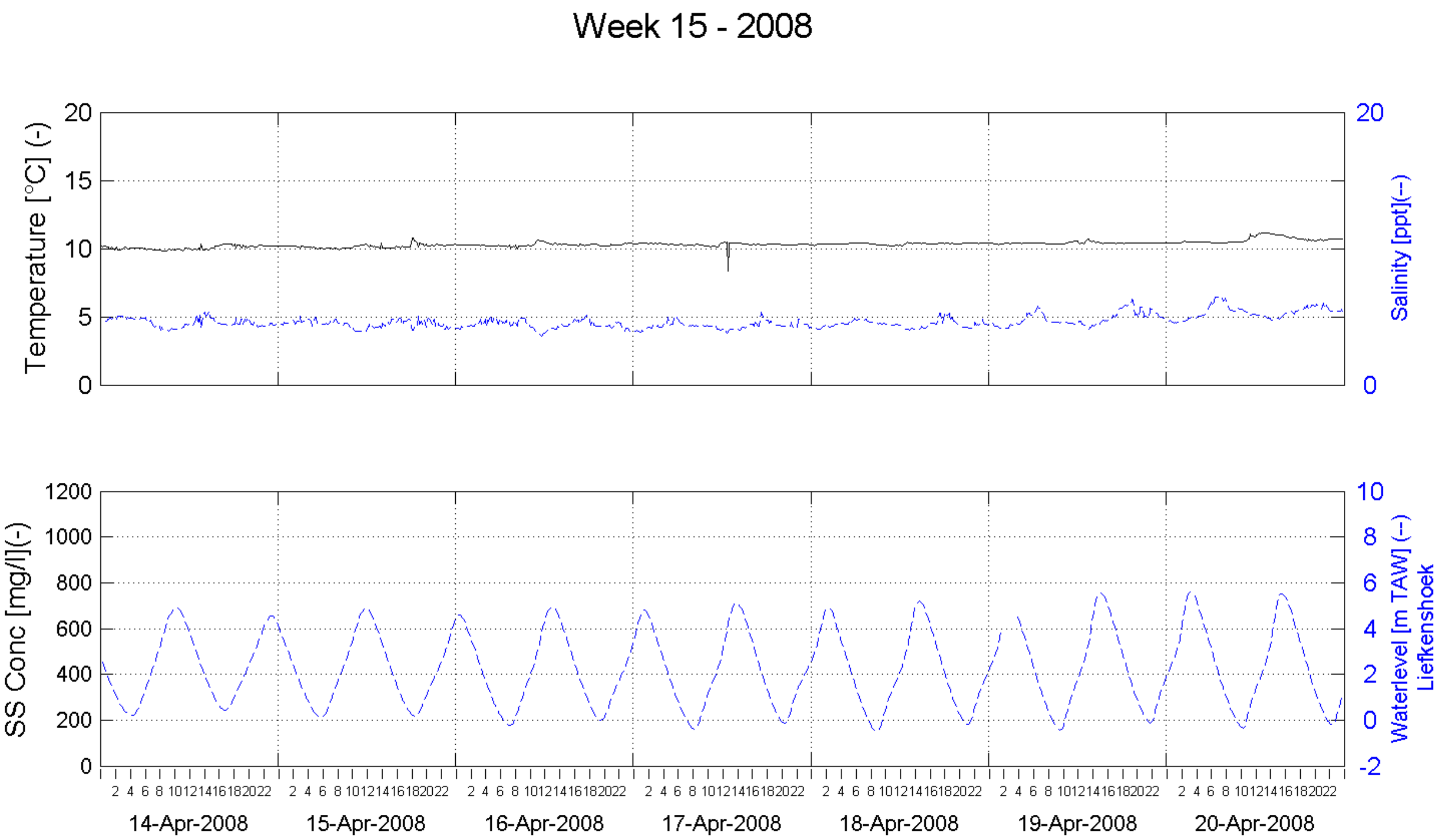
S-BACK TOP 14.53m above bottom (-2.47m TAW)

Processed by: IMDC

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

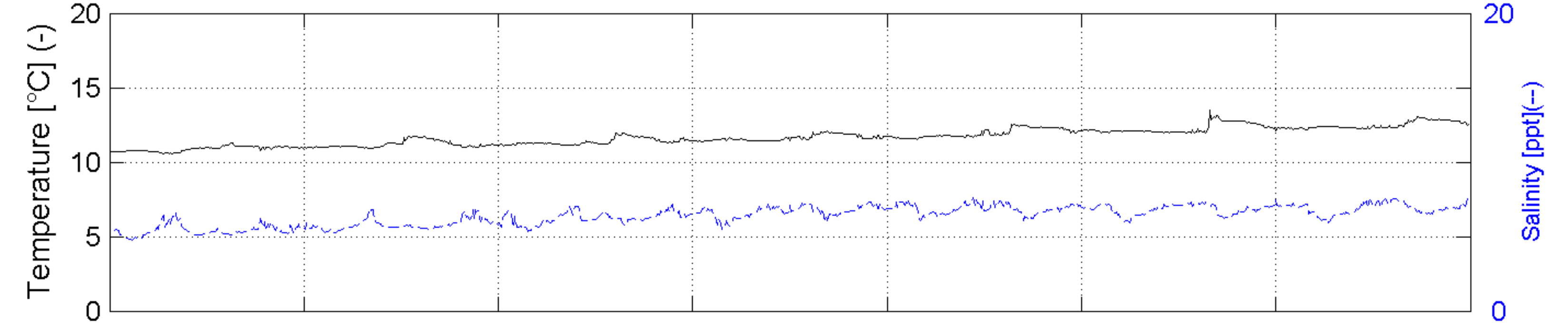
Location:

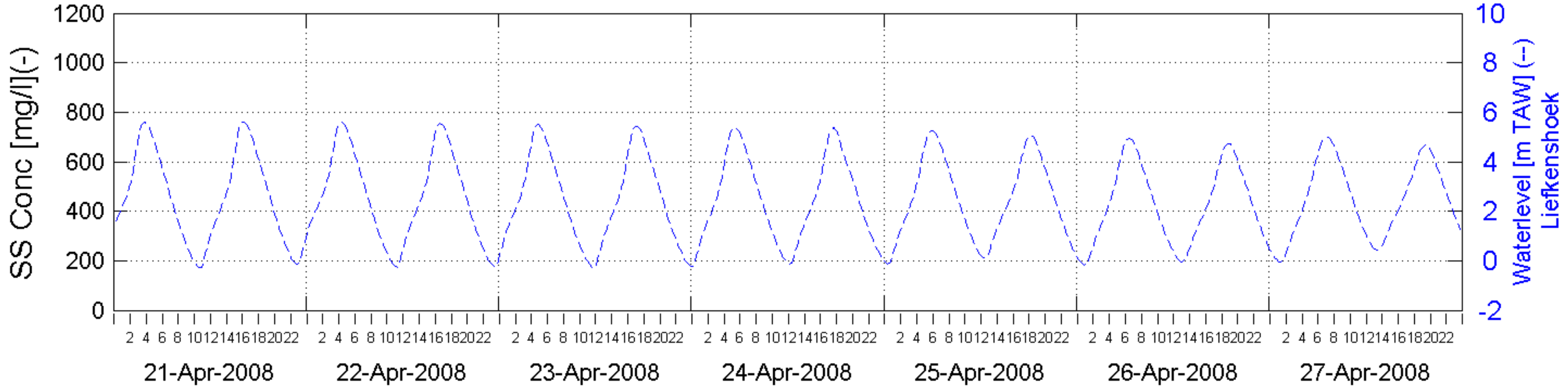
S-BACK TOP 14.53m above bottom (-2.47m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 16 - 2008





Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
S-BACK TOP 14.53m above bottom (-2.47m TAW)

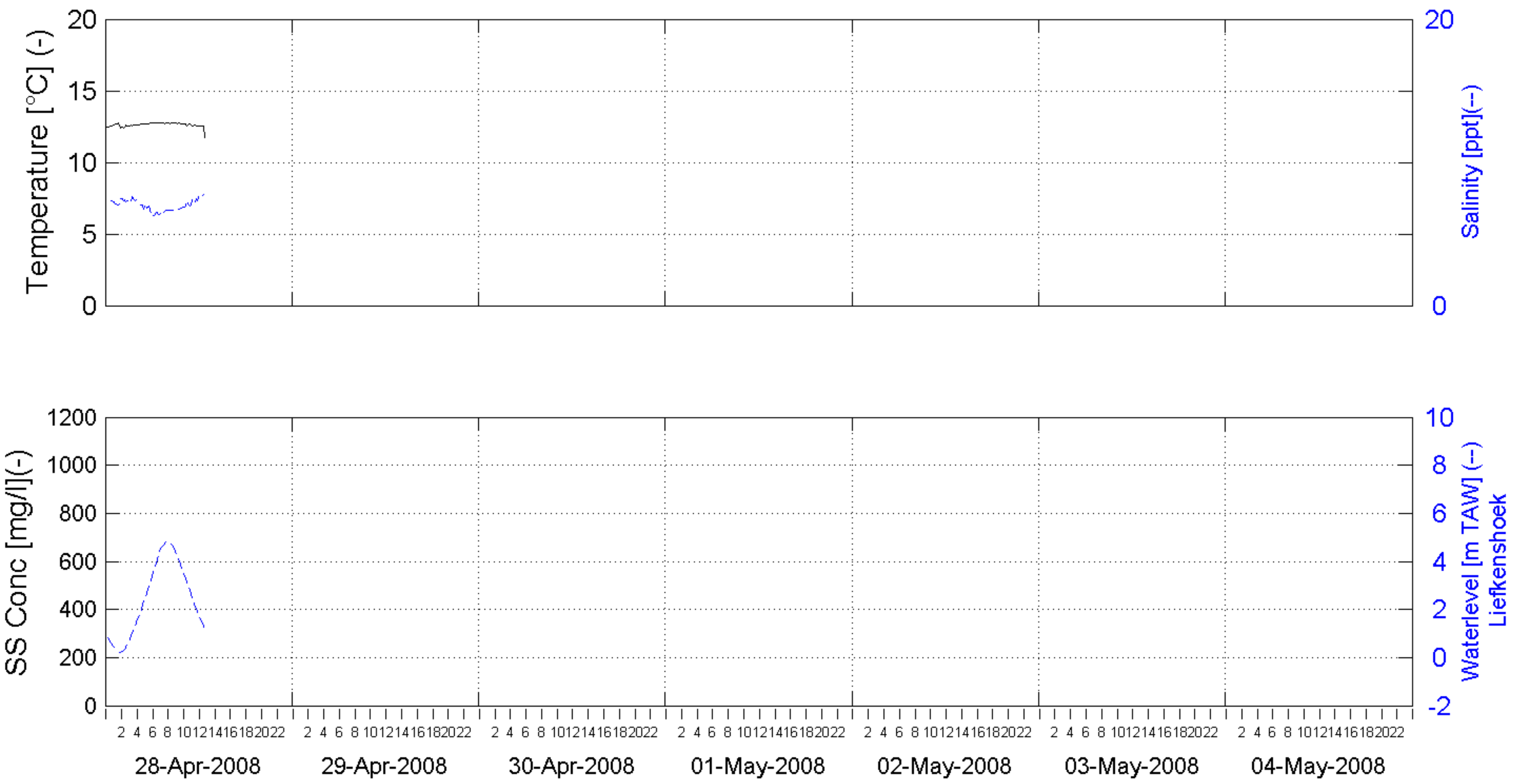
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 17 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

I/RA/11283/07.094/MSA

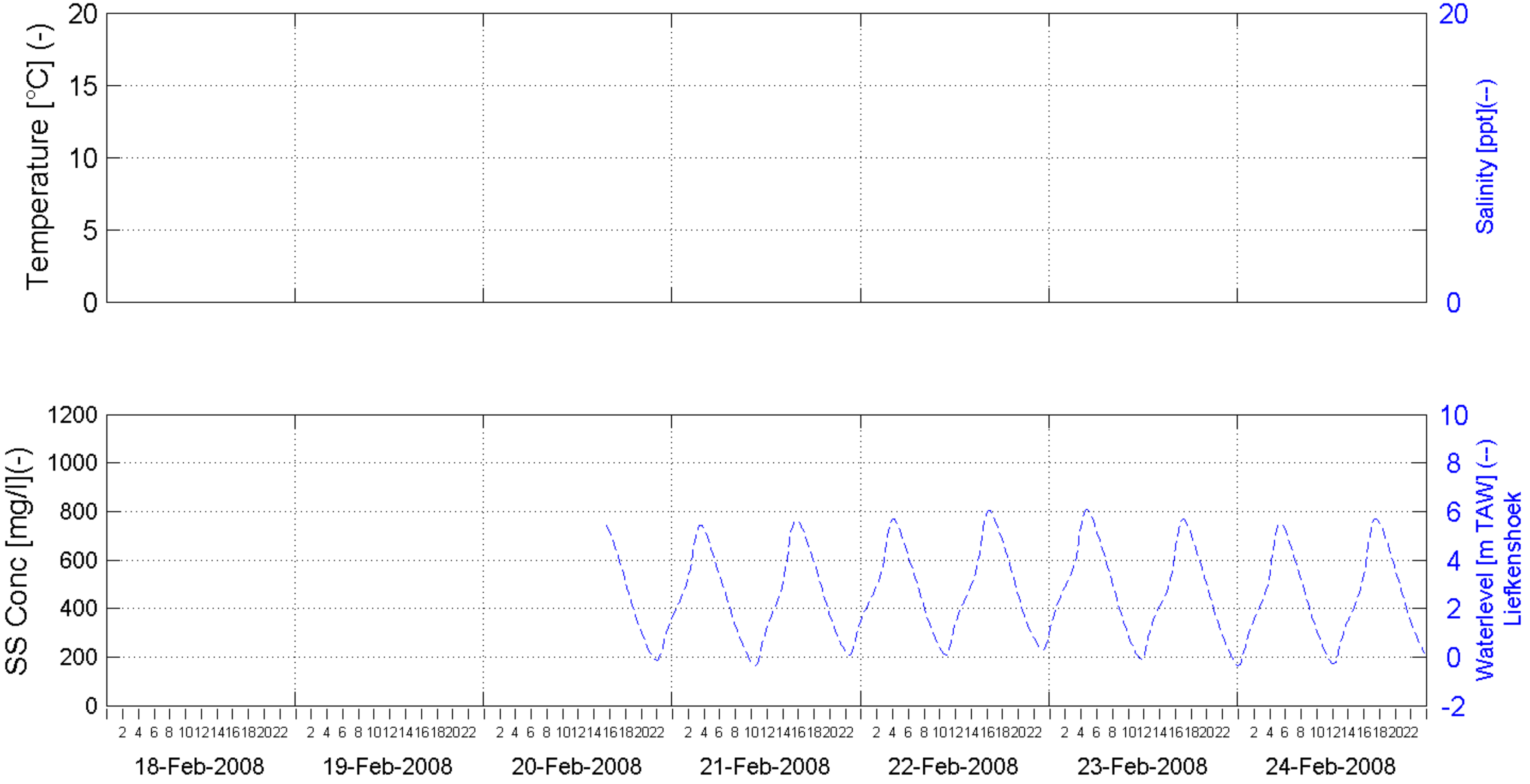
Location:

S-BACK TOP 14.53m above bottom (-2.47m TAW)

C.3 S-MIDDLE

11283 - Long-term monitoring DGD - Winter 2008

Week 7 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

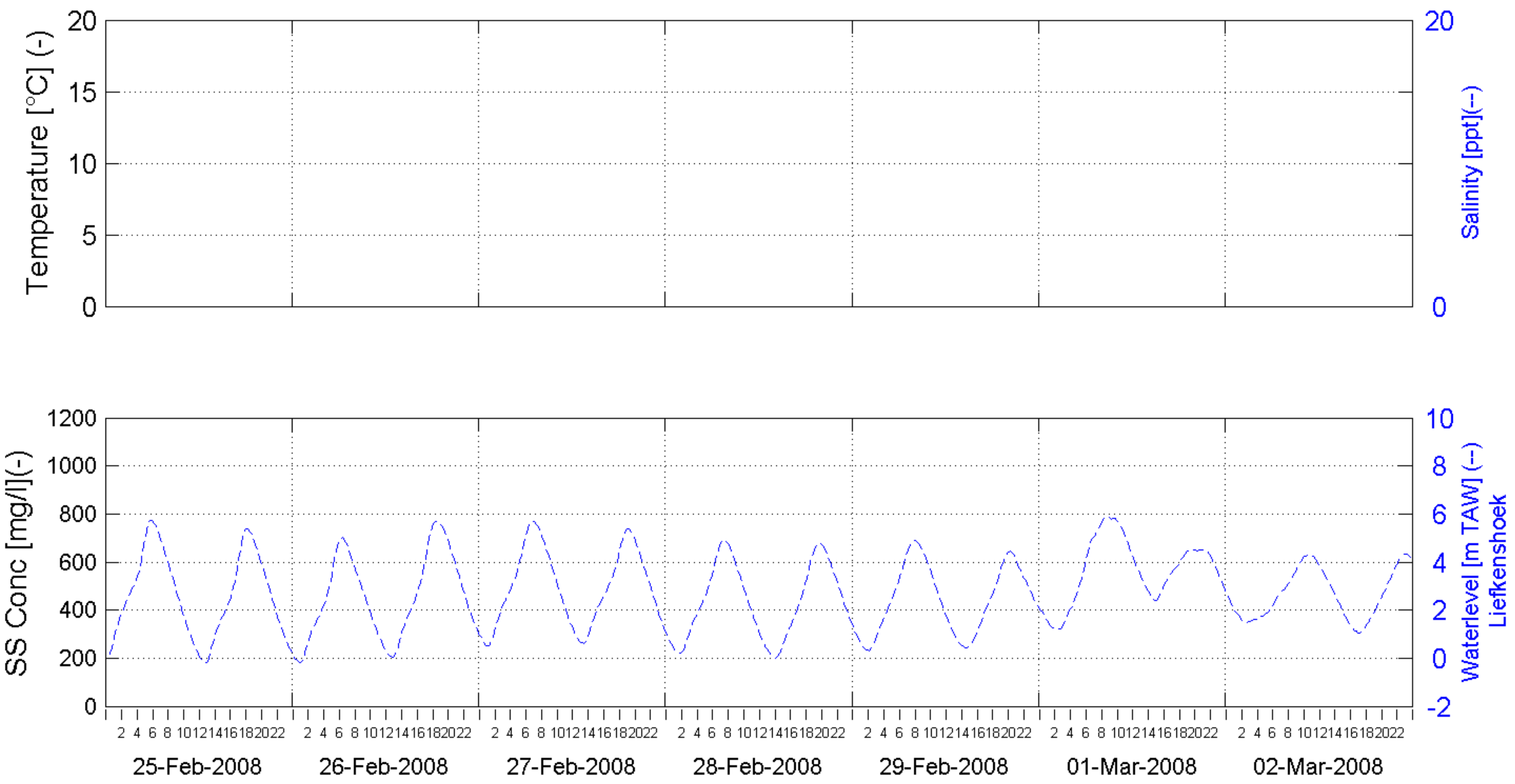
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 8 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

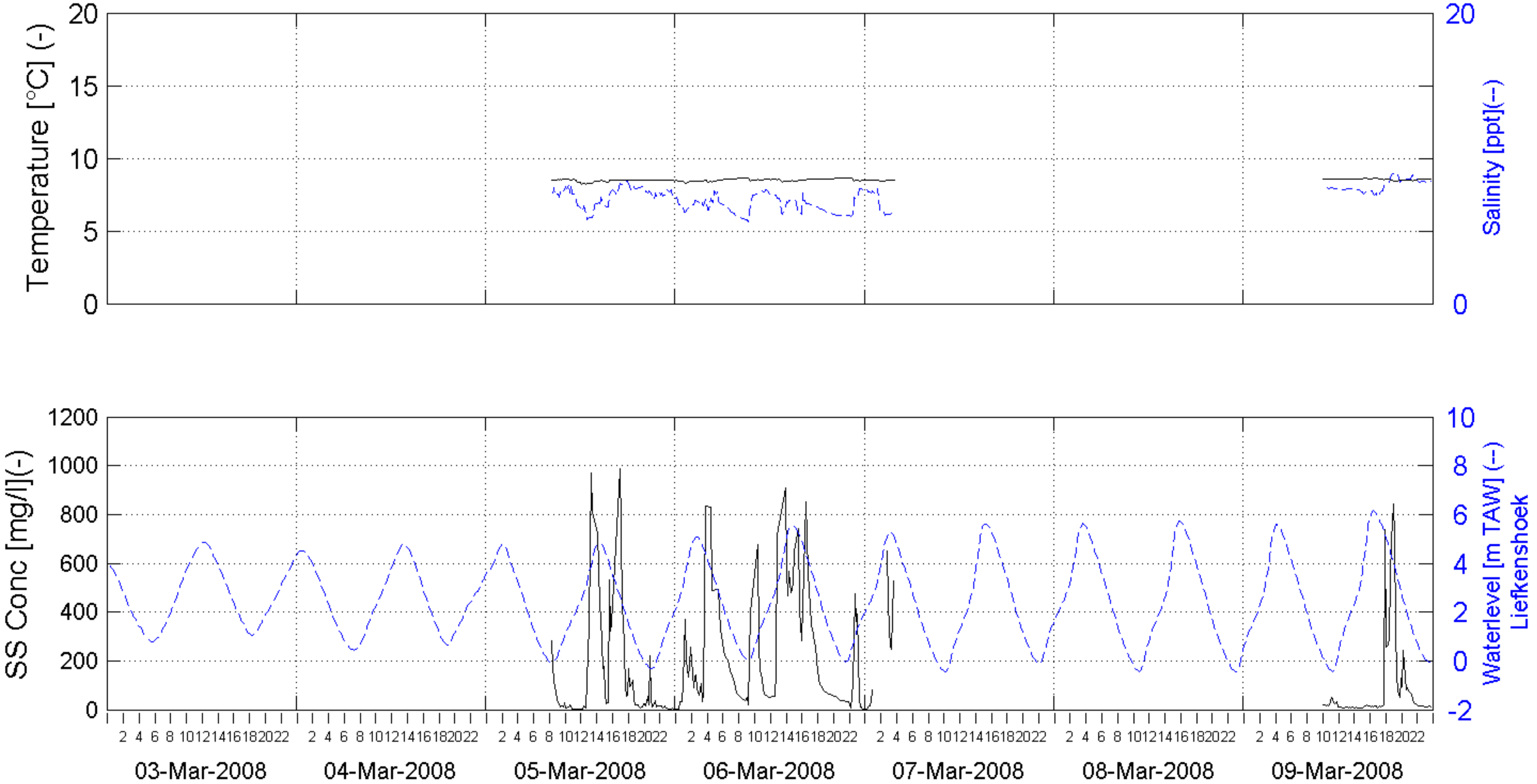
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 9 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Processed by:

In Association with:

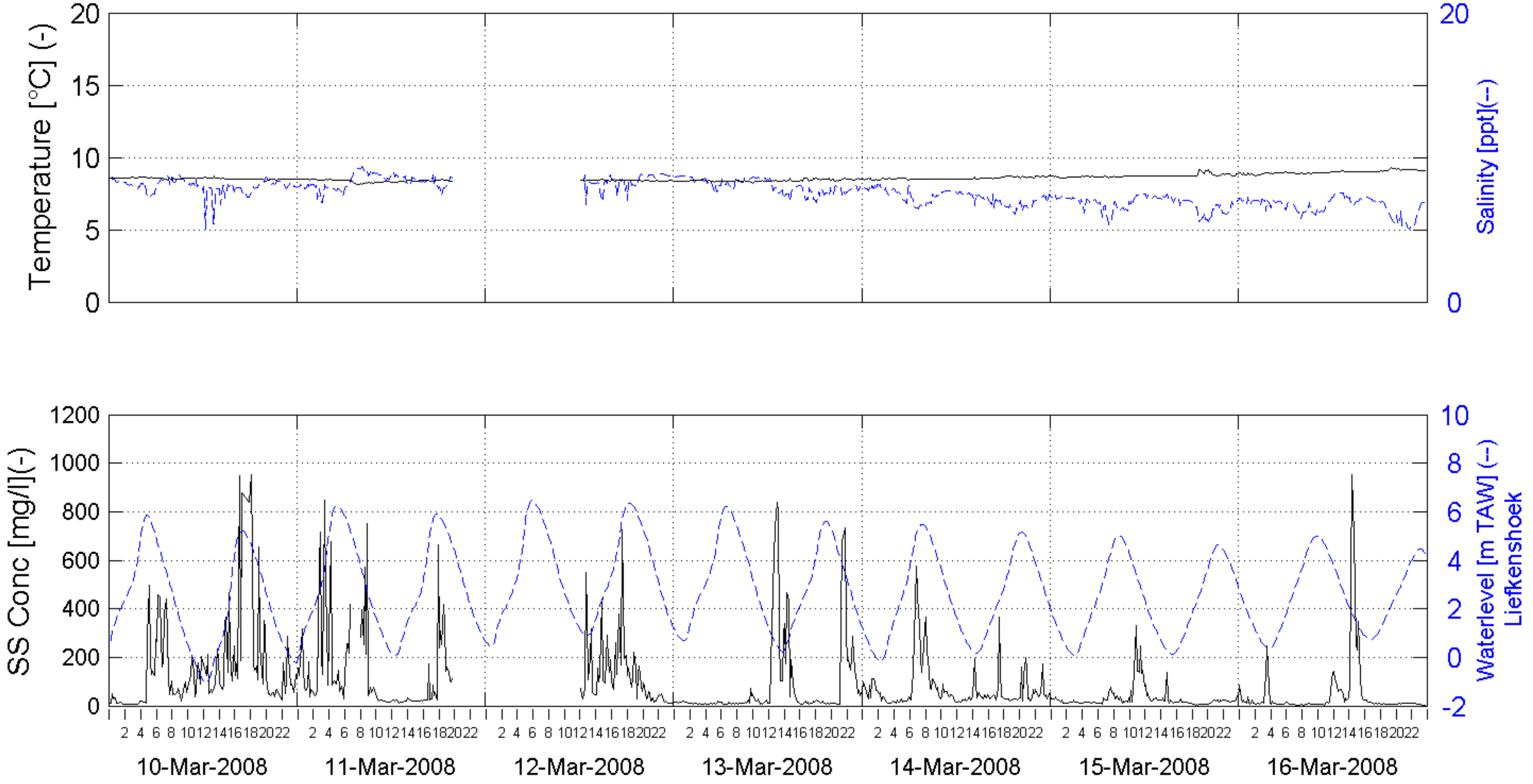
Location:

S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 10 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

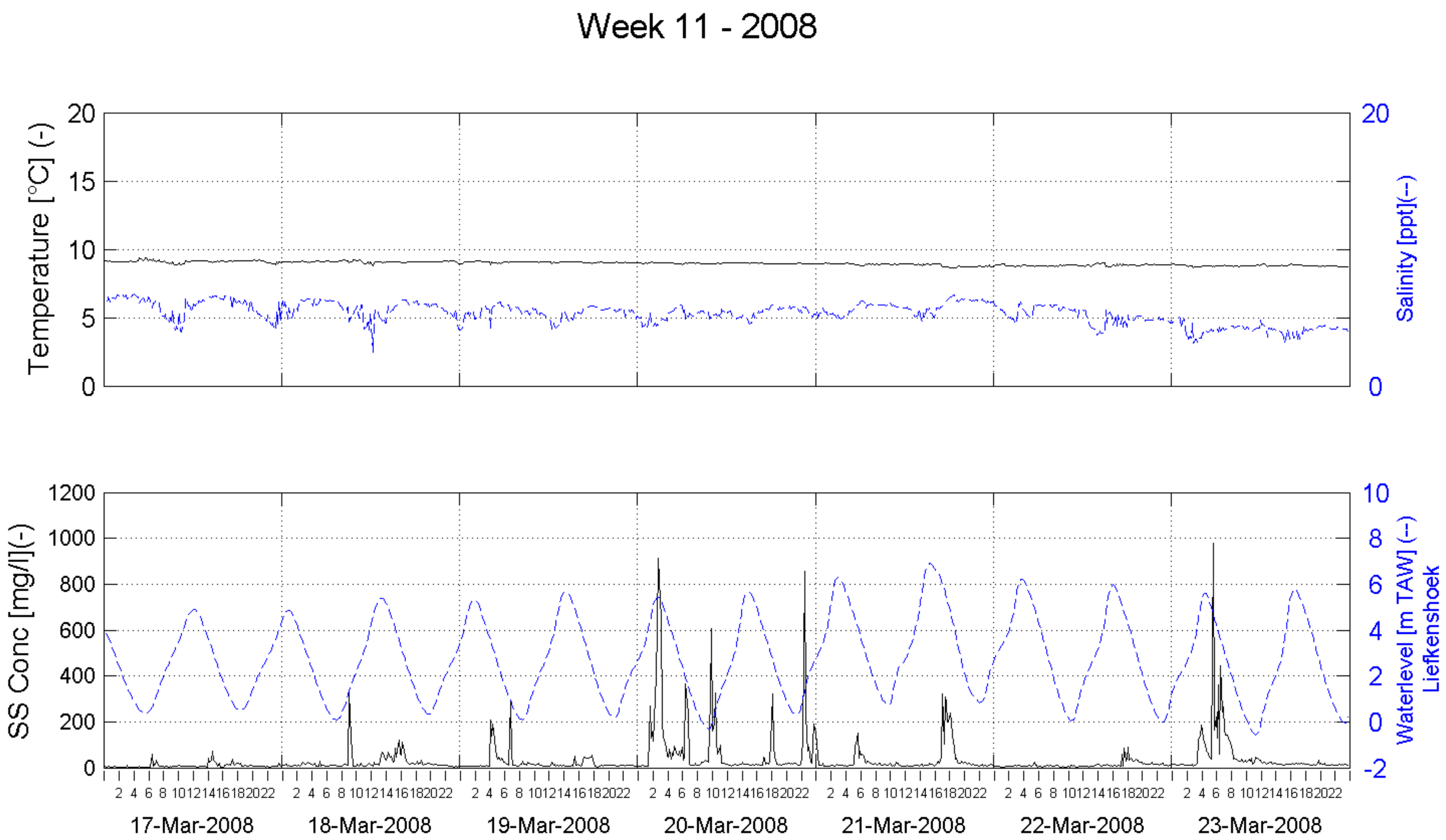
In Association with:

Location:

S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

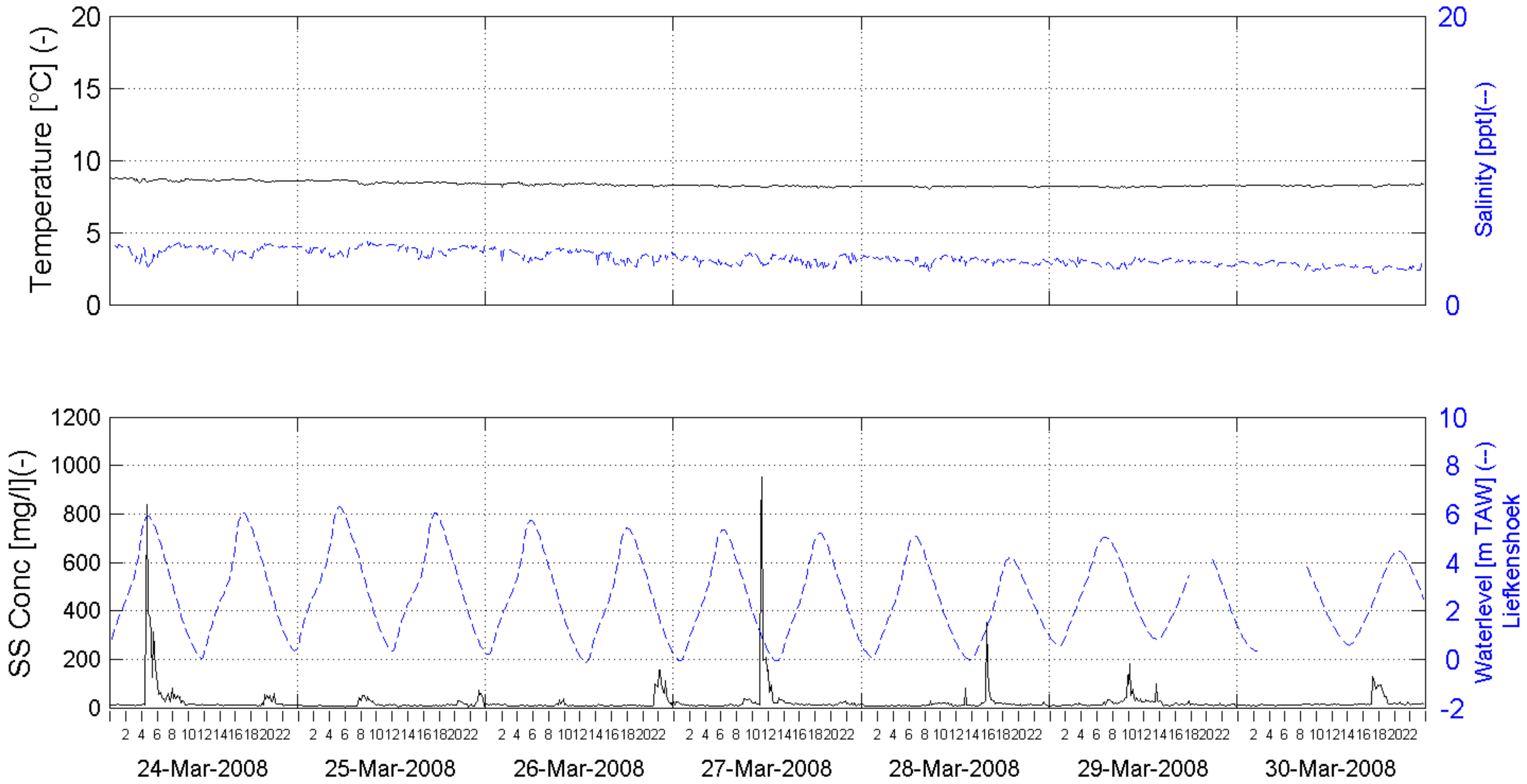
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 12 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

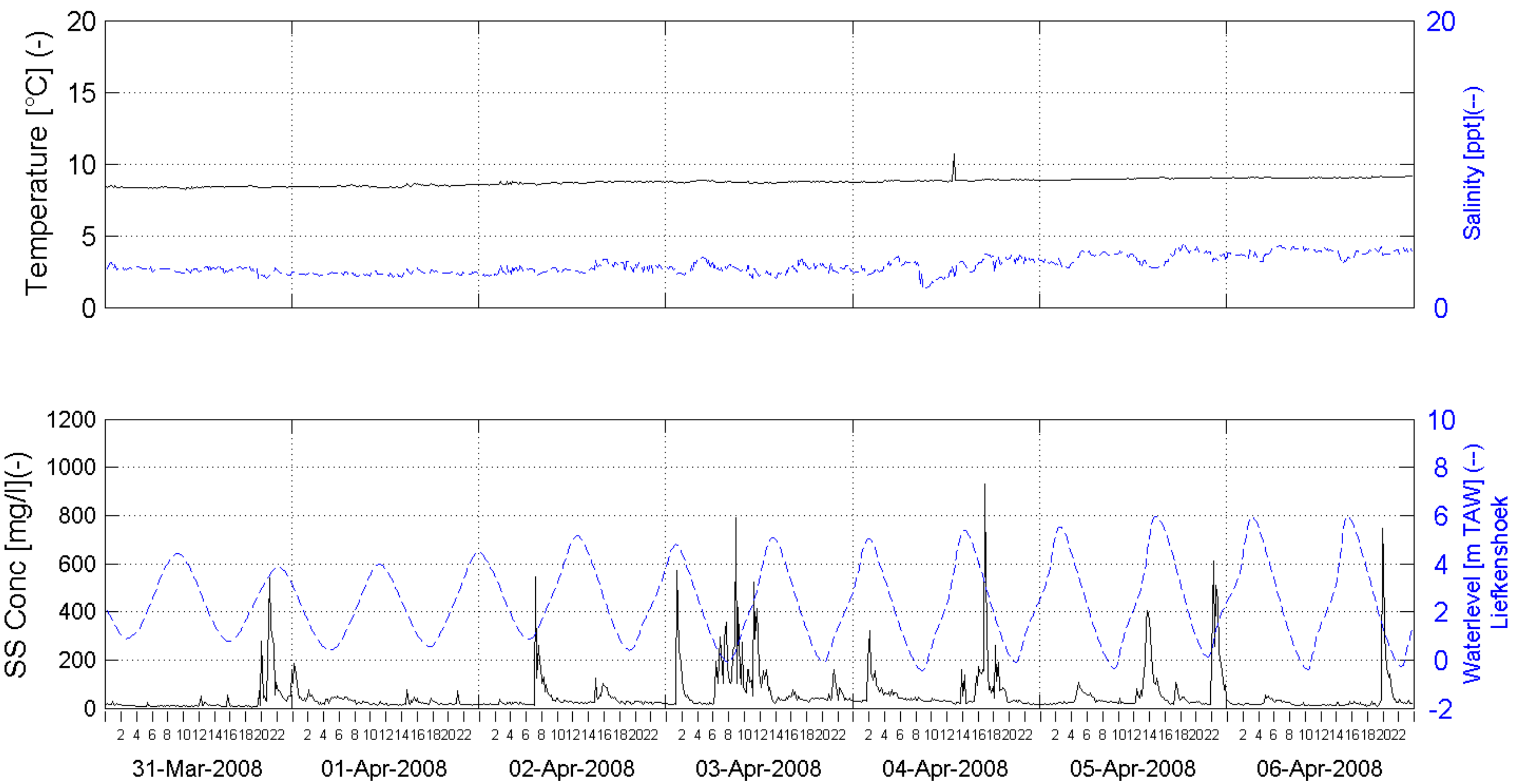
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 13 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

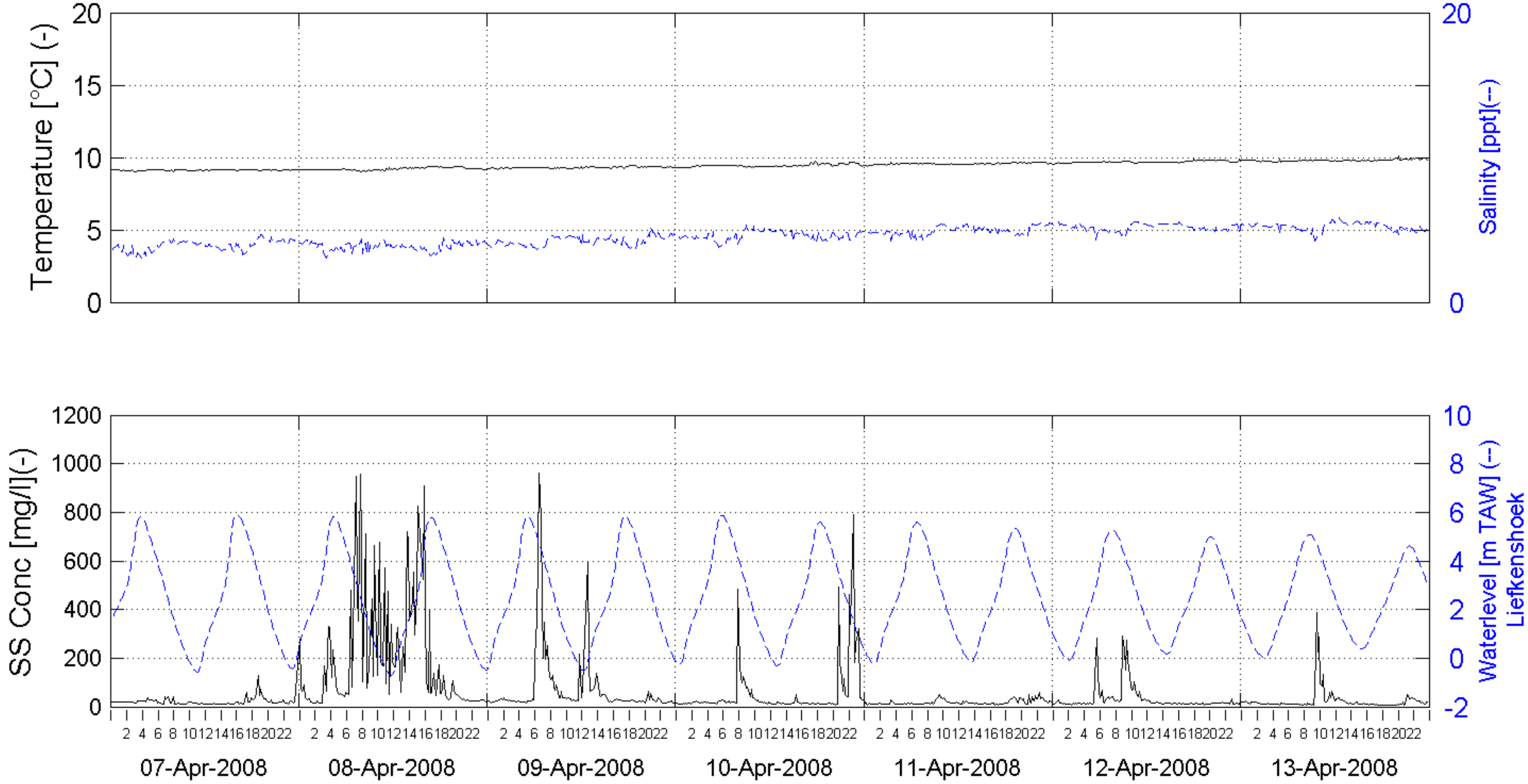
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 14 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:

S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

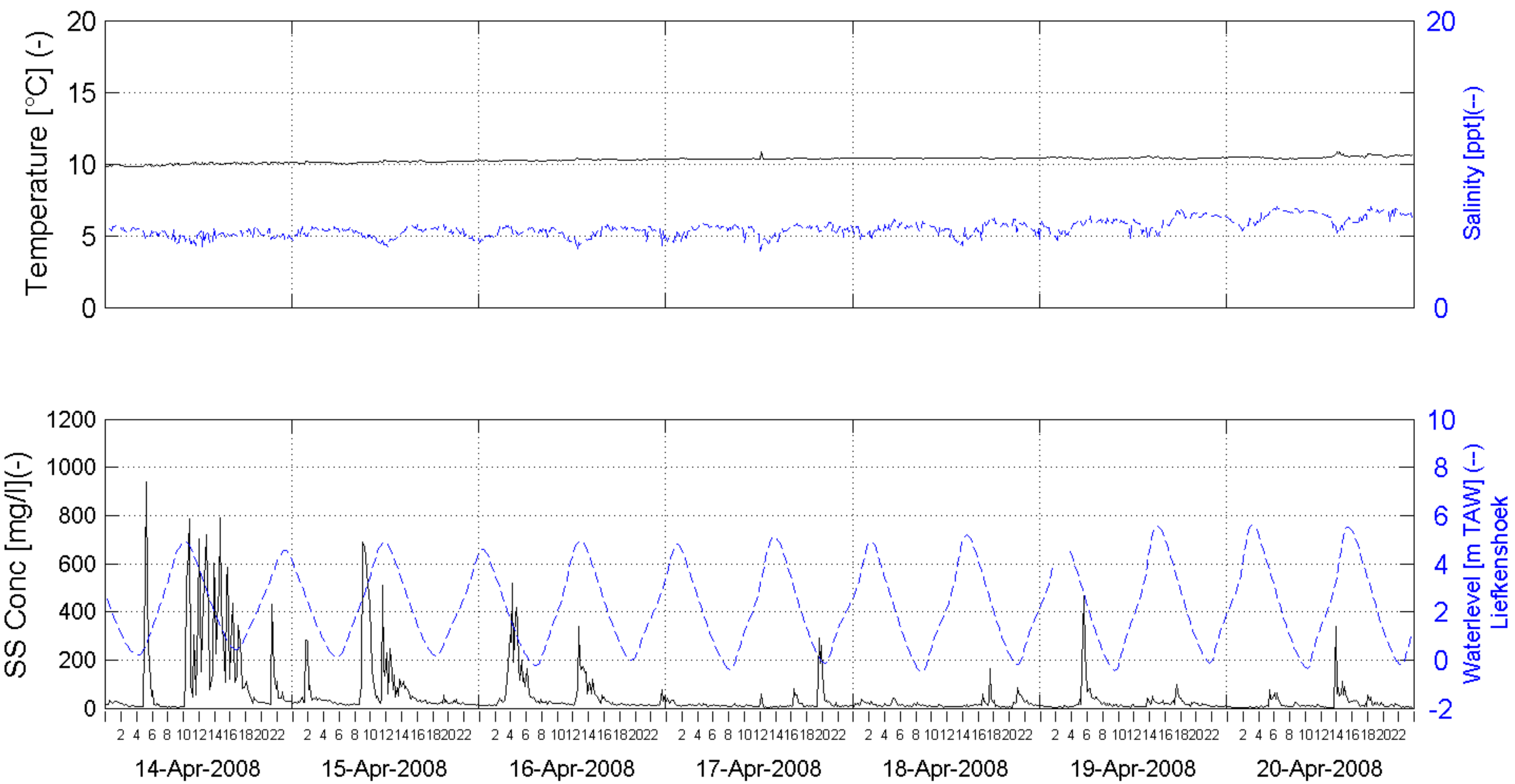
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 15 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

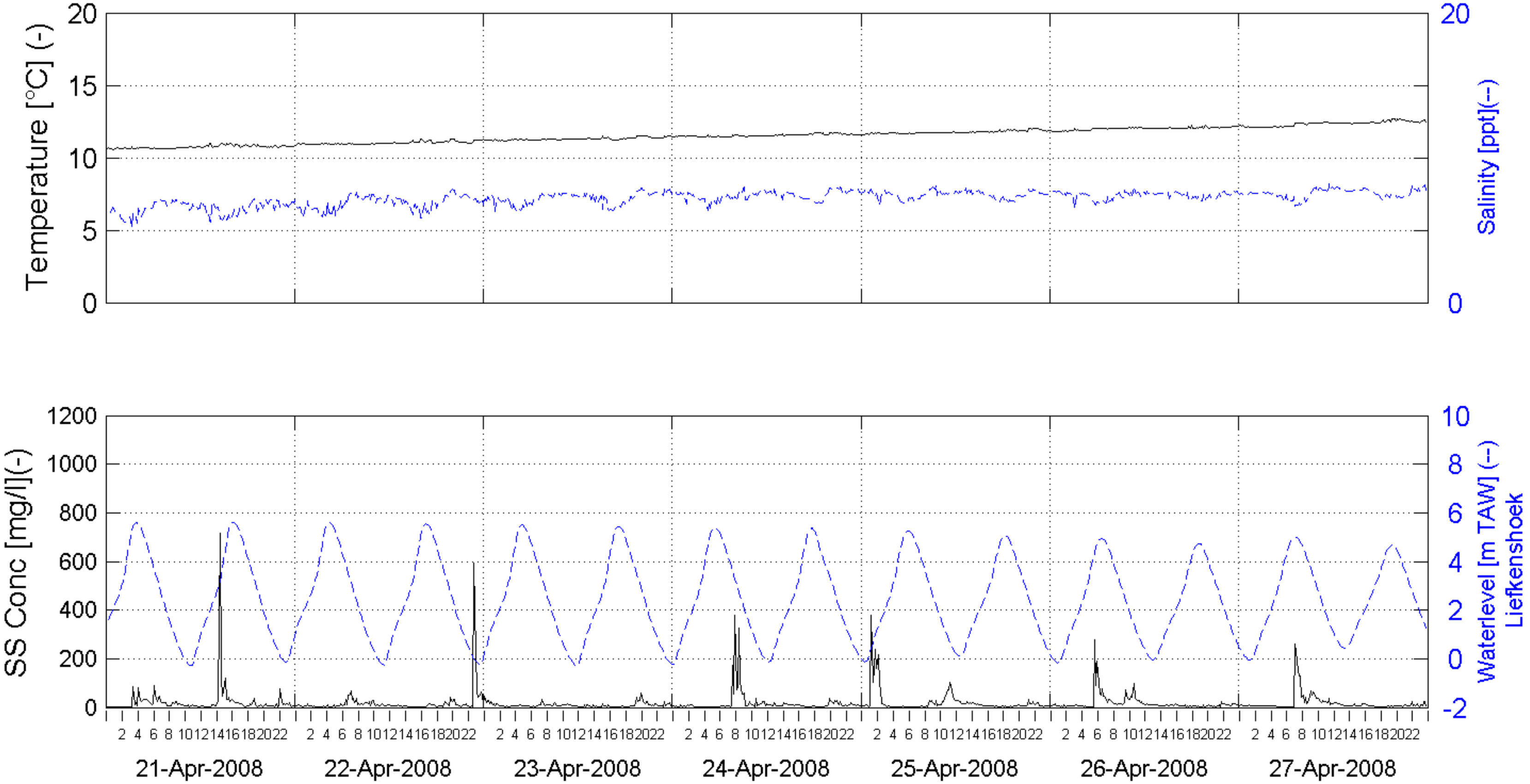
Location:

S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 16 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

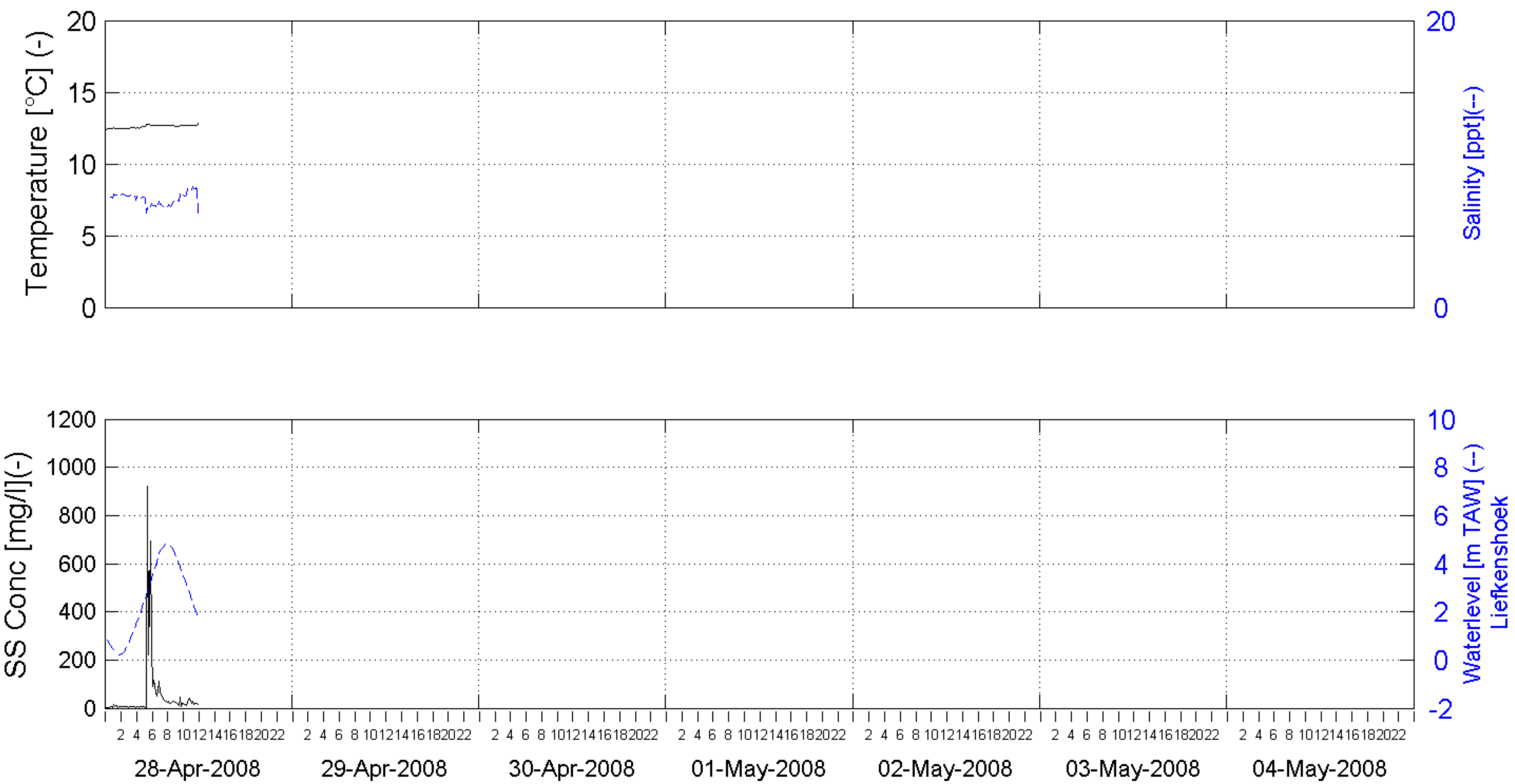
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 17 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-MIDDLE BOTTOM 4.77m above bottom (-12.23m TAW)

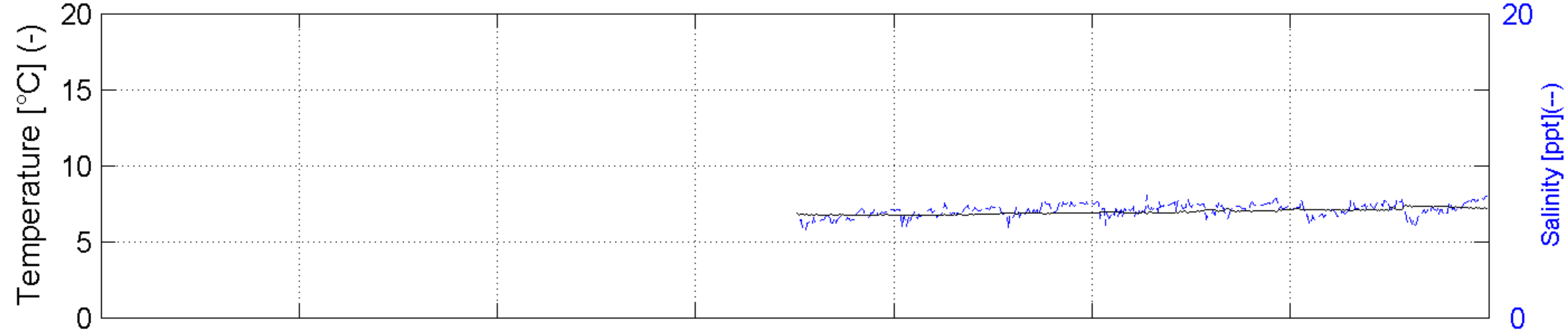
Processed by:

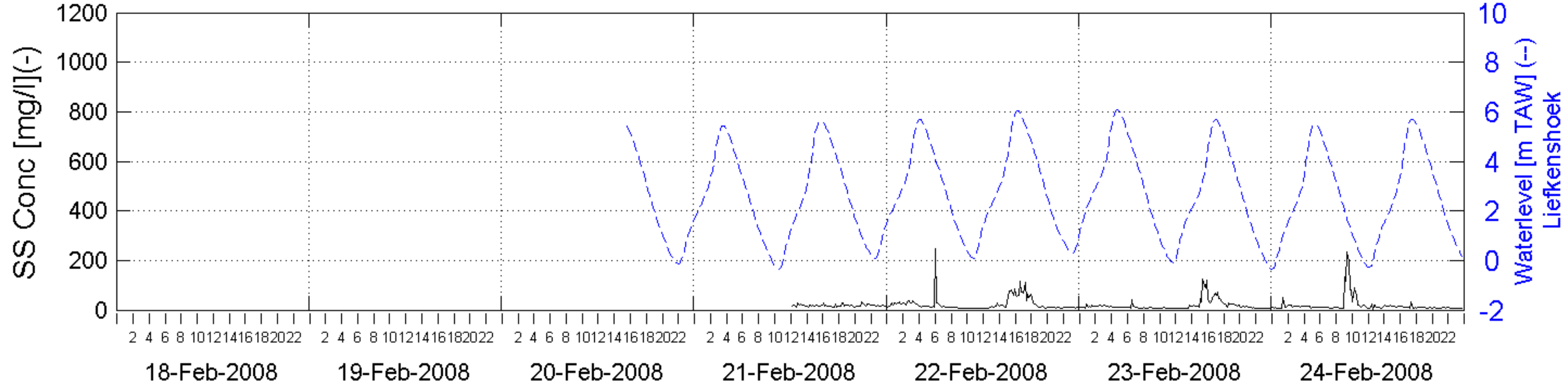
In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 7 - 2008





Week series of Salinity, Temperature,
SS Concentration and Tide

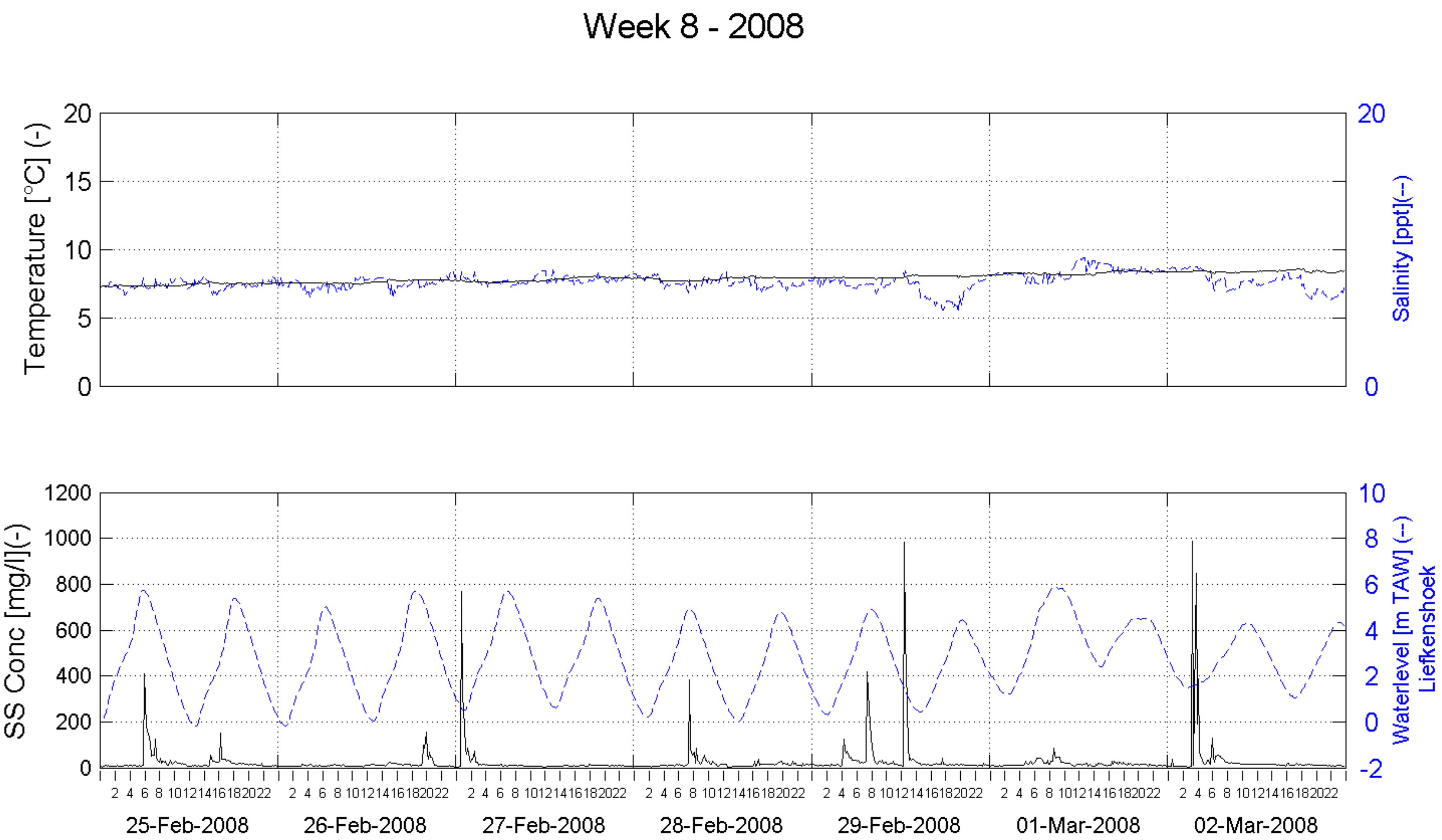
Location:
S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

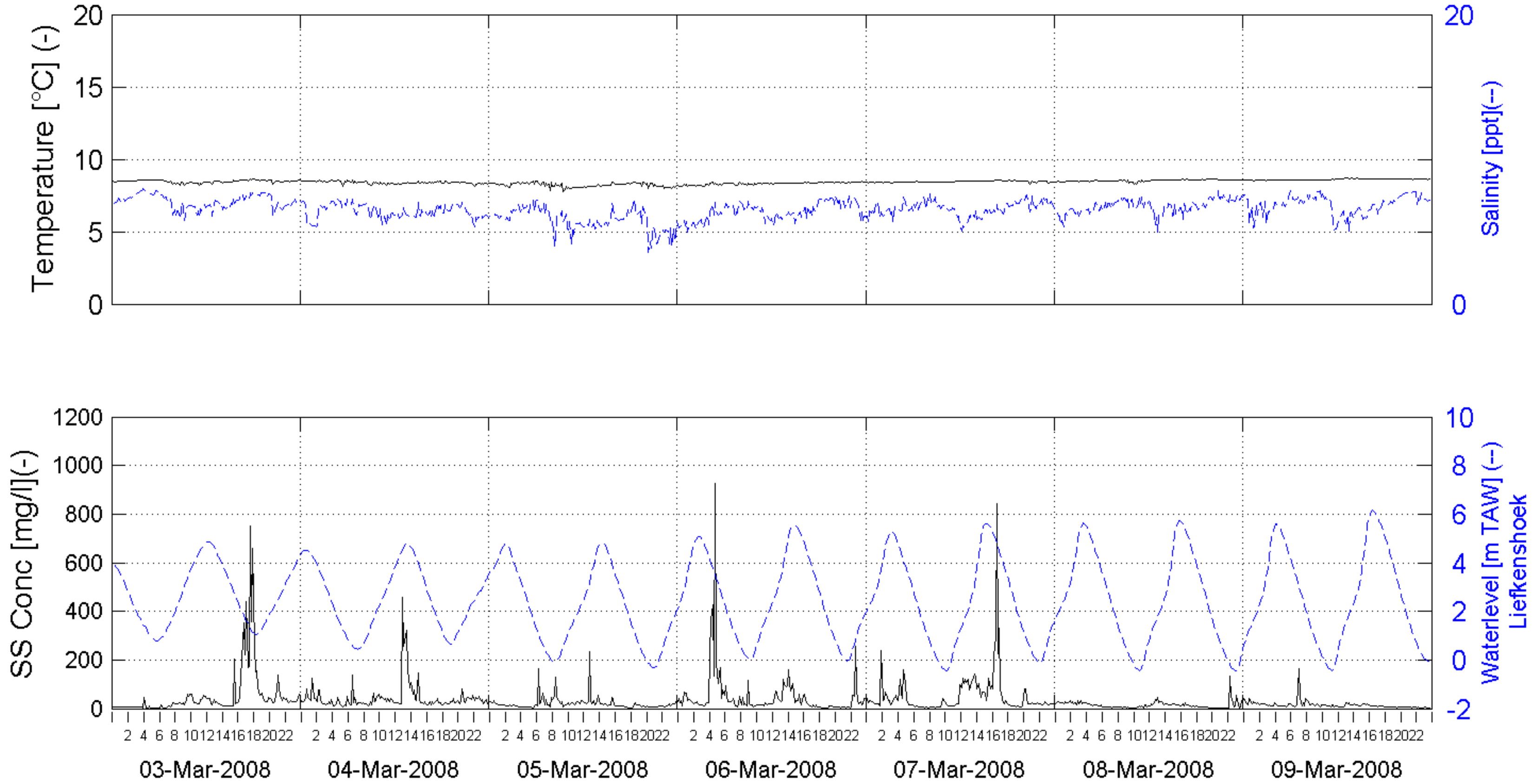
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 9 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

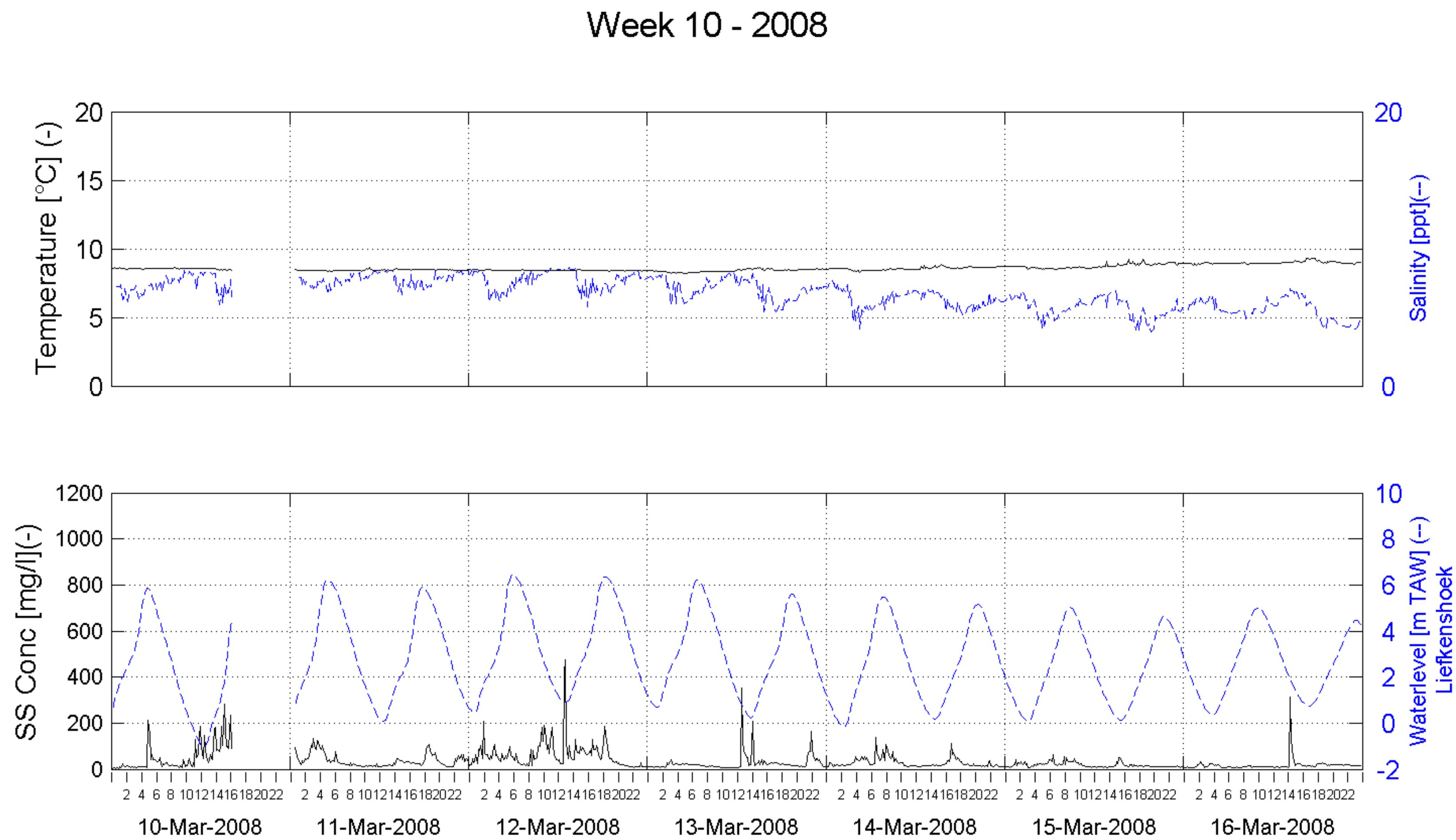
In Association with:

Location:

S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Processed by:

In Association with:

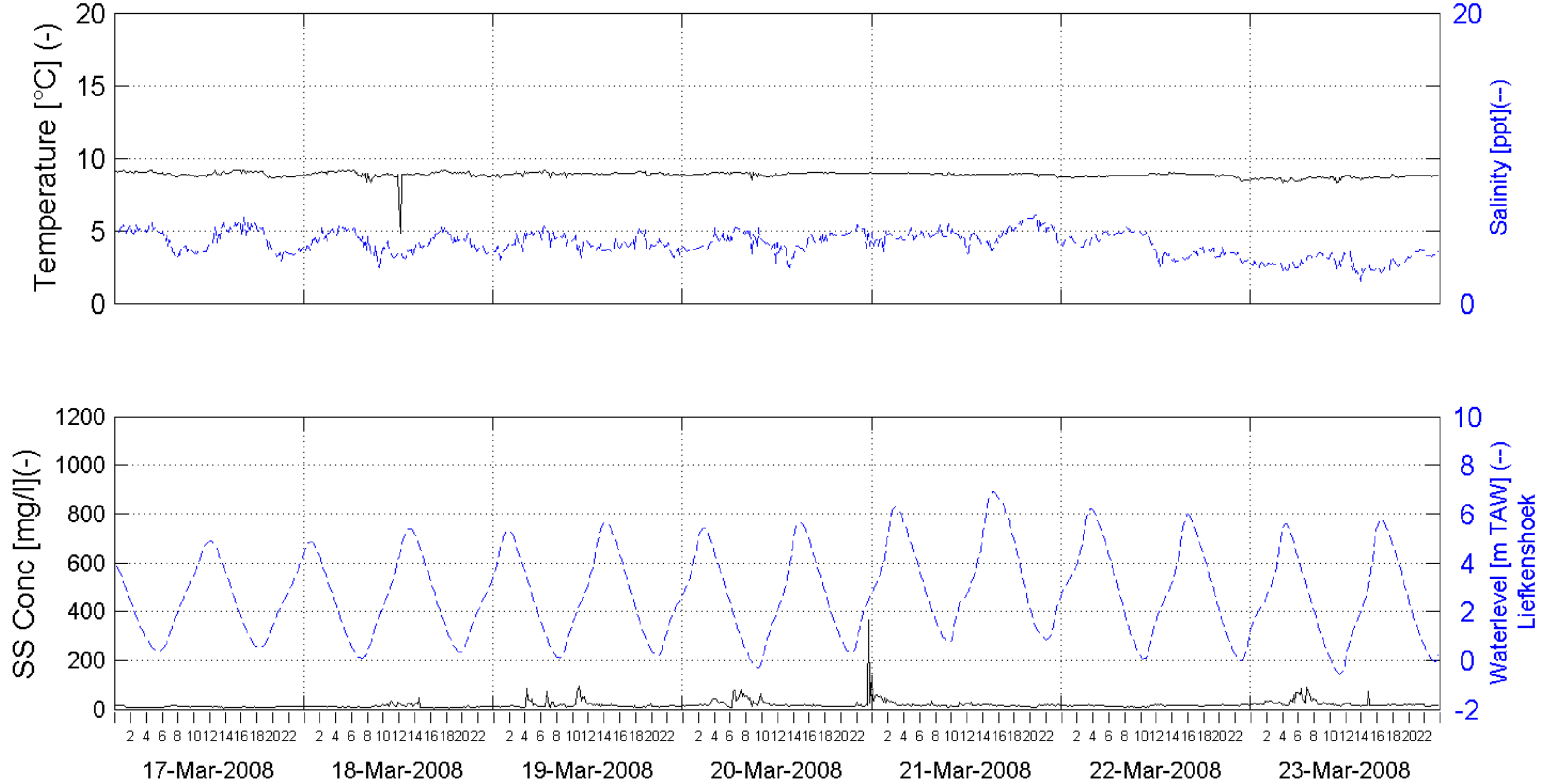
Location:

S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 11 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Processed by:

In Association with:

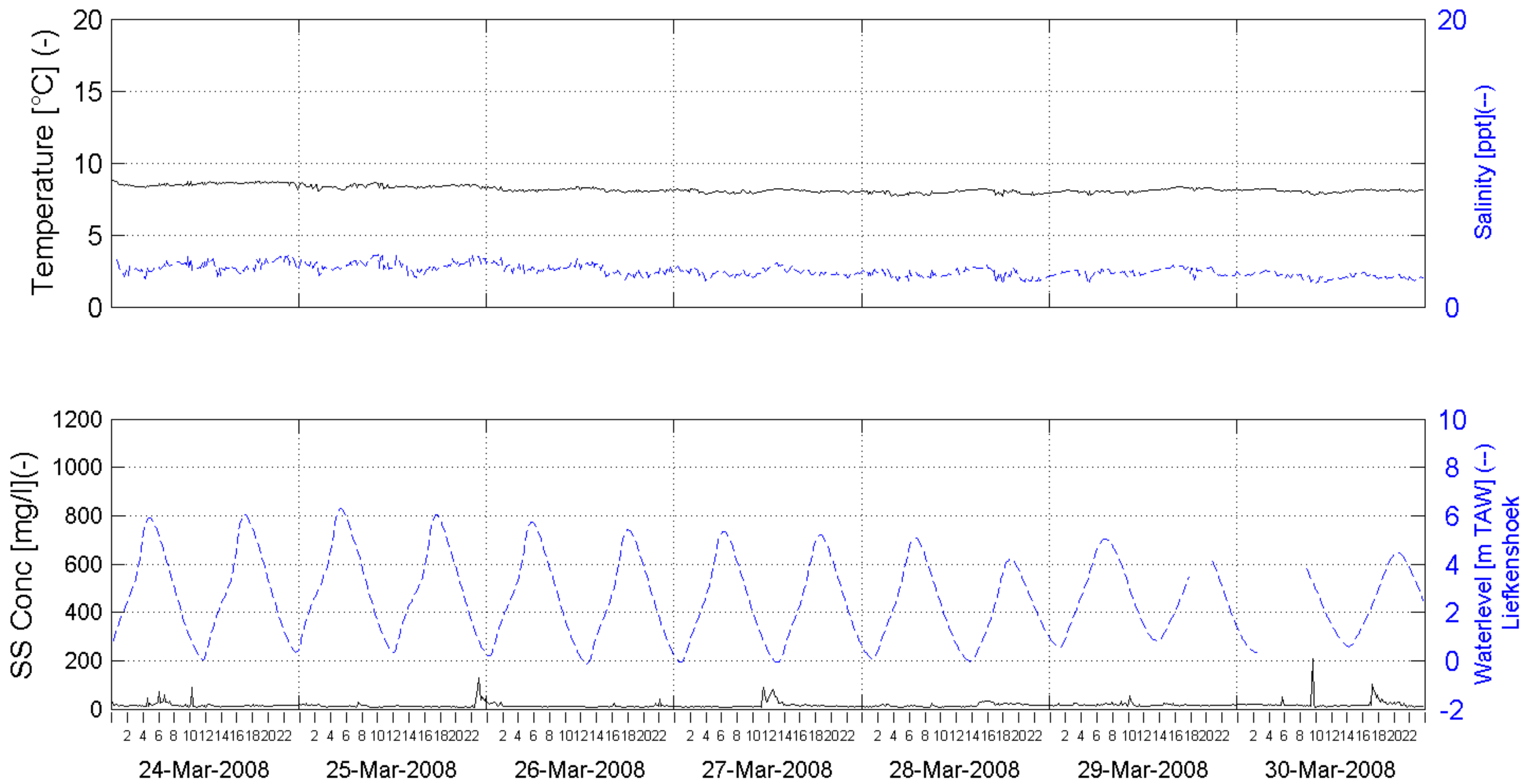
Location:

S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 12 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

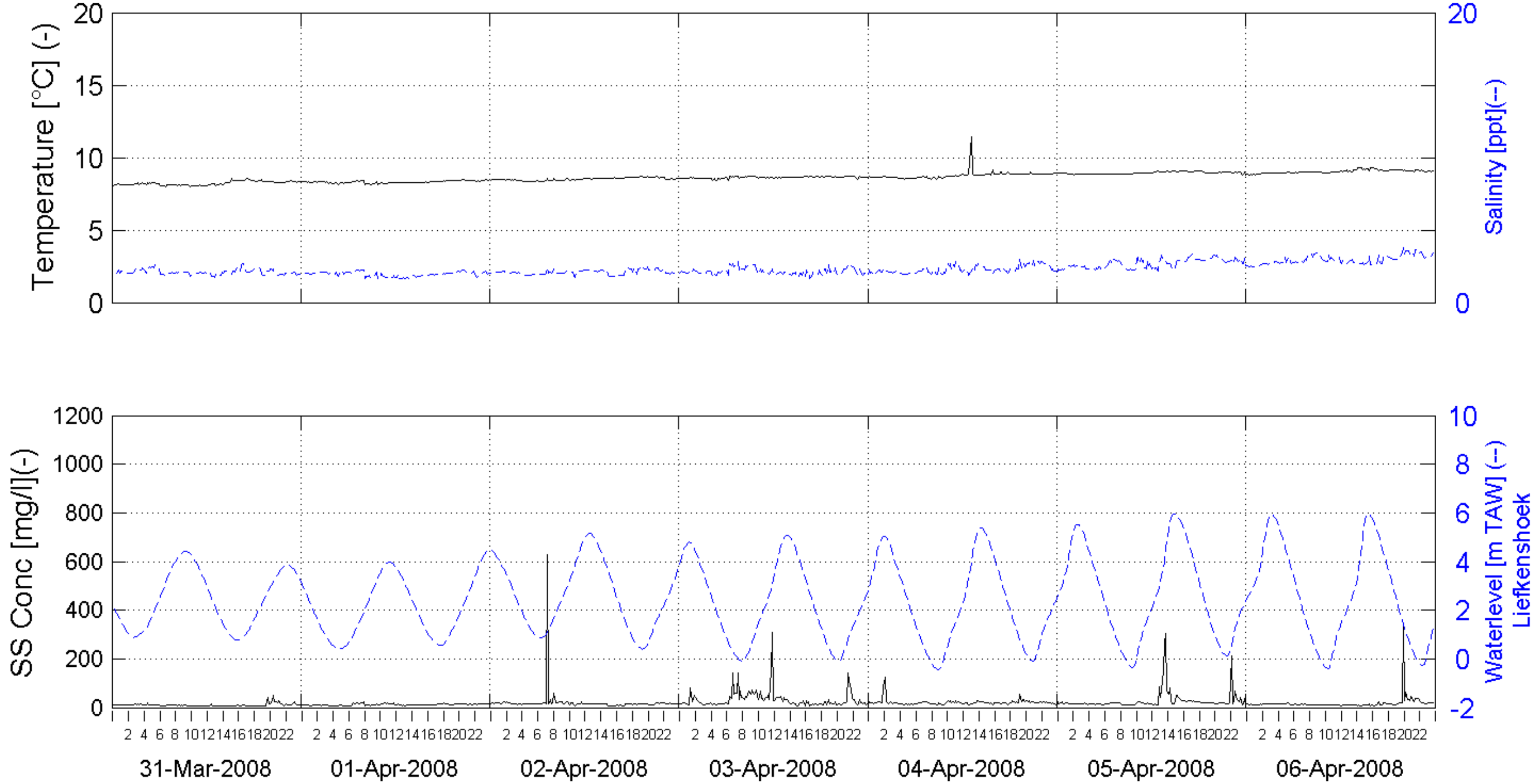
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 13 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

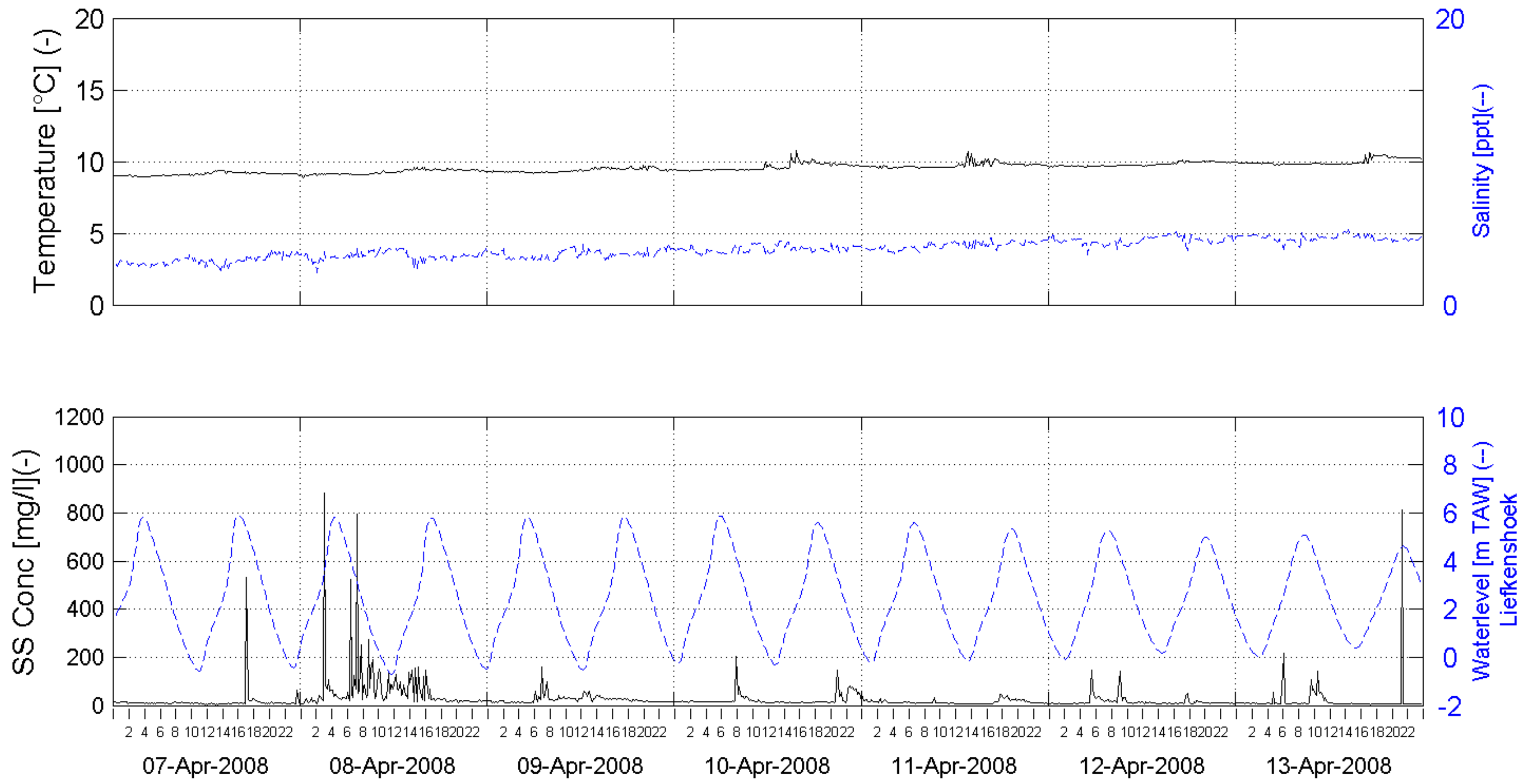
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

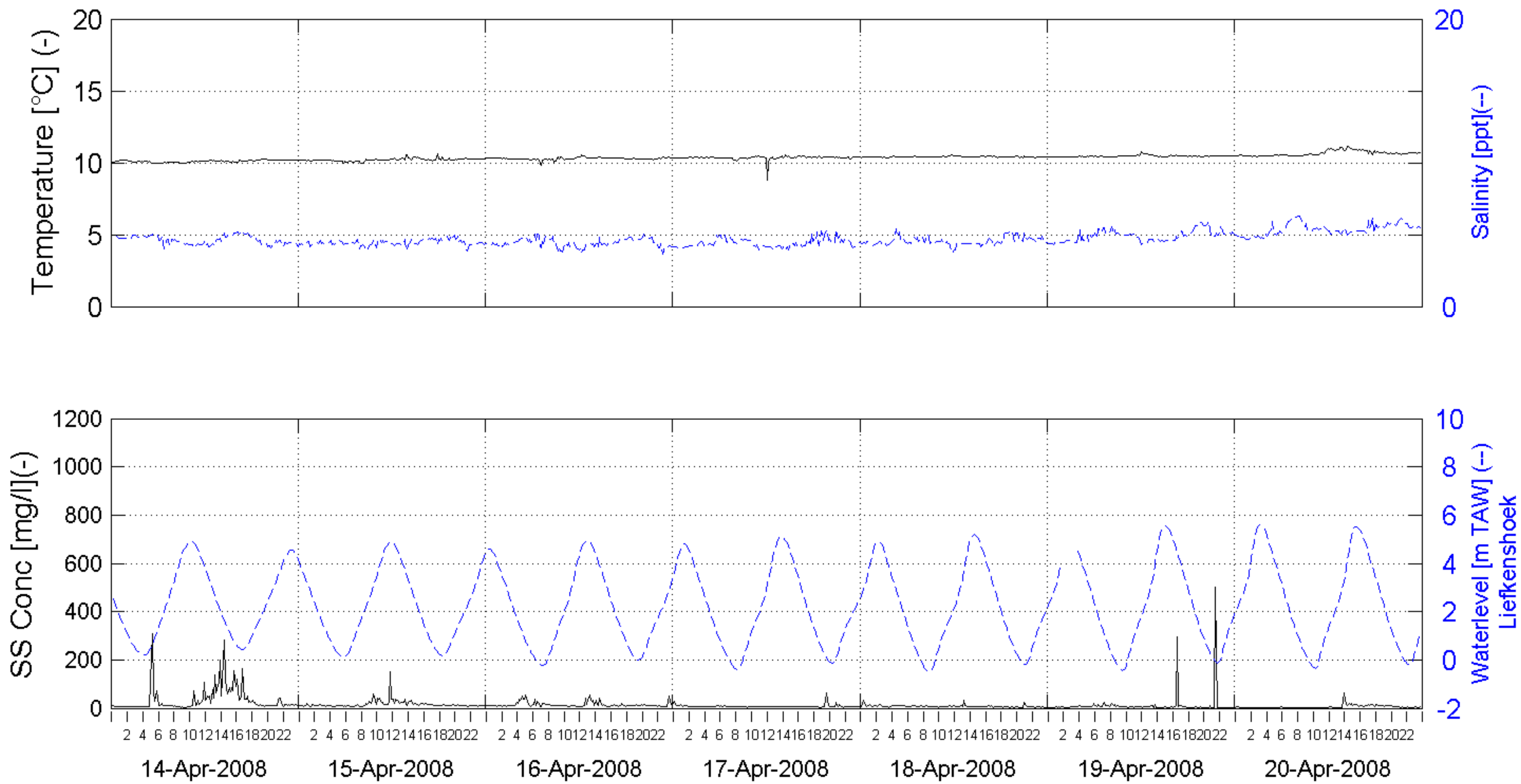
Week 14 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide	Processed by: IMDC
Location: S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)	In Association with: wl | delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 15 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

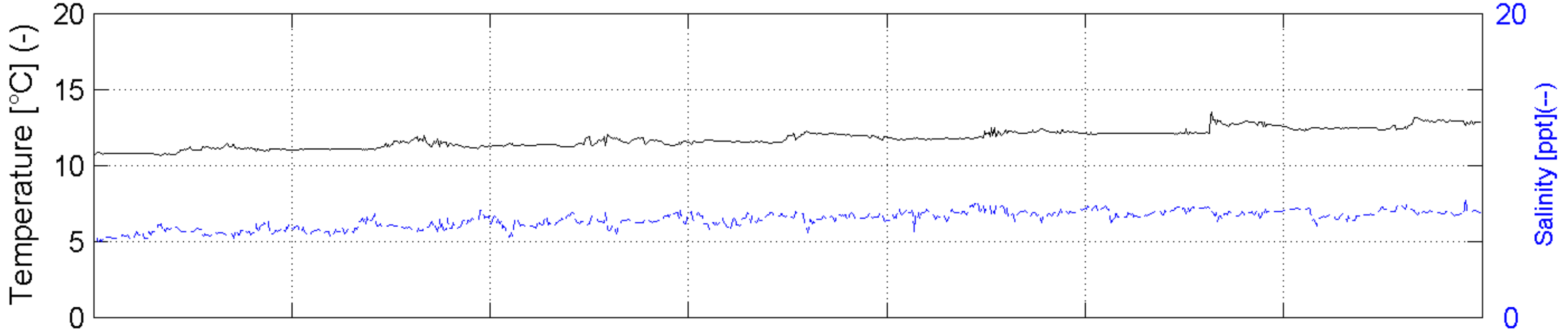
Processed by:

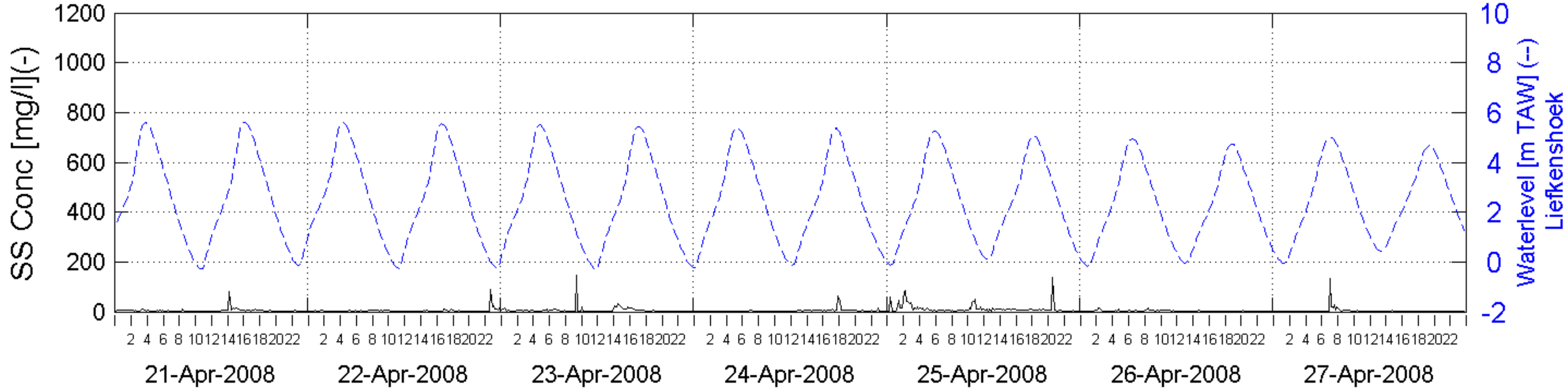
In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 16 - 2008





Week series of Salinity, Temperature,
SS Concentration and Tide

Processed by:

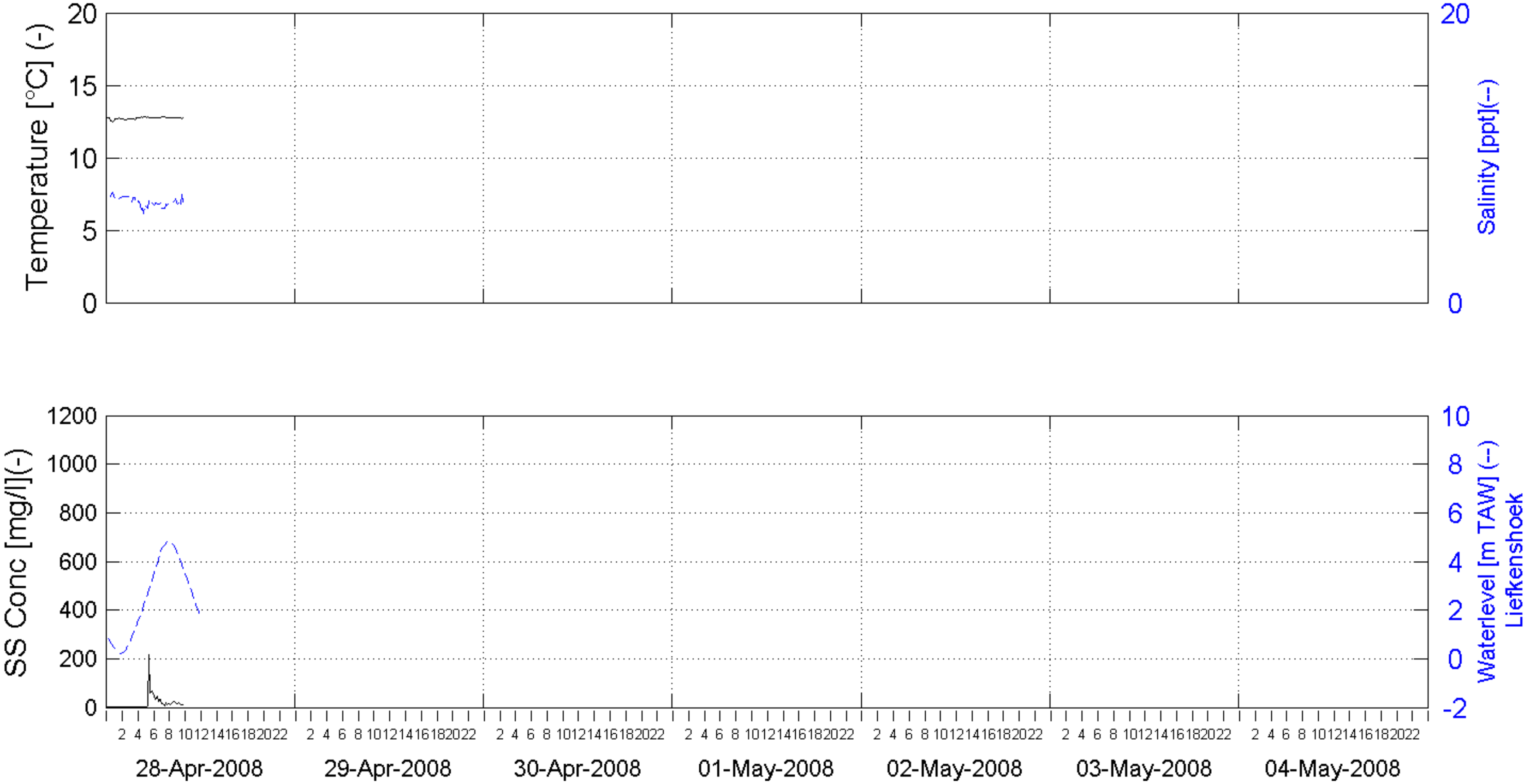
In Association with:

Location:
S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 17 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-MIDDLE TOP 14.66m above bottom (-2.34m TAW)

Processed by:

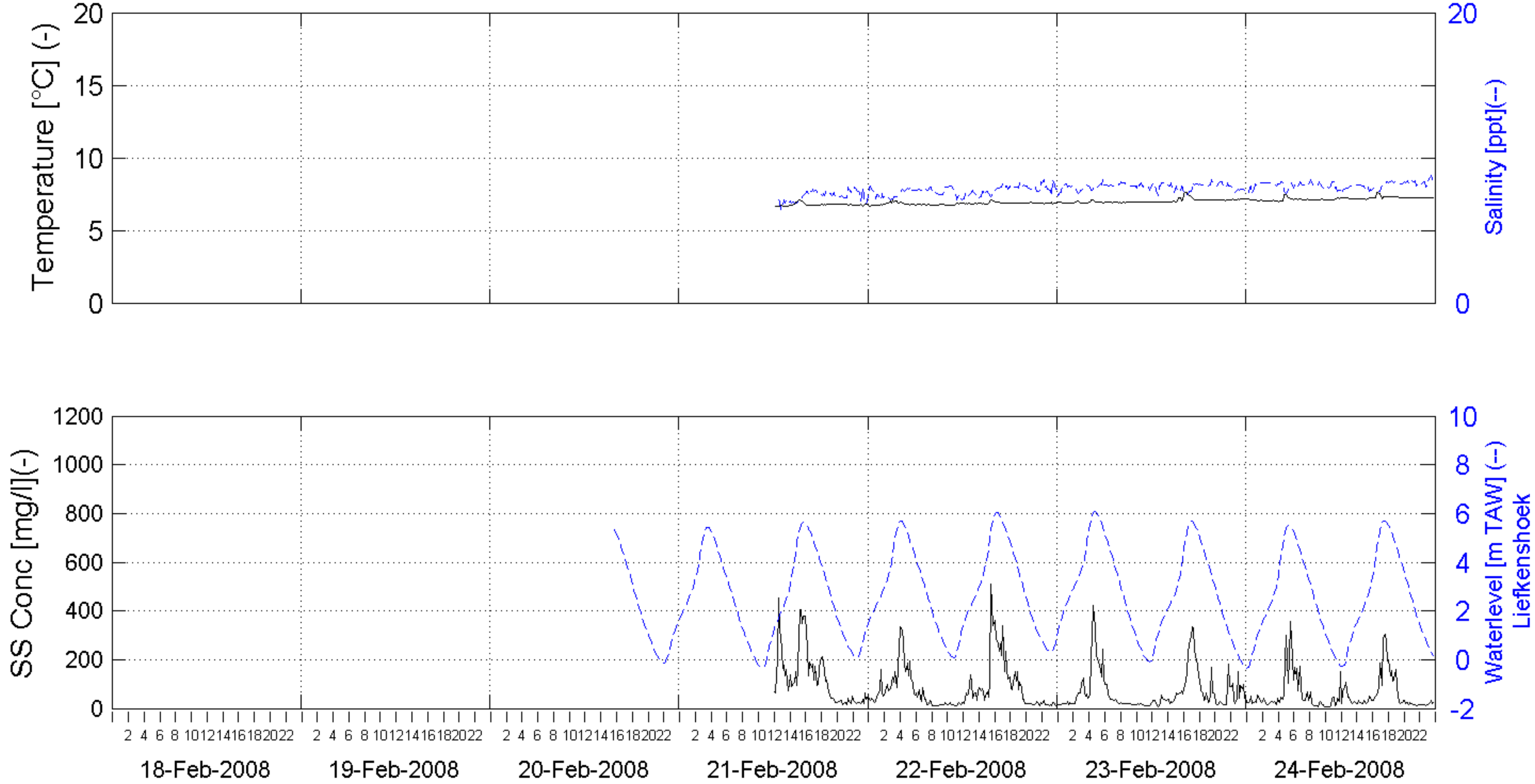
In Association with:

I/RA/11283/07.094/MSA

C.4 S-ENTRANCE

11283 - Long-term monitoring DGD - Winter 2008

Week 7 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

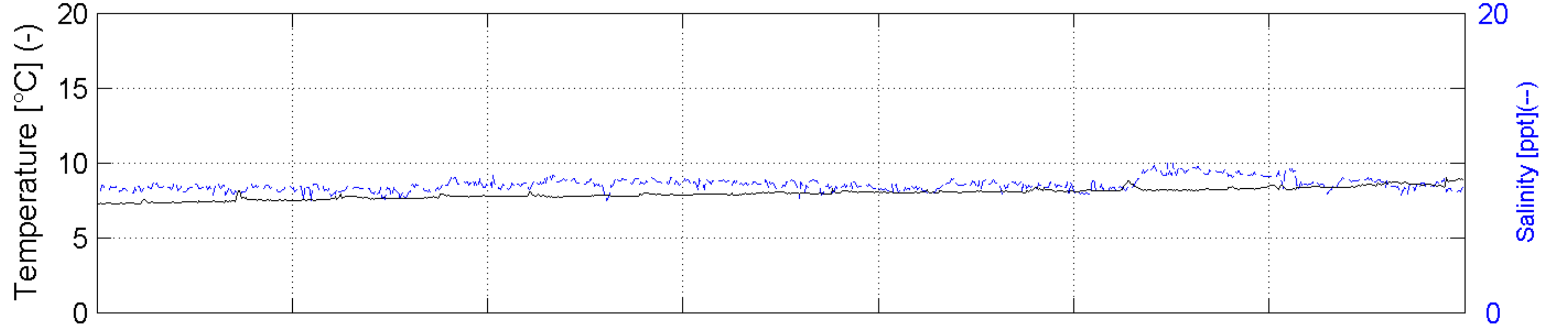
Processed by:

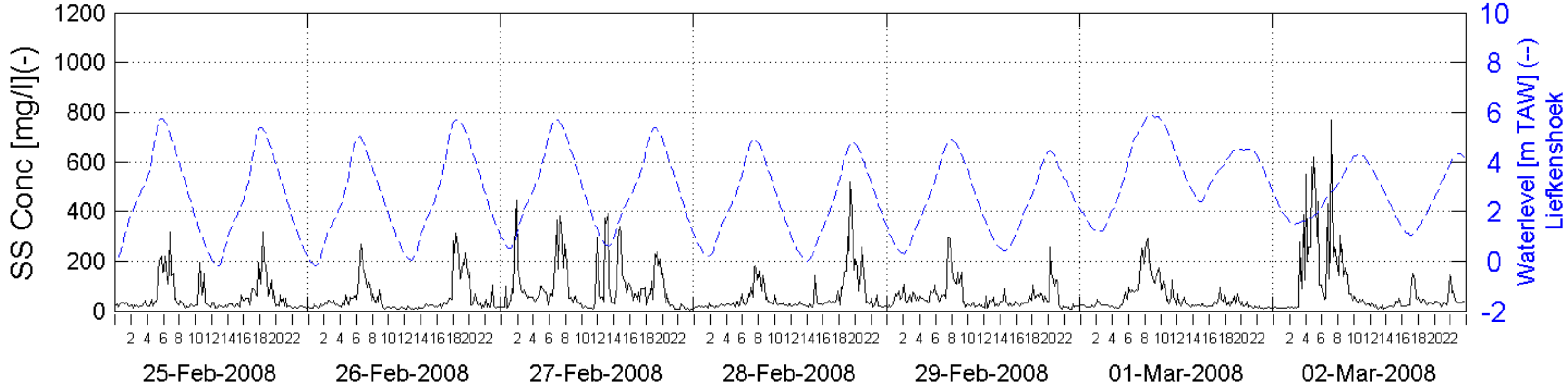
In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 8 - 2008





Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

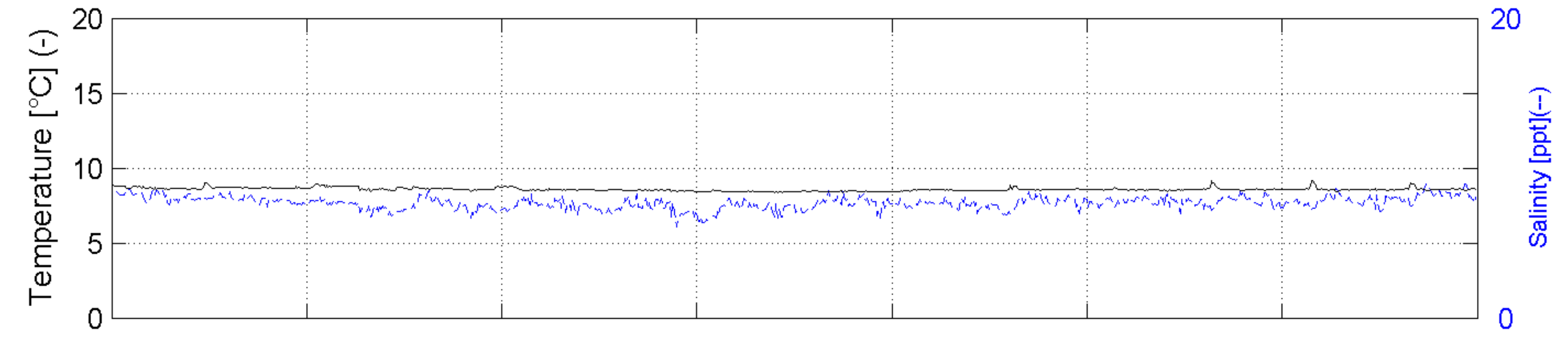
Processed by:

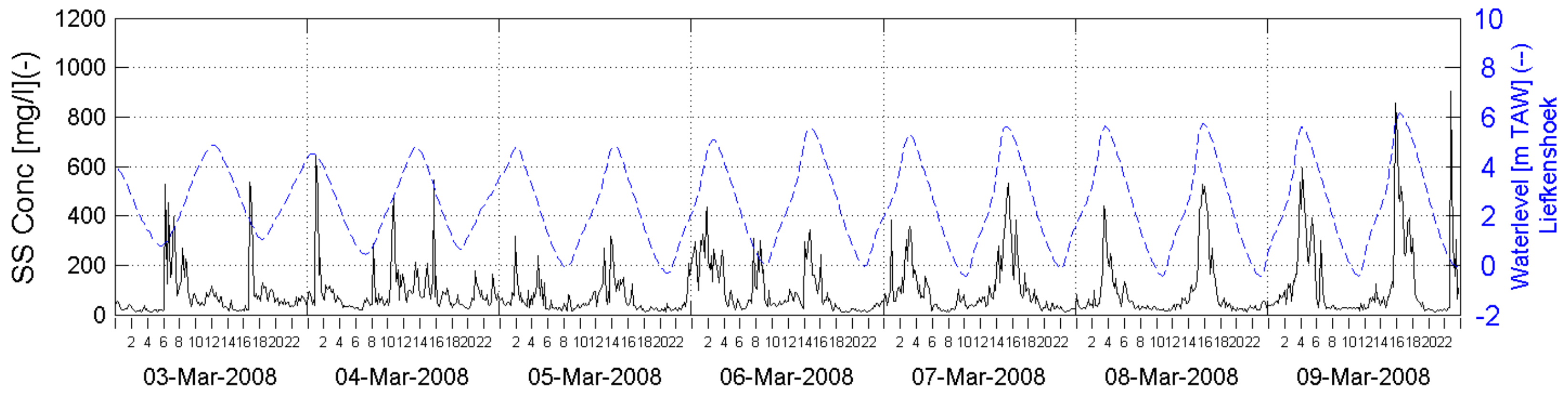
In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 9 - 2008





Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

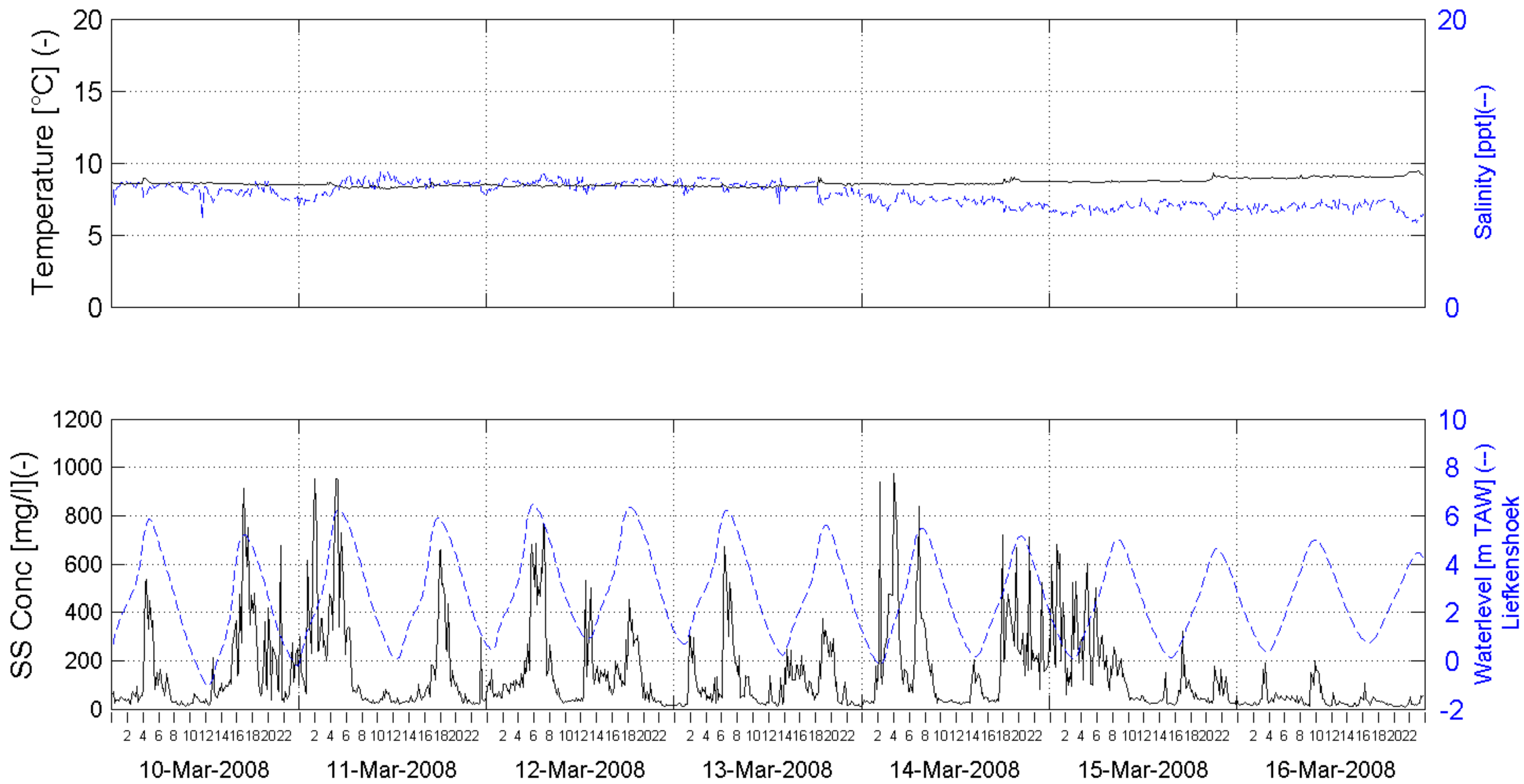
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 10 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

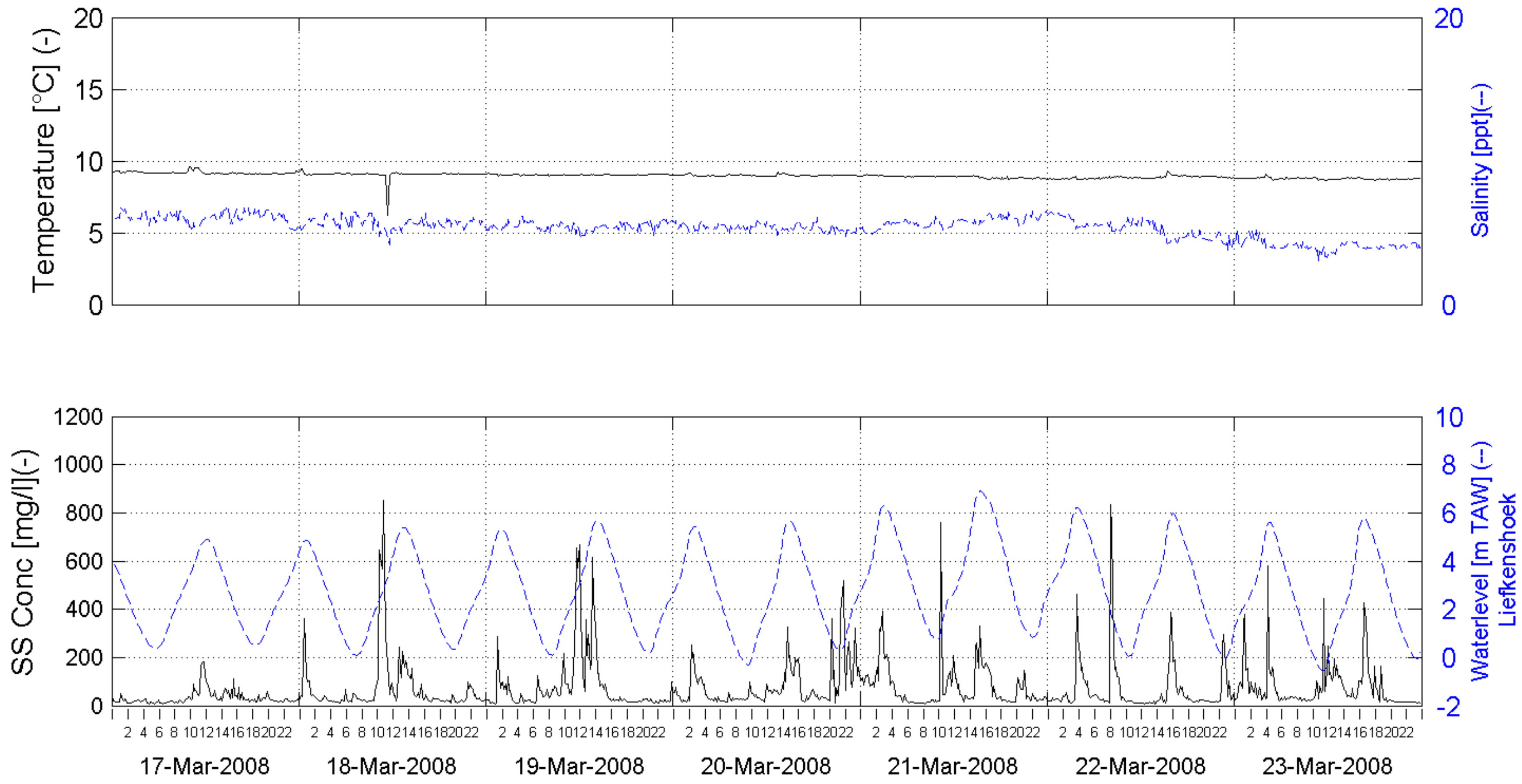
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 11 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

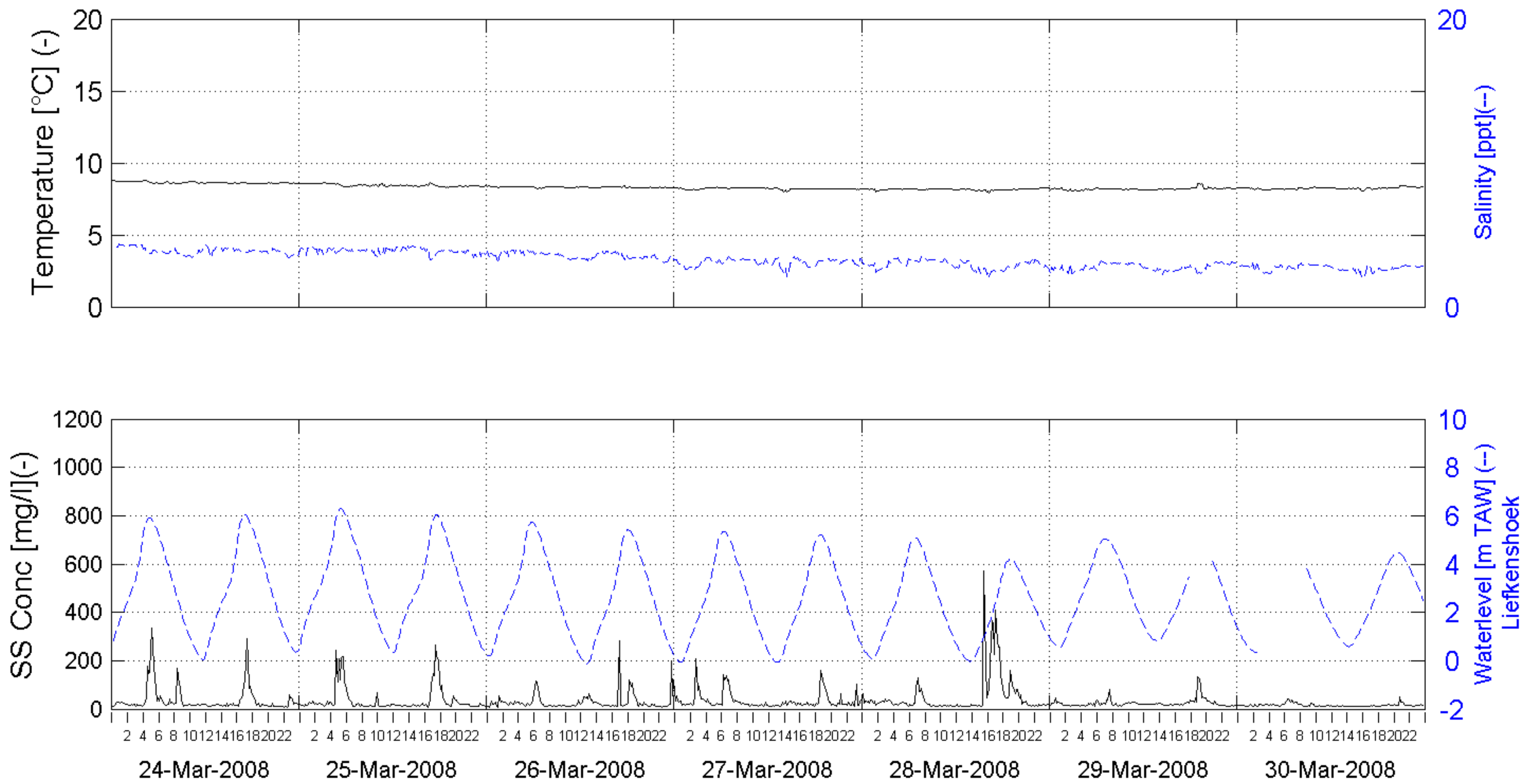
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 12 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

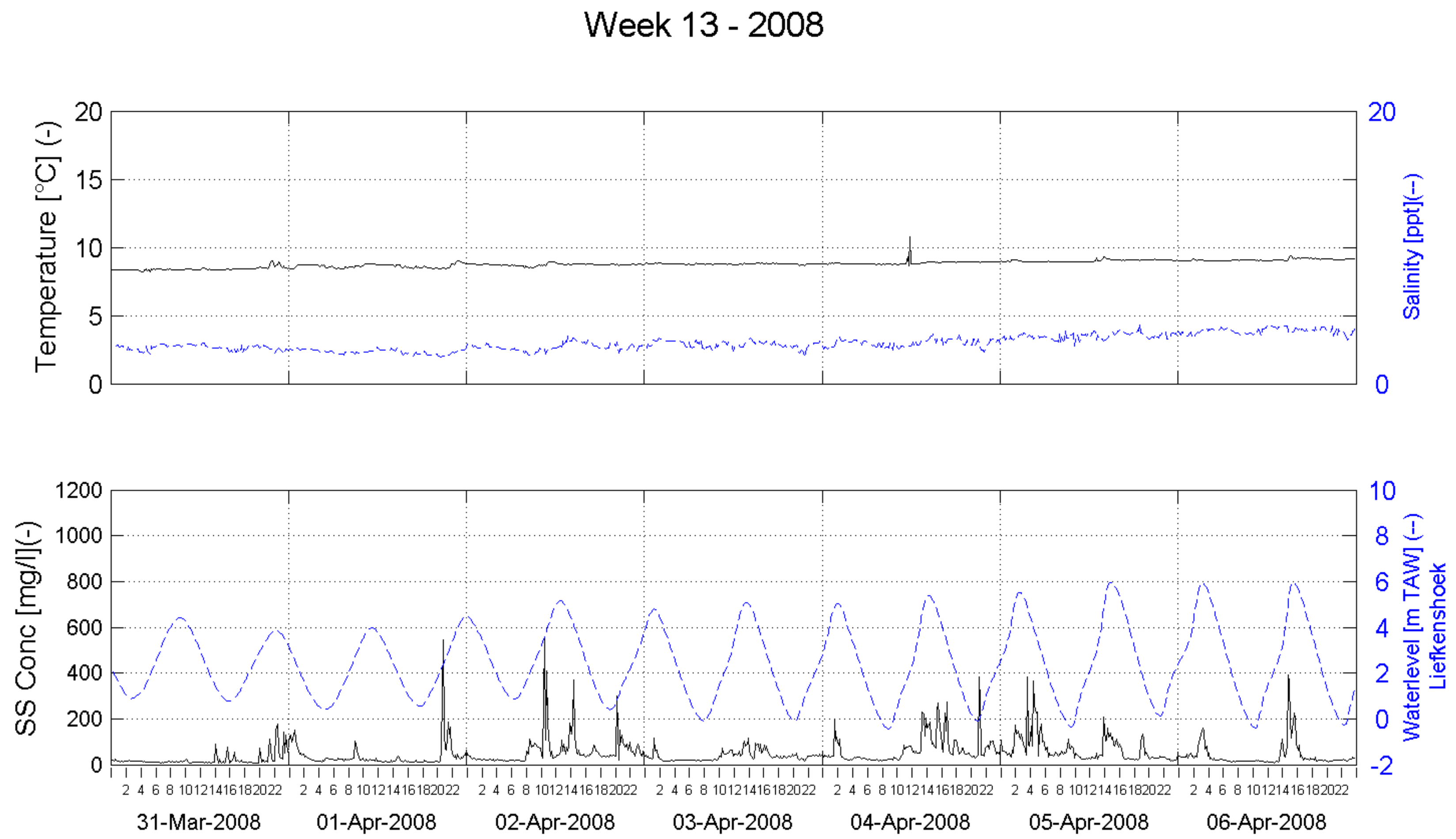
Processed by:

In Association with:

Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

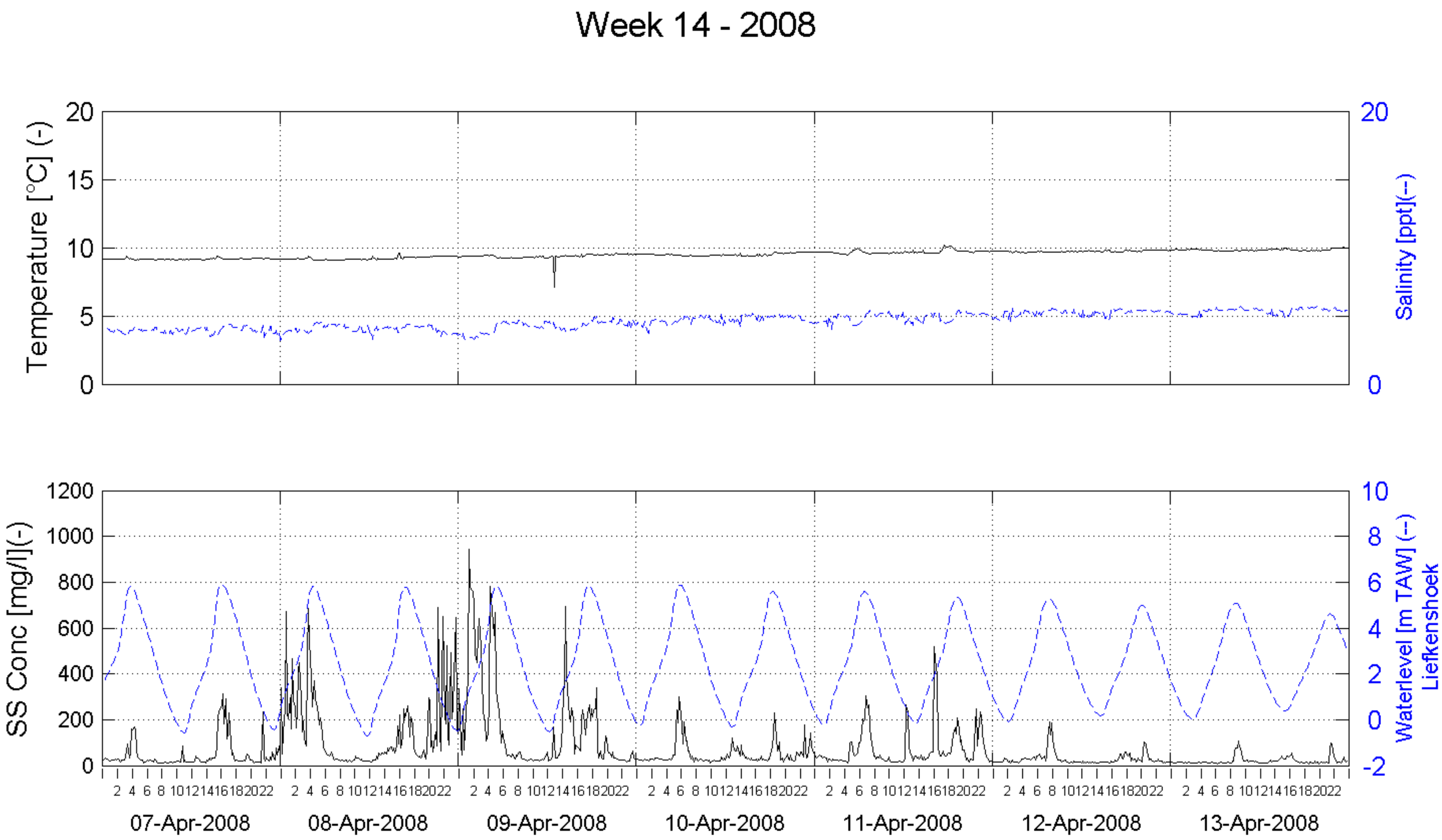
Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

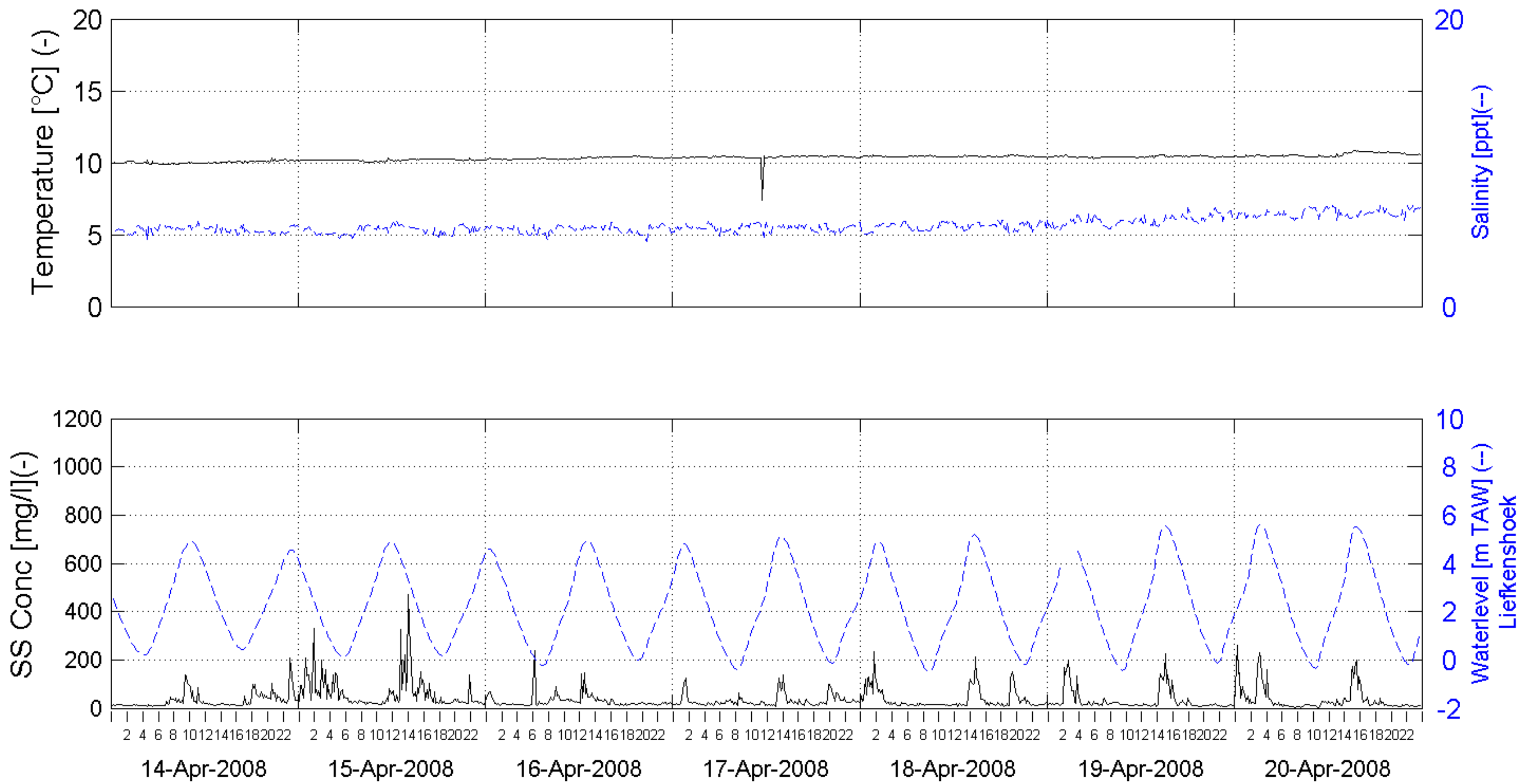
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 15 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

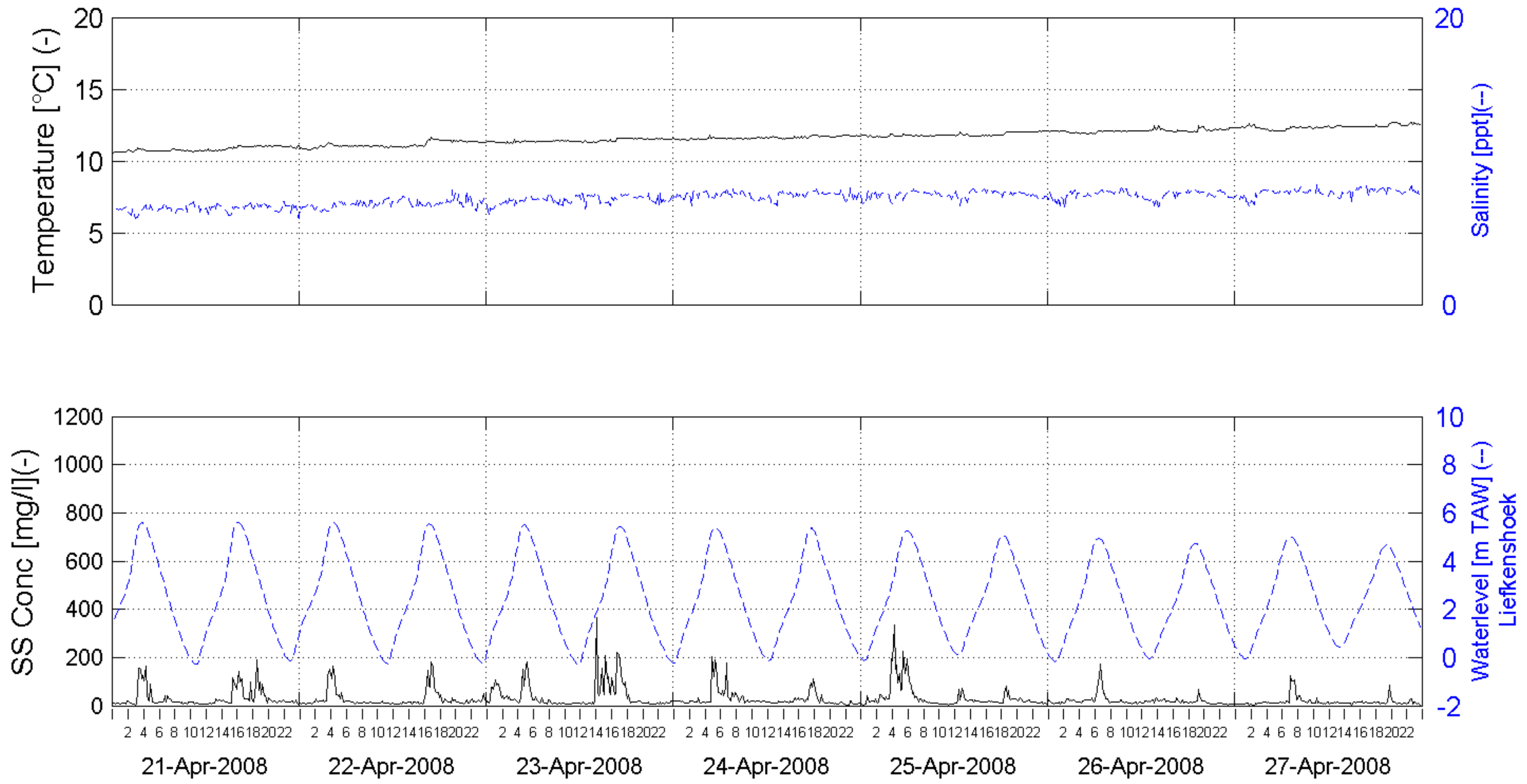
Location:

S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 16 - 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

In Association with:

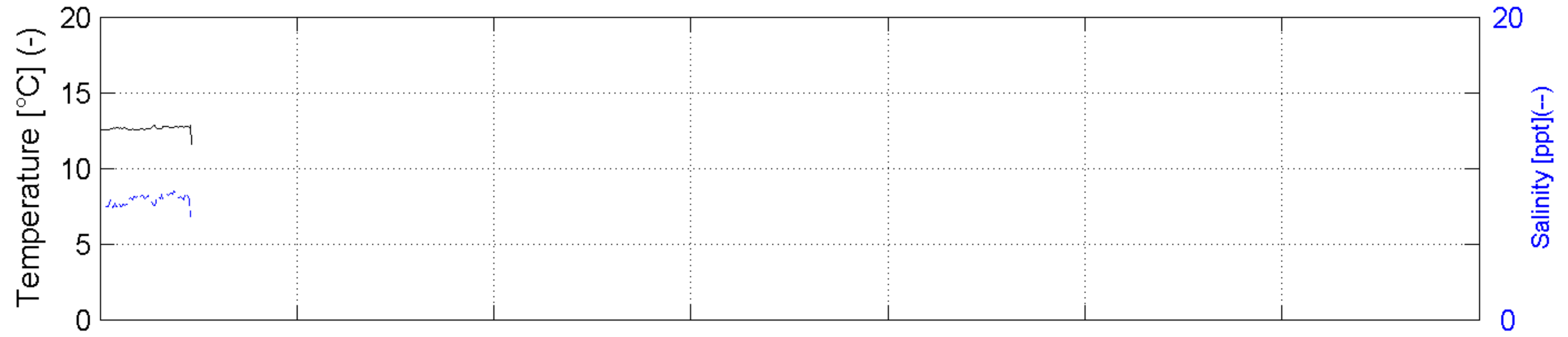
I/RA/11283/07.094/MSA

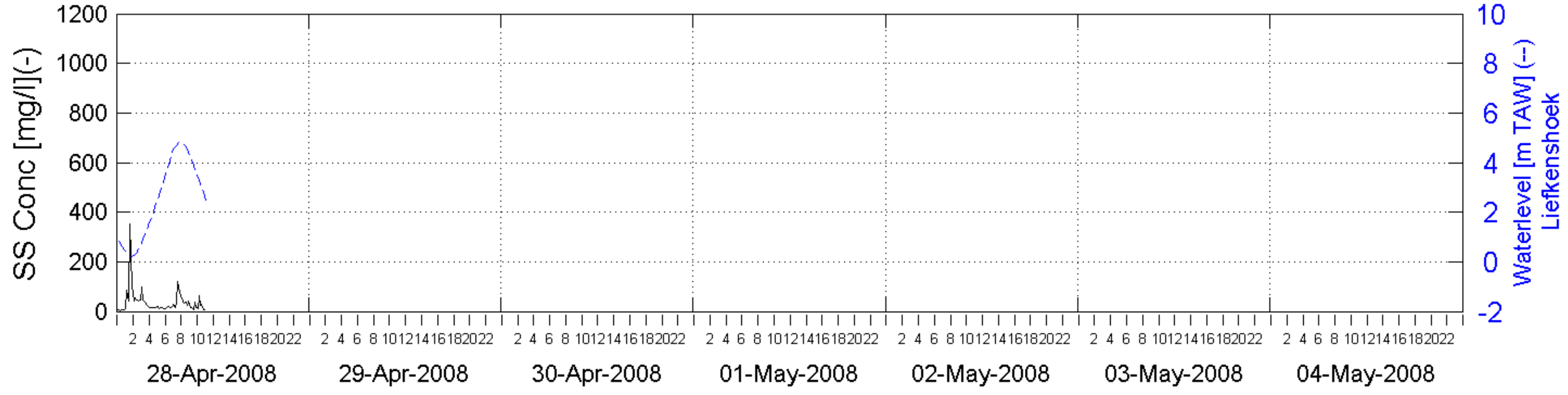
Location:

S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

11283 - Long-term monitoring DGD - Winter 2008

Week 17 - 2008





Week series of Salinity, Temperature,
SS Concentration and Tide

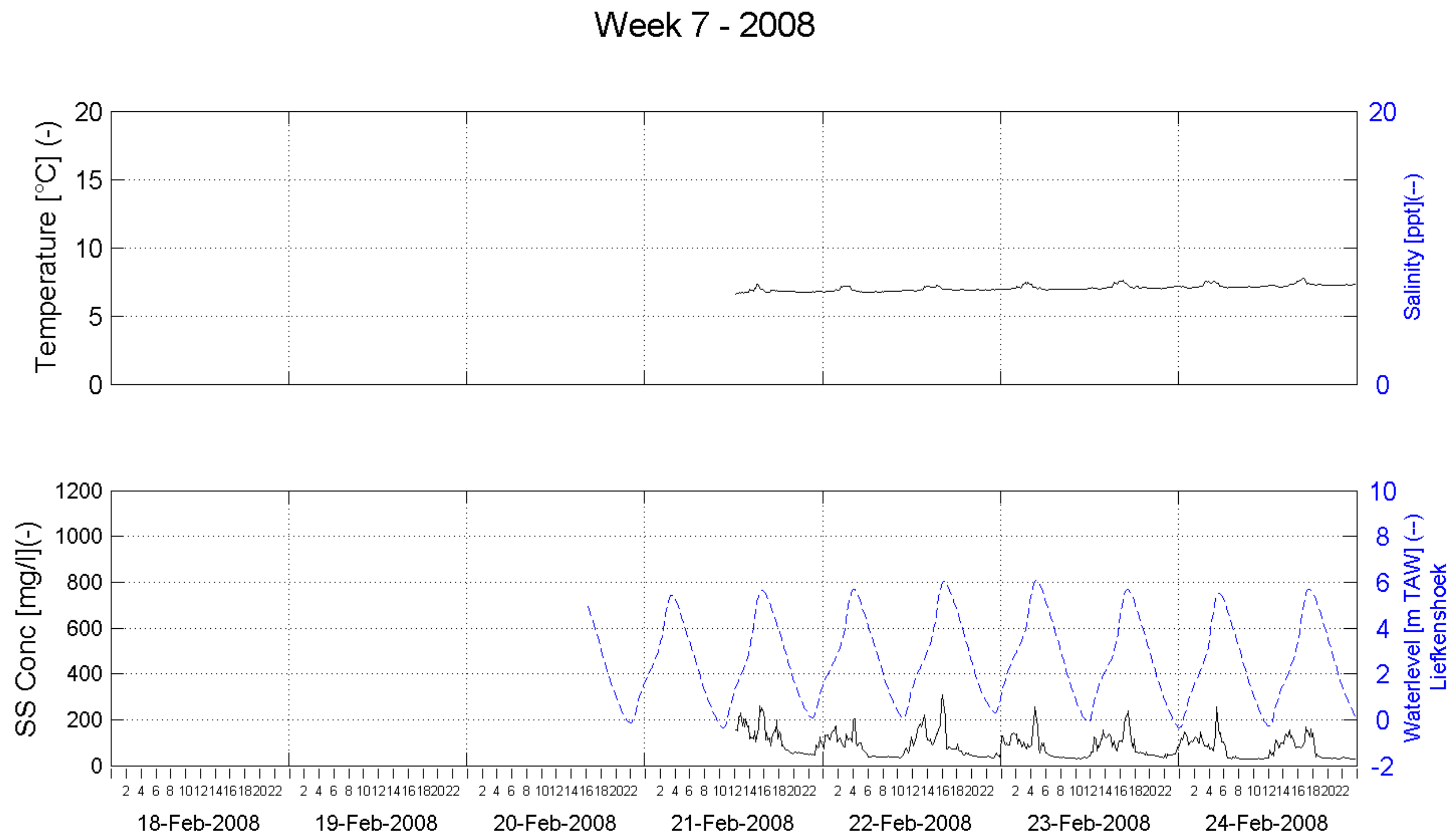
Location:
S-ENTRANCE BOTTOM 3.49m above bottom (-13.51m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

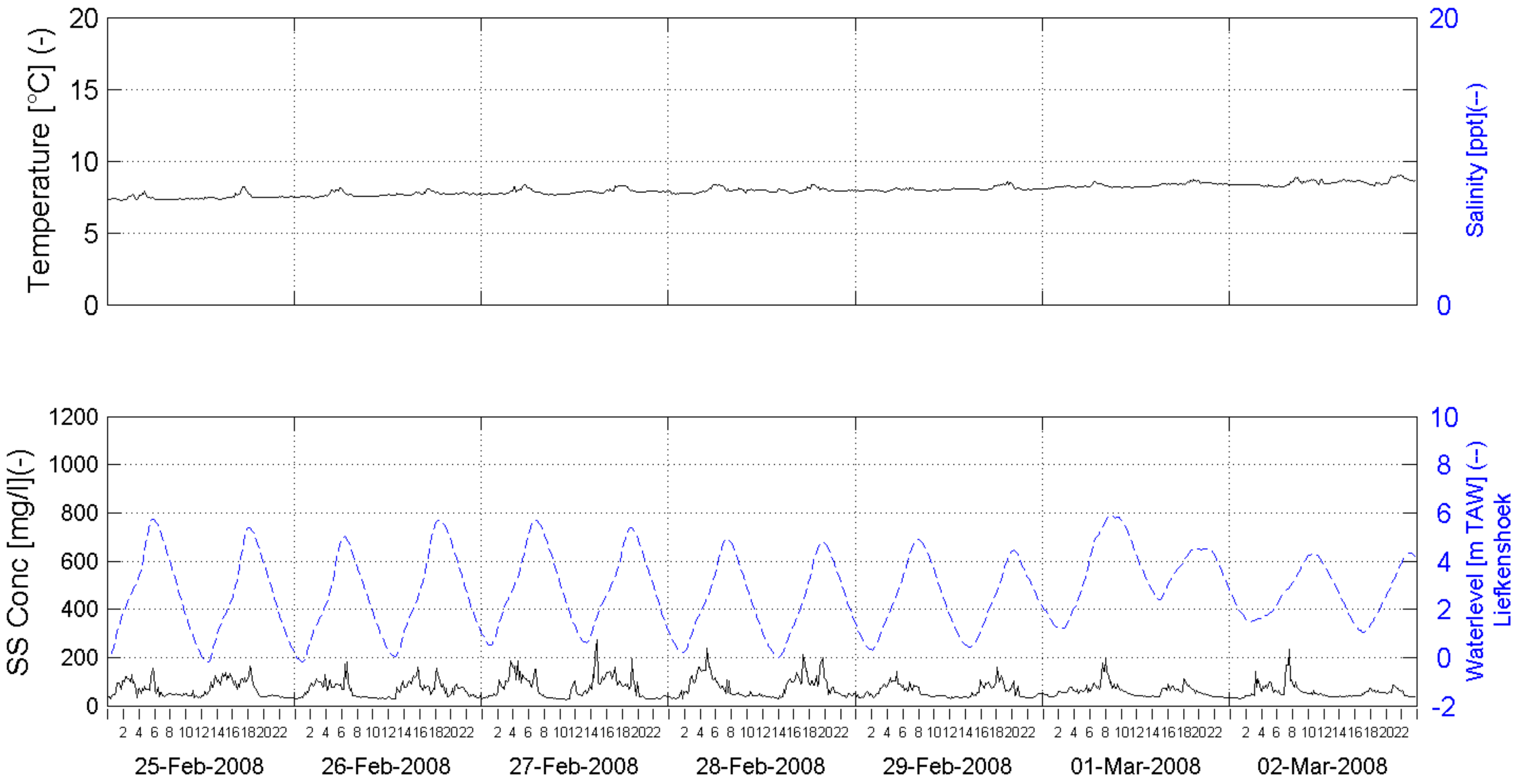
Processed by: IMDC

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 8 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Processed by:

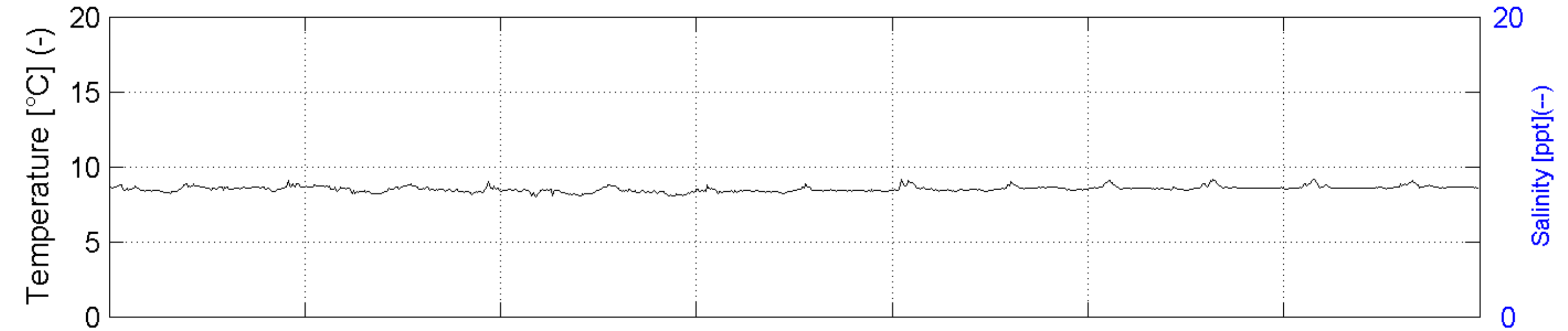
In Association with:

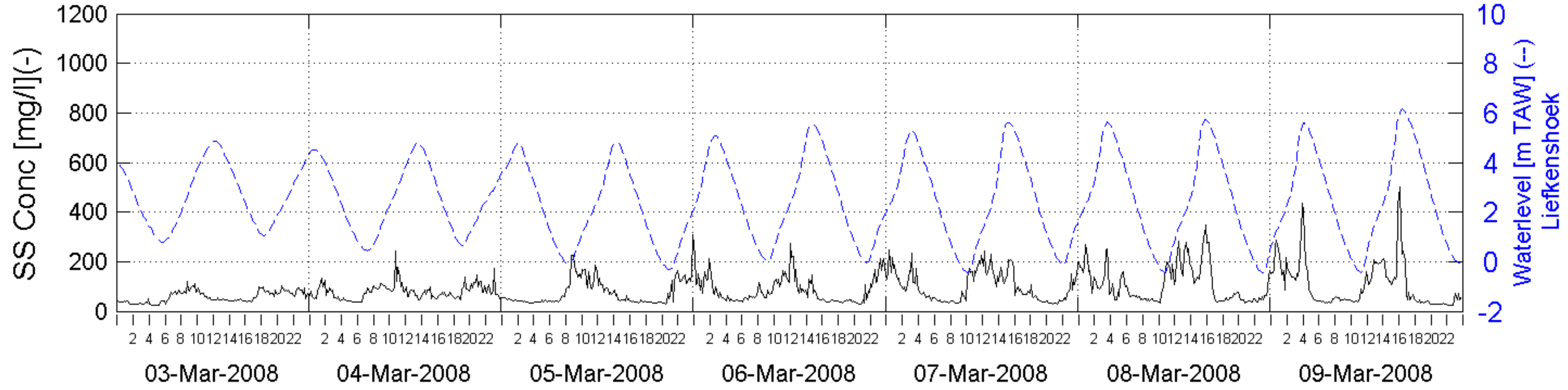
Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

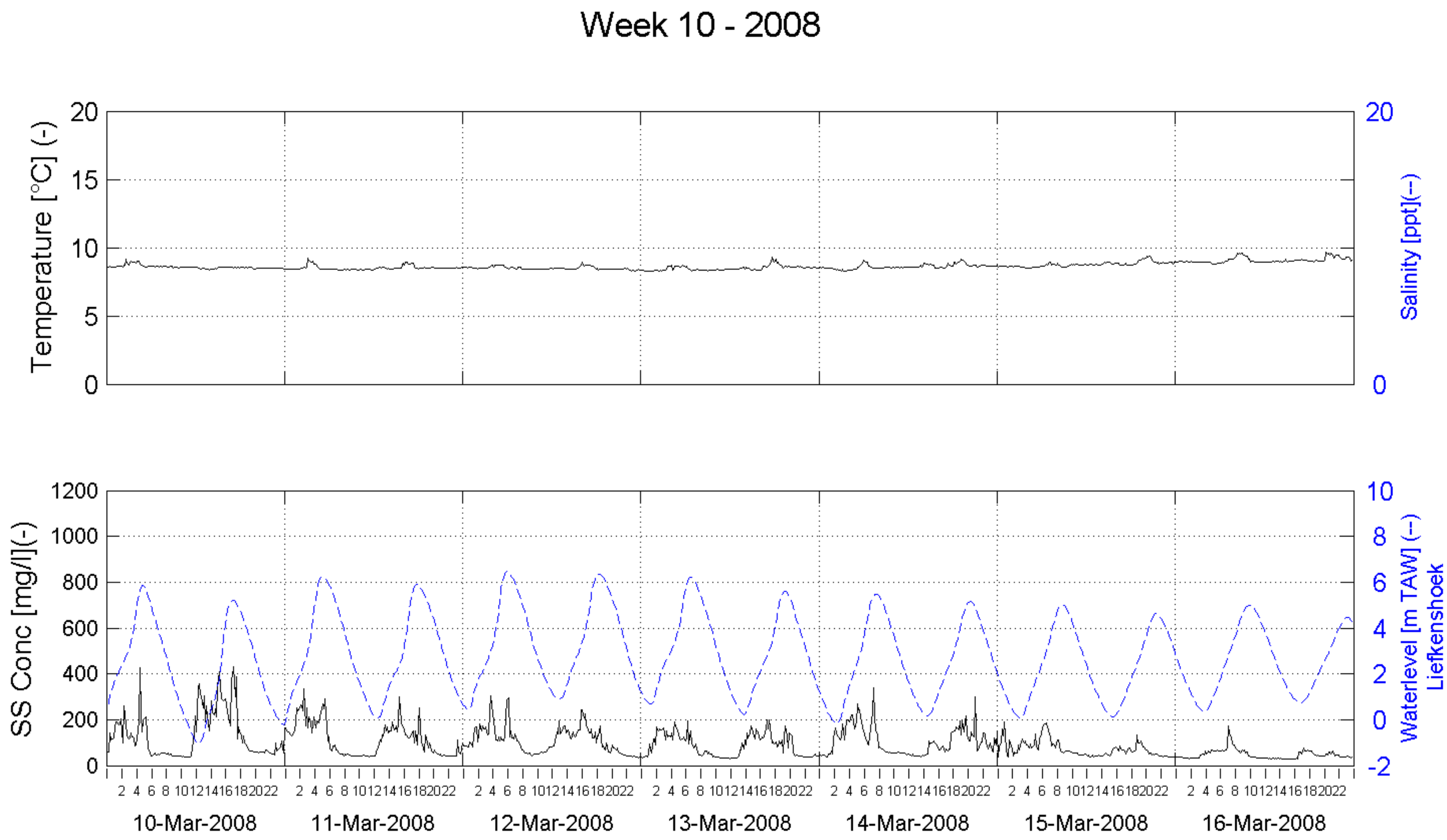
Week 9 - 2008





Week series of Salinity, Temperature, SS Concentration and Tide	Processed by:
Location: S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)	In Association with:
	I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Processed by:

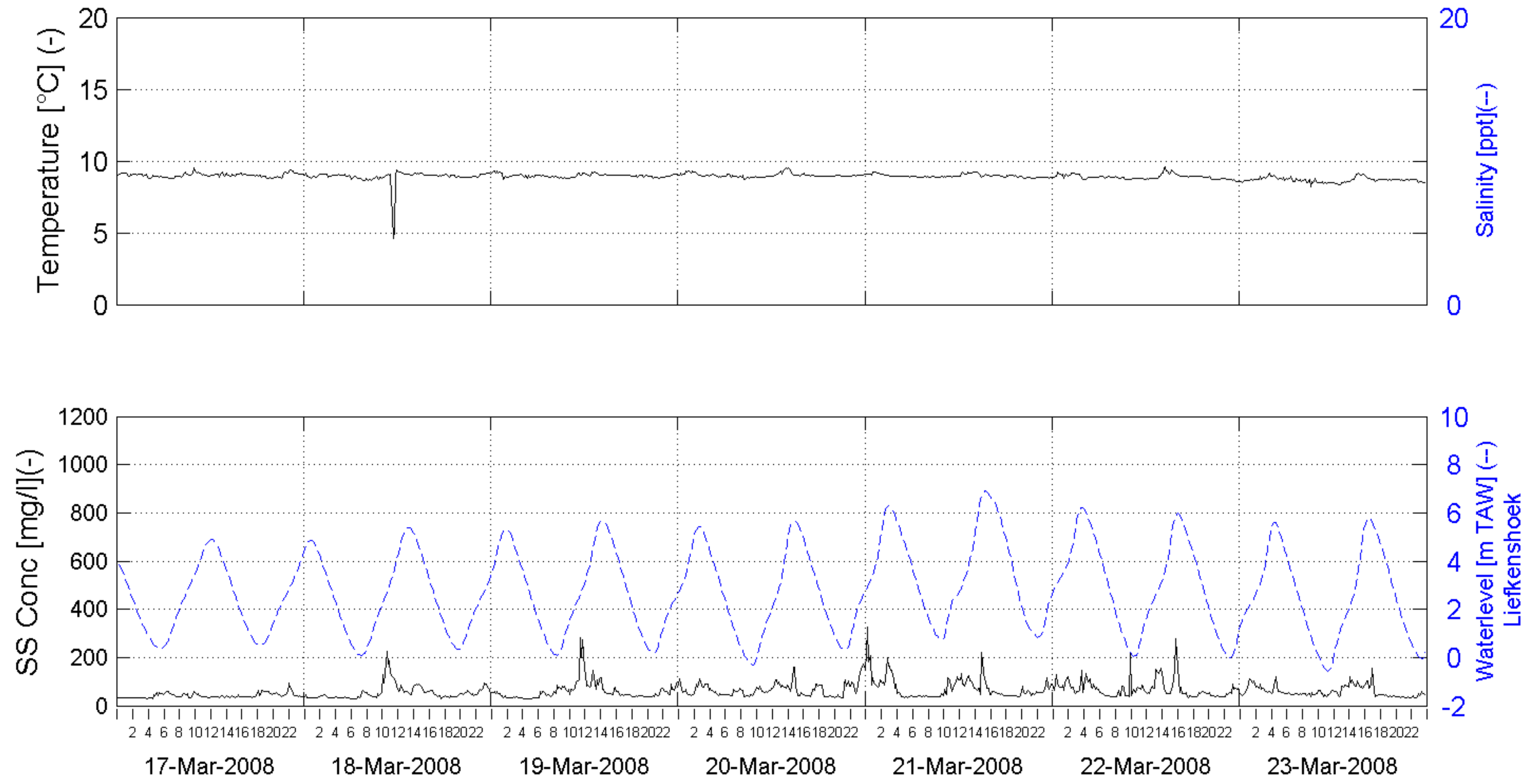
In Association with:

Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 11 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

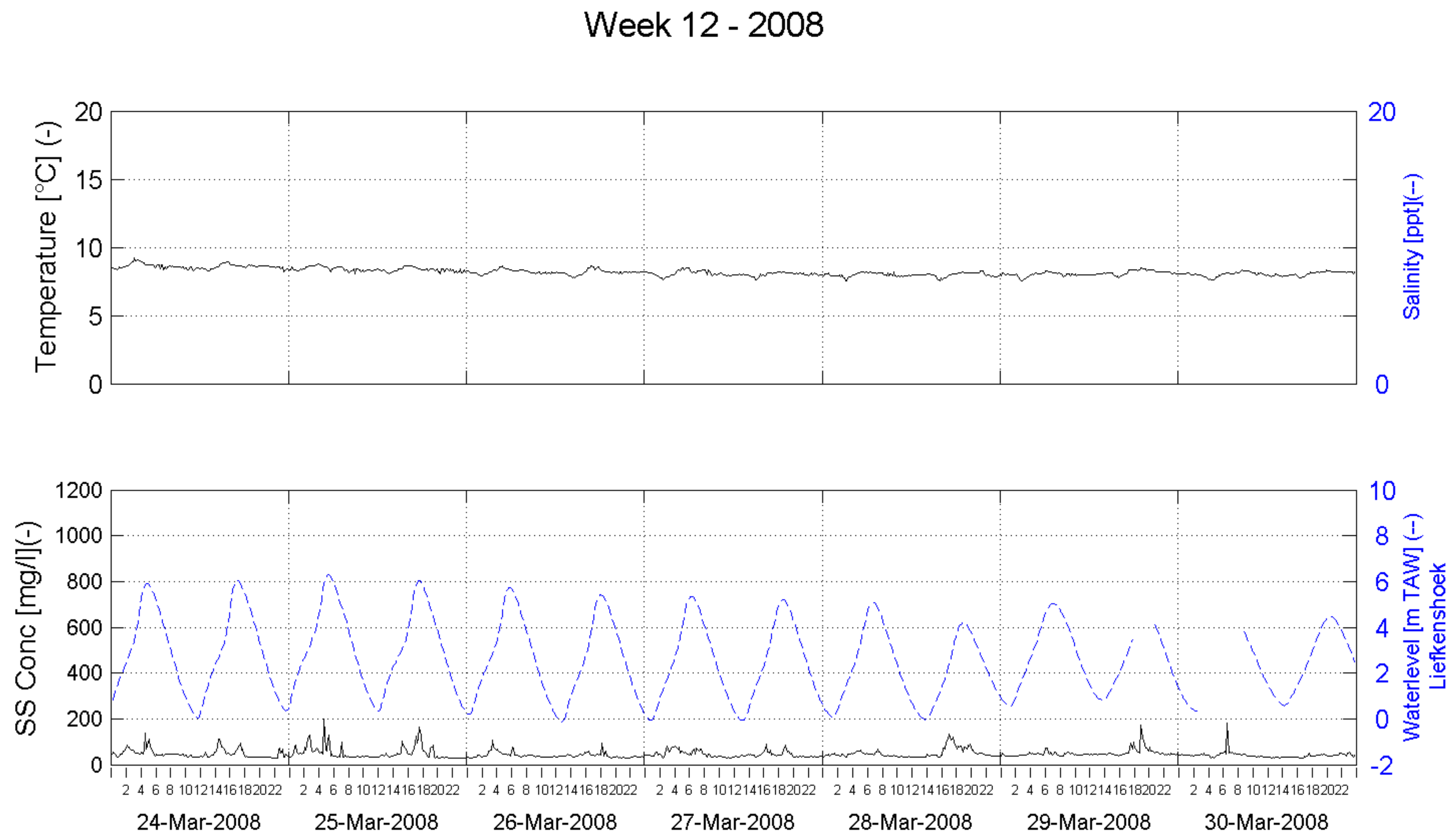
Processed by:

Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

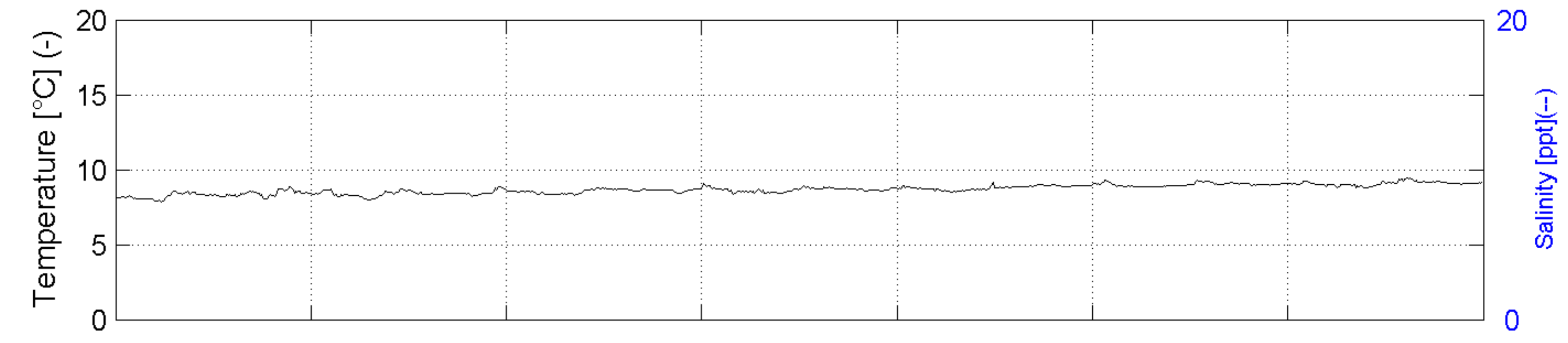
Processed by:

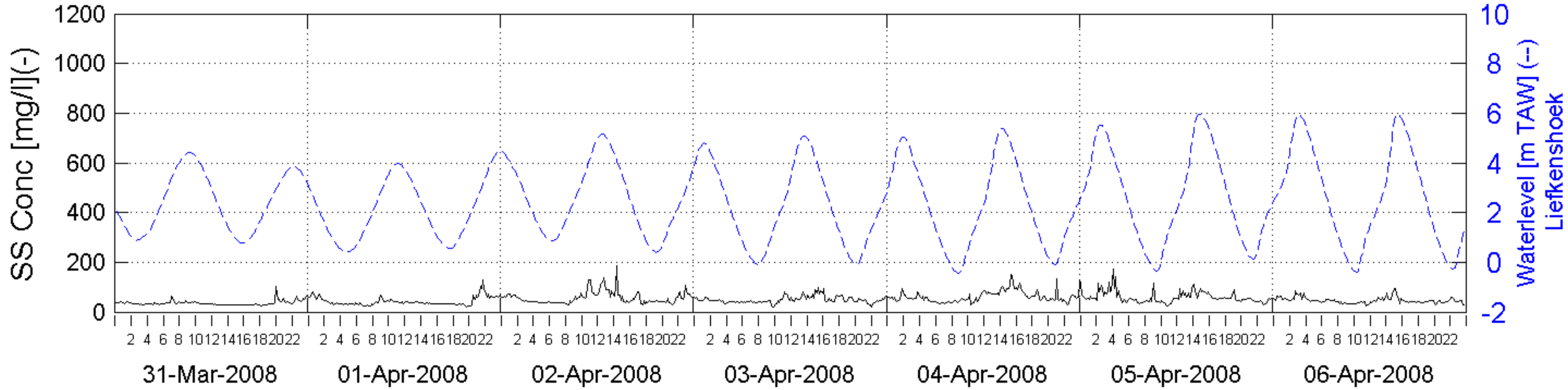
In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 13 - 2008





Week series of Salinity, Temperature,
SS Concentration and Tide

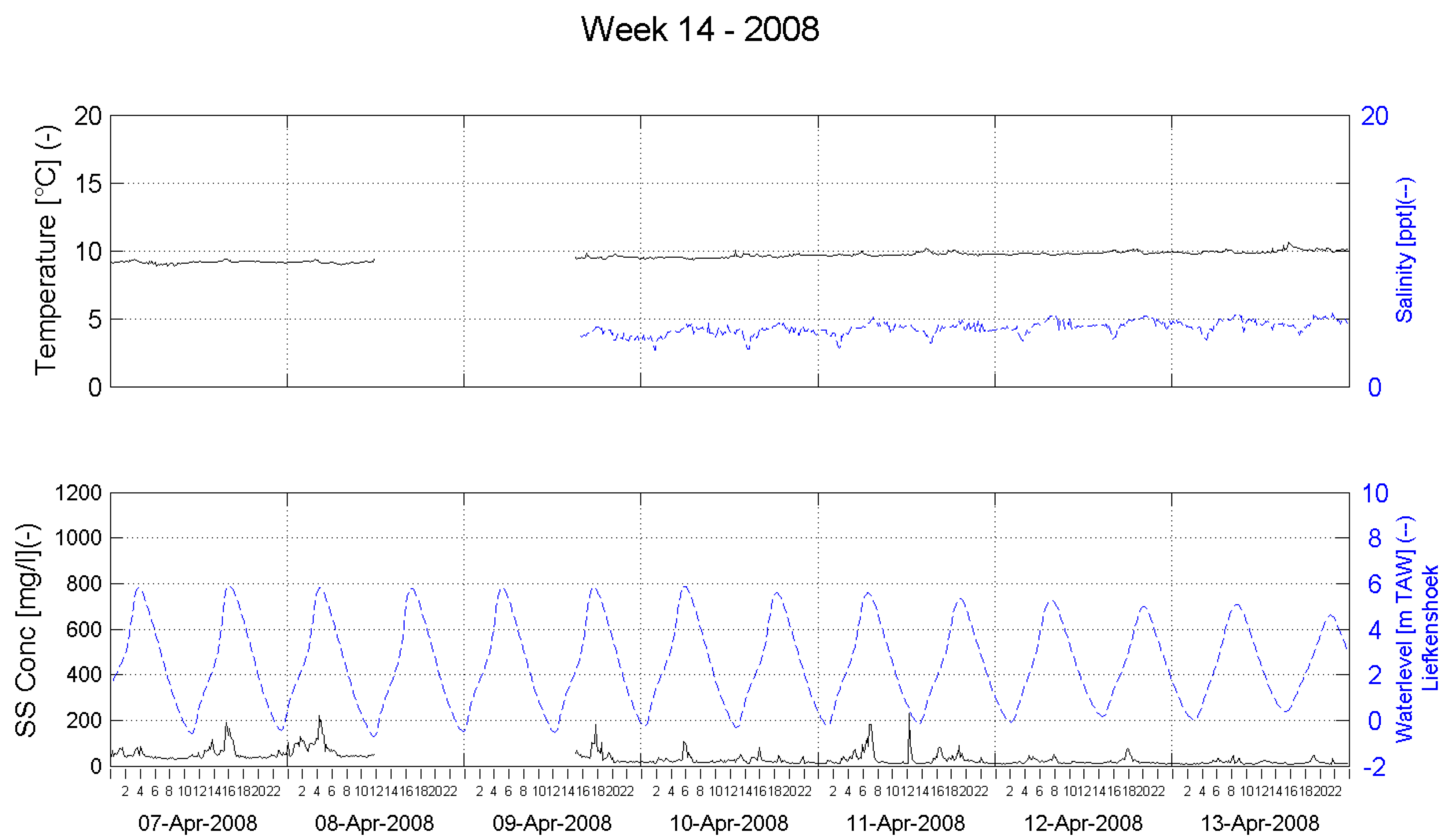
Processed by:

In Association with:

Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

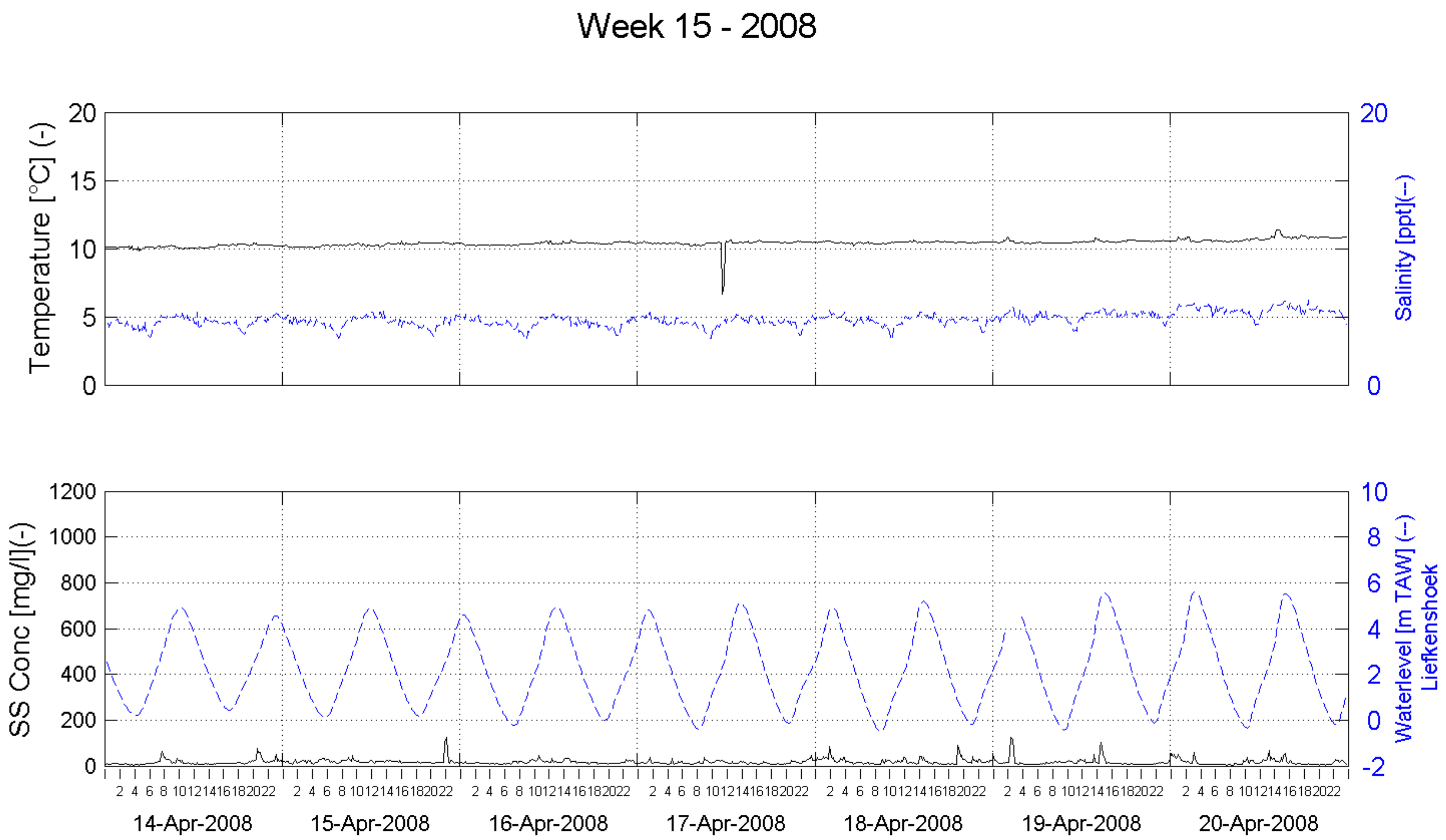
Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

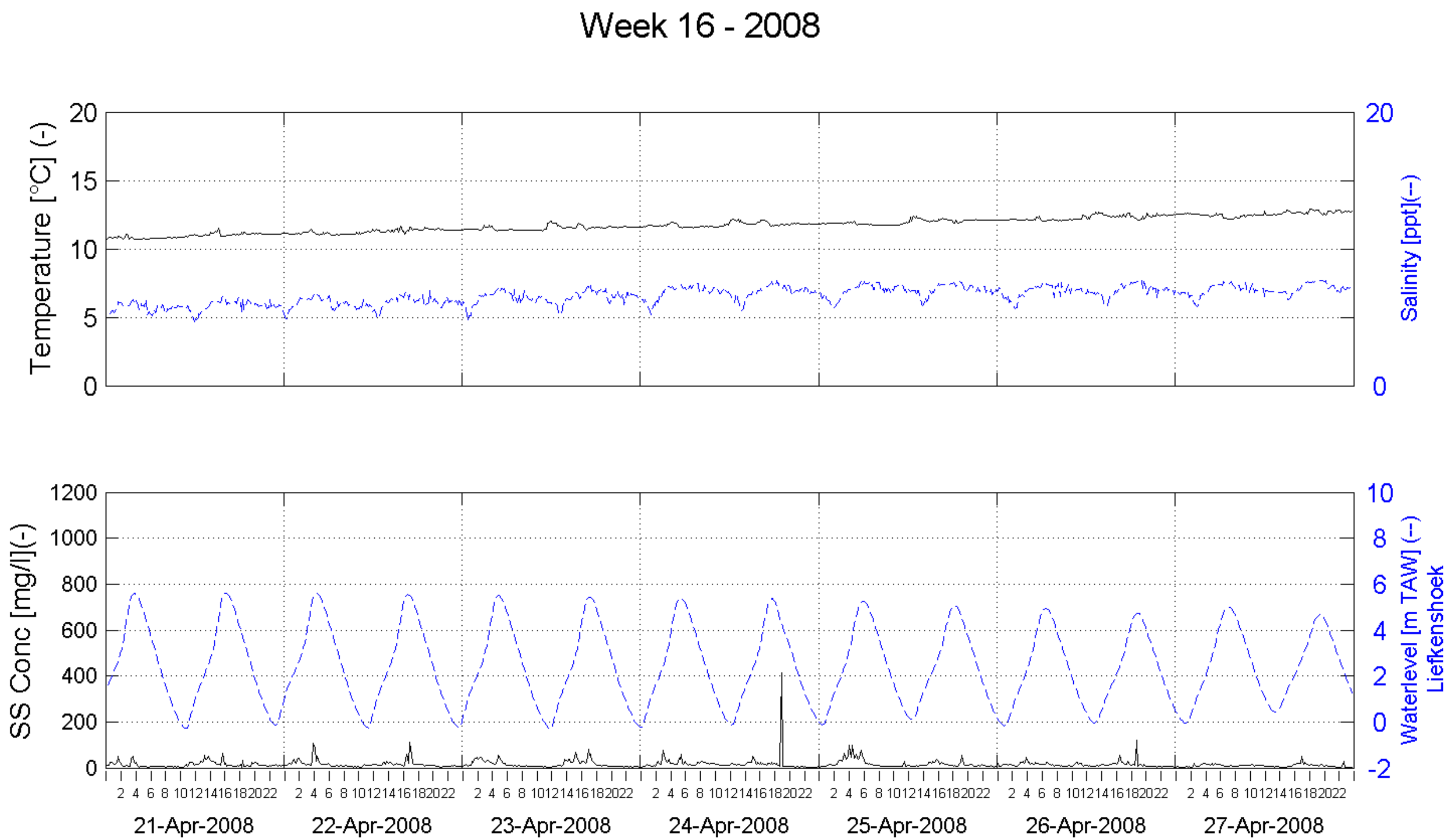
Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008



Week series of Salinity, Temperature, SS Concentration and Tide

Location:

S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

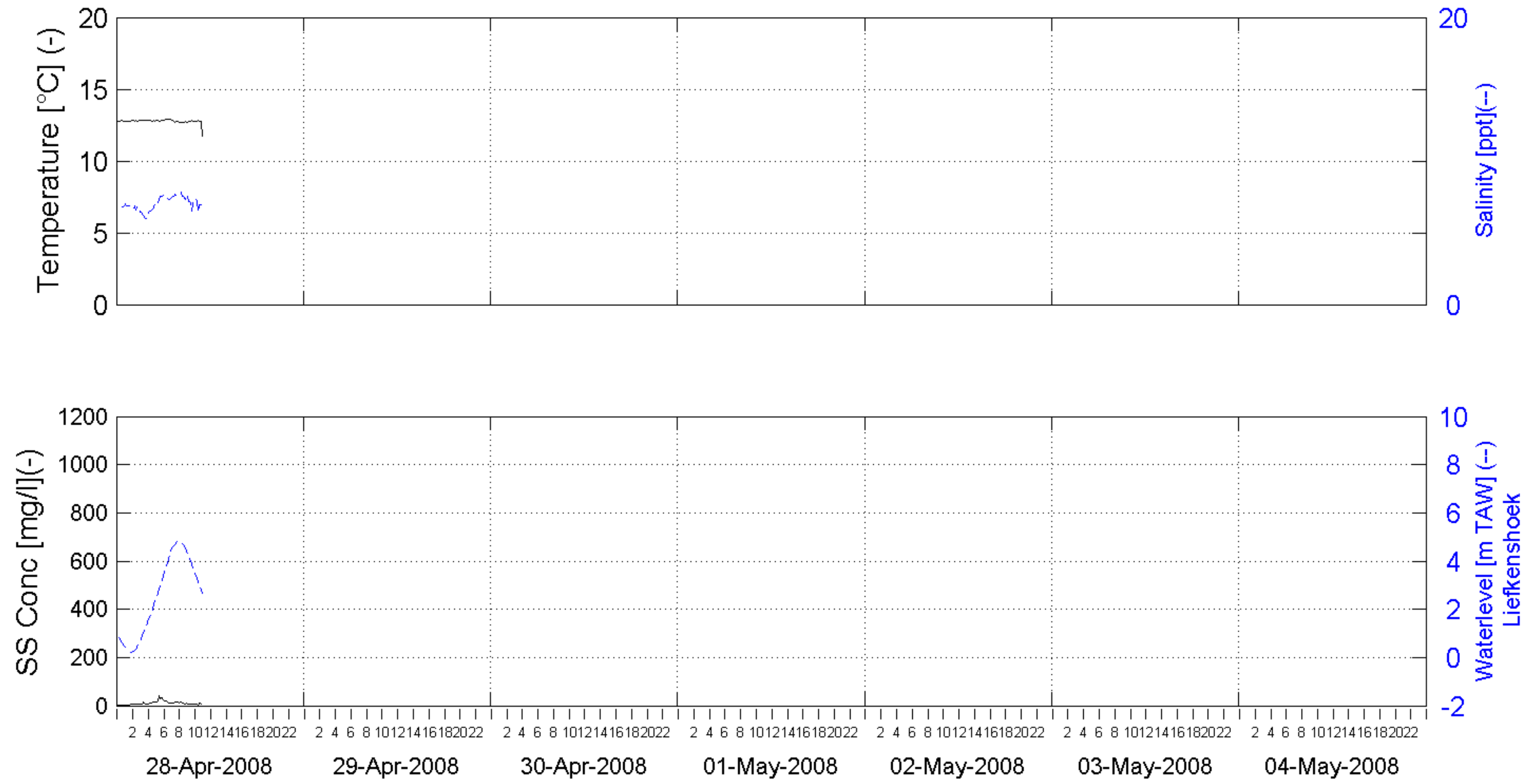
Processed by:

In Association with:

I/RA/11283/07.094/MSA

11283 - Long-term monitoring DGD - Winter 2008

Week 17 - 2008



Week series of Salinity, Temperature,
SS Concentration and Tide

Location:
S-ENTRANCE TOP 14.82m above bottom (-2.18m TAW)

Processed by:

In Association with:

I/RA/11283/07.094/MSA

APPENDIX D.

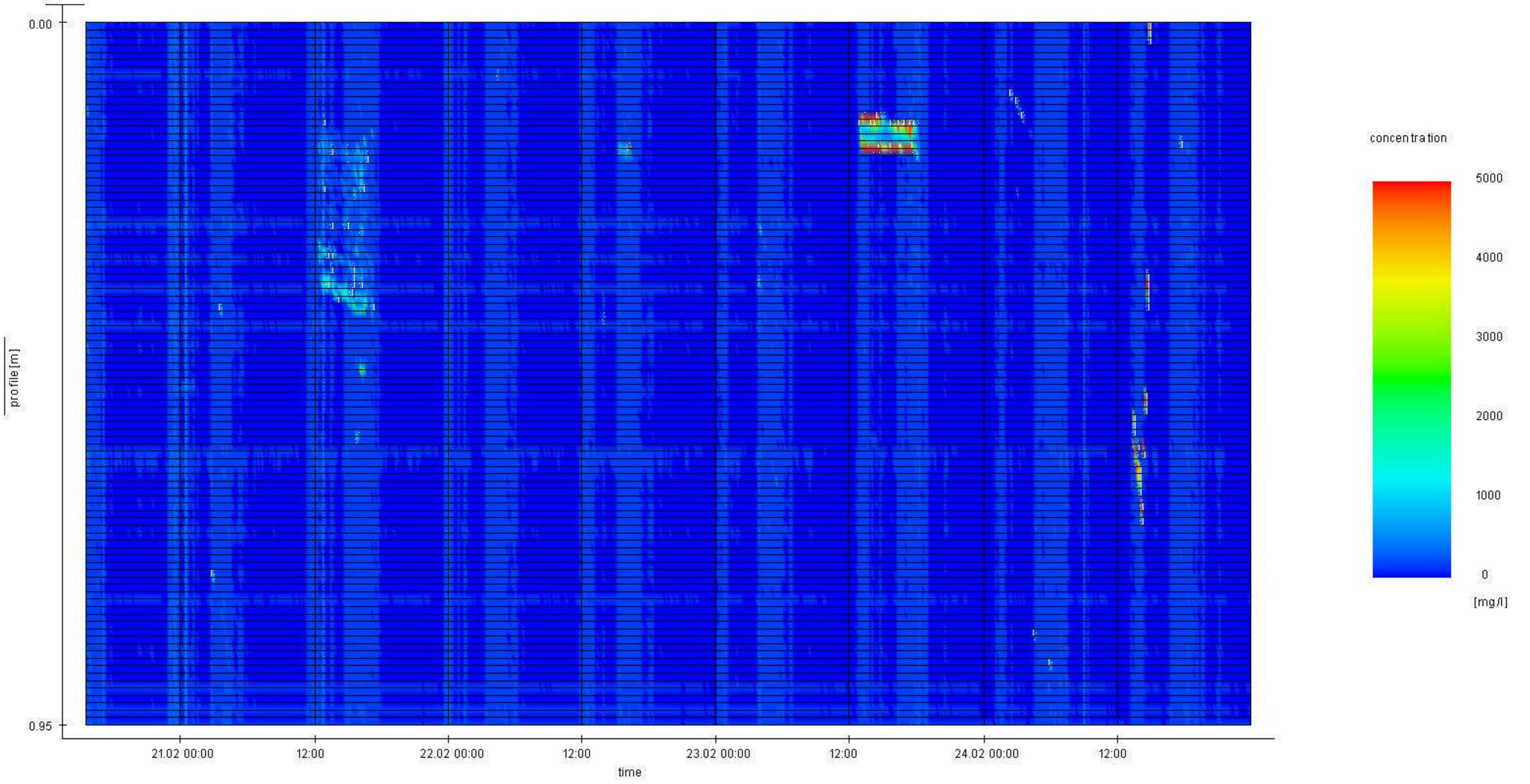
WEEKSERIES, AVERAGE TIDE & TABLES

ARGUS ASM – IV & ALTUS (MET TIME)

D.1 CDW frame

This page is intentionally left blank

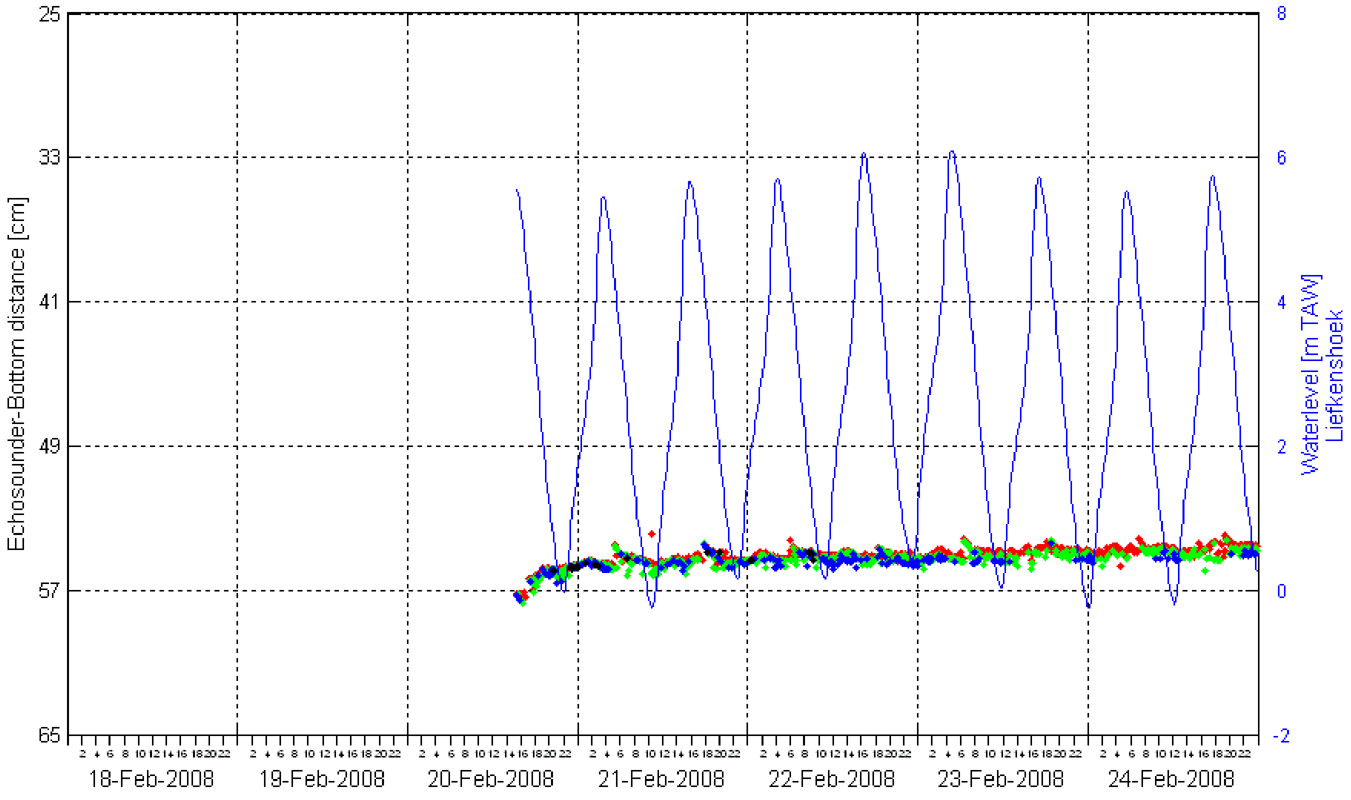
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Time series suspended sediment concentration
ARGUS ASM-IV

Location: Deurganckdok CDW	Date: 20/02/2008 – 24/02/2008	*Data processed by:* IMDC *In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok CDW

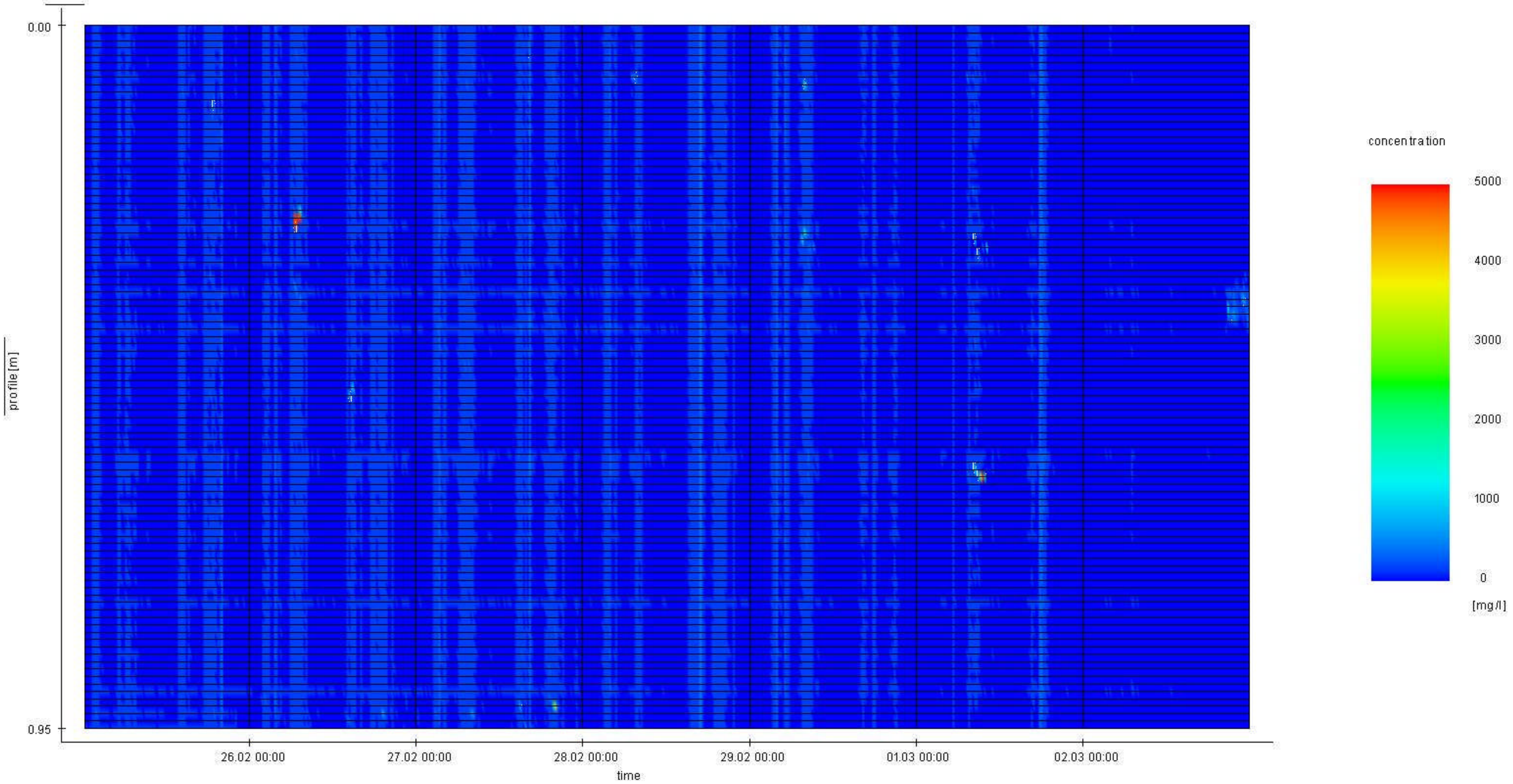
Date:
20/02/2008 – 24/02/2008

Data processed by:

In association with:

I/RA/11283/07.094/MSA

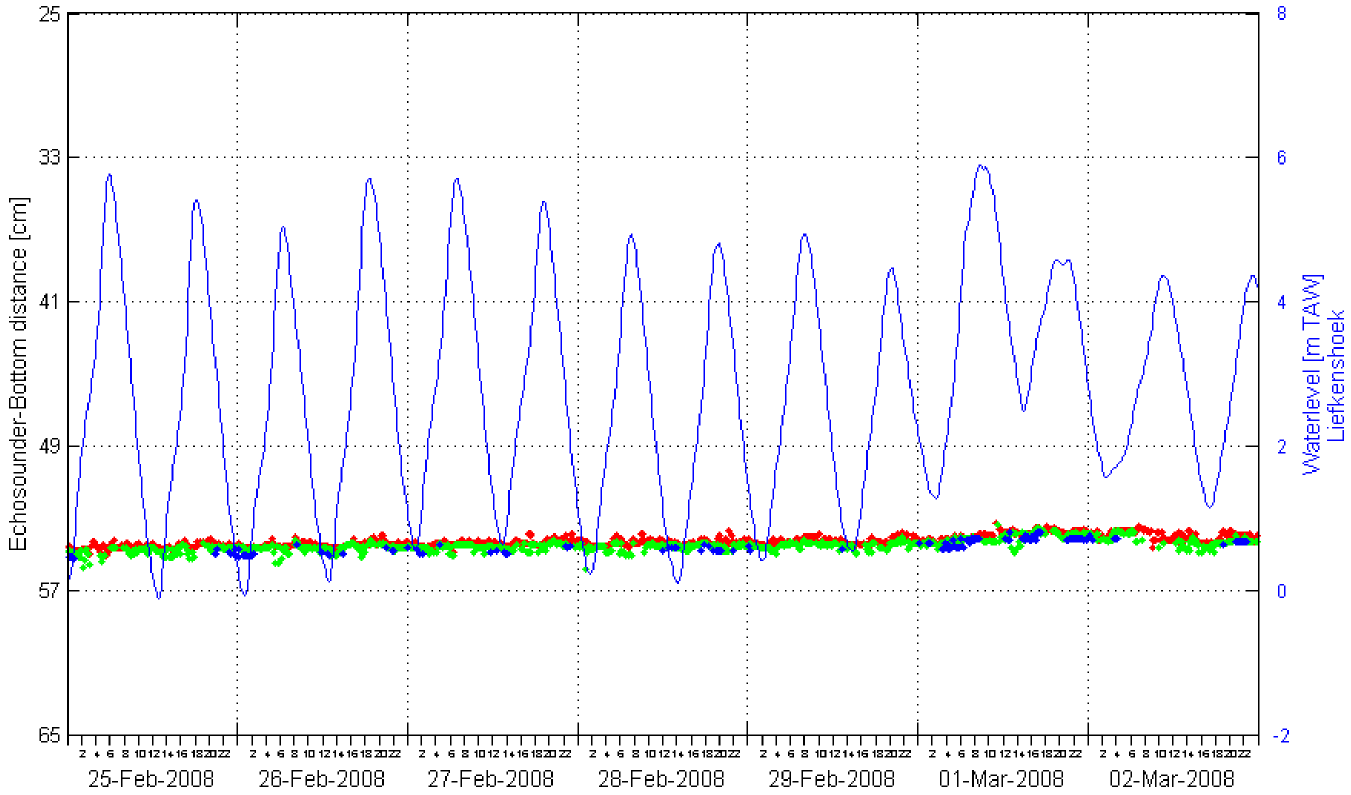
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Time series suspended sediment concentration
ARGUS ASM-IV

Location: Deurganckdok CDW	Date: 25/02/2008 – 02/03/2008	*Data processed by:* IMDC *In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



SIGNAL 4
SIGNAL 3
SIGNAL 2
SIGNAL 1

Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Data processed by:

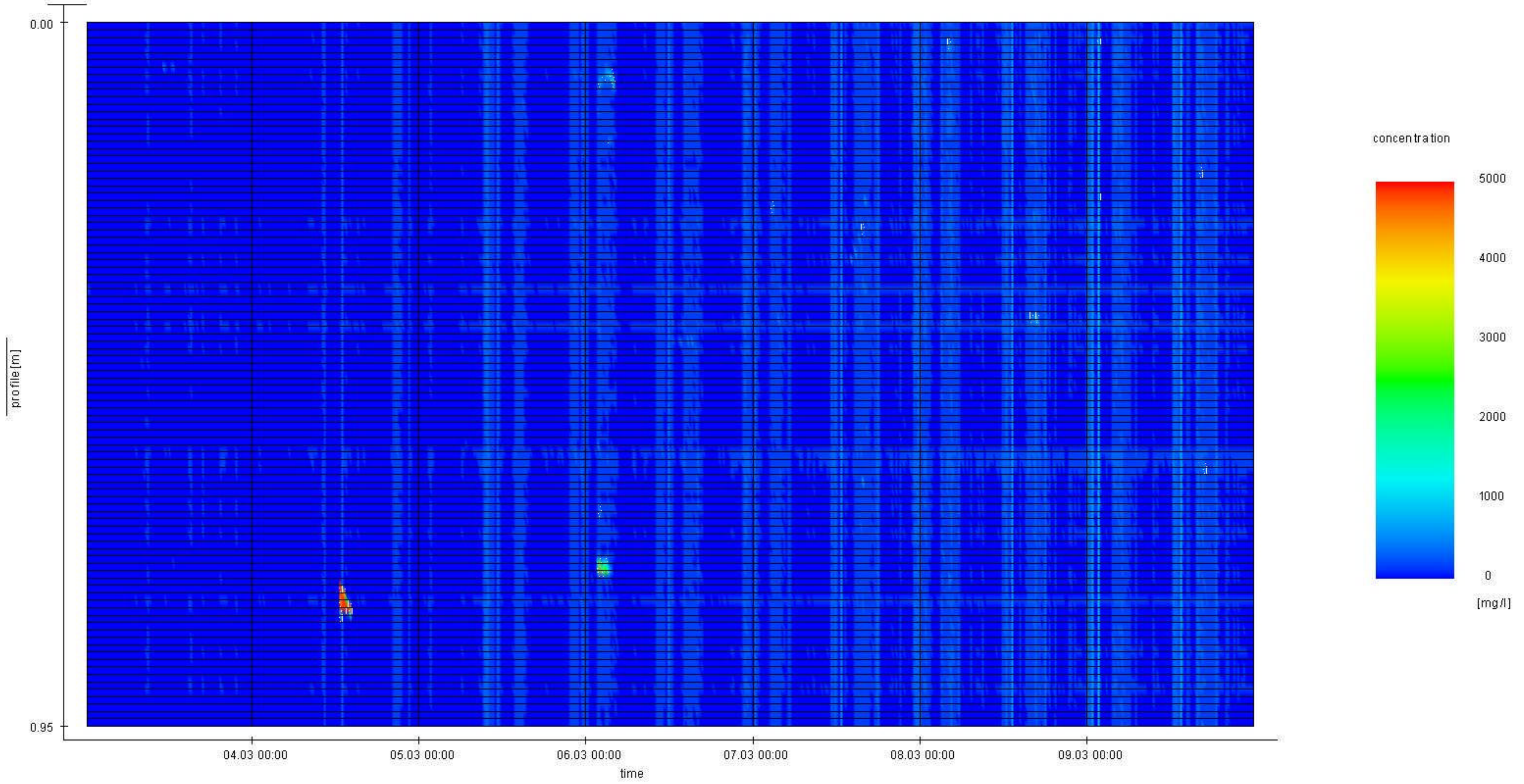
In association with:

I/RA/11283/07.094/MSA

Location:
Deurganckdok CDW

Date:
25/02/2008 – 02/03/2008

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Time series suspended sediment concentration
ARGUS ASM-IV

Location:
Deurganckdok CDW

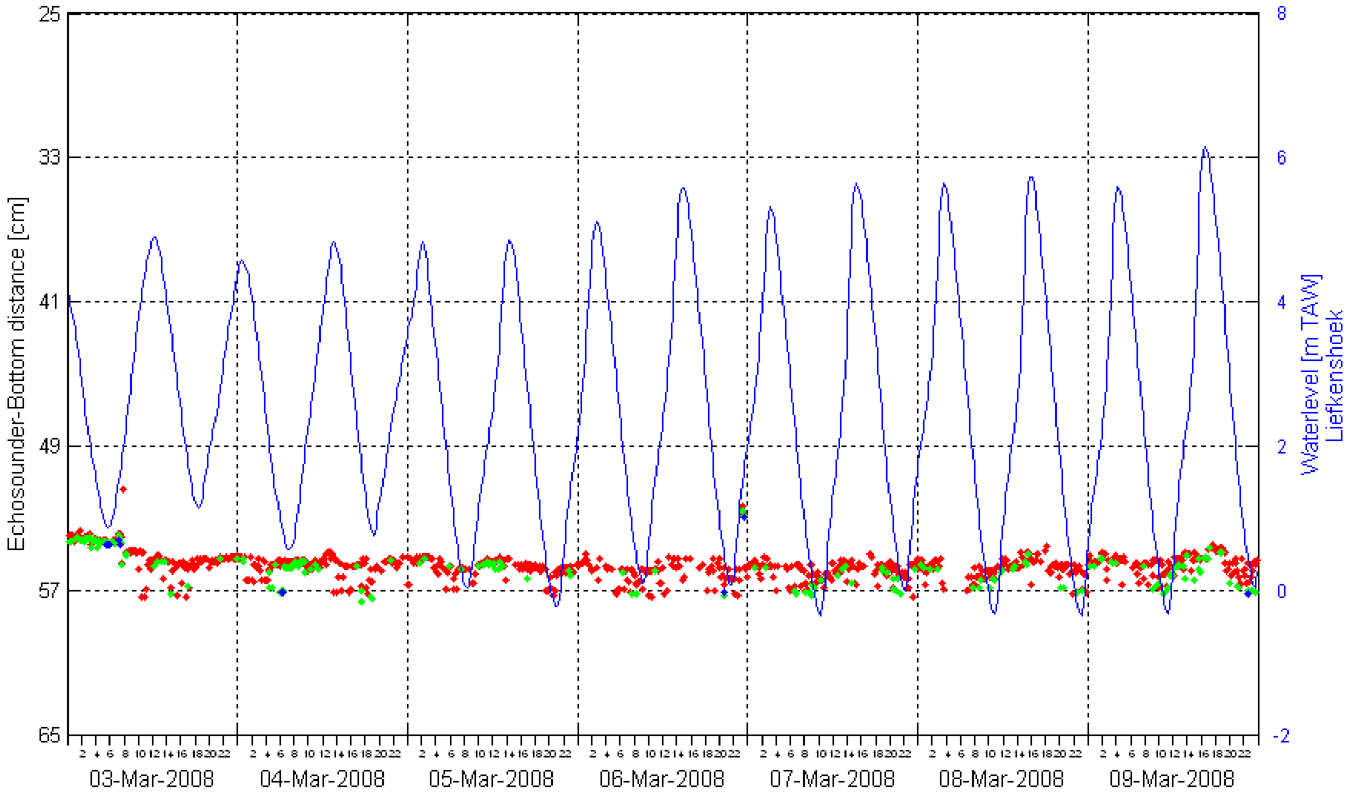
Date:
03/03/2008 – 09/03/2008

Data processed by:

In association with:

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok CDW

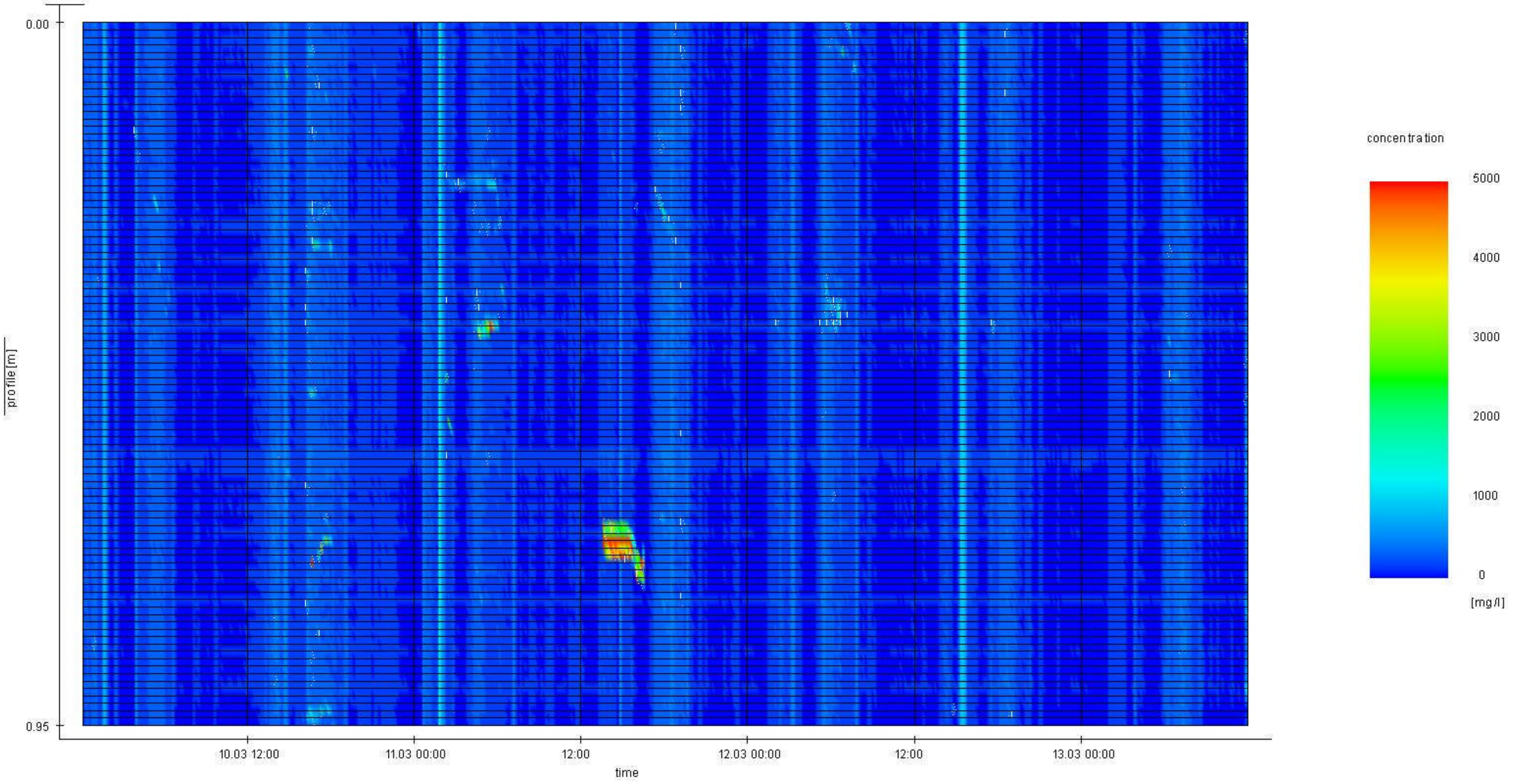
Date:
03/03/2008 – 09/03/2008

Data processed by:

In association with:

I/RA/11283/07.094/MSA

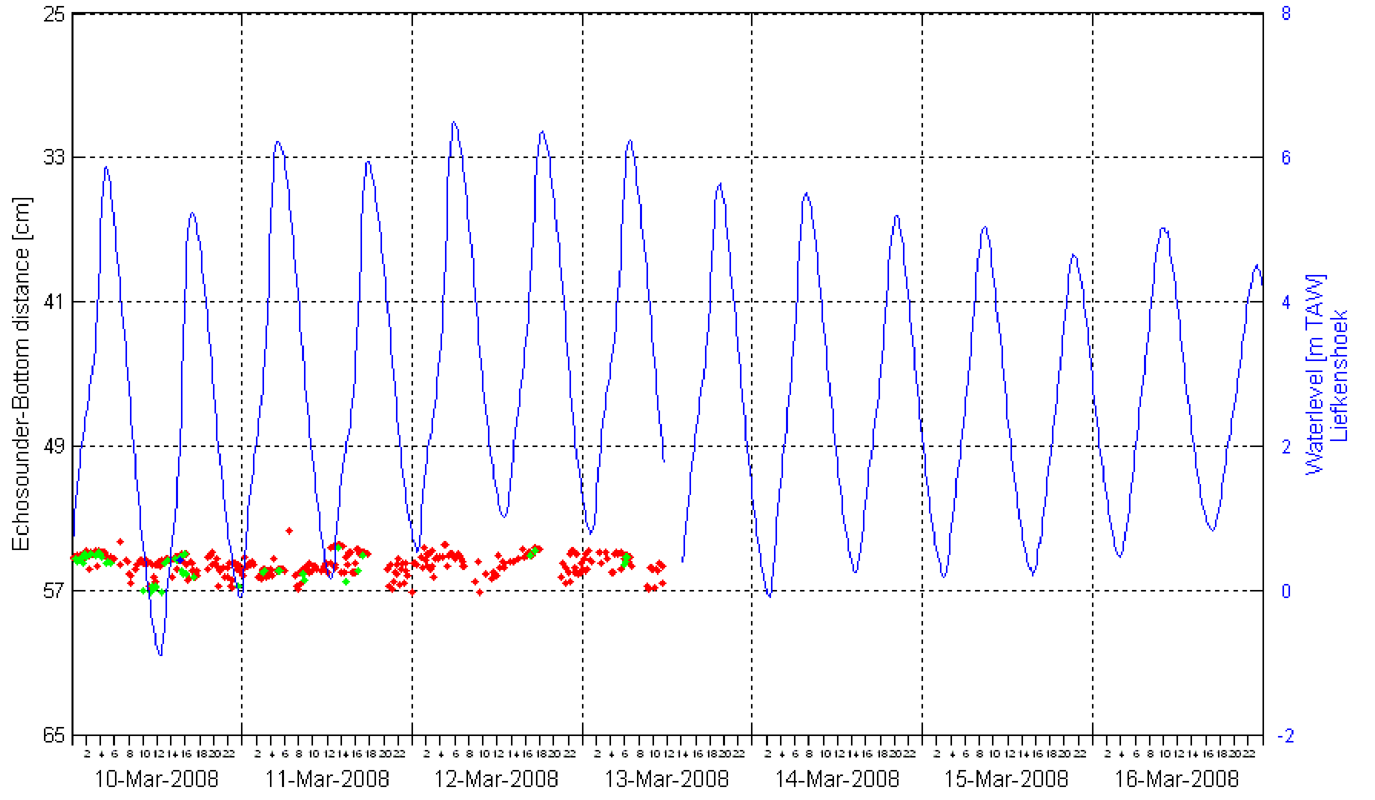
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Time series suspended sediment concentration
ARGUS ASM-IV

Location: Deurganckdok CDW	Date: 10/03/2008 – 13/03/2008	*Data processed by:* IMDC *In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok CDW

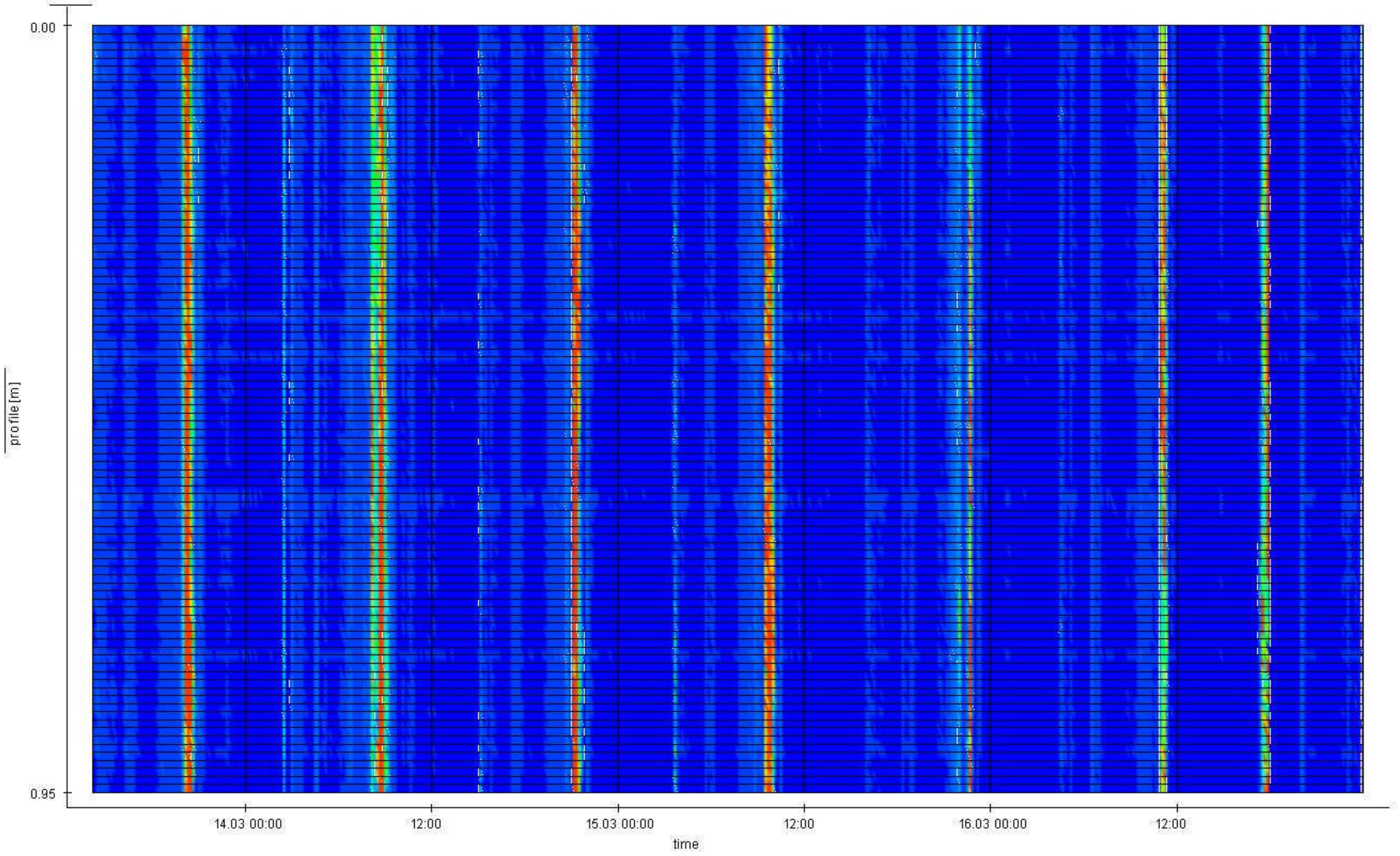
Date:
10/03/2008 – 13/03/2008

Data processed by:

In association with:

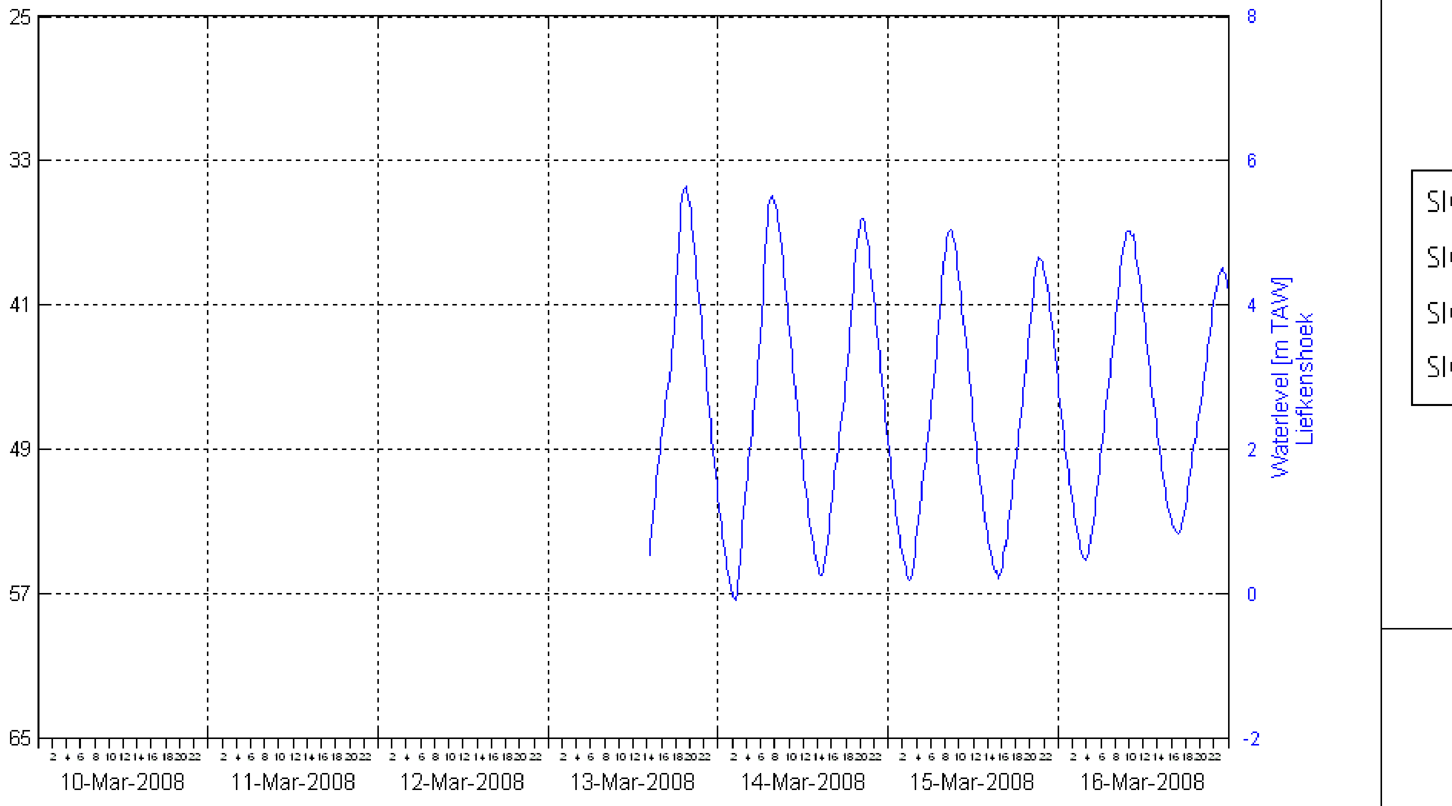
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Time series suspended sediment concentration ARGUS ASM-IV		*Data processed by:* IMDC *In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*
Location: Deurganckdok CDW	Date: 13/03/2008 – 16/03/2008	

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok CDW

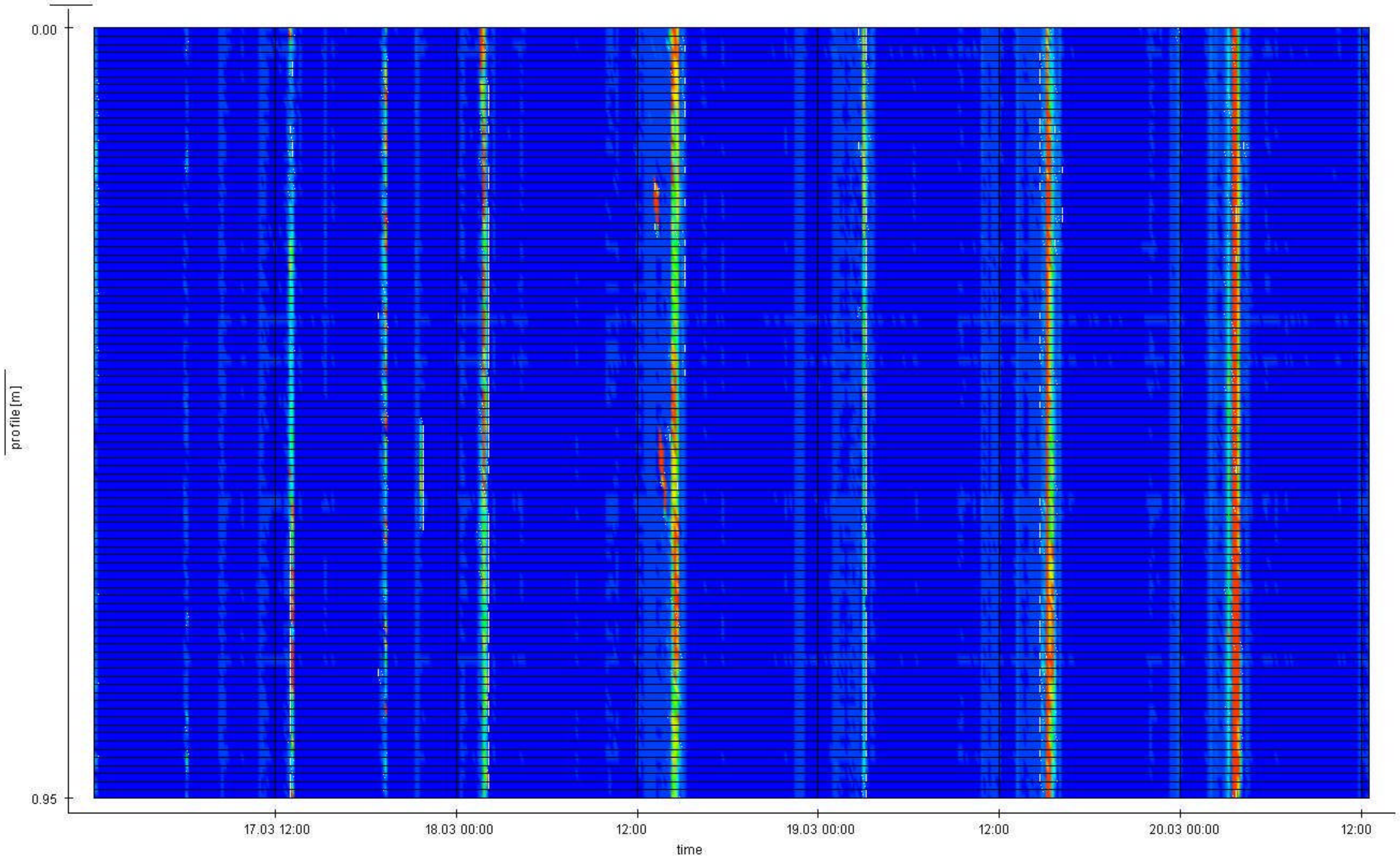
Date:
13/03/2008 – 16/03/2008

Data processed by:

In association with:

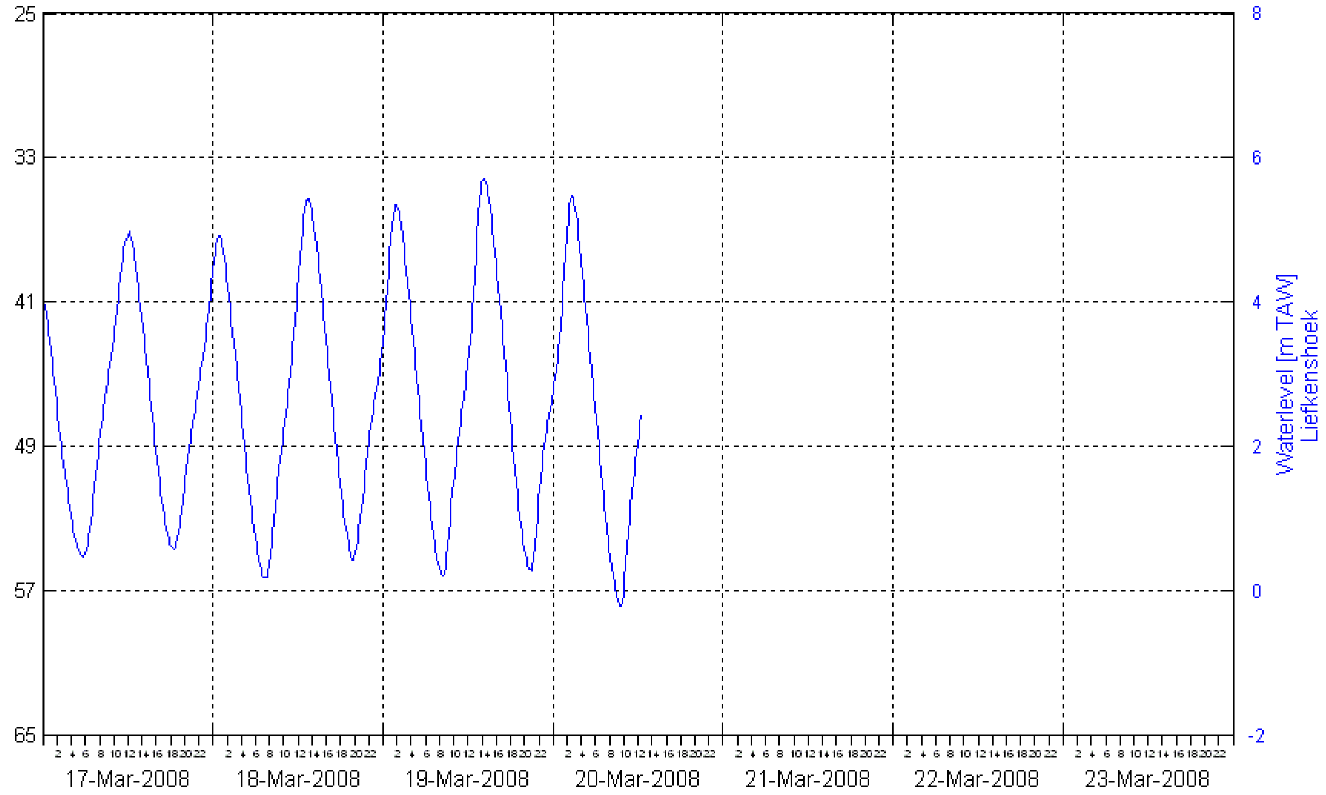
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Time series suspended sediment concentration ARGUS ASM-IV		Data processed by:
Location: Deurganckdok CDW	Date: 17/03/2008 – 20/03/2008	*In association with:* I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok CDW

Date:
17/03/2008 – 20/03/2008

Data processed by:

In association with:

I/RA/11283/07.094/MSA

ARGUS Mean SS Concentration [mg/l] per tidal phase in layers of 10 cm (*except first column 6 cm) [distances given in cm above bottom]													
Date	***Tide no.***	***Phase***	***Tidal diff [m]***	***123-118***	***117-108***	***107-98***	***97-88***	***87-78***	***77-68***	***67-58***	***57-48***	***47-38***	***37-28***
20080220	1	LW	5.5	155.8	155	134.5	145.3	162.8	133.3	164	146.2	152.1	179.3
20080221	1	HW	5.5	207.4	204.8	184.3	193.6	211	183.7	207.4	192.5	196.1	221.8
20080221	2	LW	5.7	139.2	134.1	118	127.7	144.8	113.3	145.7	128.1	135	159.2
20080221	2	HW	6	189.3	191.5	275.6	312	286.9	161.9	195.6	172.9	179.4	203.2
20080221	3	LW	5.5	146.3	143.2	162.5	163.4	189.7	138.8	153.5	134.2	139.2	165.2
20080222	3	HW	5.6	173.3	167.2	149.8	158.4	173.8	144.1	175.5	157.5	163.1	187.9
20080222	4	LW	5.5	134.7	127.2	110.8	118.7	136	106.4	140.2	120.8	126.7	152.9
20080222	4	HW	5.8	188.2	181.2	195.9	169.4	188.9	155.4	186	167.8	172.1	196.8
20080222	5	LW	5.7	124.2	114.8	102.2	111.2	128.5	98.9	132.4	114.2	118.8	144.4
20080223	5	HW	5.7	153.7	144.8	129.9	149.6	156.6	124.5	157	138.7	144	167.8
20080223	6	LW	6.1	124.5	114.4	101.2	111.8	129.1	99.3	134.2	114	117.7	143.4
20080223	6	HW	5.7	160.4	573.7	570.3	140.1	156.2	126.7	159.9	140.5	145.6	169.8
20080223	7	LW	6	133.7	179	153.6	118.8	135.9	105.5	139.6	119.5	126	151.2
20080224	7	HW	5.8	133.8	138.8	114.4	120.2	136.8	108.1	140.2	119.6	131.1	150.7
20080224	8	LW	5.8	142.5	129.5	118.8	126.9	145.2	115	151.2	128	136.7	164.1
20080224	8	HW	5.9	204.4	137.6	126.9	153.9	173.6	178.6	342.1	152.7	138.8	162.1
20080225	9	LW	5.6	125.6	114.9	107.5	115.6	132.4	102.6	136.1	114.8	123.2	147.6
20080225	9	HW	5.7	127.7	120.6	106.1	112.8	131.1	101.3	133.7	114.8	120.1	146
20080225	10	LW	5.9	103.4	91.6	82.6	90	109.4	79.4	112.6	92.8	99.7	125.6
20080225	10	HW	5.5	146.9	140.1	128.2	135	151	124.3	151.3	131.8	139.5	163.7
20080226	11	LW	5.6	119.7	108.1	97.4	105.7	124.5	95.5	126.7	106.9	114.4	133.9
20080226	11	HW	5.1	145.5	132.1	122.6	146.5	148.5	117.2	147.8	129.6	136.6	149.4
20080226	12	LW	5	116.3	103.3	100.6	209.7	124.6	89.8	123.3	102.1	109.4	124.2
20080226	12	HW	5.7	159.4	149	137	143	161.1	139.2	161.2	142.1	148.7	156.2
20080227	13	LW	5.1	119.5	108.1	97.5	105.8	125	94.9	127.9	106.9	114.6	126.4
20080227	13	HW	5.2	167.4	158	143.7	150.8	169.3	139.3	169.4	149	157	160.7
20080227	14	LW	5	132	122.3	110.2	117.2	136	110.7	139.4	119.5	126.8	137.6
20080227	14	HW	4.7	184.1	173	160.7	166.7	190.5	154.9	186.3	166.4	175	189.1
20080228	15	LW	5.1	117.3	105.4	95.9	103.1	123.2	92.6	126.3	105.1	115.3	136.5
20080228	15	HW	4.7	161.8	153.1	138.2	145.1	163.9	133.6	165	145.3	152.5	145.6
20080228	16	LW	4.9	98.4	84.1	76.4	84.1	104.5	73.2	107.5	87.3	94.4	86.6
20080228	16	HW	4.7	193	179.5	165.5	173.3	190.3	160.1	190.3	170.6	178.2	172.9
20080229	17	LW	4.4	104.1	90.7	82.3	89.5	110.8	78.3	113.6	92	100.9	92.9

ARGUS Mean SS Concentration [mg/l] per tidal phase in layers of 10 cm (*except first column 6 cm) [distances given in cm above bottom]													
Date	***Tide no.***	***Phase***	***Tidal diff [m]***	***123-118***	***117-108***	***107-98***	***97-88***	***87-78***	***77-68***	***67-58***	***57-48***	***47-38***	***37-28***
20080229	17	HW	4.5	172.1	168.7	148.8	172.5	176.3	144.4	175.4	156.4	164.3	157.2
20080229	18	LW	4.5	100.2	87.7	79.6	90.2	109.4	76.6	112.4	91.3	99	93
20080229	18	HW	3.9	119.8	108.3	98.1	104.9	127.5	94.7	129.7	110.5	114.7	109.1
20080301	19	LW	3.3	71.5	59.5	51.4	59.8	79.7	49.4	82.3	60.1	68.2	62.7
20080301	19	HW	4.7	112.2	101.2	92.4	100.3	118.9	86.6	125.8	98.8	106.3	99.6
20080301	20	LW	3.3	69.5	55.2	49.1	63.2	76.7	47	131.4	59	66.8	60.2
20080301	20	HW	2.1	160.1	149.2	136.4	146.4	167.3	134.7	168.4	147.2	156.1	153.5
20080302	21	LW	3.1	17.8	8.9	4.2	14	27	3.7	28.4	9.5	17.4	18.8
20080302	21	HW	2.9	54	41.7	36.9	45	66.9	34.8	69.6	47.1	54.6	52
20080302	22	LW	3.3	22.5	11.3	7.6	17.1	32	5.6	33.3	13.4	21	19.4
20080302	22	HW	3.3	46.9	33.2	27.1	43.8	131.7	25.1	60.3	37.6	45.1	39.6
20080303	23	LW	3.5	27.1	17.7	11.8	25.8	49.8	10.9	38.3	19.3	26.7	22.4
20080303	23	HW	4.1	61.9	52.7	41.4	51.9	71.3	42.5	72.8	51.5	59.5	52.8
20080303	24	LW	3.8	65.1	52.7	44	52	75.4	41.8	74.8	55.7	61.5	54.8
20080304	24	HW	3.4	57.2	43.2	37.8	46.4	67.4	35.6	66.4	47.7	54.5	47.2
20080304	25	LW	4	54.7	42	33.5	41.7	64.9	32.5	64.6	45	52	43.7
20080304	25	HW	4.4	99.6	86.9	77.5	84.7	108.4	75.9	107.8	88.9	322.9	88.4
20080304	26	LW	4.1	75.3	59	52.6	60.2	84.8	51.5	84.2	64.5	105	63.9
20080305	26	HW	4.1	118	105.8	95.3	103.3	125.9	93.3	124.6	105.7	113.4	106
20080305	27	LW	4.8	70.4	56.8	48	55.5	78.3	46.8	78.5	59.2	65.7	57.8
20080305	27	HW	4.9	188.3	177.6	163.2	171	192.3	161	189.3	170.8	177.8	171.7
20080305	28	LW	5.1	112.7	98.3	87.9	95.9	118.9	86.3	118	99.6	106.1	98.8
20080306	28	HW	5.3	196.3	201.5	169.8	178.1	200.6	167.4	197.6	285.7	183.4	178.1
20080306	29	LW	5	116.3	121.3	94.1	101	123.9	92.3	122.3	117.3	111.6	104.6
20080306	29	HW	5.5	188.5	174.5	164	170.2	198.6	159.8	187.2	170.5	176.8	171.6
20080306	30	LW	5.6	128.2	112.2	103.5	112	135.5	103	133.1	114.8	121.3	114
20080307	30	HW	5.2	218.4	205.3	193.5	203.5	220.3	189.6	215.4	197.4	205.3	198.2
20080307	31	LW	5.7	130.7	114.6	104.8	113.3	136.9	104.6	135.3	117.8	123.7	117.4
20080307	31	HW	6	229.3	215.5	202.8	227.5	231	197.5	224.9	208.4	213.9	207.1
20080307	32	LW	5.6	173.6	157.5	148	154.3	176.6	145.6	173.1	154.5	161.2	155.1
20080308	32	HW	5.7	246.2	232.9	219	224	243.2	211.7	238	221.9	227.8	222.1
20080308	33	LW	6	166.3	151.1	140.2	148.3	169.8	139.8	169.2	152.8	158.1	154.2
20080308	33	HW	6.1	260	248.5	231.9	238.7	259.8	227.7	253.8	236.4	243.2	238.7
20080308	34	LW	6.2	178.5	169	155	164.1	188.8	152.8	181.3	164.9	170.6	165

ARGUS Mean SS Concentration [mg/l] per tidal phase in layers of 10 cm (*except first column 6 cm) [distances given in cm above bottom]													
Date	***Tide no.***	***Phase***	***Tidal diff [m]***	***123-118***	***117-108***	***107-98***	***97-88***	***87-78***	***77-68***	***67-58***	***57-48***	***47-38***	***37-28***
20080309	34	HW	6	309.4	298.5	282.5	289.5	310.6	279.2	305.8	288	295.9	290.8
20080309	35	LW	6	172.2	156.2	143.2	150.5	173.9	143.9	171.6	154.8	161.4	156.5
20080309	35	HW	6.5	292.1	285.1	270.1	274.8	299.3	266.9	290.3	272.6	278.9	274.2
20080309	36	LW	6.1	184.8	170.4	157.8	164.1	187.8	155.7	183.7	165.9	172	166.7
20080310	36	HW	5.8	272.2	267	249.5	265	277.8	246.9	272.8	254	262.8	257.2
20080310	37	LW	7	199.1	182.8	172.3	176.5	201.6	167.4	195.9	178.9	185.9	181
20080310	37	HW	6.2	357.2	350.9	326.9	351.3	349.1	326	346.9	348.3	337.6	349.8
20080310	38	LW	5.4	239.1	229	212.1	224.7	236.7	209	236.5	239.2	224.5	236
20080311	38	HW	6.4	336	320.5	331.9	307.7	368.1	311.3	322.2	304.3	311.9	307.2
20080311	39	LW	6	202.9	188.5	187.6	180.2	247.7	172.8	199.7	184.3	188	184.8
20080311	39	HW	5.8	258.5	247.7	240.2	237.3	256.8	226.1	252.6	1026.7	245.5	238
20080312	40	LW	5.4	223.5	210.5	192.6	201.2	224.4	193.5	221.2	204.6	209.7	207.3
20080312	40	HW	6	277.3	267.1	246.5	252.2	290.1	247.4	271.6	256.9	261.8	258
20080312	41	LW	5.5	214.7	182.2	162.4	169.3	208.1	164.5	192.2	175.5	181.5	179
20080312	41	HW	5.5	309.2	300.2	279.9	283.8	309.3	278.3	303.4	286.7	292.8	294.1
20080313	42	LW	5.6	181.7	168.1	151.7	156.4	181.2	152.5	180.3	165.2	172	168.2
20080313	42	HW	5.5	216.4	202.3	185.6	190.4	216.2	188.3	211.7	195.2	201.5	197.2
20080313	43	LW	5.3	221.3	203.7	188.1	195.3	215.5	189.5	217	200.7	208.3	204.3
20080313	43	HW	5.1	211	190.7	166.8	170.2	192.1	162.1	188.7	171.3	176.5	171.1
20080314	44	LW	5.8	527.2	516.7	502.8	517	545.9	483.9	493.4	506.3	547.8	488.6
20080314	44	HW	5.6	246.1	256	228.2	226.2	250.9	216.8	238.7	219.9	228	218.4
20080314	45	LW	5.2	594.5	603.5	553.4	534	609	613.8	620.6	591.9	588.6	546.2
20080314	45	HW	5	175	160.3	139.5	142.5	164.7	133.6	167.2	144.6	148.9	147.5
20080315	46	LW	5.1	411.8	411.2	423.8	453.2	465.9	394.6	396.2	399.6	415.7	408.2
20080315	46	HW	4.9	168	148	139.6	142.9	164.4	137.2	162.3	144.6	170.6	157.5
20080315	47	LW	4.9	470.8	453.2	468.7	493.4	502.5	477	512.3	543.2	531.7	460.3
20080315	47	HW	4.4	145.3	127.2	108	109	133.7	104.9	132.9	115.8	115.6	112.5
20080316	48	LW	4.3	236.3	240.4	238.9	242.9	277	259.9	255.6	286.2	285.6	249.2
20080316	48	HW	4.6	156	138.1	118.4	122.5	145.9	112.1	139.3	124.3	127.8	122.8
20080316	49	LW	4.2	279.7	303.9	303.3	276.2	334.5	293.4	259	222.3	218.5	234.7
20080316	49	HW	3.8	304.9	293.2	315.7	308.1	355.4	281.5	323.8	326.8	298.3	317.3
20080317	50	LW	4	121	99.9	90.3	129.6	165.8	140.6	177.9	155.6	165.8	162.5
20080317	50	HW	4.5	110.4	87	76.6	75.1	99.3	73.3	98.7	84	90	92.9
20080317	51	LW	4.4	162.4	91.2	99.5	153.5	134.9	135.2	173	160.8	169.1	116.2

ARGUS Mean SS Concentration [mg/l] per tidal phase in layers of 10 cm (*except first column 6 cm) [distances given in cm above bottom]													
Date	***Tide no.***	***Phase***	***Tidal diff [m]***	***123-118***	***117-108***	***107-98***	***97-88***	***87-78***	***77-68***	***67-58***	***57-48***	***47-38***	***37-28***
20080318	51	HW	4.4	134.7	168.2	131.2	142.6	159.1	158.8	160.2	104.9	125.2	84.8
20080318	52	LW	4.7	311.4	210.1	200	203.7	246.3	227.2	215.1	194.9	185.7	157.8
20080318	52	HW	5.3	119.9	98.4	200.8	87.6	109.9	147	105.1	93.1	96.5	92.1
20080318	53	LW	5	479.9	383.7	327.9	291.4	361.6	414.7	461	394.3	337.1	301.6
20080319	53	HW	4.9	134.5	110.6	98.2	100.3	125.6	91.8	119.7	105.1	108.2	103.2
20080319	54	LW	5.1	208	201.2	179.4	143	174.6	124.3	148.4	126	119.7	106
20080319	54	HW	5.5	169.5	143.6	127.4	129.8	155.4	122.4	150.2	133	137.7	132.7
20080319	55	LW	5.4	289.5	363.6	393.7	379.1	377.2	355.2	403.2	441.9	472.3	396
20080320	55	HW	5.2	158.9	137.2	120.9	124	149.2	114.5	142.8	125.4	130.4	125.6
20080320	56	LW	5.7	449.3	450.4	462.3	457.7	497.7	467.6	504.6	523.6	531.9	480.4

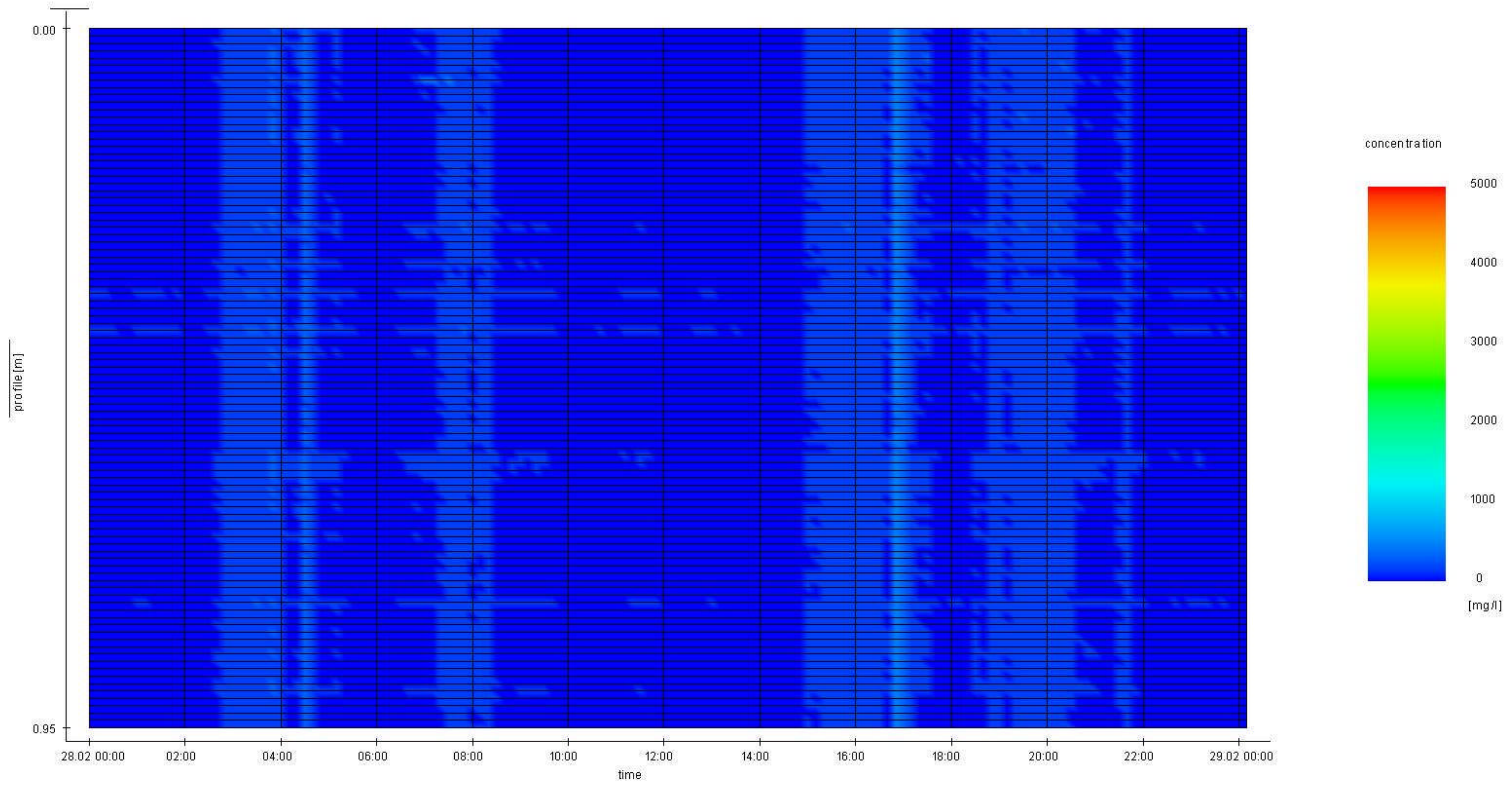
ALTUS Echosounder bottom distance [cm]						
Date	**Tide no.**	**Phase**	**Signal 1**	**Signal 2**	**Signal 3**	**Signal 4**
20080220	1	HW to LW	55.83	56.04	56.49	-
20080221	1	LW to HW	55.46	55.5	55.59	-
20080221	2	HW to LW	53.9	56.04	-	-
20080221	2	LW to HW	55.38	55.42	55.42	-
20080221	3	HW to LW	55.26	55.46	-	-
20080222	3	LW to HW	55.3	55.38	55.75	-
20080222	4	HW to LW	55.05	55.17	55.26	-
20080222	4	LW to HW	55.26	55.54	-	-
20080222	5	HW to LW	55.13	55.26	55.38	-
20080223	5	LW to HW	55.13	55.21	-	-
20080223	6	HW to LW	54.8	55.05	55.38	-
20080223	6	LW to HW	54.64	-	-	-
20080224	7	HW to LW	54.88	54.93	55.3	-
20080224	7	LW to HW	54.84	-	-	-
20080224	8	HW to LW	54.6	54.76	-	-
20080224	8	LW to HW	54.43	55.13	-	-
20080225	9	HW to LW	54.68	54.84	55.13	-
20080225	9	LW to HW	54.6	-	-	-
20080225	10	HW to LW	54.64	54.8	-	-
20080225	10	LW to HW	54.6	55.13	-	-
20080226	11	HW to LW	54.56	54.56	-	-
20080226	11	LW to HW	54.68	55.21	-	-
20080226	12	HW to LW	54.56	54.72	54.97	-
20080226	12	LW to HW	54.35	54.51	-	-
20080227	13	HW to LW	54.47	54.64	-	-
20080227	13	LW to HW	54.43	54.47	-	-
20080227	14	HW to LW	54.35	54.64	-	-
20080227	14	LW to HW	54.39	54.76	-	-
20080228	15	HW to LW	54.51	54.68	-	-
20080228	15	LW to HW	54.6	55.09	-	-
20080228	16	HW to LW	54.39	54.64	-	-
20080228	16	LW to HW	54.43	54.56	54.8	-
20080229	17	HW to LW	54.47	54.64	-	-
20080229	17	LW to HW	54.1	54.39	-	-
20080229	18	HW to LW	54.43	54.51	-	-
20080229	18	LW to HW	54.35	54.39	-	-
20080301	19	HW to LW	54.14	54.27	54.35	-
20080301	19	LW to HW	53.9	54.1	54.14	-
20080301	20	HW to LW	53.81	53.81	54.14	-
20080301	20	LW to HW	53.69	53.73	-	-
20080302	21	HW to LW	54.06	54.19	-	-
20080302	21	LW to HW	54.23	-	-	-

ALTUS Echosounder bottom distance [cm]

Date	Tide no.	Phase	Signal 1	Signal 2	Signal 3	Signal 4
20080302	22	HW to LW	54.43	54.72	-	-
20080302	22	LW to HW	54.06	54.31	-	-
20080303	23	HW to LW	54.31	54.31	-	-
20080303	23	LW to HW	55.34	-	-	-
20080303	24	HW to LW	55.59	-	-	-
20080304	24	LW to HW	55.13	-	-	-
20080304	25	HW to LW	55.5	55.71	-	-
20080304	25	LW to HW	55.21	-	-	-
20080304	26	HW to LW	56.49	57.36	-	-
20080305	26	LW to HW	55.17	-	-	-
20080305	27	HW to LW	55.83	-	-	-
20080305	27	LW to HW	55.26	-	-	-
20080305	28	HW to LW	57.27	-	-	-
20080306	28	LW to HW	-	-	-	-
20080306	29	HW to LW	55.87	-	-	-
20080306	29	LW to HW	56.45	-	-	-
20080306	30	HW to LW	55.79	-	-	-
20080307	30	LW to HW	55.63	-	-	-
20080307	31	HW to LW	56	-	-	-
20080307	31	LW to HW	56.61	-	-	-
20080307	32	HW to LW	56.04	-	-	-
20080308	32	LW to HW	56.9	-	-	-
20080308	33	HW to LW	56	56.41	-	-
20080308	33	LW to HW	55.26	-	-	-
20080308	34	HW to LW	55.63	-	-	-
20080309	34	LW to HW	55.42	-	-	-
20080309	35	HW to LW	56.78	-	-	-
20080309	35	LW to HW	55.17	55.26	-	-
20080309	36	HW to LW	55.91	57.07	-	-
20080310	36	LW to HW	54.93	-	-	-
20080310	37	HW to LW	55.63	-	-	-
20080310	37	LW to HW	55.91	56.24	-	-
20080310	38	HW to LW	55.83	-	-	-
20080311	38	LW to HW	-	-	-	-
20080311	39	HW to LW	-	-	-	-
20080311	39	LW to HW	55.01	-	-	-
20080312	40	HW to LW	-	-	-	-
20080312	40	LW to HW	55.01	-	-	-
20080312	41	HW to LW	55.38	-	-	-
20080312	41	LW to HW	-	-	-	-
20080313	42	HW to LW	-	-	-	-
20080313	42	LW to HW	55.38	-	-	-

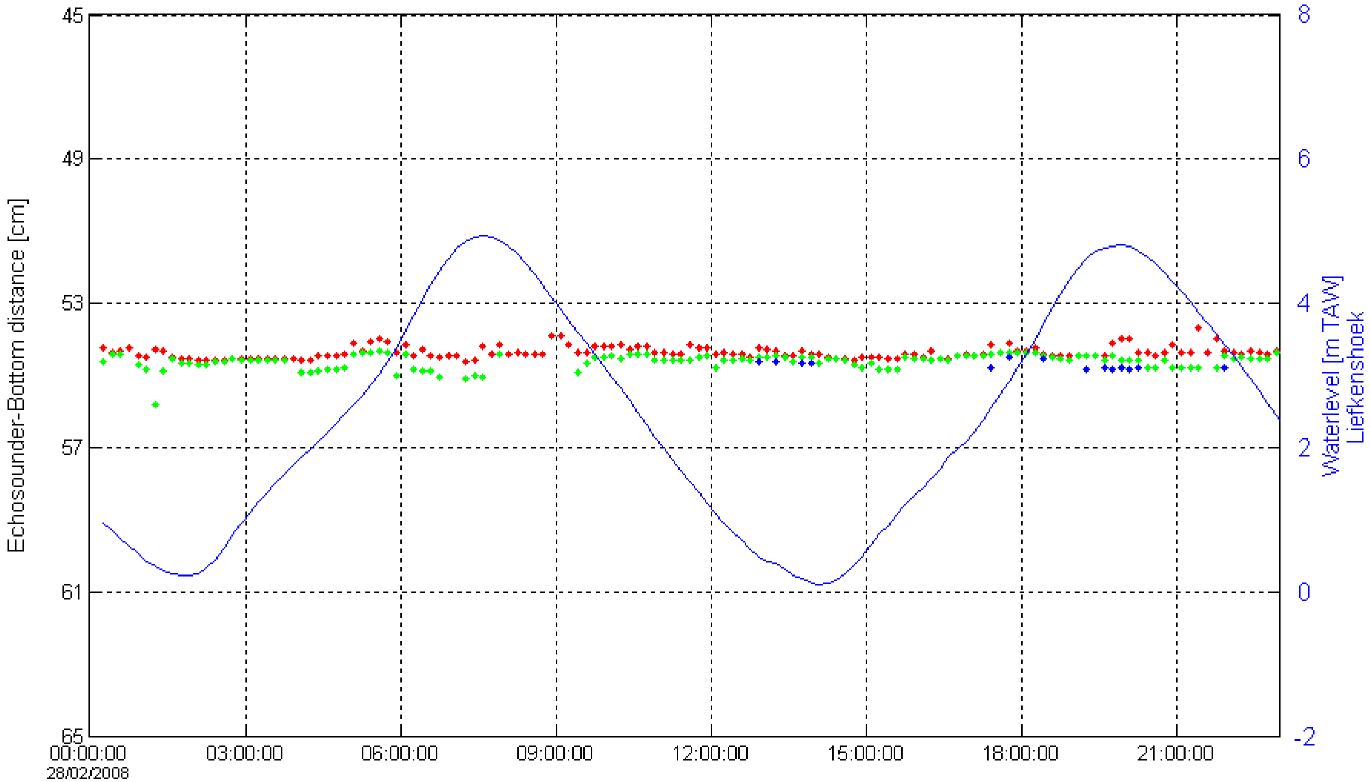
ALTUS Echosounder bottom distance [cm]						
Date	**Tide no.**	**Phase**	**Signal 1**	**Signal 2**	**Signal 3**	**Signal 4**
20080313	43	HW to LW	-	-	-	-
20080313	43	LW to HW	-	-	-	-
20080314	44	HW to LW	-	-	-	-
20080314	44	LW to HW	-	-	-	-
20080314	45	HW to LW	-	-	-	-
20080314	45	LW to HW	-	-	-	-
20080315	46	HW to LW	-	-	-	-
20080315	46	LW to HW	-	-	-	-
20080315	47	HW to LW	-	-	-	-
20080315	47	LW to HW	-	-	-	-
20080316	48	HW to LW	-	-	-	-
20080316	48	LW to HW	-	-	-	-
20080316	49	HW to LW	-	-	-	-
20080316	49	LW to HW	-	-	-	-
20080317	50	HW to LW	-	-	-	-
20080317	50	LW to HW	-	-	-	-
20080317	51	HW to LW	-	-	-	-
20080318	51	LW to HW	-	-	-	-
20080318	52	HW to LW	-	-	-	-
20080318	52	LW to HW	-	-	-	-
20080318	53	HW to LW	-	-	-	-
20080319	53	LW to HW	-	-	-	-
20080319	54	HW to LW	-	-	-	-
20080319	54	LW to HW	-	-	-	-
20080319	55	HW to LW	-	-	-	-
20080320	55	LW to HW	-	-	-	-
20080320	56	HW to LW	-	-	-	-

11283 Accretion Deurganckok - Near bed continuous monitoring – Winter 2008



Time series suspended sediment concentration ARGUS ASM-IV		Data processed by: IMDC
Location: Deurganckdok CDW	Date: Avg Tide 28/02/08	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



SIGNAL 4
SIGNAL 3
SIGNAL 2
SIGNAL 1

Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok CDW

Date:
Avg Tide 28/02/08

Data processed by:

In association with:

I/RA/11283/07.094/MSA

D.2 Sill frame

This page is intentionally left blank

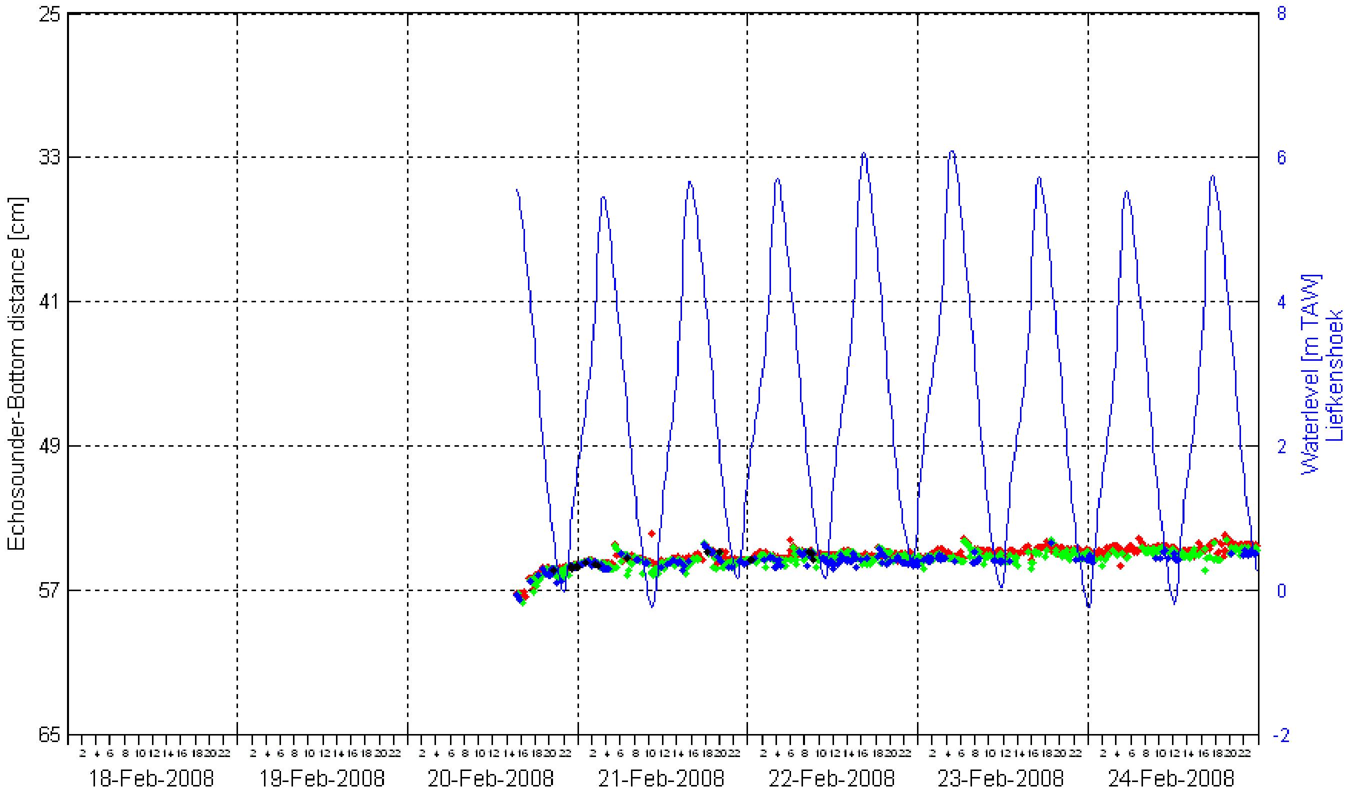
11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008

No data

Time series suspended sediment concentration ARGUS ASM-IV		*Data processed by:*
Location: Deurganckdok Sill	Date: 20/02/2008 – 24/02/2008	*In association with:*

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



SIGNAL 4	●
SIGNAL 3	●
SIGNAL 2	●
SIGNAL 1	●

Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

Location:
Deurganckdok Sill

Date:
20/02/2008 – 24/02/2008

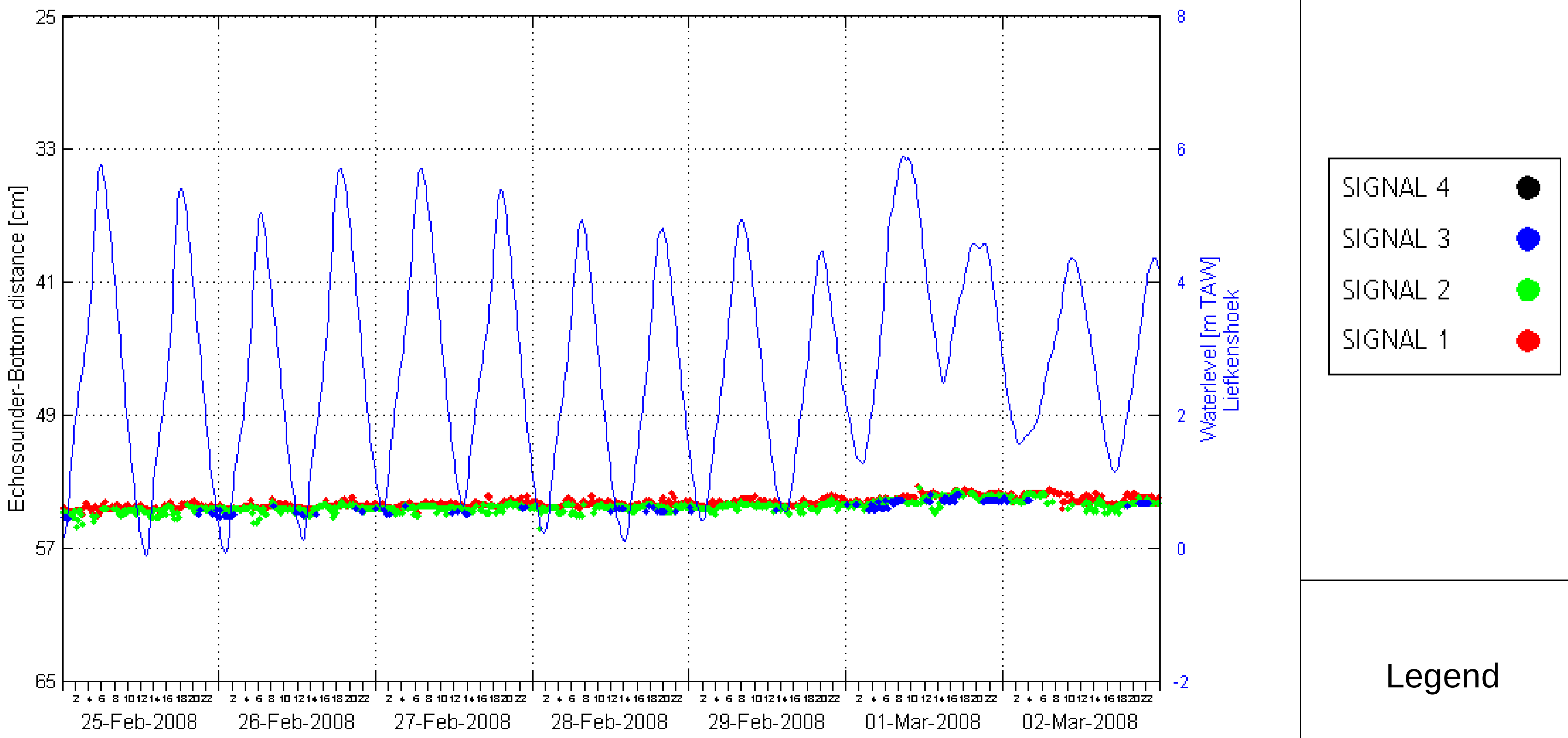
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008

No data

Time series suspended sediment concentration ARGUS ASM-IV		*Data processed by:*
Location: Deurganckdok Sill	Date: 25/02/2008 – 02/03/2008	*In association with:* wL | delft hydraulics GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok Sill

Date:
25/02/2008 – 02/03/2008

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

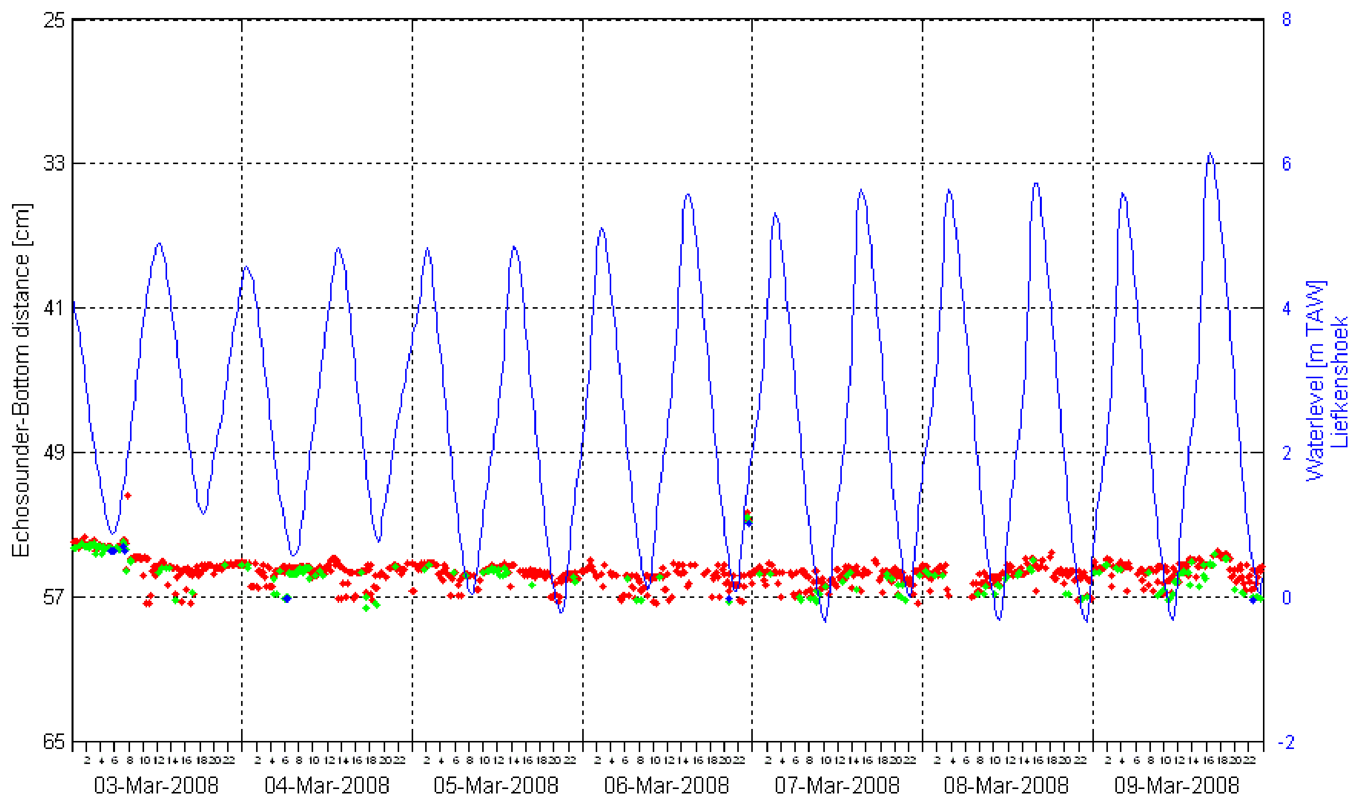
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008

No data

Time series suspended sediment concentration ARGUS ASM-IV		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 03/03/2008 – 09/03/2008	In association with: WL | delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok Sill

Date:
03/03/2008 – 09/03/2008

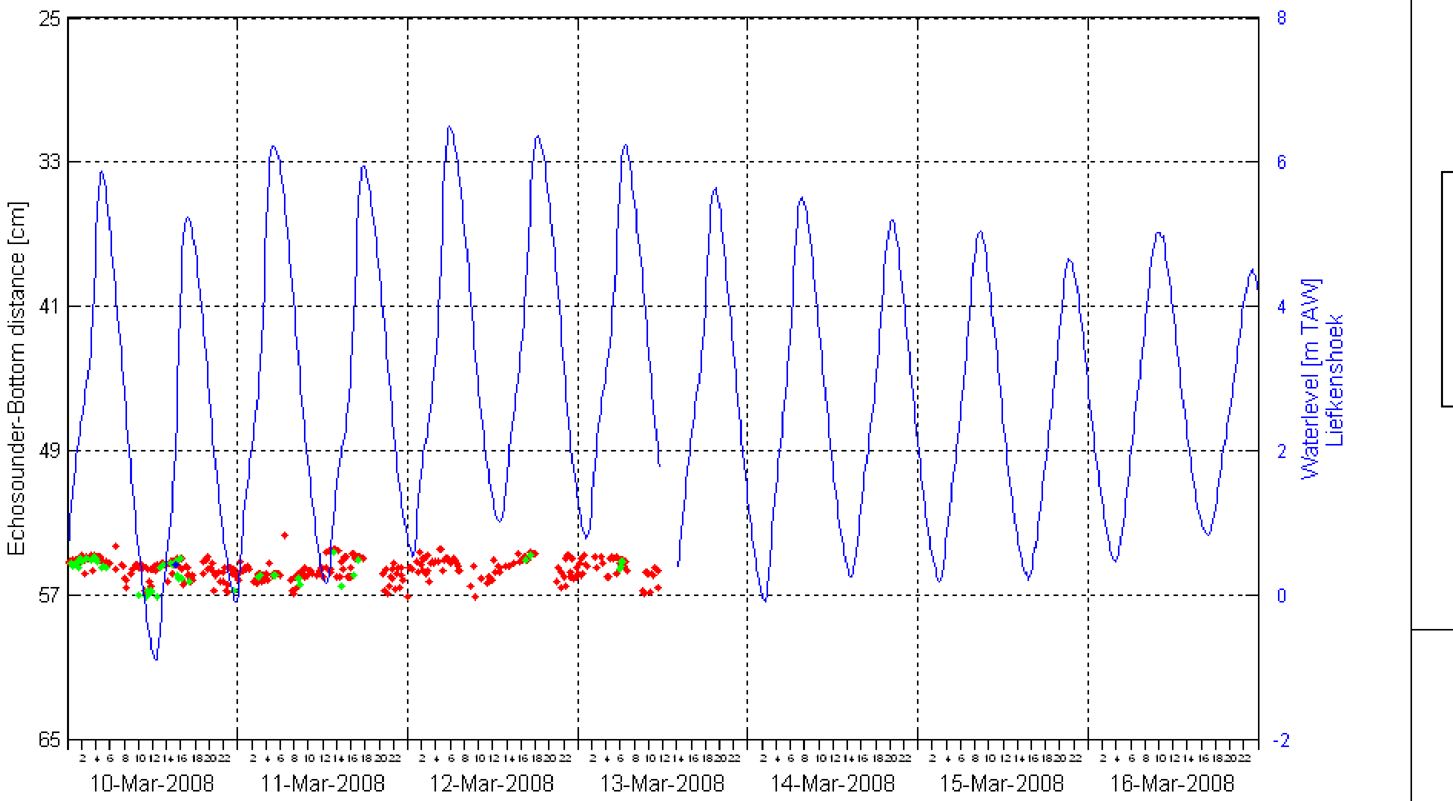
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008		
No data		
Time series suspended sediment concentration ARGUS ASM-IV		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: 10/03/2008 – 13/03/2008	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok Sill

Date:
10/03/2008 – 13/03/2008

Data processed by:

In association with:

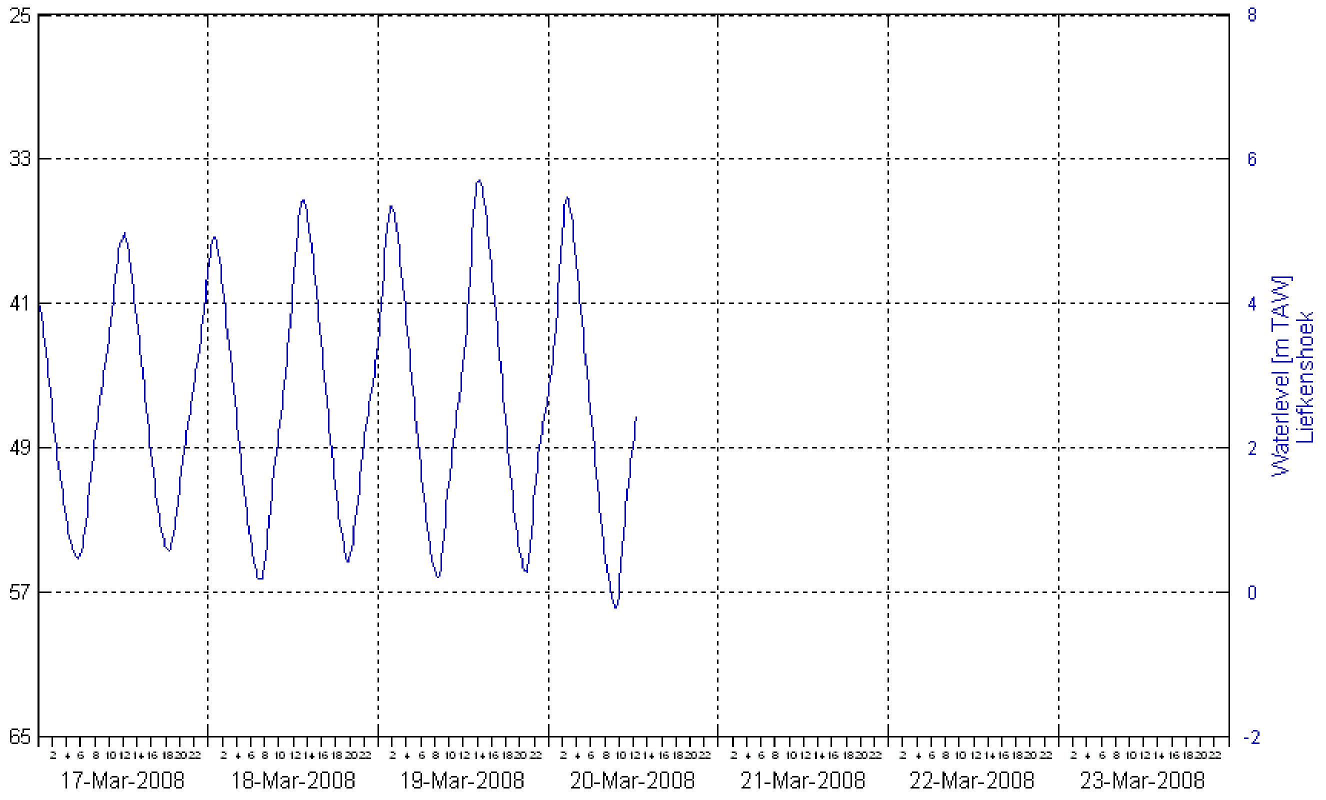
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008		

No data

Time series suspended sediment concentration ARGUS ASM-IV		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: 28/10/2007 – 31/10/2007	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



SIGNAL 4
SIGNAL 3
SIGNAL 2
SIGNAL 1

Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok Sill

Date:
28/10/2007 – 31/10/2007

Data processed by:

In association with:

I/RA/11283/07.094/MSA

ALTUS Echosounder bottom distance [cm]

Date	Tide no.	Phase	Signal 1	Signal 2	Signal 3	Signal 4
20080227	1	LW to HW	-	-	-	-
20080228	1	HW to LW	-	-	-	-
20080228	2	LW to HW	-	-	-	-
20080228	2	HW to LW	49.64	-	-	-
20080228	3	LW to HW	49.1	49.39	-	-
20080229	3	HW to LW	-	-	-	-
20080229	4	LW to HW	48.86	-	-	-
20080229	4	HW to LW	48.7	-	-	-
20080229	5	LW to HW	48.16	-	-	-
20080301	5	HW to LW	48	48.08	48.2	-
20080301	6	LW to HW	48.12	48.2	-	-
20080301	6	HW to LW	-	-	-	-
20080301	7	LW to HW	-	-	-	-
20080302	7	HW to LW	-	-	-	-
20080302	8	LW to HW	-	-	-	-
20080302	8	HW to LW	-	-	-	-
20080302	9	LW to HW	-	-	-	-
20080303	9	HW to LW	-	-	-	-
20080303	10	LW to HW	43.73	43.81	43.97	-
20080303	10	HW to LW	42.82	-	-	-
20080304	11	LW to HW	42.09	42.33	-	-
20080304	11	HW to LW	42.45	42.58	42.7	-
20080304	12	LW to HW	41.59	41.72	41.84	-
20080304	12	HW to LW	40.61	40.61	-	-
20080305	13	LW to HW	40.44	40.52	40.57	-
20080305	13	HW to LW	40.52	40.69	-	-
20080306	14	LW to HW	51.53	51.53	51.73	-
20080306	14	HW to LW	50.79	50.83	50.95	-
20080306	15	LW to HW	60.15	60.23	-	-
20080306	15	HW to LW	47.71	48.82	-	-
20080307	16	LW to HW	47.59	-	-	-
20080307	16	HW to LW	46.97	47.05	47.42	-
20080307	17	LW to HW	51.9	51.9	51.98	-
20080307	17	HW to LW	45.33	46.19	46.23	46.35
20080308	18	LW to HW	53.17	53.25	53.41	-
20080308	18	HW to LW	45.66	45.82	45.94	-
20080308	19	LW to HW	59	59.33	-	-
20080308	19	HW to LW	45.53	45.98	-	-
20080309	20	LW to HW	49.06	49.06	49.19	49.23
20080309	20	HW to LW	44.42	44.55	44.84	-
20080309	21	LW to HW	-	-	-	-
20080309	21	HW to LW	44.71	44.8	44.88	-

ALTUS Echosounder bottom distance [cm]

Date	Tide no.	Phase	Signal 1	Signal 2	Signal 3	Signal 4
20080310	22	LW to HW	44.3	44.34	44.42	44.51
20080310	22	HW to LW	43.77	43.85	43.93	44.51
20080310	23	LW to HW	44.02	44.02	44.34	-
20080310	23	HW to LW	44.38	44.59	-	-
20080311	24	LW to HW	46.52	46.6	46.68	-
20080311	24	HW to LW	42.45	42.45	42.82	-
20080311	25	LW to HW	42.91	42.95	43.07	-
20080312	25	HW to LW	42.37	42.41	42.45	-
20080312	26	LW to HW	47.34	47.79	47.87	47.96
20080312	26	HW to LW	42.17	42.21	42.33	42.41
20080312	27	LW to HW	41.26	41.35	41.59	41.67
20080313	27	HW to LW	41.39	41.39	41.43	-
20080313	28	LW to HW	41.02	41.02	41.06	41.06
20080313	28	HW to LW	40.69	40.85	41.06	41.06
20080313	29	LW to HW	40.48	40.61	40.65	40.69
20080314	29	HW to LW	40.65	40.69	40.85	41.02
20080314	30	LW to HW	39.79	39.87	39.87	39.99
20080314	30	HW to LW	39.99	40.03	40.07	41.26
20080314	31	LW to HW	39.91	39.95	39.95	39.99
20080315	31	HW to LW	38.47	38.51	38.6	-
20080315	32	LW to HW	38.02	38.02	38.02	38.14
20080315	32	HW to LW	38.19	38.23	38.68	-
20080315	33	LW to HW	38.19	38.27	38.31	-
20080316	33	HW to LW	38.27	38.35	38.35	-
20080316	34	LW to HW	38.35	38.43	38.47	38.56
20080316	34	HW to LW	38.47	38.47	38.56	-
20080316	35	LW to HW	38.84	38.92	-	-
20080317	35	HW to LW	38.6	38.6	-	-
20080317	36	LW to HW	38.68	38.72	38.76	-
20080317	36	HW to LW	37.12	-	-	-
20080318	37	LW to HW	37.49	37.49	-	-
20080318	37	HW to LW	38.72	38.88	-	-
20080318	38	LW to HW	36.75	37.04	-	-
20080318	38	HW to LW	36.63	36.71	36.83	-
20080319	39	LW to HW	36.54	-	-	-
20080319	39	HW to LW	36.67	36.75	-	-
20080319	40	LW to HW	35.72	-	-	-
20080319	40	HW to LW	35.44	35.85	-	-
20080320	41	LW to HW	35.35	-	-	-
20080320	41	HW to LW	35.68	-	-	-
20080320	42	LW to HW	35.39	35.39	-	-
20080320	42	HW to LW	35.89	35.97	-	-

ALTUS Echosounder bottom distance [cm]						
Date	Tide no.	Phase	Signal 1	Signal 2	Signal 3	Signal 4
20080321	43	LW to HW	34.86	34.9	35.19	-
20080321	43	HW to LW	34.7	34.74	34.82	-
20080321	44	LW to HW	38.56	38.72	-	-
20080321	44	HW to LW	34.78	34.86	34.94	35.07
20080322	45	LW to HW	34	-	-	-
20080322	45	HW to LW	33.38	33.55	-	-
20080322	46	LW to HW	33.71	33.75	33.83	-
20080322	46	HW to LW	33.75	33.79	-	-
20080323	47	LW to HW	34.04	34.24	-	-
20080323	47	HW to LW	33.92	-	-	-
20080323	48	LW to HW	33.71	-	-	-
20080323	48	HW to LW	33.26	34.04	-	-
20080324	49	LW to HW	34.29	-	-	-
20080324	49	HW to LW	34.2	-	-	-
20080324	50	LW to HW	35.6	35.6	35.64	35.76
20080324	50	HW to LW	35.85	35.93	-	-
20080325	51	LW to HW	35.6	35.64	35.64	35.72
20080325	51	HW to LW	35.56	35.64	-	-
20080325	52	LW to HW	37.24	37.28	37.41	-
20080326	52	HW to LW	37.53	38.64	-	-
20080326	53	LW to HW	37.65	37.98	38.06	-
20080326	53	HW to LW	18.93	18.93	18.97	18.97
20080326	54	LW to HW	18.03	18.03	18.15	18.28
20080327	54	HW to LW	17.45	17.78	17.78	18.15
20080327	55	LW to HW	16.8	16.96	17.86	18.19
20080327	55	HW to LW	17.09	17.99	18.07	18.28
20080327	56	LW to HW	16.26	16.35	16.39	-
20080328	56	HW to LW	15.65	15.69	15.73	15.9
20080328	57	LW to HW	15.48	15.61	15.98	-
20080328	57	HW to LW	14.66	14.79	-	-
20080328	58	LW to HW	-	-	14.58	14.66
20080329	58	HW to LW	-	14.66	-	-
20080329	59	LW to HW	-	14.87	15.07	-
20080329	59	HW to LW	14.7	14.95	15.12	-
20080329	60	LW to HW	14.58	14.62	14.79	-
20080330	60	HW to LW	14.54	14.62	14.62	-
20080330	61	LW to HW	14.74	14.79	14.87	14.95
20080330	61	HW to LW	14.83	14.87	14.87	15.07
20080330	62	LW to HW	14.91	14.91	15.07	15.32
20080331	62	HW to LW	14.91	14.99	15.2	15.53
20080331	63	LW to HW	14.91	15.07	15.16	15.32
20080331	63	HW to LW	15.12	15.2	15.2	-

ALTUS Echosounder bottom distance [cm]						
Date	Tide no.	Phase	Signal 1	Signal 2	Signal 3	Signal 4
20080331	64	LW to HW	15.16	15.28	15.4	-
20080401	64	HW to LW	15.24	15.36	15.77	-
20080401	65	LW to HW	15.36	15.44	15.9	-
20080401	65	HW to LW	-	-	15.53	-
20080401	66	LW to HW	-	-	-	-
20080402	66	HW to LW	-	-	-	-
20080402	67	LW to HW	-	-	-	-
20080402	67	HW to LW	-	-	-	-
20080403	68	LW to HW	-	-	-	-
20080403	68	HW to LW	-	-	-	-
20080403	69	LW to HW	-	-	-	-
20080403	69	HW to LW	-	-	-	-
20080404	70	LW to HW	-	-	-	-
20080404	70	HW to LW	-	-	-	-
20080404	71	LW to HW	-	-	-	-
20080404	71	HW to LW	-	-	-	-
20080405	72	LW to HW	-	-	-	-
20080405	72	HW to LW	-	-	-	-
20080405	73	LW to HW	-	-	-	-
20080405	73	HW to LW	-	-	-	-
20080406	74	LW to HW	-	-	-	-
20080406	74	HW to LW	-	-	-	-
20080406	75	LW to HW	-	-	-	-
20080406	75	HW to LW	-	-	-	-
20080407	76	LW to HW	-	-	-	-
20080407	76	HW to LW	-	-	-	-
20080407	77	LW to HW	-	-	-	-
20080407	77	HW to LW	-	-	-	-
20080408	78	LW to HW	-	14.58	14.58	-
20080408	78	HW to LW	-	-	-	-
20080408	79	LW to HW	-	-	14.83	-
20080408	79	HW to LW	-	-	-	-
20080409	80	LW to HW	-	-	-	-

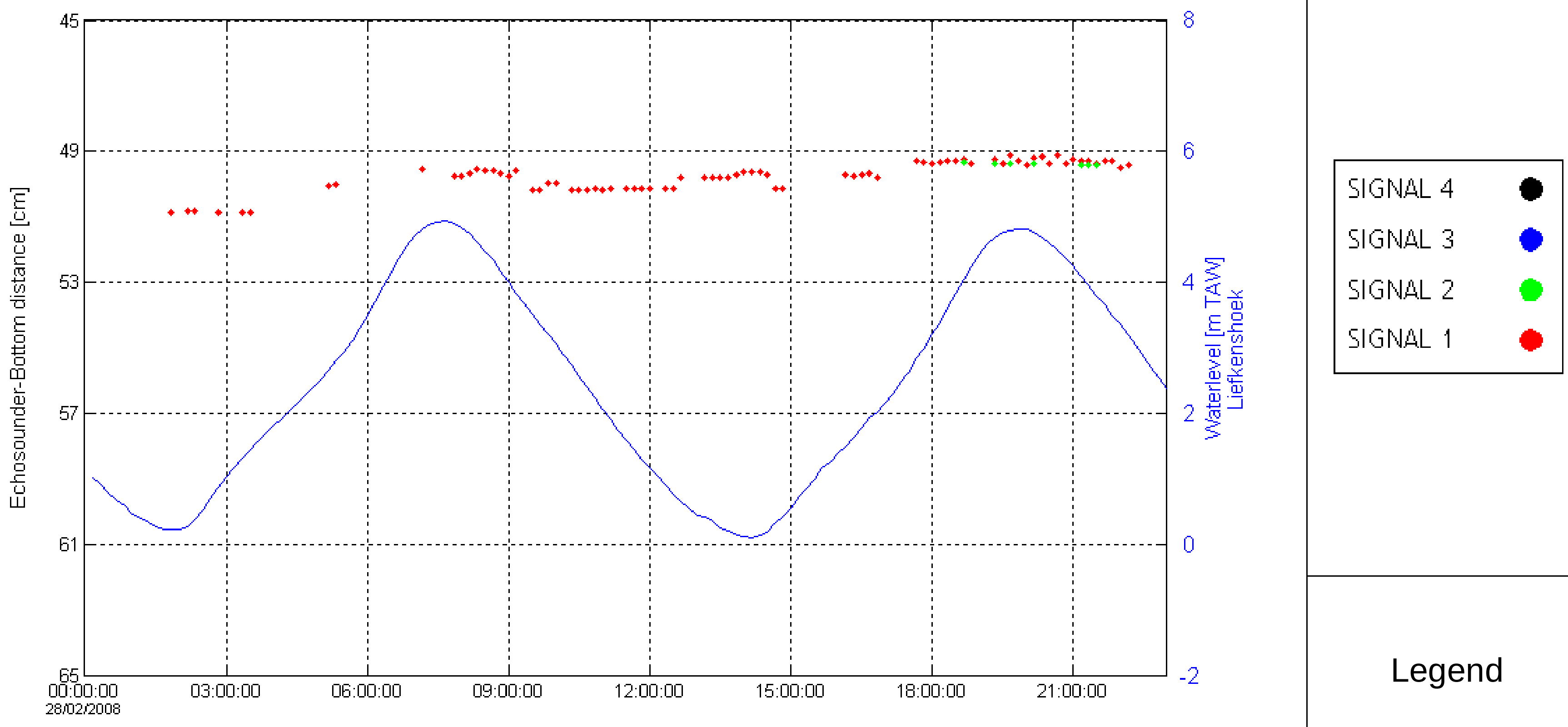
This page is intentionally left blank

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008

No data

Time series suspended sediment concentration ARGUS ASM-IV		*Data processed by:*
Location: Deurganckdok Sill	Date: Avg Tide 28/02/08	*In association with:* wl | delft hydraulics GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok - Near bed continuous monitoring – Winter 2008



Legend

Echosounder – bottom distance
Waterlevel [mTAW] at Liefkenshoek

Location:
Deurganckdok Sill

Date:
Avg Tide 28/02/08

Data processed by:

In association with:

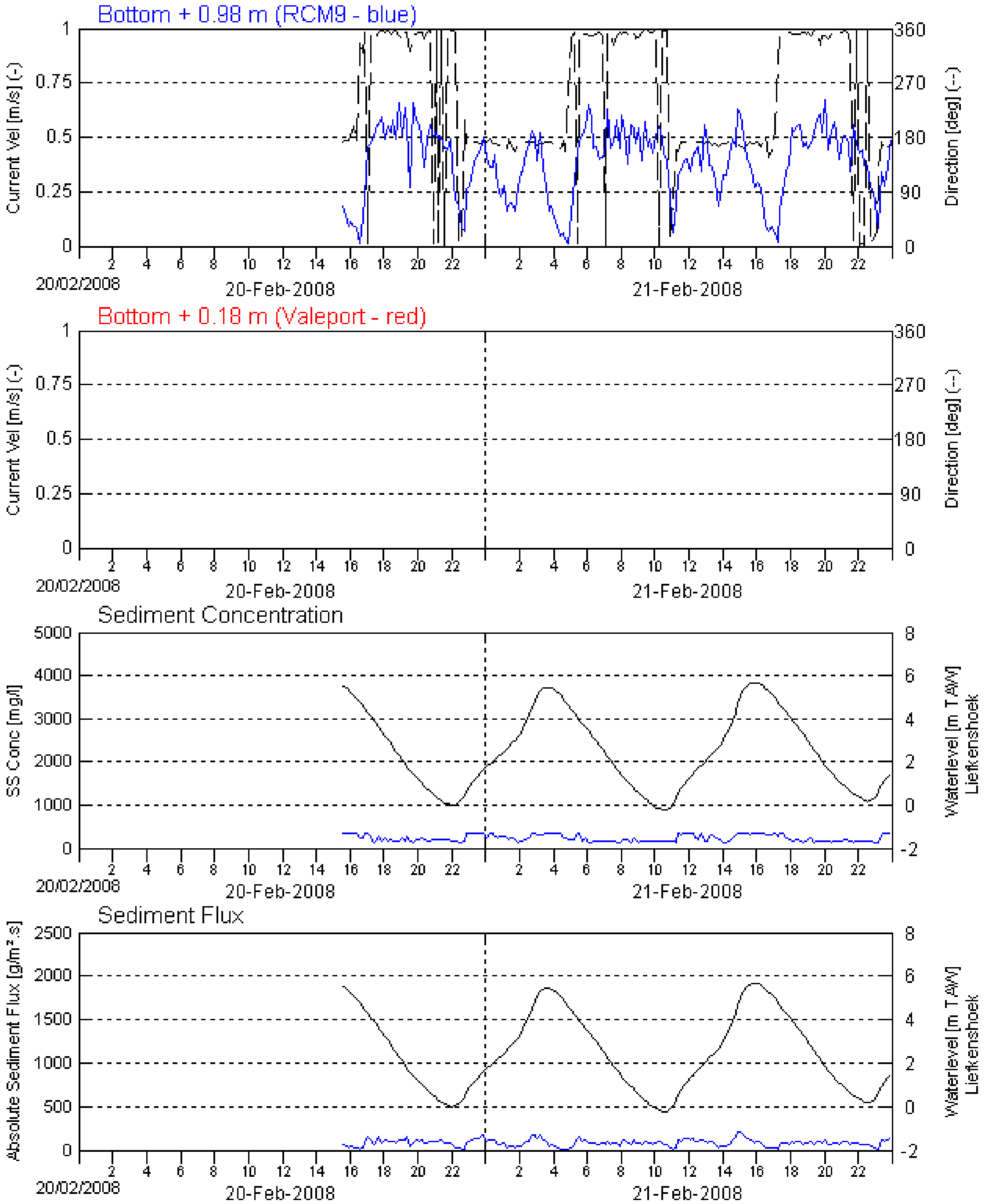
I/RA/11283/07.094/MSA

APPENDIX E.

TIMESERIES RCM9 & VALEPORT

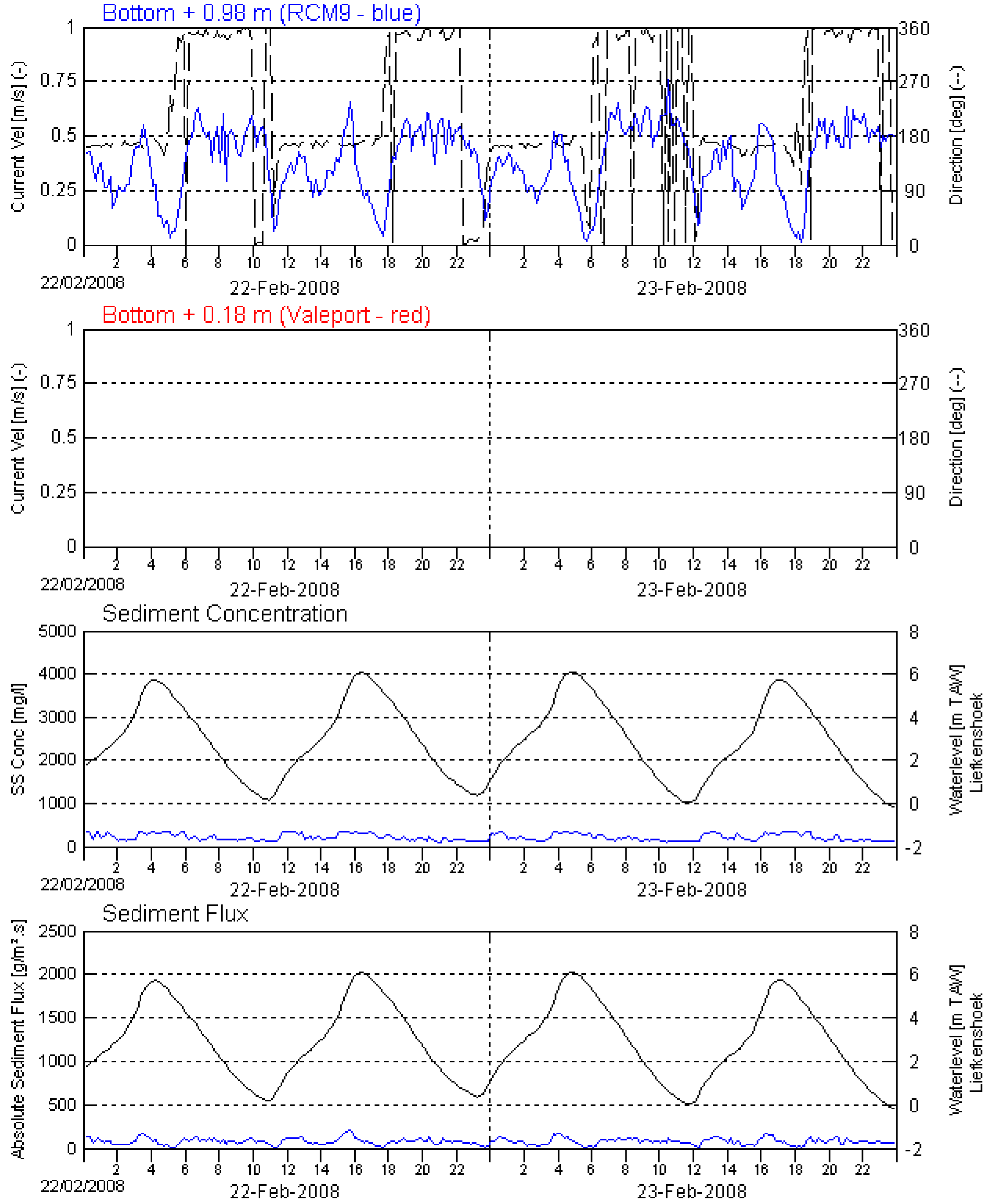
E.1 CDW frame

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



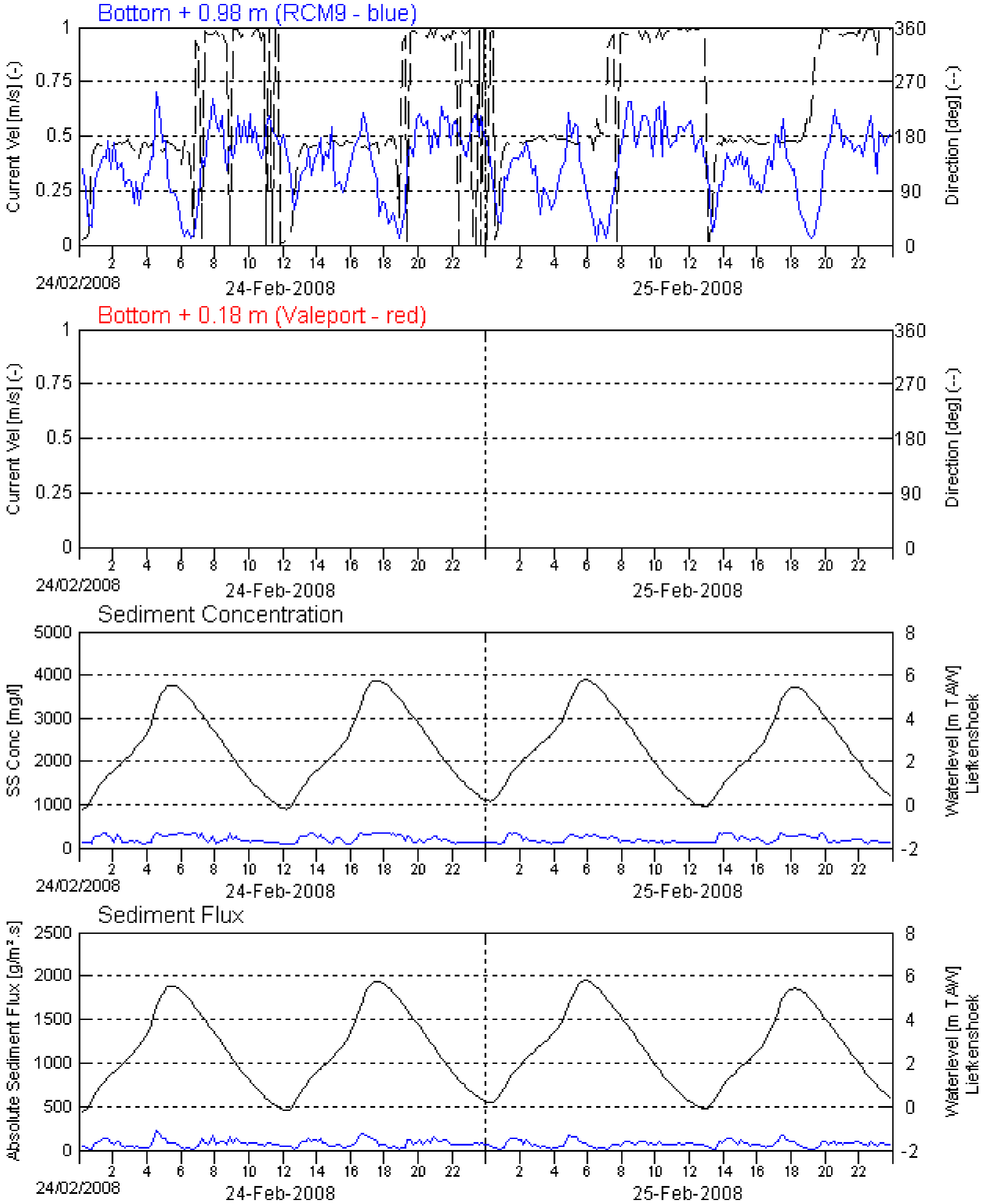
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok CDW	Date: 20/02/2008– 21/0/2008	*In association with:* WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok CDW	Date: 22/02/2008– 23/02/2008	*In association with:* WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel

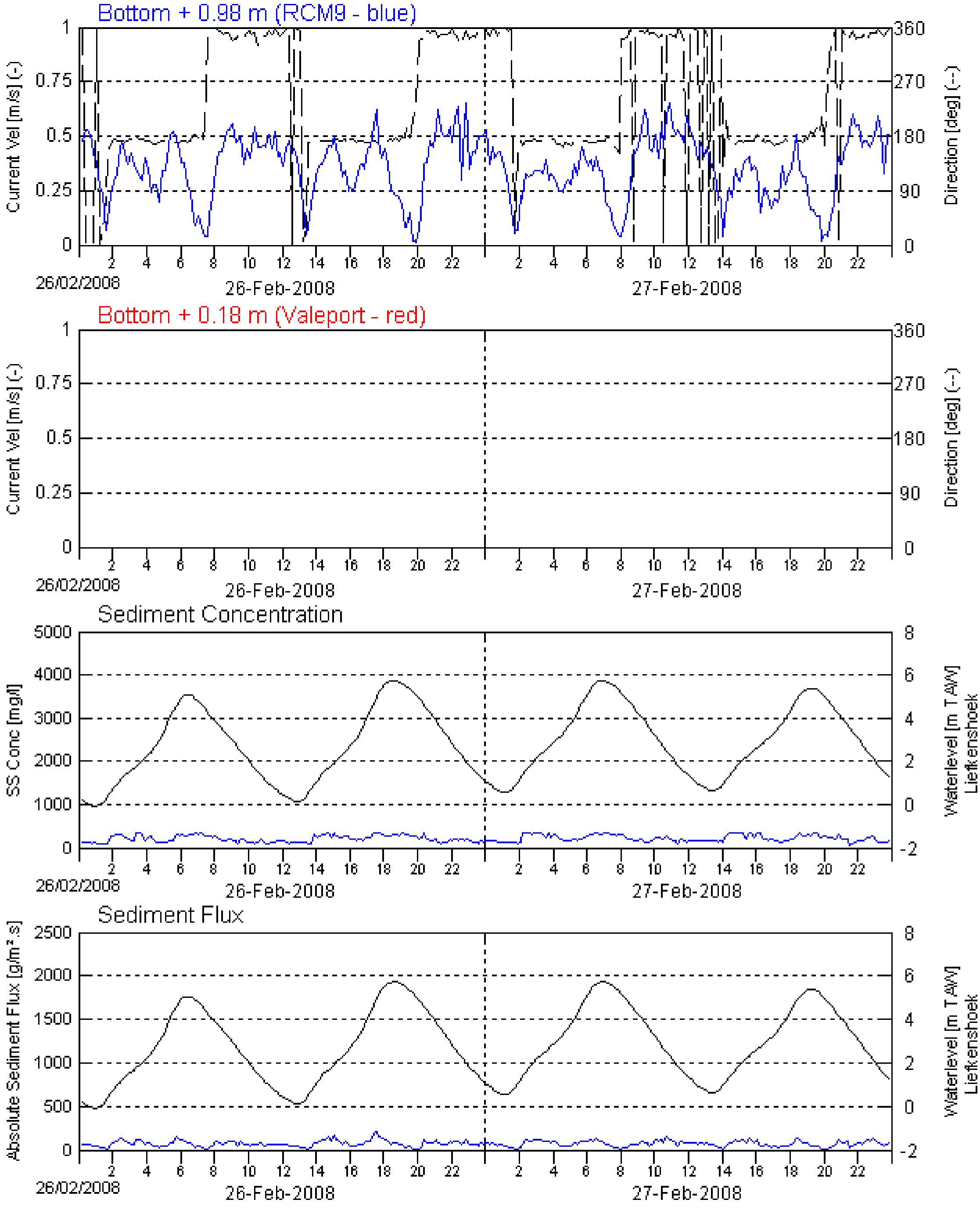
Location: Deurganckdok CDW	Date: 24/02/2008– 25/02/2008

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

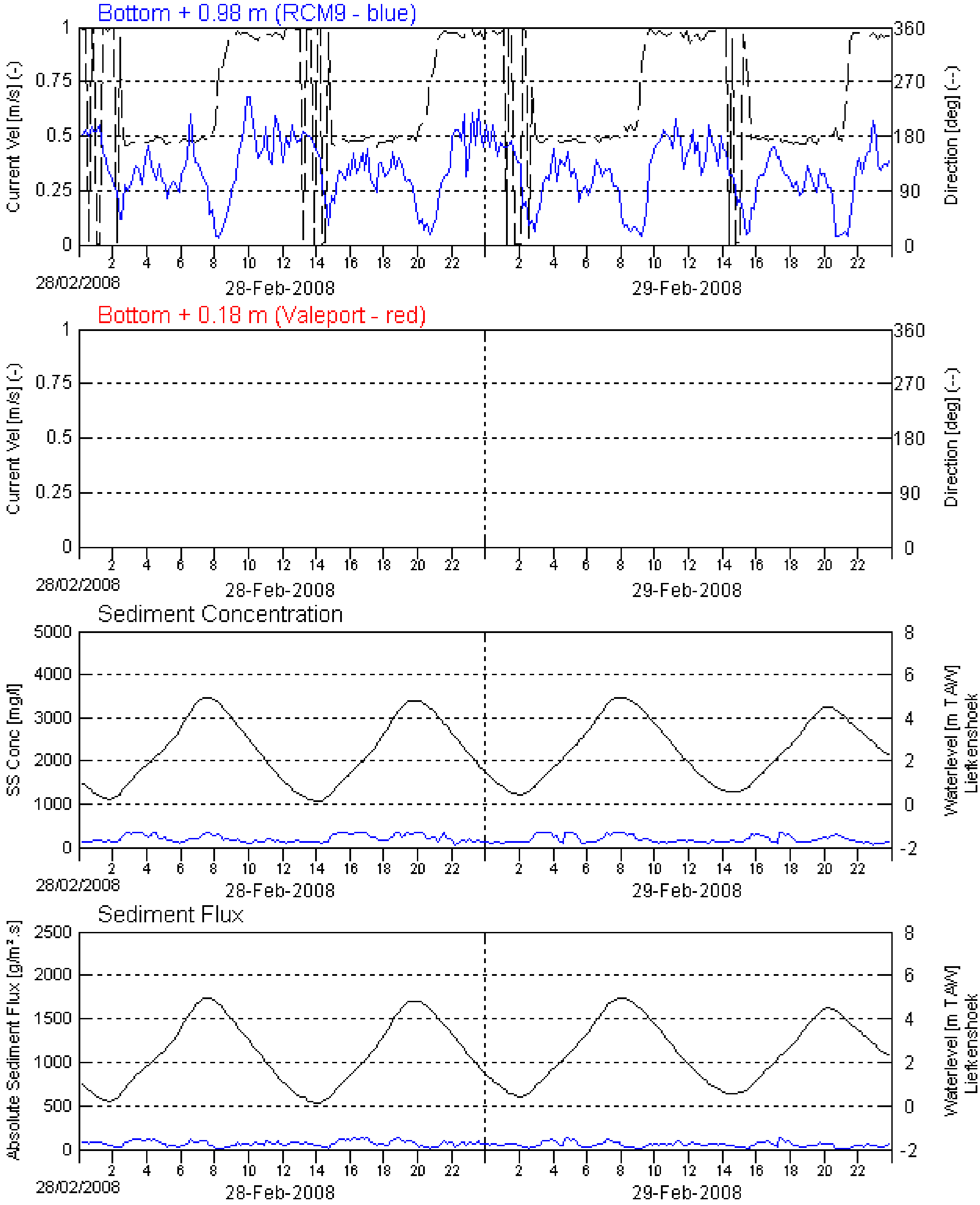
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



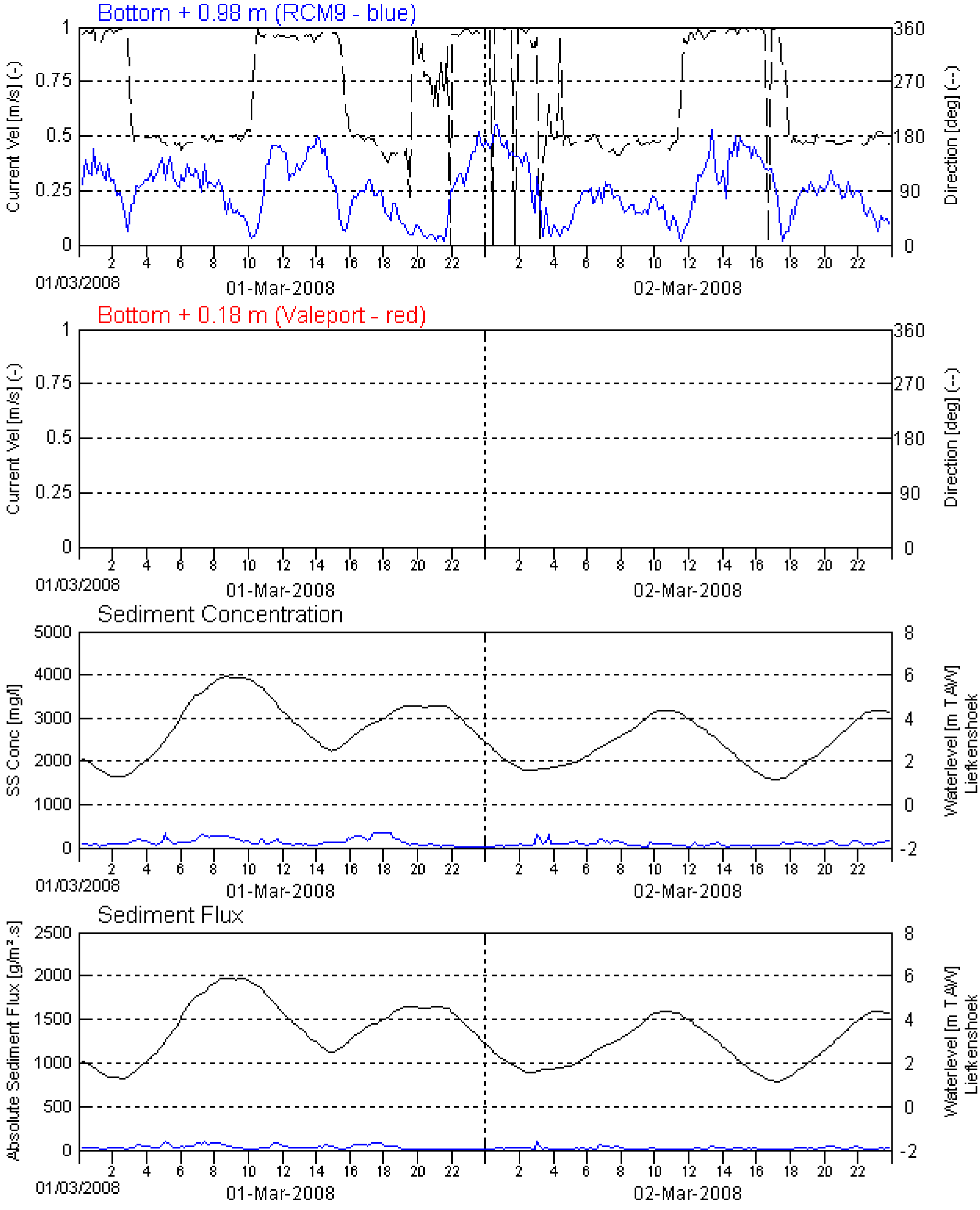
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok CDW	Date: 26/02/2008– 27/02/2008	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



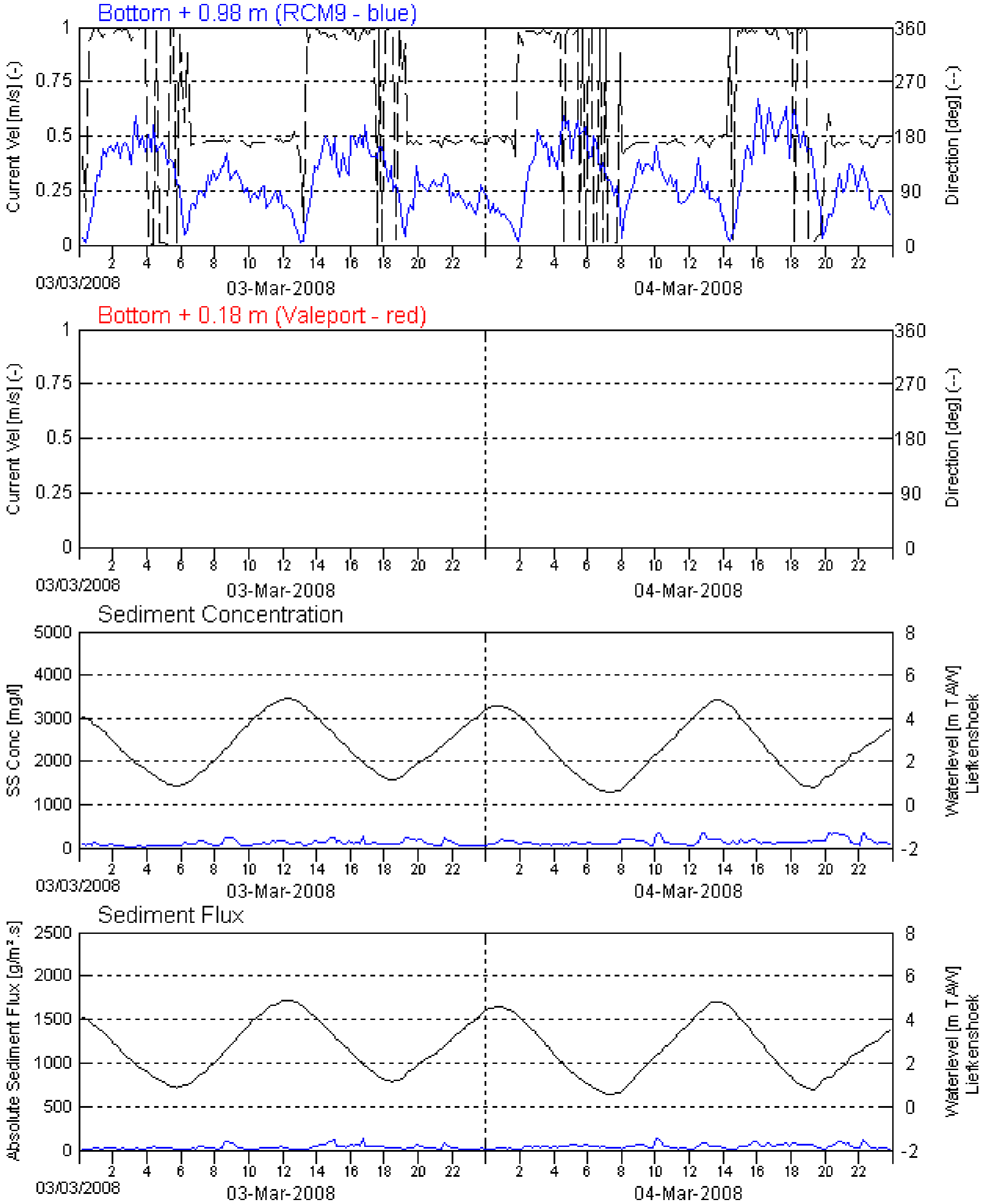
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 28/02/2008– 29/02/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



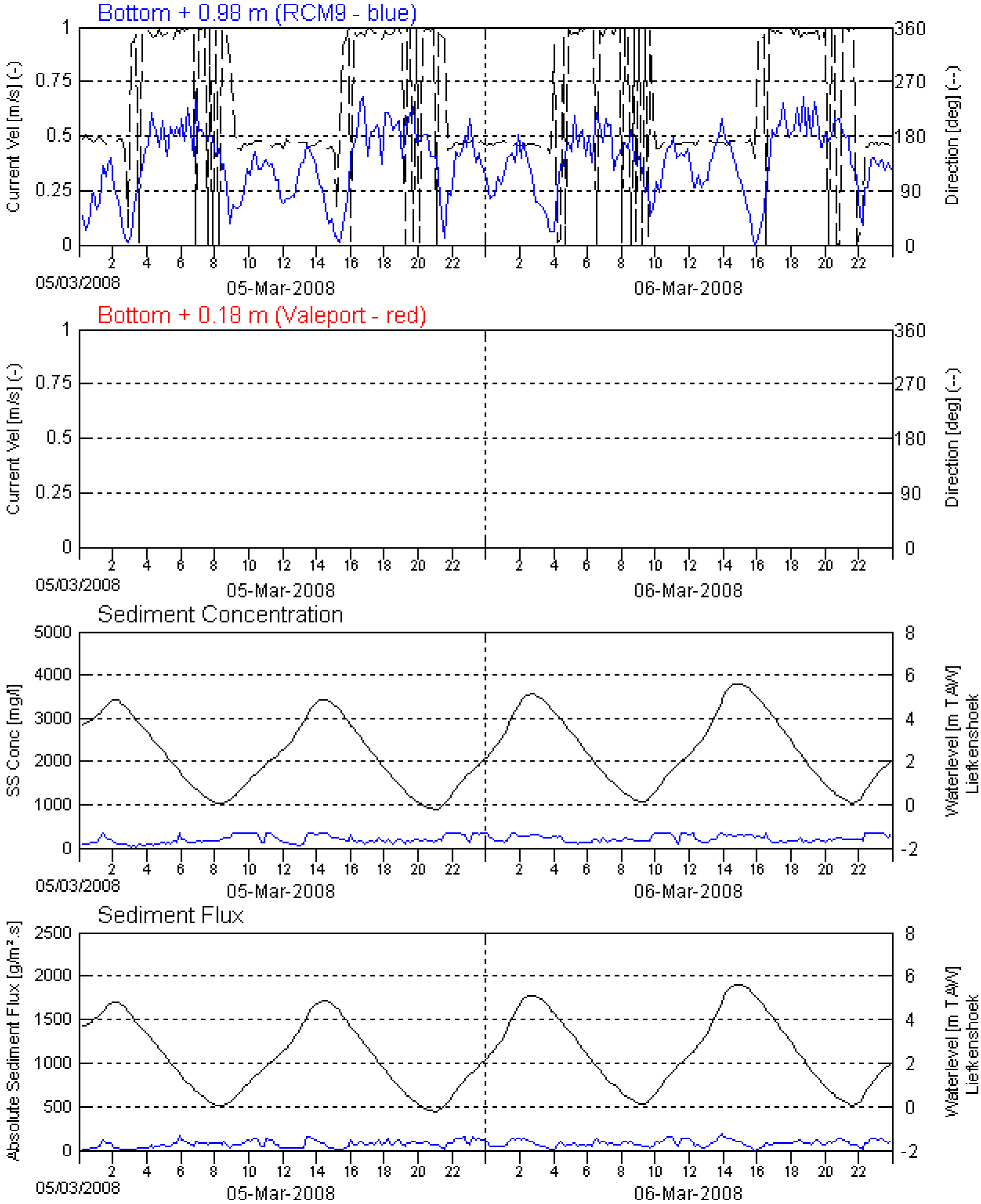
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 01/03/2008– 02/03/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



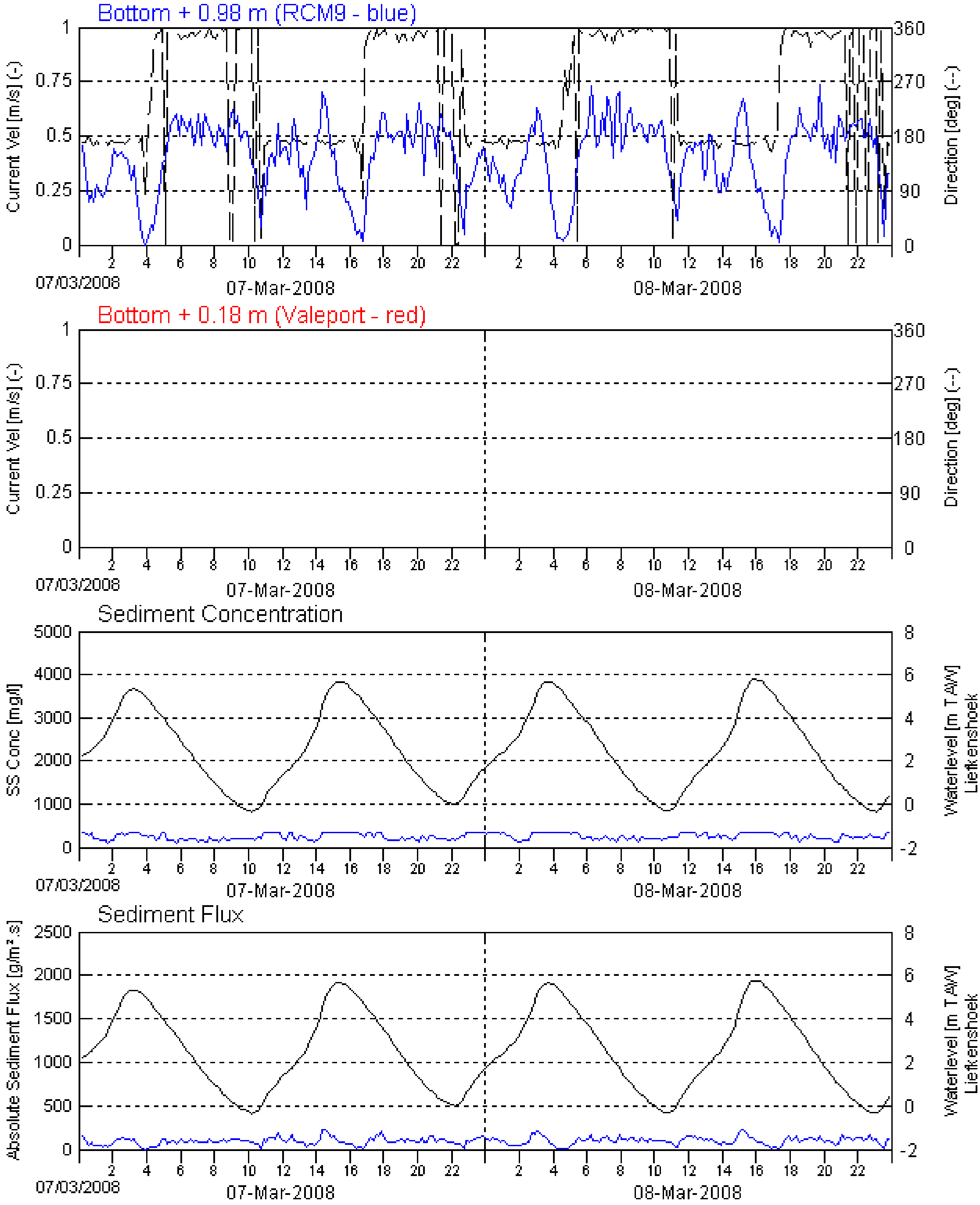
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 03/03/2008– 04/03/2008	In association with: WL | delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



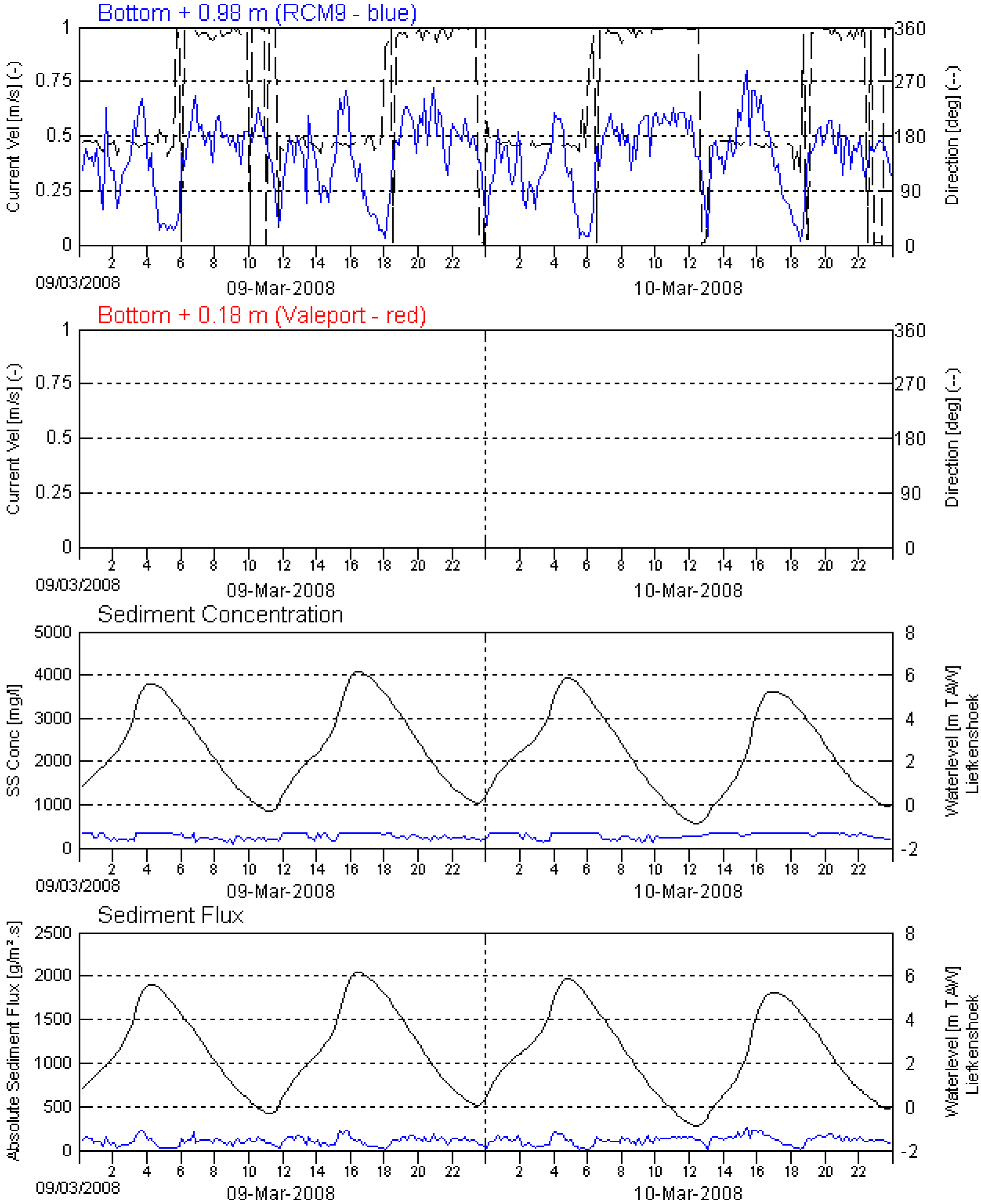
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 05/03/2008– 06/03/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



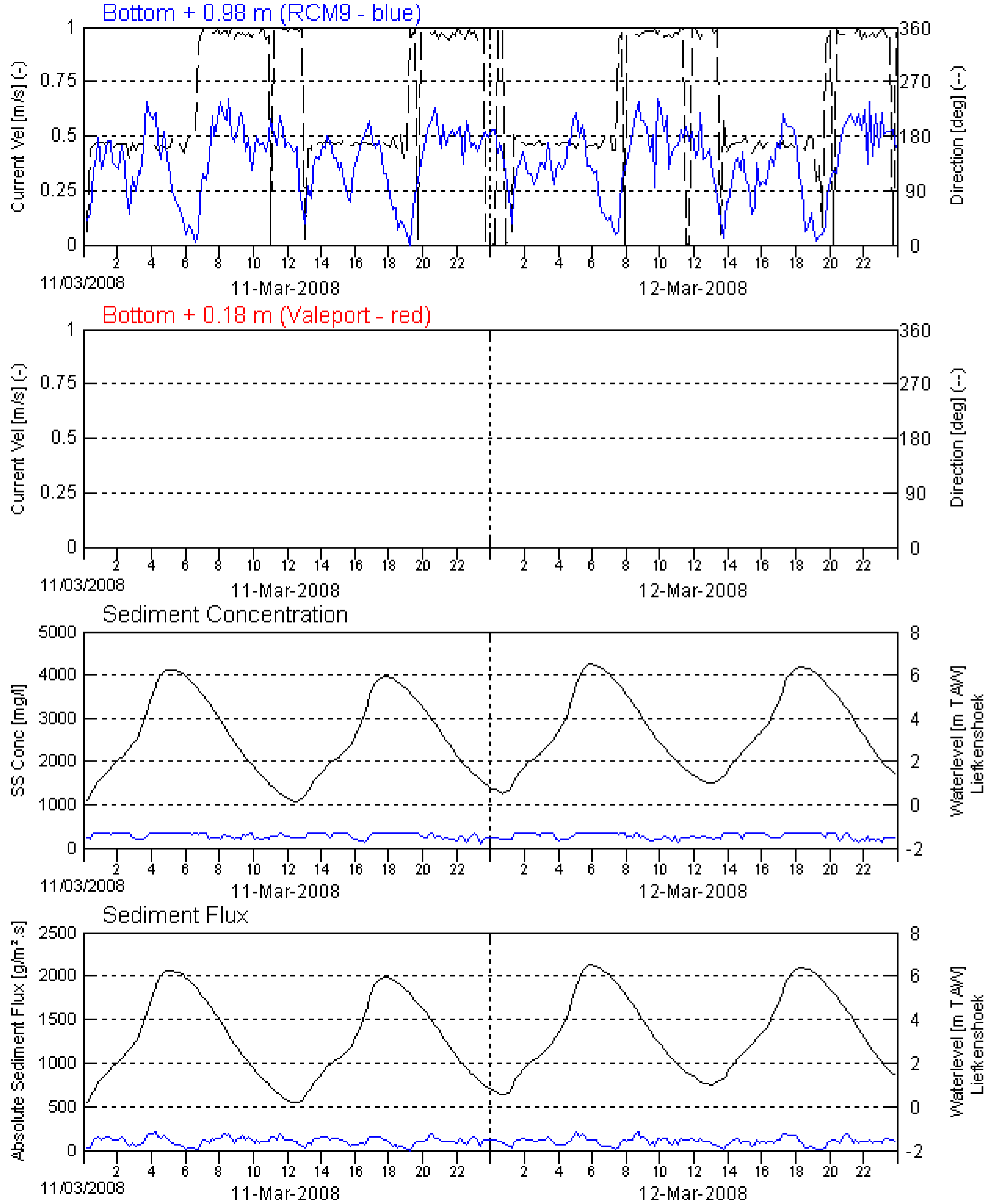
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 07/03/2008– 08/03/2008	In association with: WL | delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



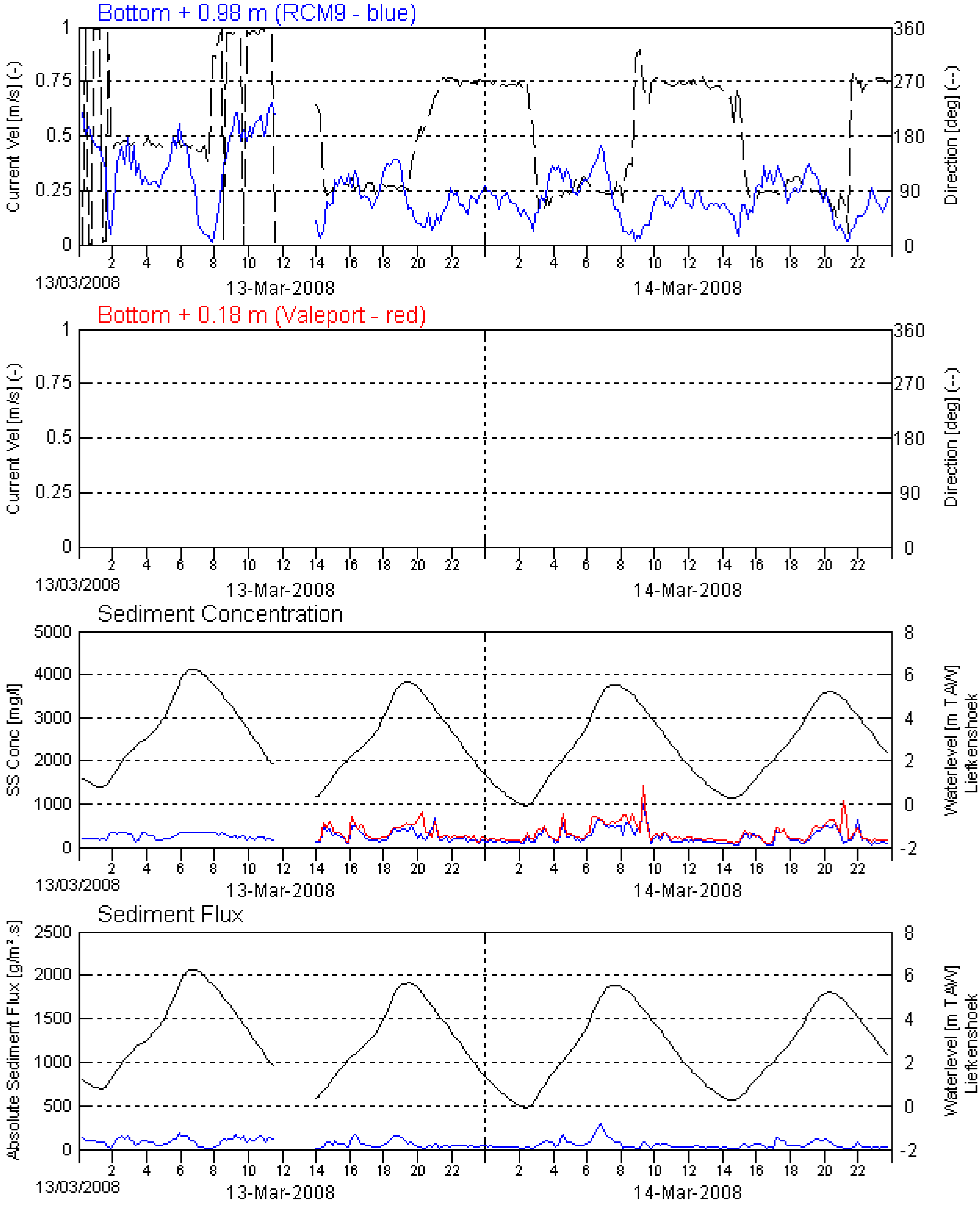
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 09/03/2008– 10/03/2008	In association with: WL	delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 11/03/2008– 12/03/2008	In association with: WL | delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel

Location: Deurganckdok CDW

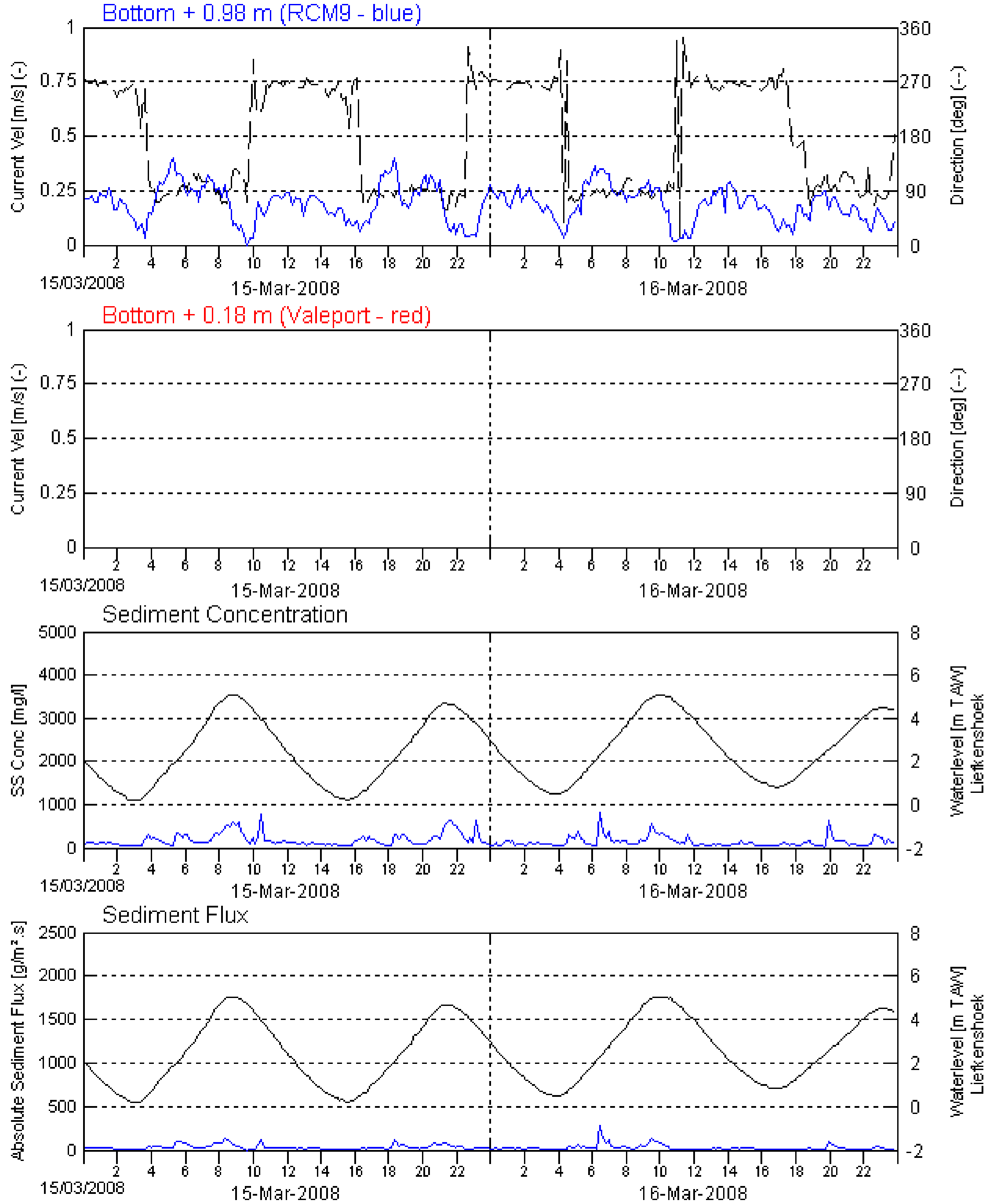
Date: 13/03/2008– 14/03/2008

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

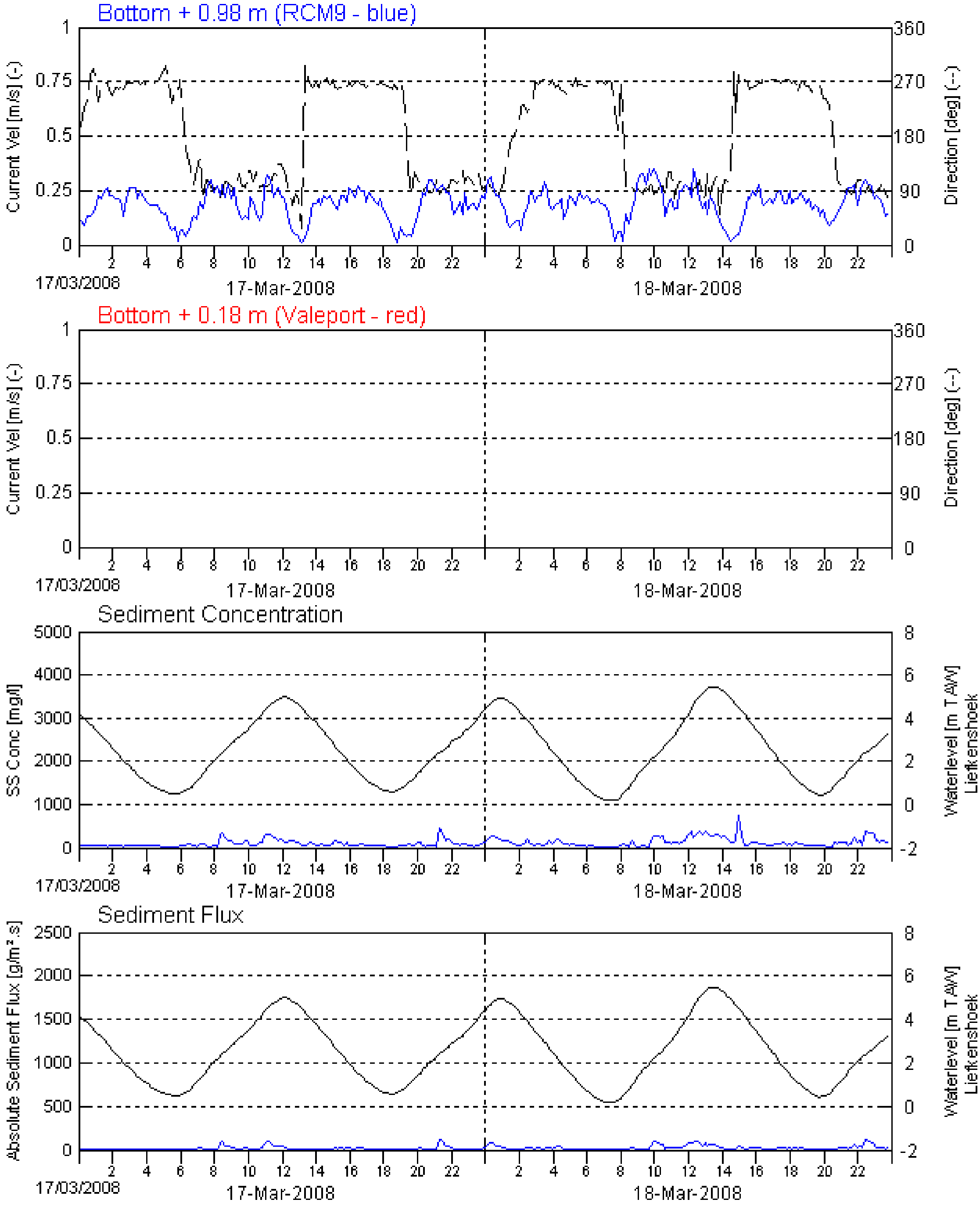
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 15/03/2008– 16/03/2008	In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

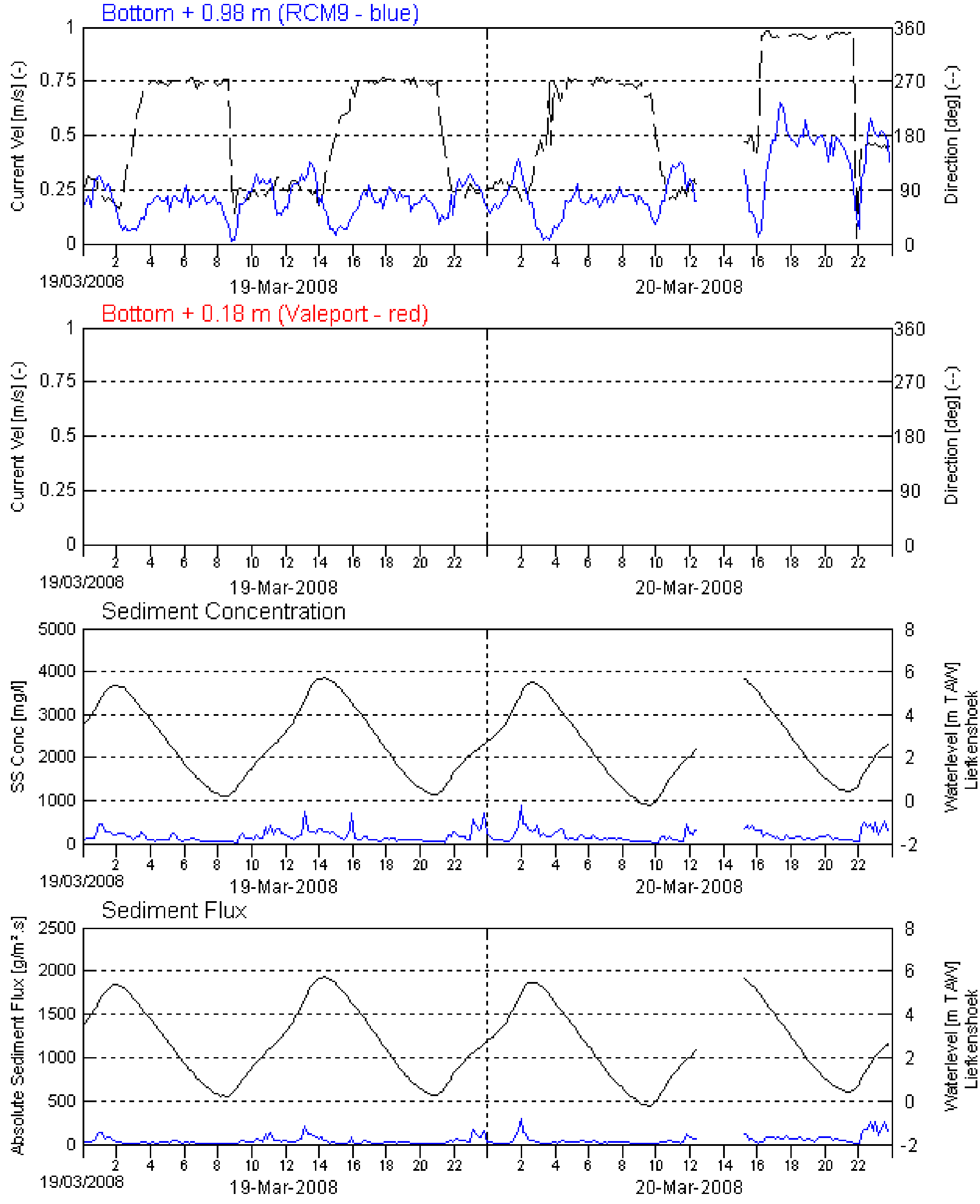
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel

Location: Deurganckdok CDW	Date: 17/03/2008– 18/03/2008	*Data processed by:* IMDC *In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

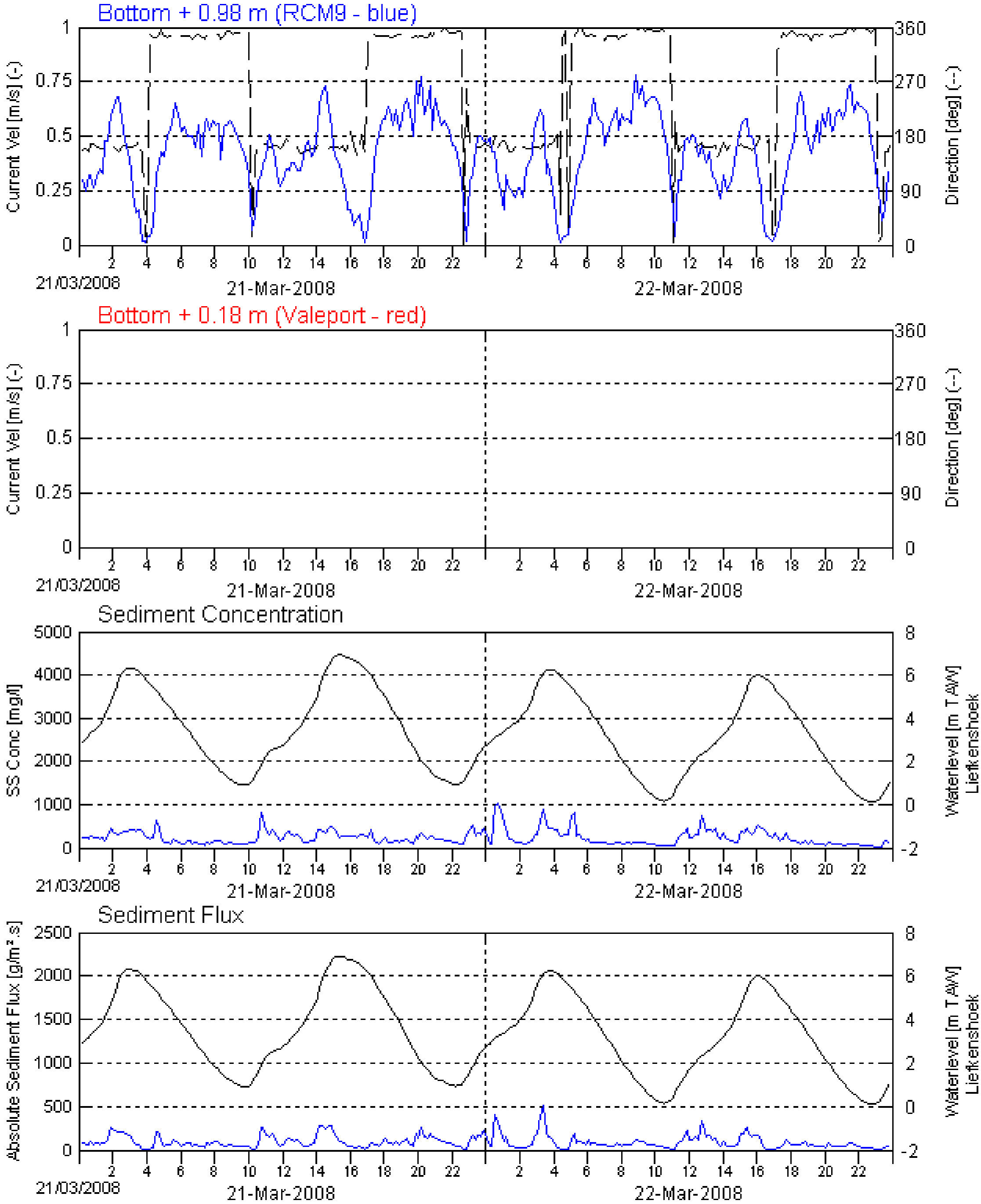
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel	Data processed by: IMDC
Location: Deurganckdok CDW — Date: 19/03/2008– 20/03/2008	In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel

Location:
Deurganckdok CDW

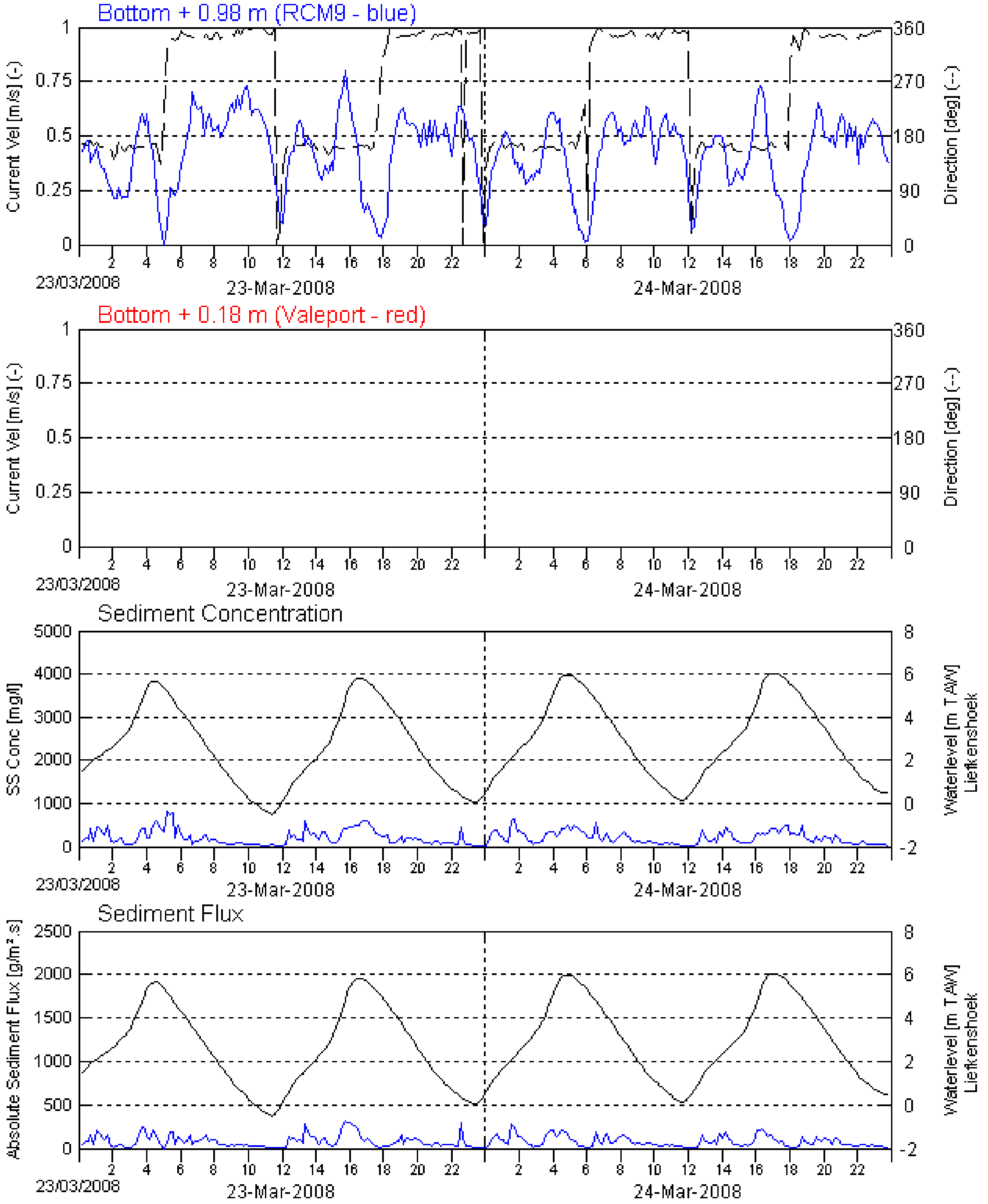
Date:
21/03/2008– 22/03/2008

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

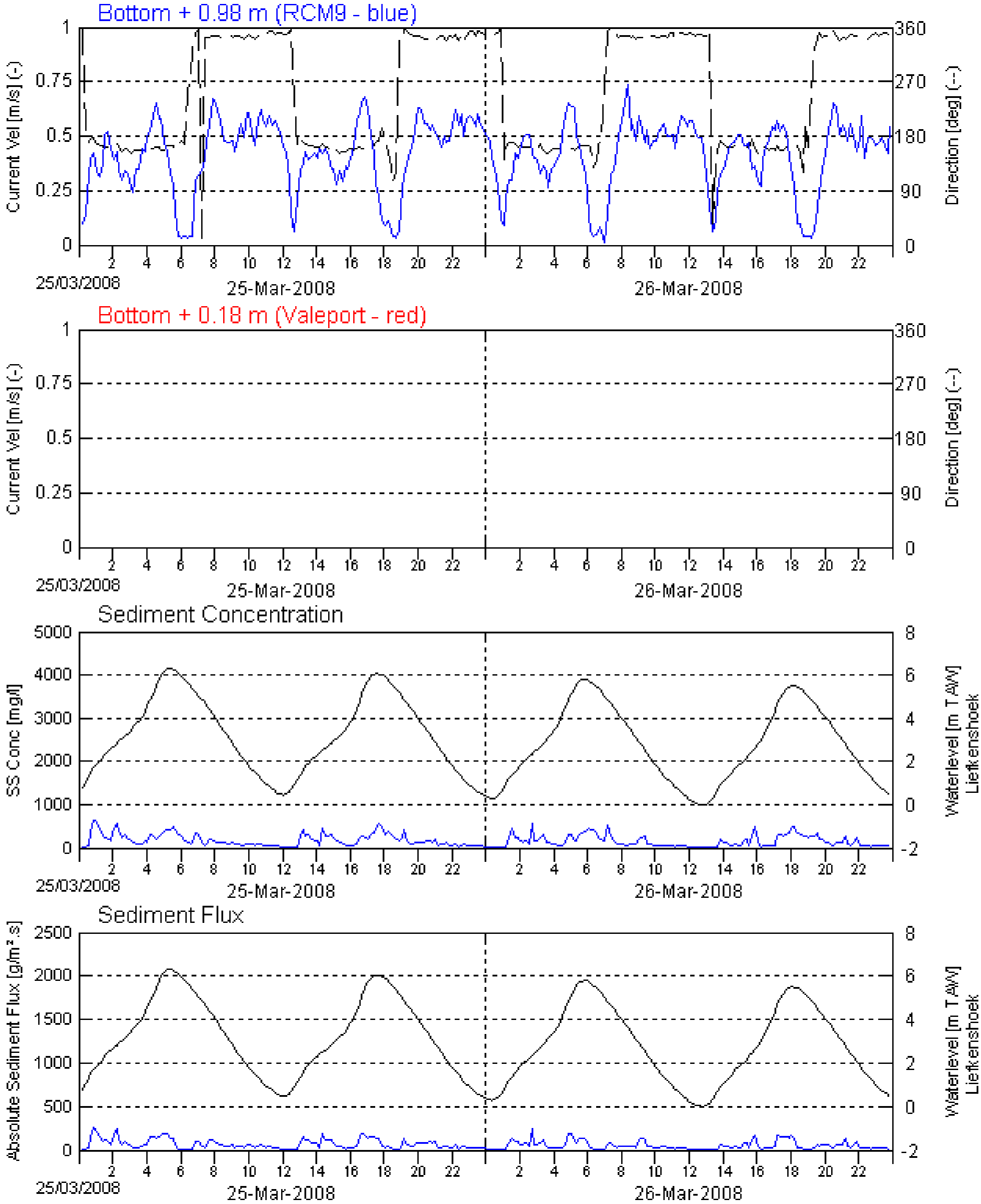
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



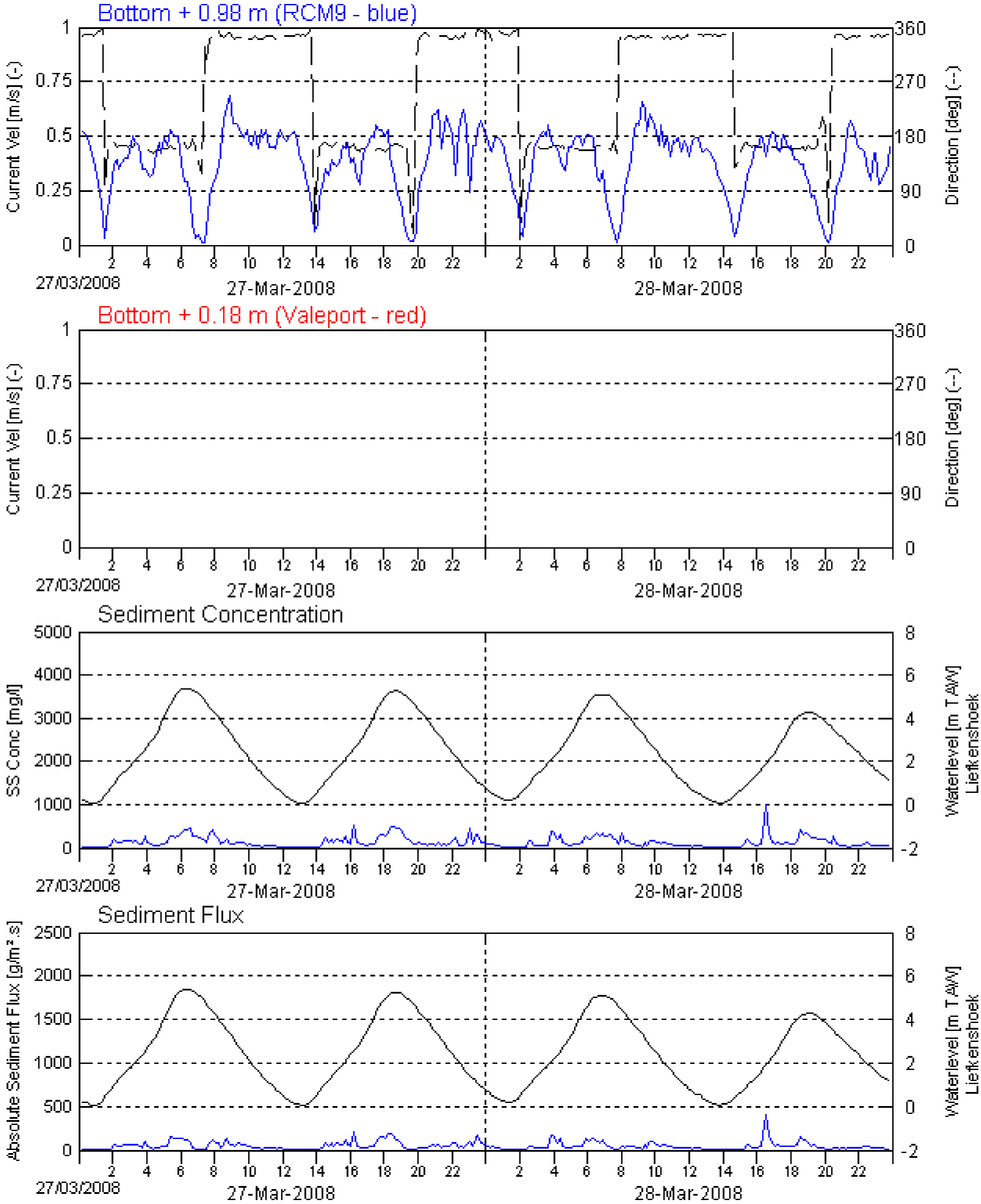
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 23/03/2008– 24/03/2008	In association with: WL | delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 25/03/2008– 26/03/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel

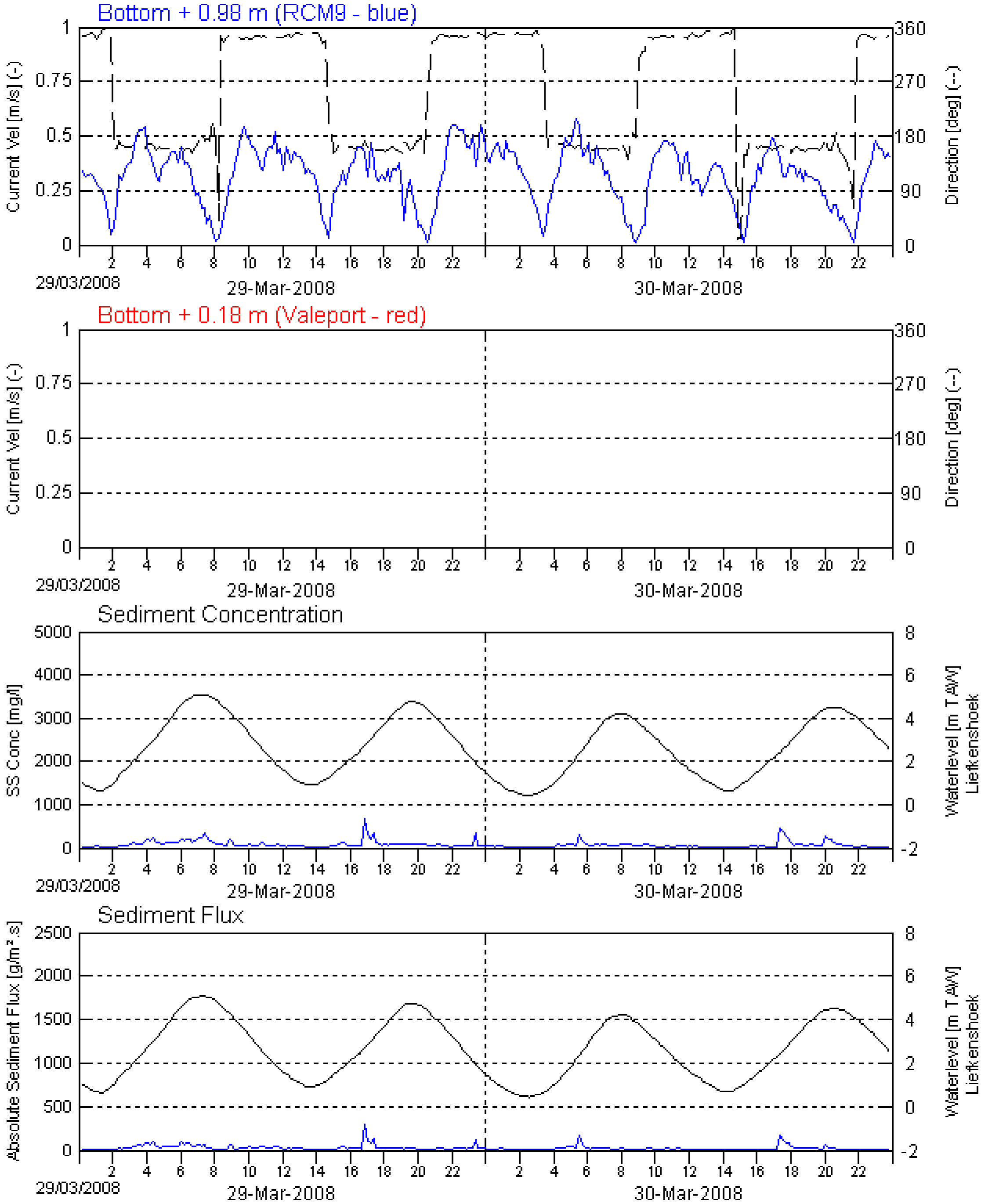
Location: Deurganckdok CDW	Date: 27/03/2008– 28/03/2008

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

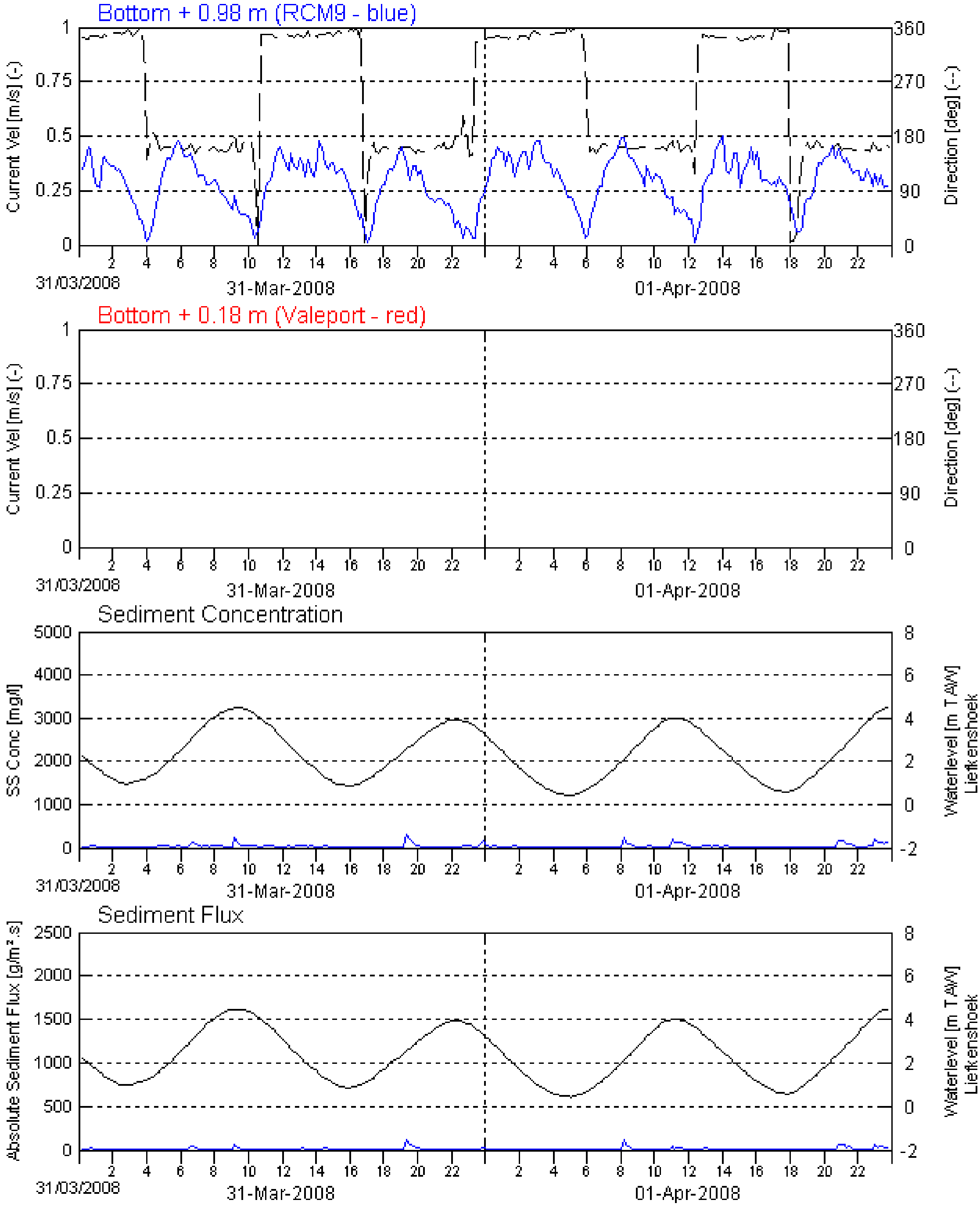
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



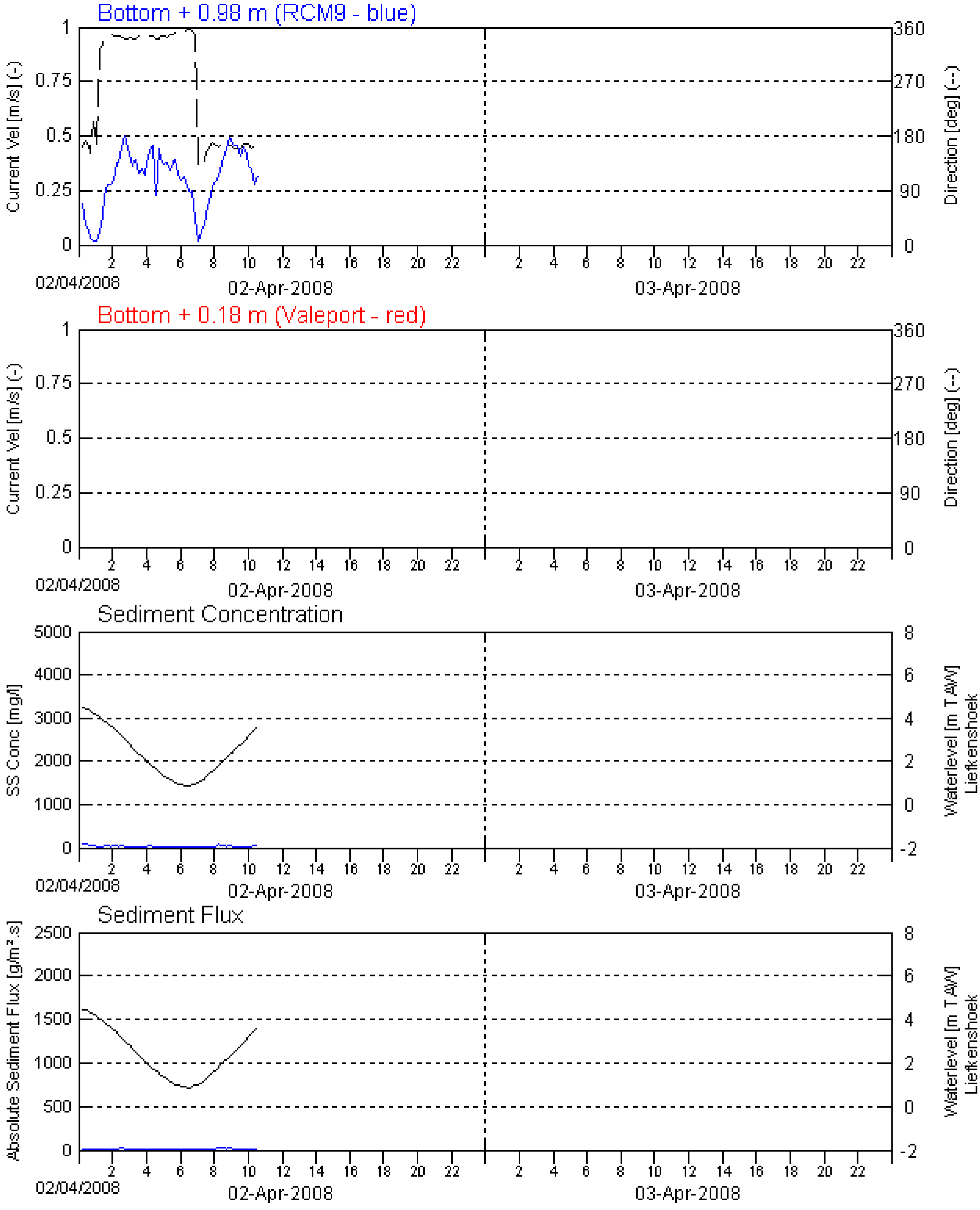
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 29/03/2008– 30/03/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 31/03/2008– 01/04/2008	In association with: WL delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 02/04/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080220	1	HW to LW	5.6	0.4	350	-	-	222.6	-	84.3	-
20080221	1	LW to HW	5.4	0.3	169.1	-	-	258.5	-	89.2	-
20080221	2	HW to LW	5.7	0.4	351.1	-	-	198.4	-	73	-
20080221	2	LW to HW	5.9	0.4	165.5	-	-	250.2	-	98.7	-
20080221	3	HW to LW	5.5	0.4	351.2	-	-	209.2	-	73.4	-
20080222	3	LW to HW	5.5	0.3	161.8	-	-	245	-	83.9	-
20080222	4	HW to LW	5.5	0.4	346.6	-	-	203	-	72.6	-
20080222	4	LW to HW	5.8	0.3	162.7	-	-	253.9	-	91.6	-
20080222	5	HW to LW	5.7	0.4	350.7	-	-	183.4	-	69.9	-
20080223	5	LW to HW	5.7	0.3	159.7	-	-	220	-	78.3	-
20080223	6	HW to LW	6.1	0.4	356.1	-	-	185.3	-	73.5	-
20080223	6	LW to HW	5.7	0.3	161	-	-	224.2	-	82.3	-
20080224	7	HW to LW	6	0.4	358	-	-	188.9	-	67.7	-
20080224	7	LW to HW	5.7	0.3	160.9	-	-	207.9	-	78.1	-
20080224	8	HW to LW	5.7	0.4	358.4	-	-	200.5	-	70.1	-
20080224	8	LW to HW	5.9	0.4	160.5	-	-	220.3	-	86.2	-
20080225	9	HW to LW	5.5	0.4	355	-	-	195.1	-	70.5	-
20080225	9	LW to HW	5.6	0.3	168.3	-	-	195.9	-	71.3	-
20080225	10	HW to LW	5.9	0.4	347.4	-	-	168.3	-	62.1	-
20080225	10	LW to HW	5.5	0.3	167.4	-	-	219.3	-	78.7	-
20080226	11	HW to LW	5.5	0.4	345.2	-	-	176.1	-	61.6	-
20080226	11	LW to HW	5.1	0.3	166.8	-	-	208.9	-	73.8	-
20080226	12	HW to LW	4.9	0.4	347.2	-	-	182	-	59.3	-
20080226	12	LW to HW	5.6	0.3	169.9	-	-	237.6	-	88.9	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080227	13	HW to LW	5.2	0.4	343.4	-	-	190.4	-	64.8	-
20080227	13	LW to HW	5.2	0.3	168.6	-	-	241.5	-	77	-
20080227	14	HW to LW	5.1	0.4	353.6	-	-	199.3	-	71.3	-
20080227	14	LW to HW	4.7	0.3	171.2	-	-	241.2	-	70.2	-
20080228	15	HW to LW	5.2	0.4	347.8	-	-	180.2	-	65.7	-
20080228	15	LW to HW	4.7	0.3	171.2	-	-	225.8	-	72	-
20080228	16	HW to LW	4.8	0.4	343.8	-	-	157.7	-	55.5	-
20080228	16	LW to HW	4.7	0.3	171.4	-	-	261.3	-	83.7	-
20080229	17	HW to LW	4.4	0.4	342.6	-	-	164.5	-	54.3	-
20080229	17	LW to HW	4.5	0.3	175.8	-	-	241.2	-	67.1	-
20080229	18	HW to LW	4.4	0.4	342.7	-	-	156.5	-	49.4	-
20080229	18	LW to HW	3.9	0.3	176.5	-	-	198.7	-	56.8	-
20080301	19	HW to LW	3.2	0.3	341.9	-	-	125.4	-	30.3	-
20080301	19	LW to HW	4.6	0.3	173.8	-	-	176.2	-	50	-
20080301	20	HW to LW	3.4	0.3	336.9	-	-	119.7	-	33.4	-
20080301	20	LW to HW	2.1	0.2	164.6	-	-	216.1	-	41.1	-
20080302	21	HW to LW	3	0.3	339.6	-	-	45.3	-	12.2	-
20080302	21	LW to HW	2.8	0.2	169.6	-	-	105.6	-	19.4	-
20080302	22	HW to LW	3.2	0.3	350	-	-	53.7	-	15.5	-
20080302	22	LW to HW	3.2	0.2	175.3	-	-	92	-	18.9	-
20080303	23	HW to LW	3.5	0.3	358.6	-	-	62.7	-	17.7	-
20080303	23	LW to HW	4	0.2	174.2	-	-	111.7	-	28.7	-
20080303	24	HW to LW	3.8	0.3	353.7	-	-	119.2	-	43.2	-
20080304	24	LW to HW	3.4	0.2	171.7	-	-	105.6	-	23.3	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080304	25	HW to LW	4	0.4	353.3	-	-	105.6	-	34.5	-
20080304	25	LW to HW	4.3	0.3	168.2	-	-	153.1	-	42.3	-
20080304	26	HW to LW	4.1	0.4	353.7	-	-	131	-	53	-
20080305	26	LW to HW	4	0.2	168	-	-	182.4	-	44.2	-
20080305	27	HW to LW	4.8	0.4	354.5	-	-	120.6	-	53.7	-
20080305	27	LW to HW	4.8	0.3	169.5	-	-	244.7	-	75.2	-
20080305	28	HW to LW	5	0.4	356.2	-	-	175.8	-	69.1	-
20080306	28	LW to HW	5.3	0.4	166.1	-	-	260.9	-	92.9	-
20080306	29	HW to LW	5	0.4	359.2	-	-	183.3	-	64.9	-
20080306	29	LW to HW	5.5	0.4	168.5	-	-	252.6	-	94.8	-
20080306	30	HW to LW	5.5	0.4	352.8	-	-	197.3	-	77.3	-
20080307	30	LW to HW	5.3	0.3	165.3	-	-	262.3	-	86.9	-
20080307	31	HW to LW	5.6	0.4	350.3	-	-	200.8	-	80.3	-
20080307	31	LW to HW	6	0.4	167.6	-	-	259.5	-	108.5	-
20080307	32	HW to LW	5.6	0.4	351.6	-	-	240.1	-	91.8	-
20080308	32	LW to HW	5.6	0.4	170.4	-	-	282.2	-	101	-
20080308	33	HW to LW	5.9	0.4	346.5	-	-	234.4	-	93.1	-
20080308	33	LW to HW	6.1	0.4	168.3	-	-	276.2	-	110.5	-
20080308	34	HW to LW	6.1	0.4	350.5	-	-	245.2	-	98.8	-
20080309	34	LW to HW	5.9	0.4	164	-	-	265.2	-	102.7	-
20080309	35	HW to LW	5.9	0.4	354.1	-	-	240.1	-	91.2	-
20080309	35	LW to HW	6.5	0.4	163.8	-	-	278.1	-	111.1	-
20080309	36	HW to LW	6.1	0.4	351.7	-	-	259.1	-	103.2	-
20080310	36	LW to HW	5.8	0.4	166.4	-	-	273.2	-	101.5	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080310	37	HW to LW	6.7	0.4	351.6	-	-	250.4	-	104.7	-
20080310	37	LW to HW	6.2	0.5	163.2	-	-	317.9	-	151.1	-
20080310	38	HW to LW	5.3	0.4	0.8	-	-	302.2	-	111.9	-
20080311	38	LW to HW	6.3	0.4	161.6	-	-	290.1	-	113.9	-
20080311	39	HW to LW	6	0.4	351.1	-	-	273.8	-	105.7	-
20080311	39	LW to HW	5.8	0.4	165.1	-	-	279.7	-	105.3	-
20080312	40	HW to LW	5.4	0.4	354.7	-	-	257.2	-	94.8	-
20080312	40	LW to HW	5.9	0.4	164.2	-	-	286	-	109.5	-
20080312	41	HW to LW	5.5	0.4	353.6	-	-	259.2	-	100.4	-
20080312	41	LW to HW	5.4	0.3	165	-	-	294.1	-	99.6	-
20080313	42	HW to LW	5.5	0.4	356.5	-	-	235.8	-	88.6	-
20080313	42	LW to HW	5.4	0.4	166	-	-	259.7	-	92.5	-
20080313	43	HW to LW	5.9	0.4	351.9	-	-	252.5	195.1	86.5	-
20080313	43	LW to HW	5.3	0.3	99.3	-	-	282.1	360.1	72.6	-
20080314	44	HW to LW	5.7	0.2	254.9	-	-	199.8	280.7	32	-
20080314	44	LW to HW	5.5	0.3	91.6	-	-	317.9	396.3	95.7	-
20080314	45	HW to LW	5.3	0.2	260.5	-	-	245.5	329.7	31	-
20080314	45	LW to HW	4.9	0.3	94.4	-	-	235.5	292.1	59.3	-
20080315	46	HW to LW	5	0.2	273.6	-	-	159.1	317.2	22.5	-
20080315	46	LW to HW	4.9	0.2	98.2	-	-	221.7	-	51.1	-
20080315	47	HW to LW	4.8	0.2	252.1	-	-	158.9	-	22.7	-
20080315	47	LW to HW	4.4	0.2	85.7	-	-	177.3	-	37.9	-
20080316	48	HW to LW	4.2	0.2	275.2	-	-	188.9	-	22.3	-
20080316	48	LW to HW	4.6	0.2	82.2	-	-	197.4	-	49.5	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

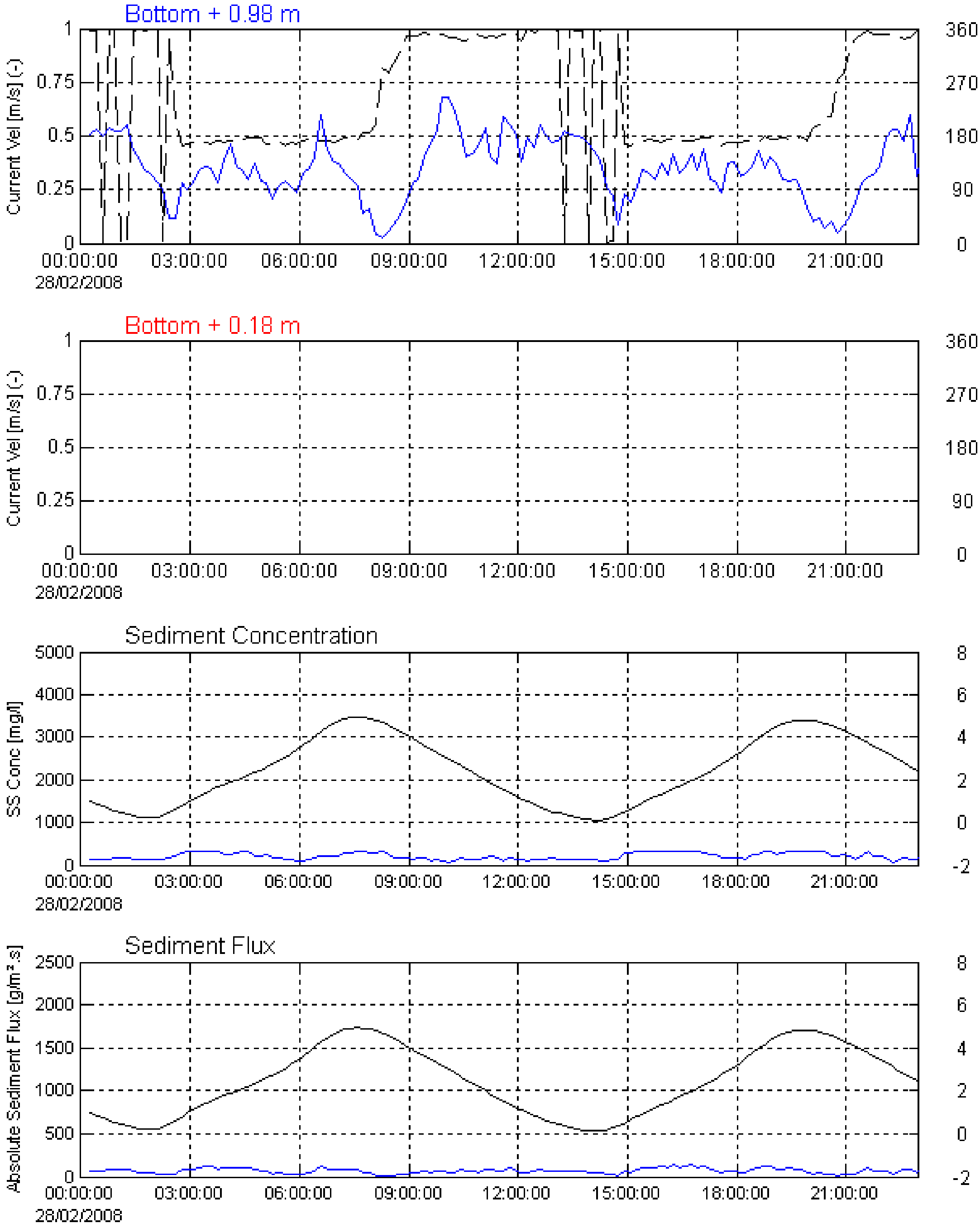
Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080316	49	HW to LW	4.2	0.2	273.2	-	-	110.8	-	16.8	-
20080316	49	LW to HW	3.7	0.1	106.8	-	-	128	-	19.3	-
20080317	50	HW to LW	4	0.2	258.5	-	-	55.2	-	9	-
20080317	50	LW to HW	4.5	0.2	110.8	-	-	122.9	-	26.6	-
20080317	51	HW to LW	4.4	0.2	268.6	-	-	78.1	-	12.6	-
20080318	51	LW to HW	4.3	0.2	103.8	-	-	113.2	-	24.8	-
20080318	52	HW to LW	4.7	0.2	250	-	-	79.5	-	14.1	-
20080318	52	LW to HW	5.3	0.2	100.5	-	-	155.5	-	35.6	-
20080318	53	HW to LW	5	0.2	265.5	-	-	131.5	-	18.1	-
20080319	53	LW to HW	4.9	0.2	98.8	-	-	169.6	-	40.9	-
20080319	54	HW to LW	5.1	0.2	258.5	-	-	117.8	-	17.9	-
20080319	54	LW to HW	5.5	0.2	87.3	-	-	206.8	-	50.3	-
20080319	55	HW to LW	5.4	0.2	254.3	-	-	135.3	-	20.6	-
20080320	55	LW to HW	5.2	0.2	96.2	-	-	226.4	-	57.3	-
20080320	56	HW to LW	5.7	0.2	255.4	-	-	143.1	-	20.7	-
20080321	56	LW to HW	6.5	0.4	100.2	-	-	208.7	-	81	-
20080321	57	HW to LW	5.4	0.4	348.8	-	-	191.2	-	66.3	-
20080321	57	LW to HW	6	0.4	158.6	-	-	301.5	-	129.4	-
20080321	58	HW to LW	6	0.5	348.8	-	-	206.6	-	88.8	-
20080322	58	LW to HW	5.3	0.4	162.7	-	-	353.5	-	133.6	-
20080322	59	HW to LW	6.1	0.5	351.8	-	-	194.6	-	67.6	-
20080322	59	LW to HW	5.8	0.4	161.6	-	-	302	-	124.6	-
20080322	60	HW to LW	5.9	0.5	349.5	-	-	147.9	-	49.6	-
20080323	60	LW to HW	5.5	0.4	158.9	-	-	206.5	-	80.6	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080323	61	HW to LW	6.1	0.5	348	-	-	186.7	-	63.1	-
20080323	61	LW to HW	6.3	0.4	157.9	-	-	249.8	-	123.8	-
20080323	62	HW to LW	5.7	0.4	345	-	-	190.1	-	63.9	-
20080324	62	LW to HW	5.9	0.4	158.9	-	-	251.8	-	107.4	-
20080324	63	HW to LW	5.8	0.4	346	-	-	182.3	-	62.1	-
20080324	63	LW to HW	5.8	0.4	157.4	-	-	201.5	-	89	-
20080324	64	HW to LW	5.5	0.4	344.8	-	-	180.4	-	56	-
20080325	64	LW to HW	5.8	0.4	160.5	-	-	249.6	-	103.3	-
20080325	65	HW to LW	5.8	0.4	342.3	-	-	132.3	-	46.1	-
20080325	65	LW to HW	5.6	0.4	161.7	-	-	192.7	-	81.9	-
20080326	66	HW to LW	5.7	0.4	348.7	-	-	145.5	-	46.2	-
20080326	66	LW to HW	5.5	0.4	159.1	-	-	180.6	-	76.2	-
20080326	67	HW to LW	5.8	0.4	345.9	-	-	131	-	38	-
20080326	67	LW to HW	5.5	0.4	158.1	-	-	141.9	-	60.6	-
20080327	68	HW to LW	5.4	0.4	344.8	-	-	136.1	-	39.2	-
20080327	68	LW to HW	5.3	0.4	157.7	-	-	137	-	55.9	-
20080327	69	HW to LW	5.3	0.4	346.3	-	-	127.1	-	39.6	-
20080327	69	LW to HW	5.2	0.4	157.8	-	-	174.2	-	70.8	-
20080328	70	HW to LW	5	0.4	348.9	-	-	131	-	45.7	-
20080328	70	LW to HW	4.9	0.4	156	-	-	130.2	-	55	-
20080328	71	HW to LW	5	0.4	344.7	-	-	105.3	-	34.9	-
20080328	71	LW to HW	4.2	0.4	157	-	-	157.8	-	62.9	-
20080329	72	HW to LW	3.6	0.3	343	-	-	87.5	-	20.7	-
20080329	72	LW to HW	4.4	0.3	159.8	-	-	122	-	42.2	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE											
Date	**Tide no.**	**Phase**	**Tidal Diff**	**UP Velocity (RCM9) Bottom +1.0m**		**DOWN Velocity (Valeport) Bottom +0.1m**		**SS Concentration [mg/l]**		**SS Flux [g/m²s]**	
			[m]	**Magnitude [m/s]**	**Direction [°]**	**Magnitude [m/s]**	**Direction [°]**	**UP (RCM9)**	**DOWN (Valeport)**	**UP (RCM9)**	**DOWN (Valeport)**
20080329	73	HW to LW	4.1	0.3	344.1	-	-	76.4	-	22.4	-
20080329	73	LW to HW	3.8	0.3	161.4	-	-	99.9	-	33.8	-
20080330	74	HW to LW	4.3	0.4	343	-	-	51.2	-	16.9	-
20080330	74	LW to HW	3.8	0.3	161.9	-	-	62.2	-	24.5	-
20080330	75	HW to LW	3.5	0.3	342	-	-	40.8	-	10.3	-
20080330	75	LW to HW	3.8	0.3	156.3	-	-	87.2	-	26.2	-
20080331	76	HW to LW	3.5	0.3	351.1	-	-	33.4	-	8.9	-
20080331	76	LW to HW	3.5	0.3	160.5	-	-	40.5	-	12.2	-
20080331	77	HW to LW	3.6	0.3	349.1	-	-	34.7	-	9.8	-
20080331	77	LW to HW	3	0.2	155.4	-	-	36.5	-	11.1	-
20080401	78	HW to LW	3.5	0.3	344.2	-	-	25.9	-	7	-
20080401	78	LW to HW	3.5	0.3	160.2	-	-	37	-	12	-
20080401	79	HW to LW	3.4	0.3	347.6	-	-	34	-	8.9	-
20080402	79	LW to HW	3.9	0.3	155.5	-	-	55.1	-	18.4	-
20080402	80	HW to LW	3.6	0.3	342.7	-	-	30.6	-	8.2	-

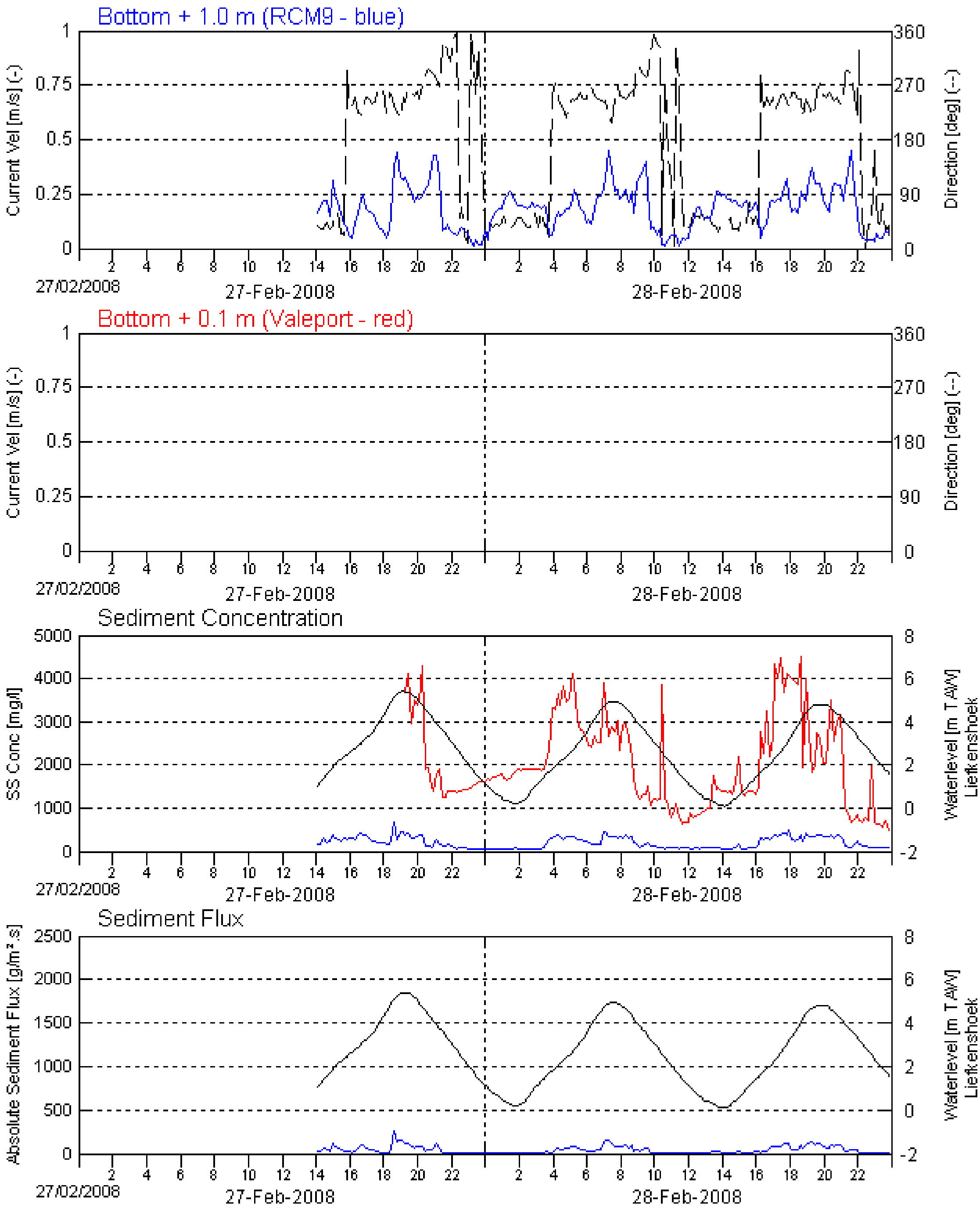
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok CDW	Date: Avg Tide 28/02/08	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

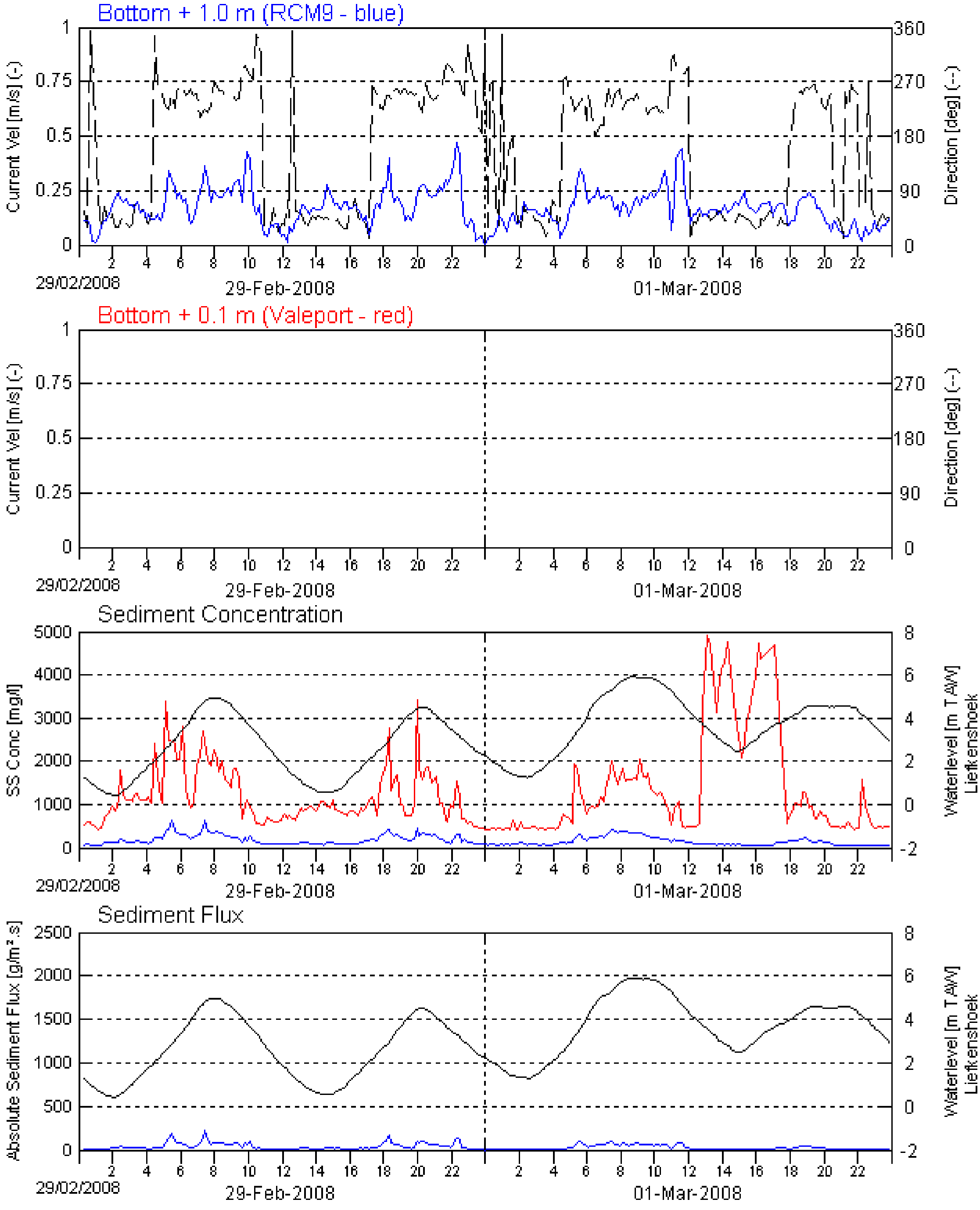
E.2 Sill Frame

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



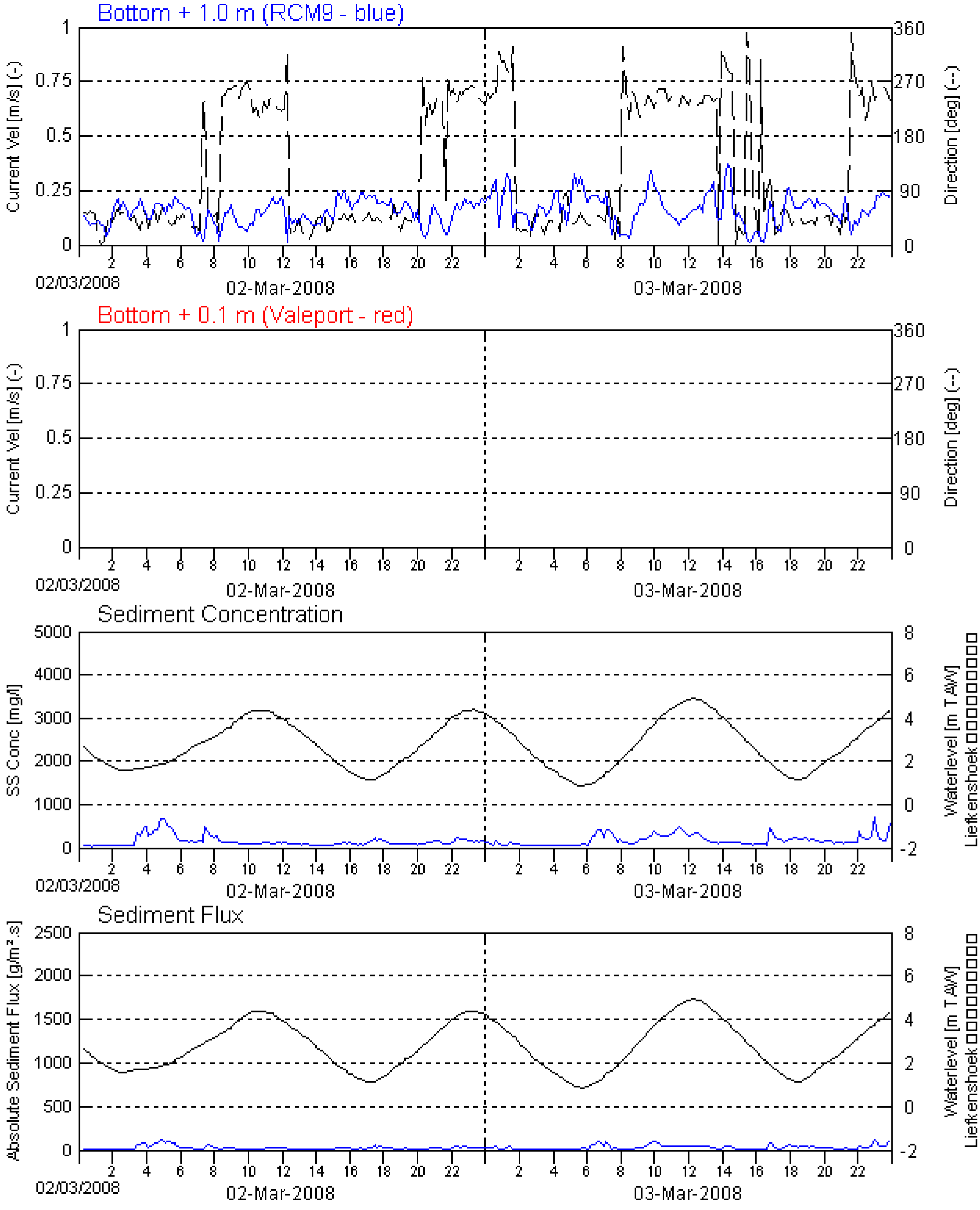
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 27/02/2008– 28/02/2008	In association with: WL delft hydraulics, GEMS International I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



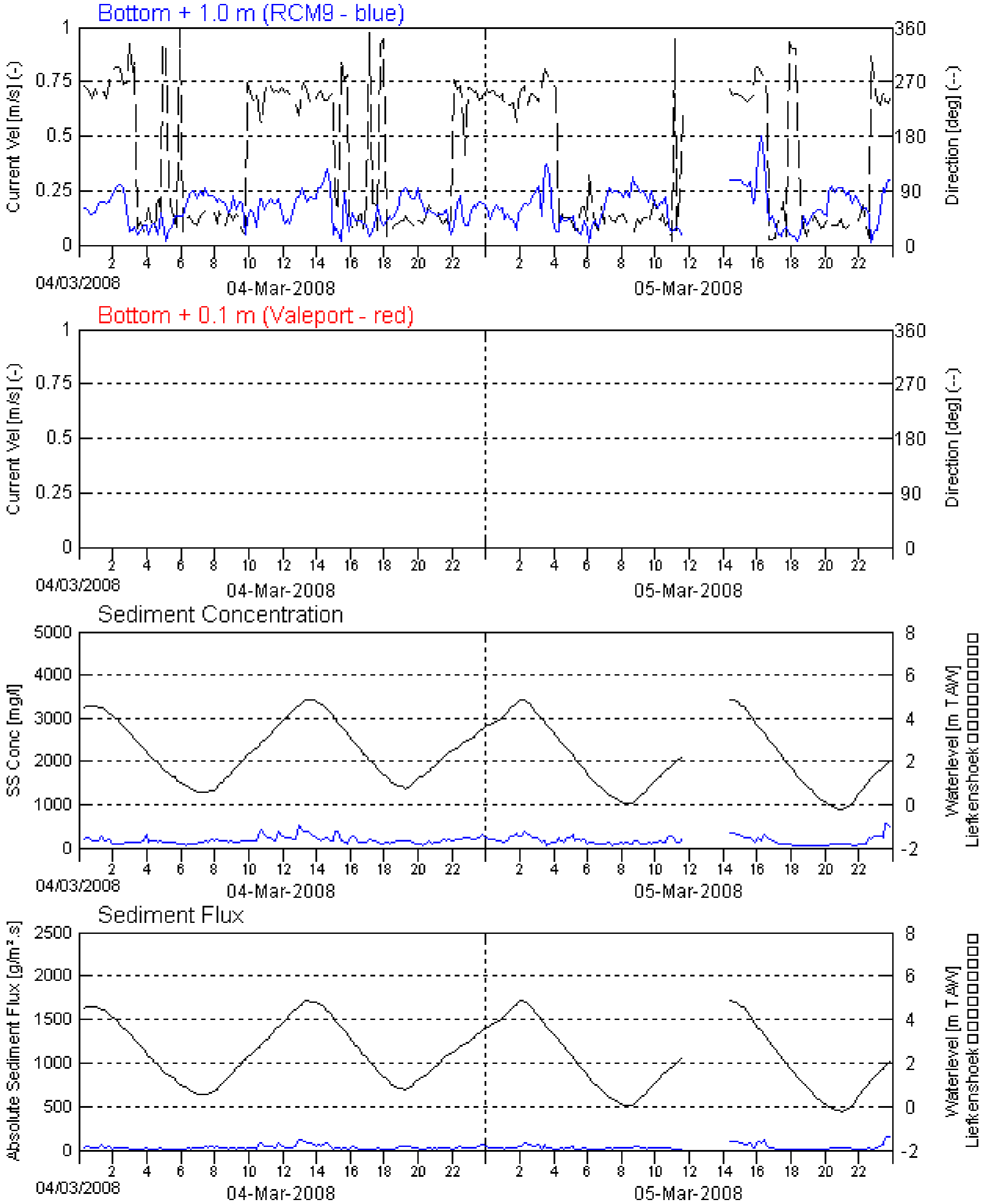
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel	*Data processed by:* IMDC *In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07/094/MSA*
Location: Deurganckdok Sill	Date: 29/02/2008– 01/03/2008

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: 02/03/2008– 03/03/2008	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07/094/MSA*

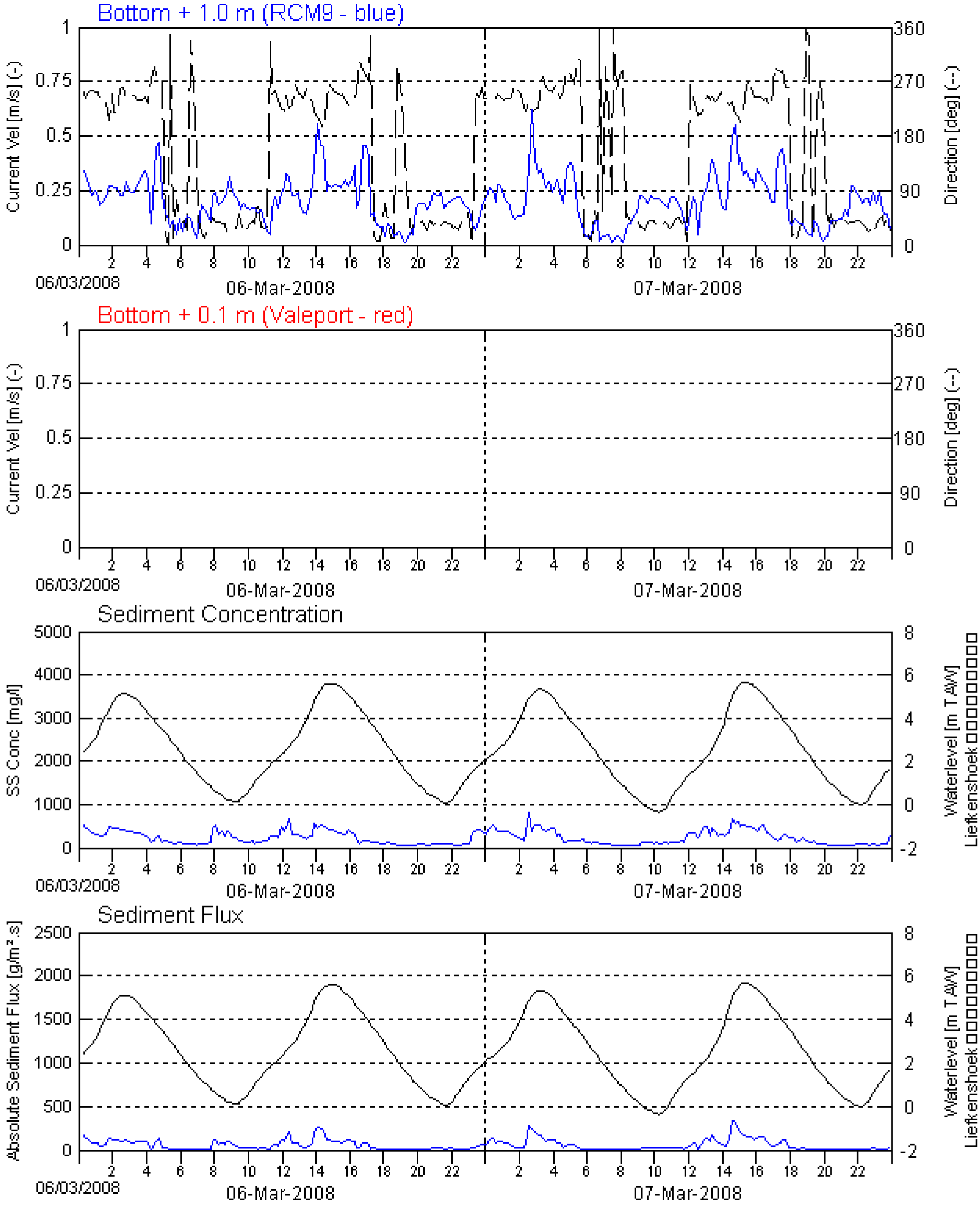
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by:
Location: Deurganckdok Sill	Date: 04/03/2008– 05/03/2008	In association with:

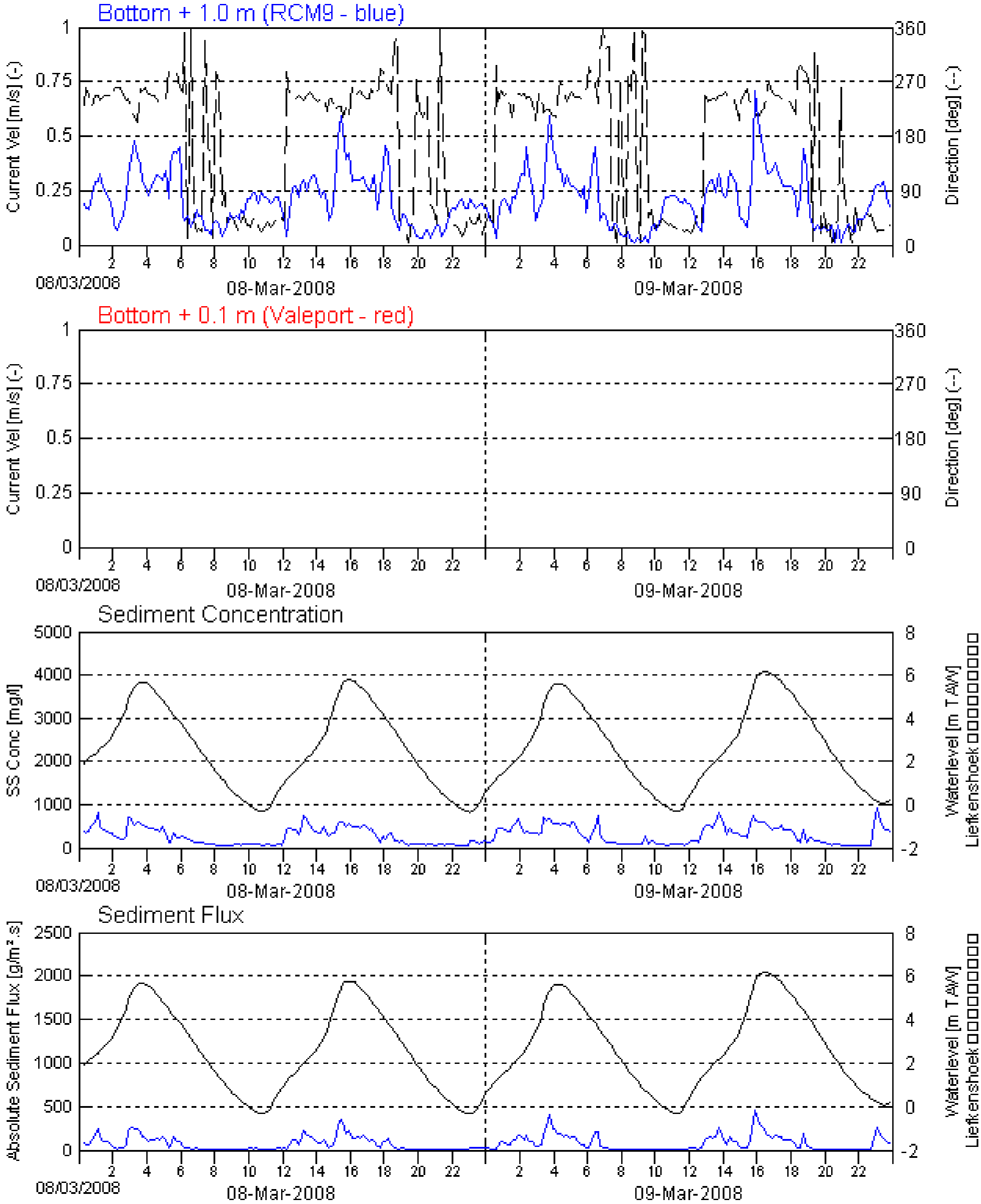
I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 06/03/2008– 07/03/2008	In association with: WL delft hydraulics, GEMS International
		I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel

Location: Deurganckdok Sill

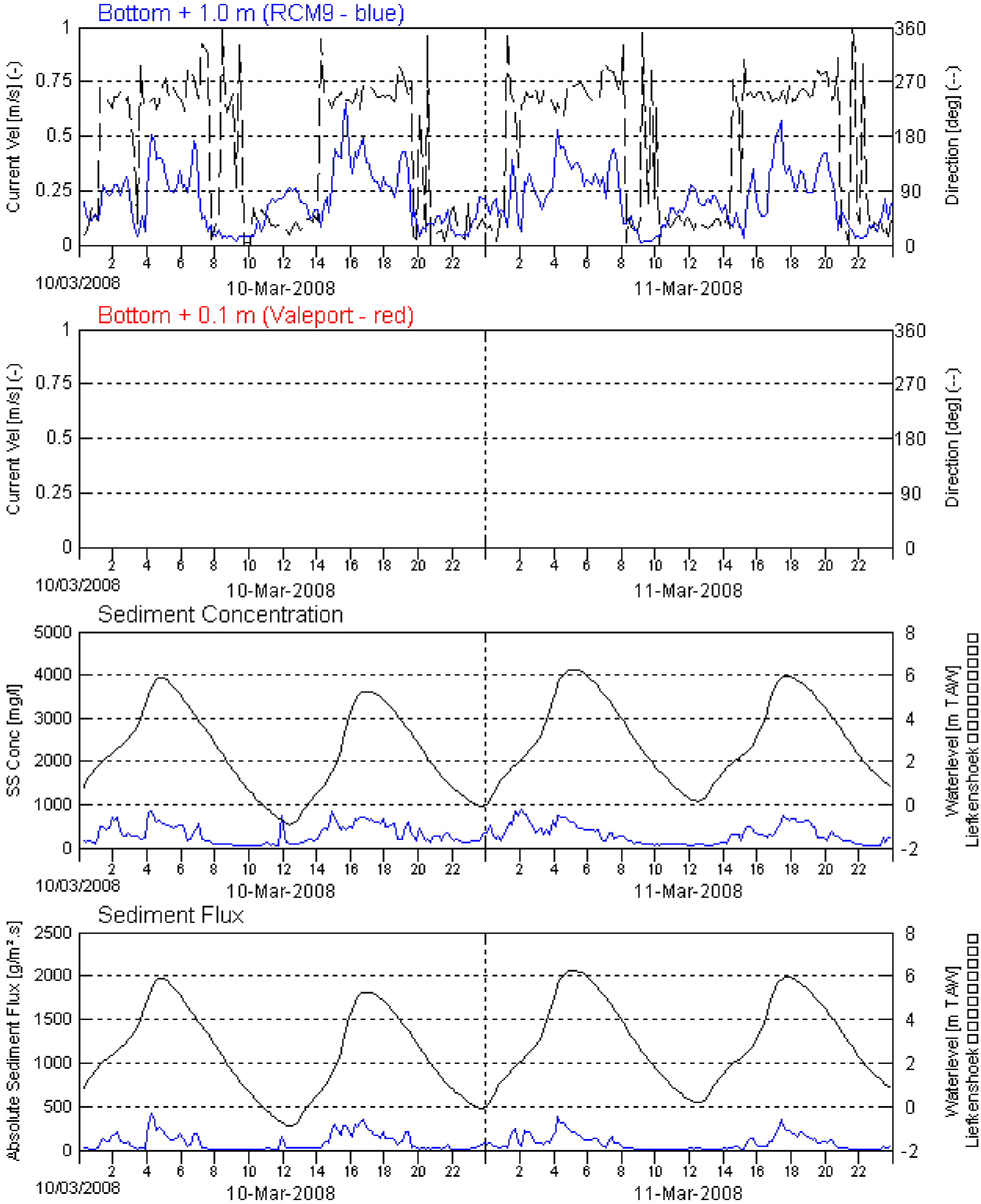
Date: 08/03/2008– 09/03/2008

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

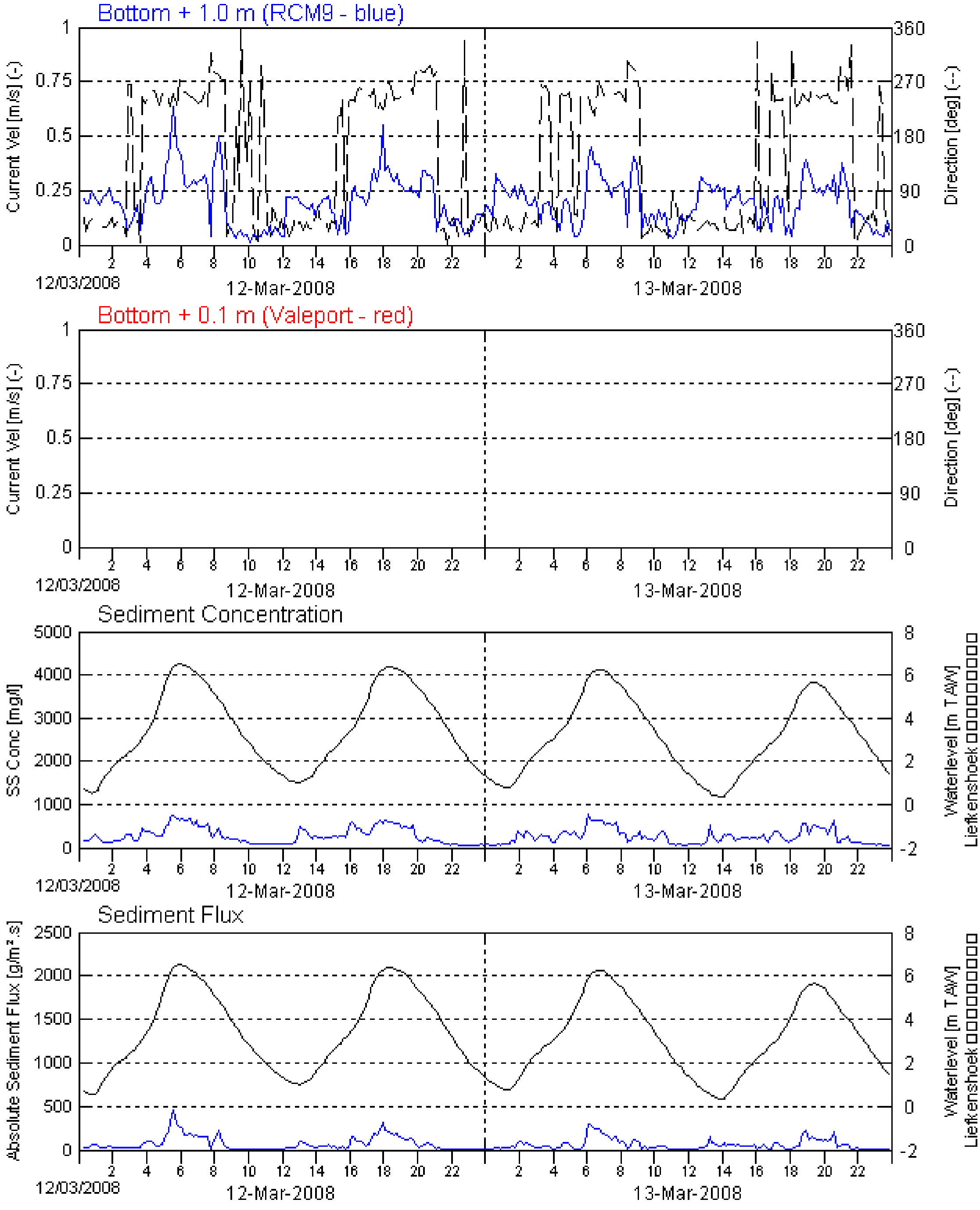
I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: 10/03/2008– 11/03/2008	*In association with:* WL | delft hydraulics, GEMS International
		I/RA/11283/07/094/MSA

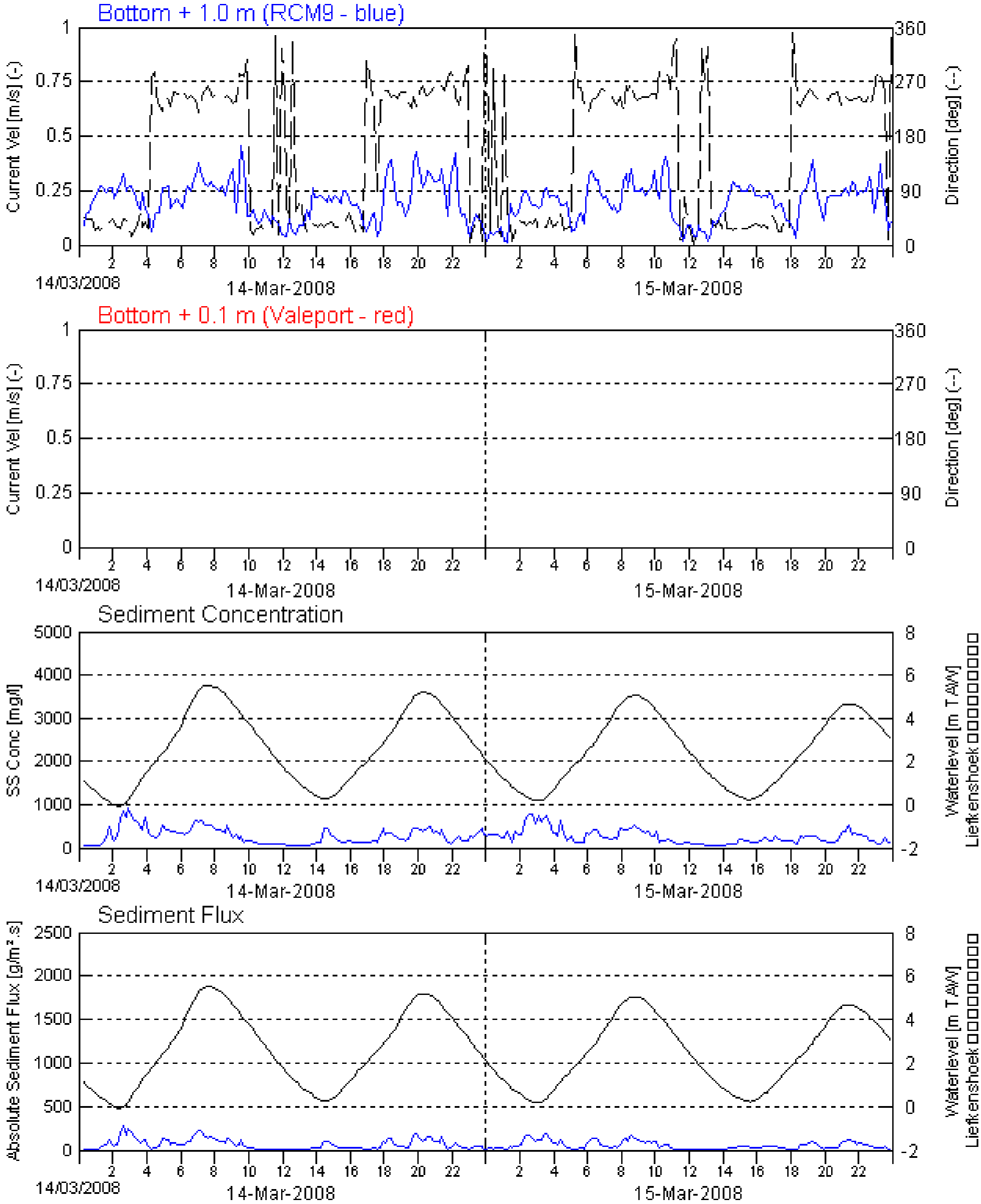
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel	Data processed by: IMDC
Location: Deurganckdok Sill — Date: 12/03/2008– 13/03/2008	In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel

Location: Deurganckdok Sill

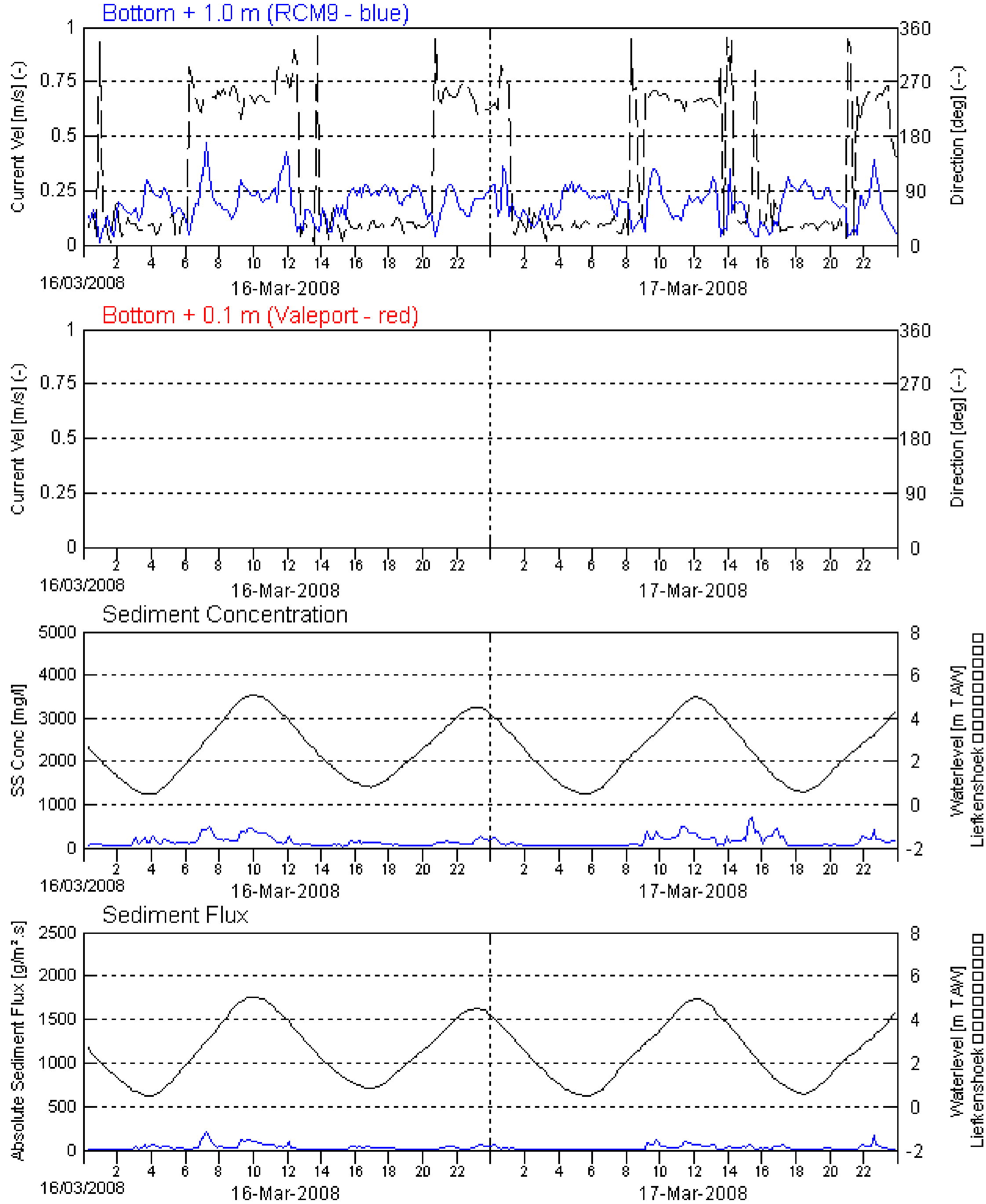
Date: 14/03/2008– 15/03/2008

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

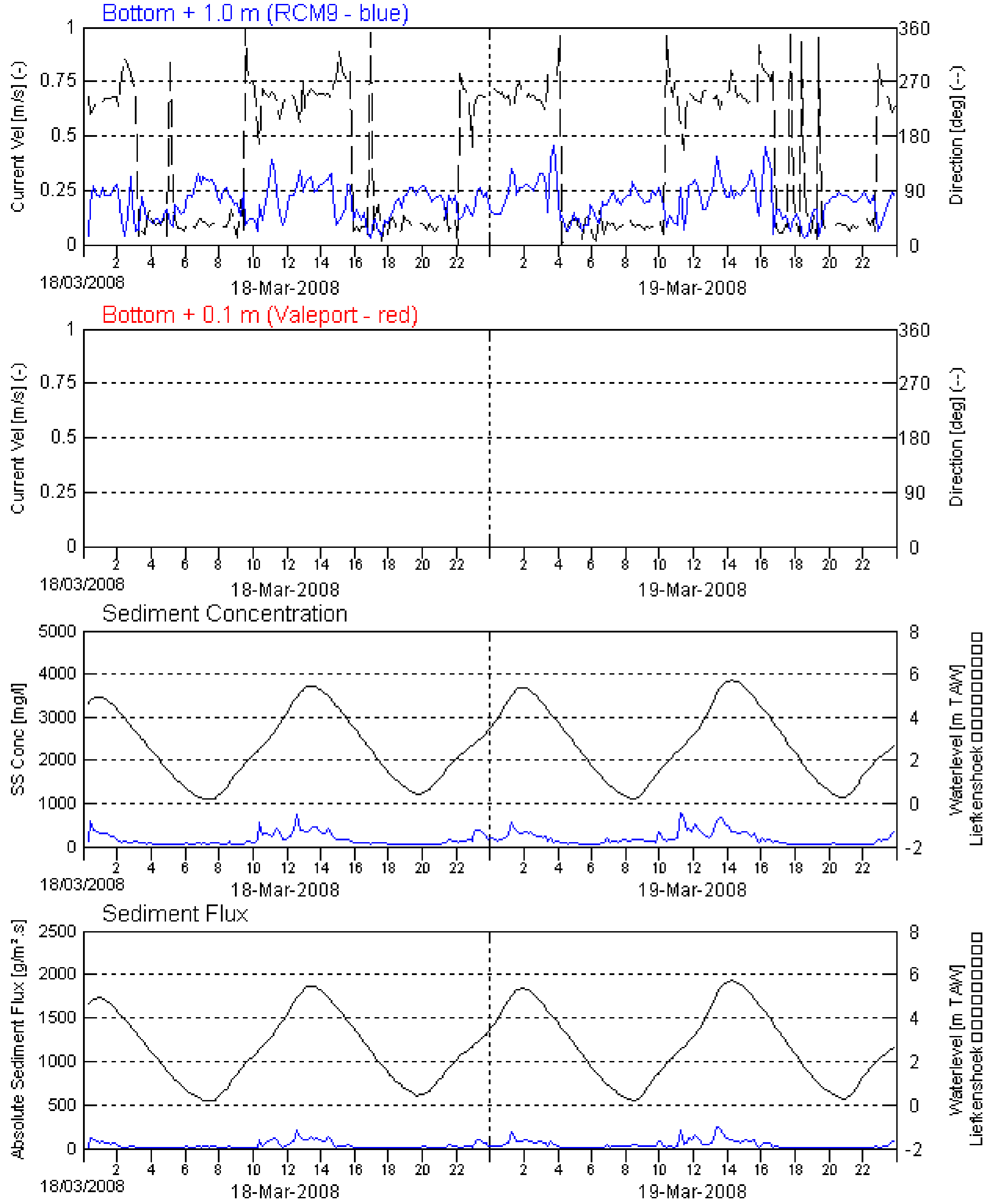
I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



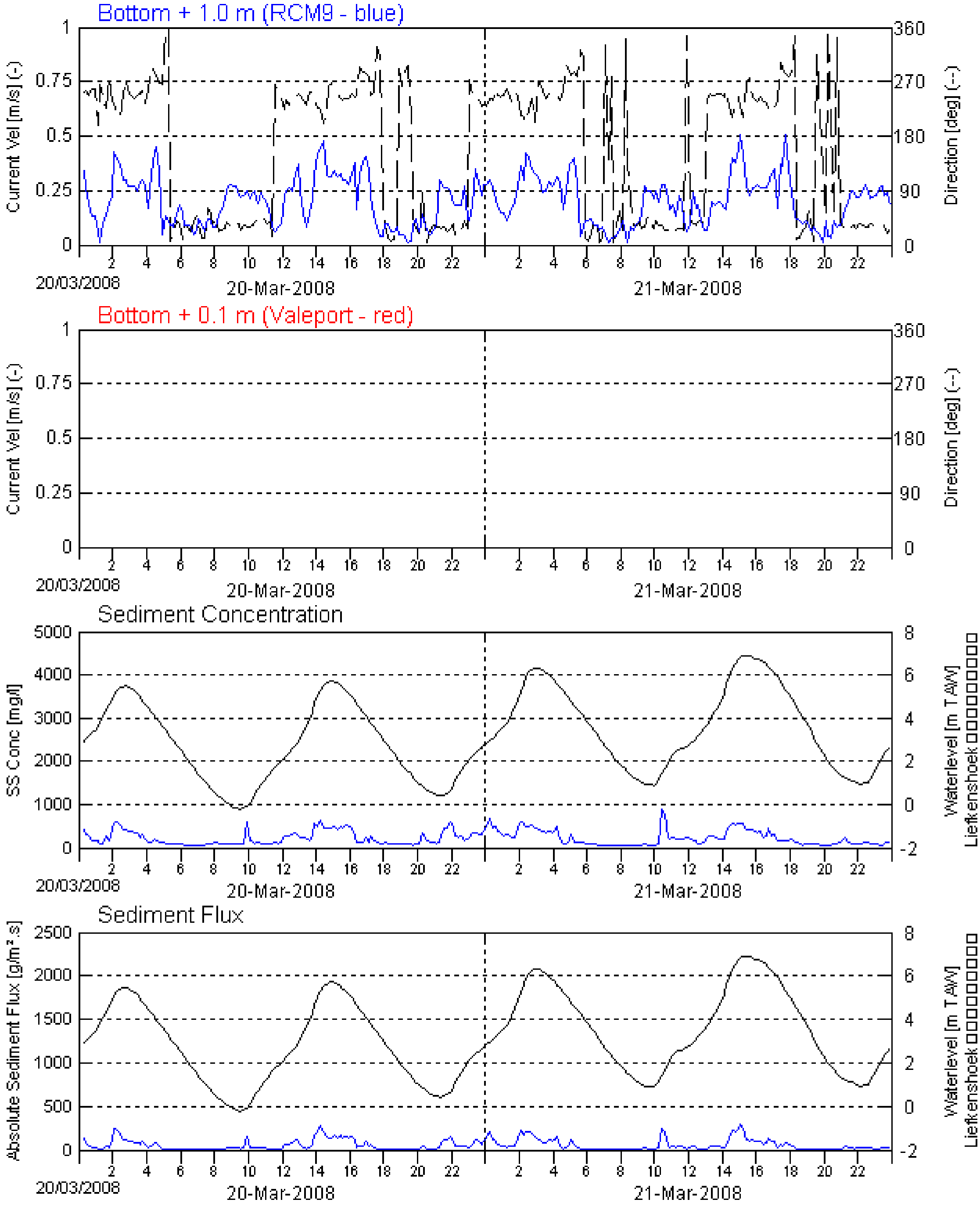
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: 16/03/2008– 17/03/2008	*In association with:* WL | delft hydraulics, GEMS International
		I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



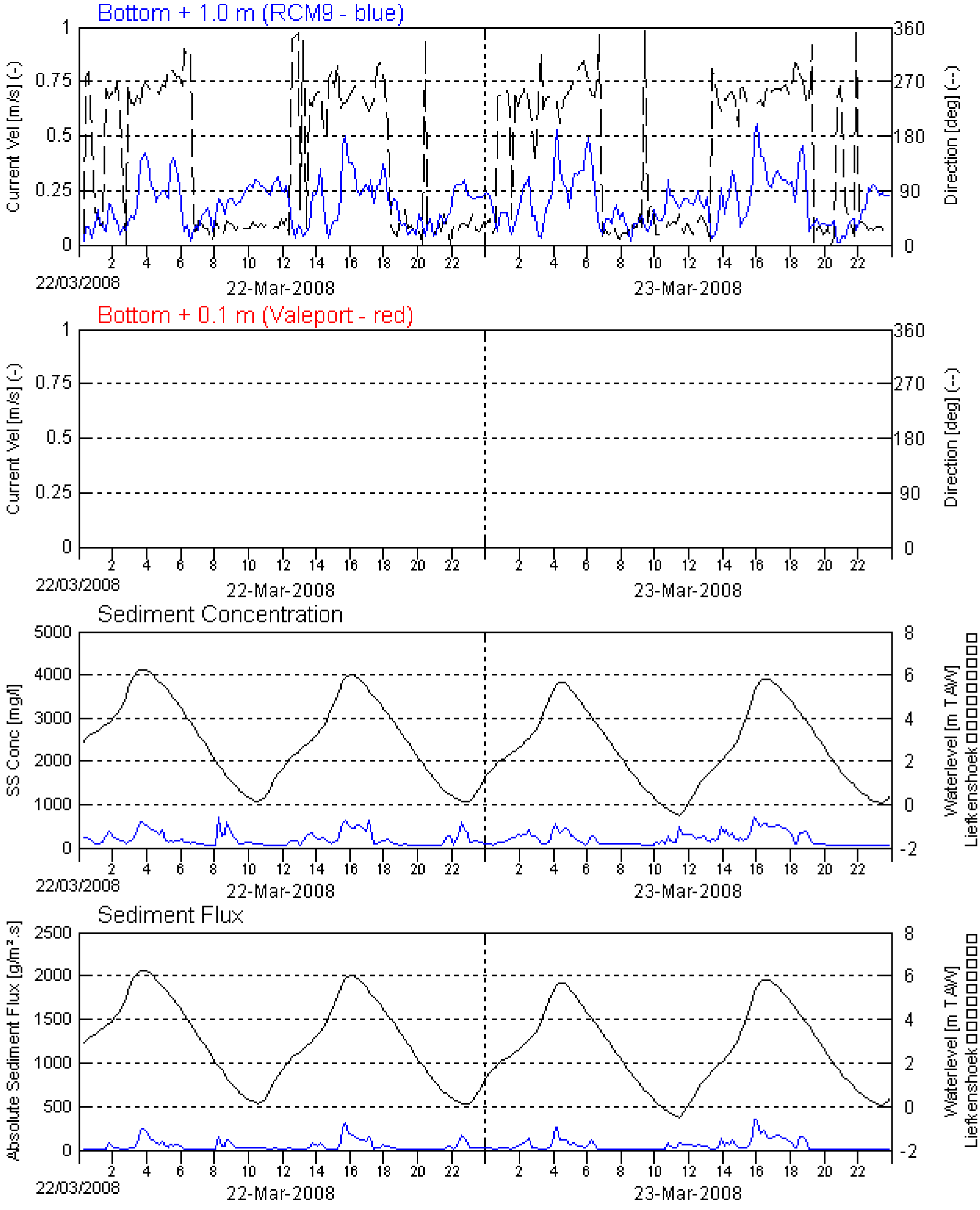
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: 18/03/2008– 19/03/2008	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07/094/MSA*

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



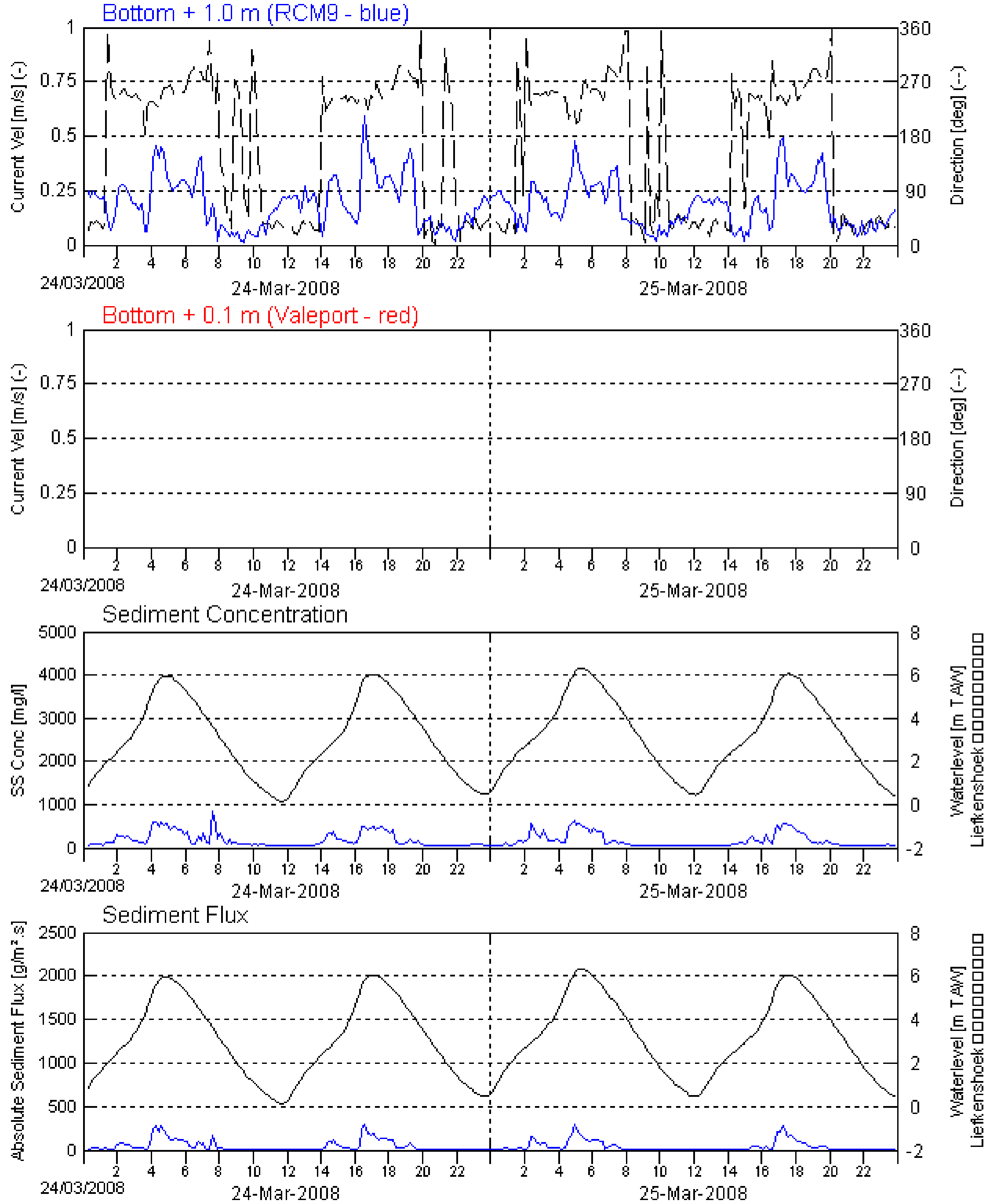
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: 20/03/2008– 21/03/2008	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07/094/MSA*

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 22/03/2008– 23/03/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07/094/MSA

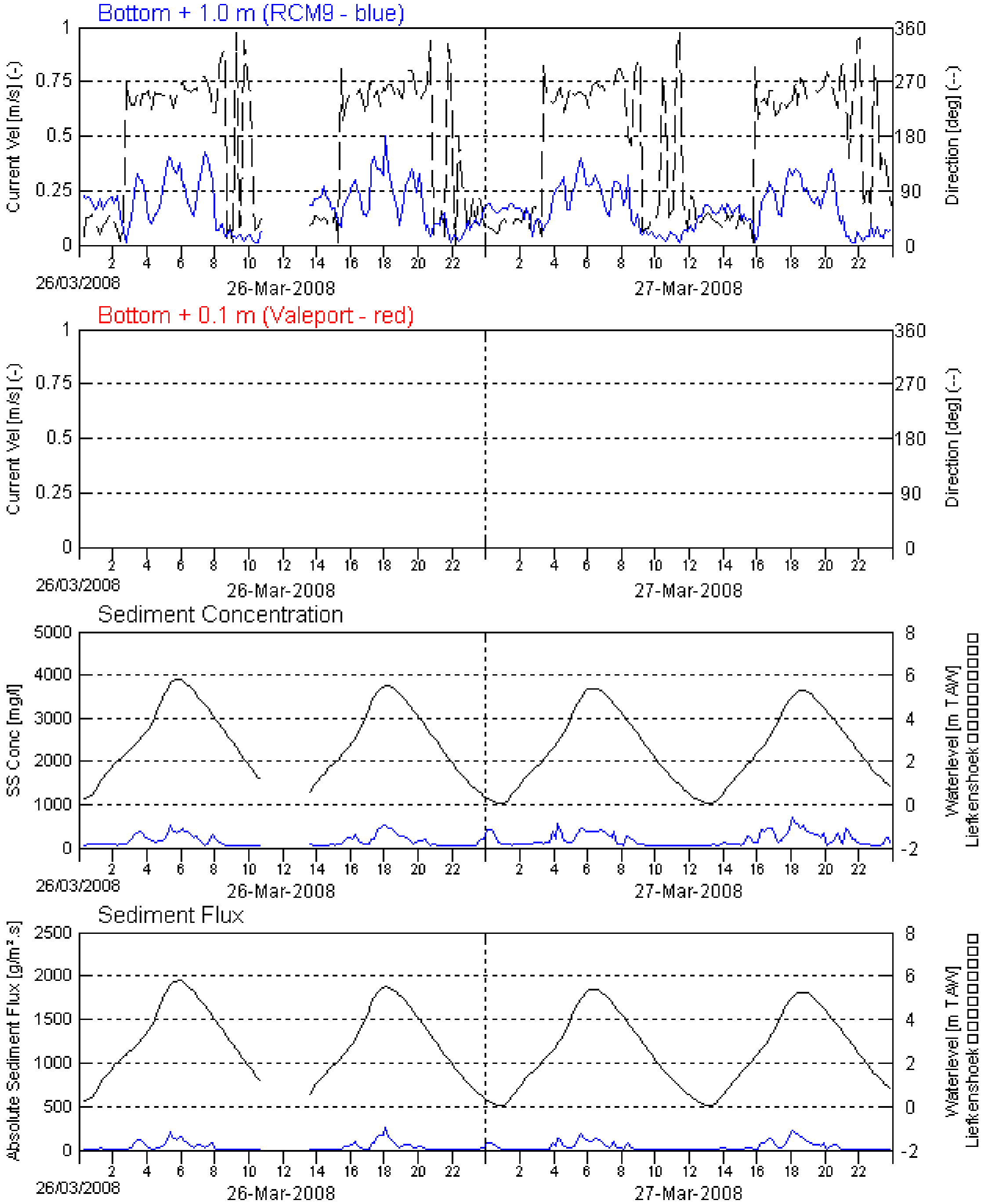
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel	*Data processed by:* IMDC
Location: Deurganckdok Sill / Date: 24/03/2008– 25/03/2008	*In association with:* WL | delft hydraulics, GEMS International

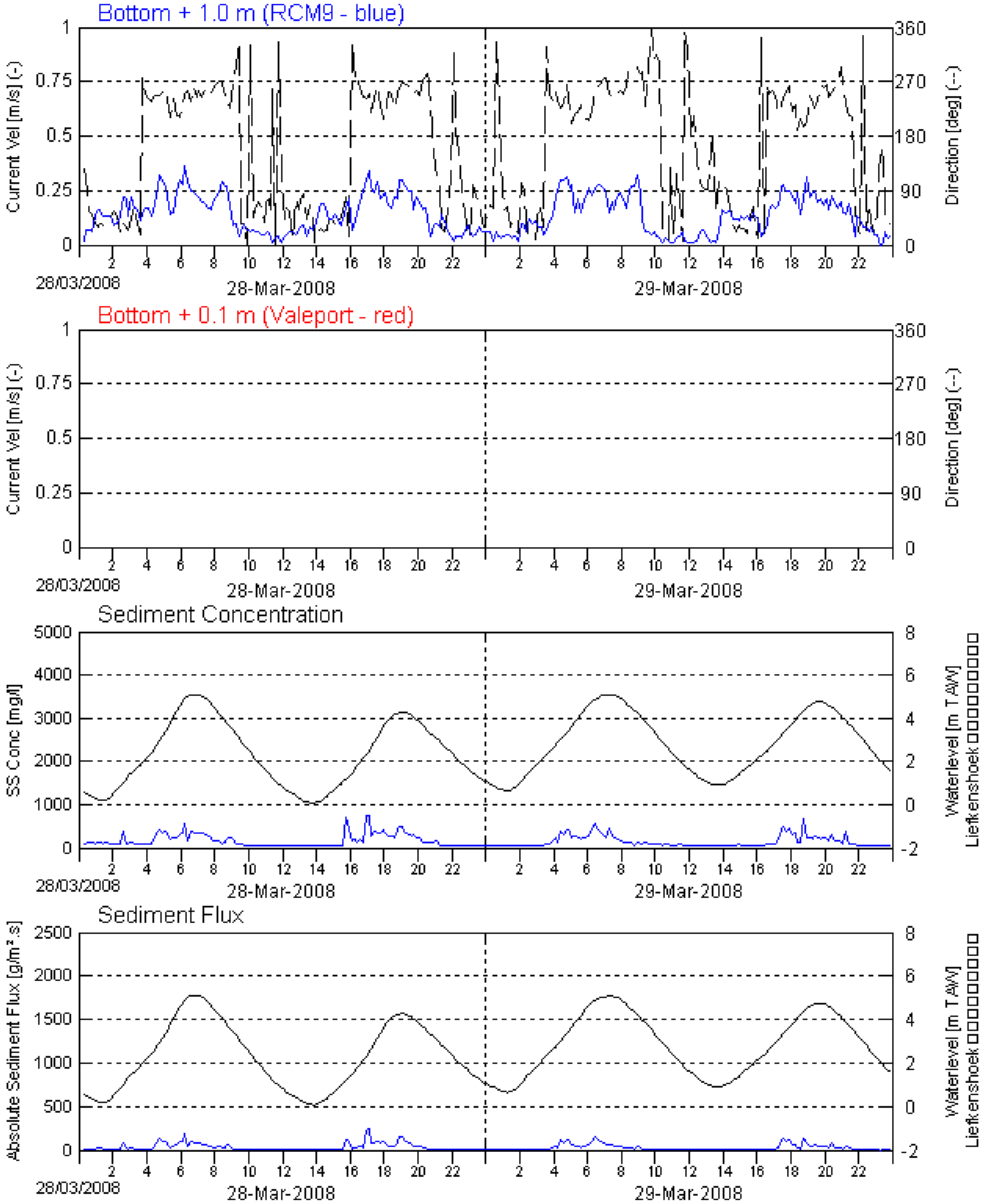
I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



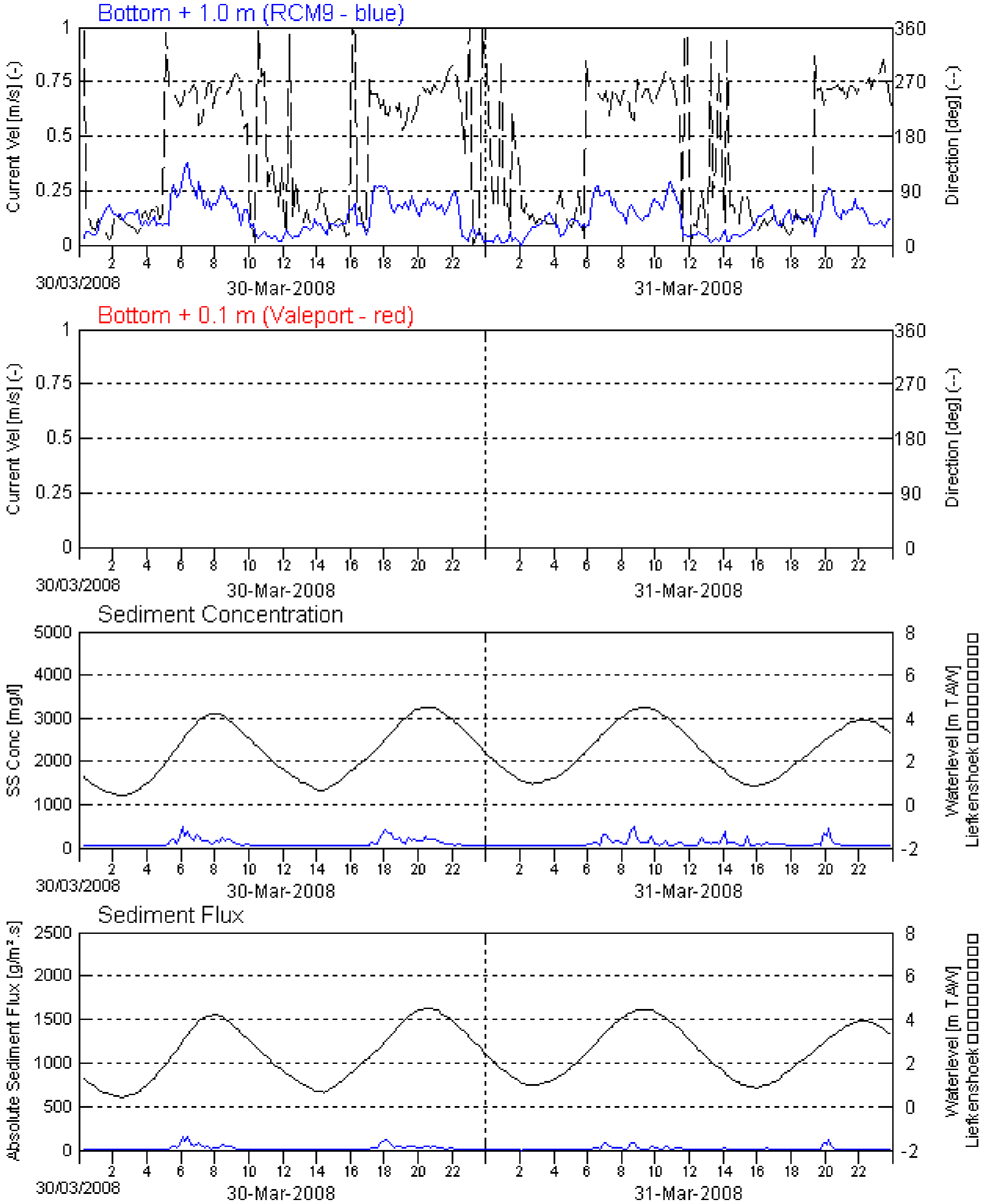
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 26/03/2008– 27/03/2008	In association with: WL delft hydraulics, GEMS International
		I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 28/03/2008– 29/03/2008	In association with: WL | delft hydraulics, GEMS International I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel

Data processed by: IMDC

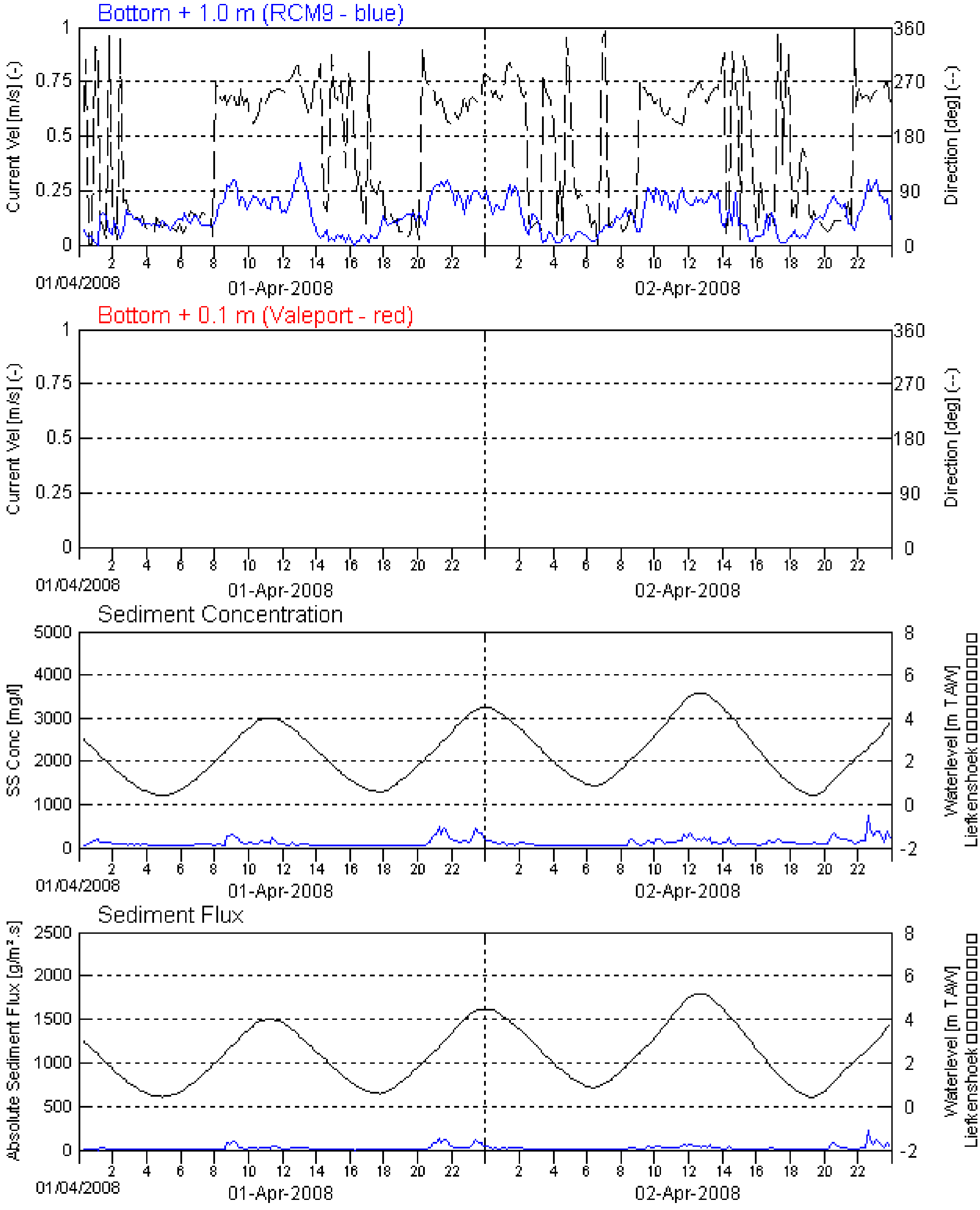
In association with: WL | delft hydraulics, GEMS International

Location: Deurganckdok Sill

Date: 30/03/2008– 31/03/2008

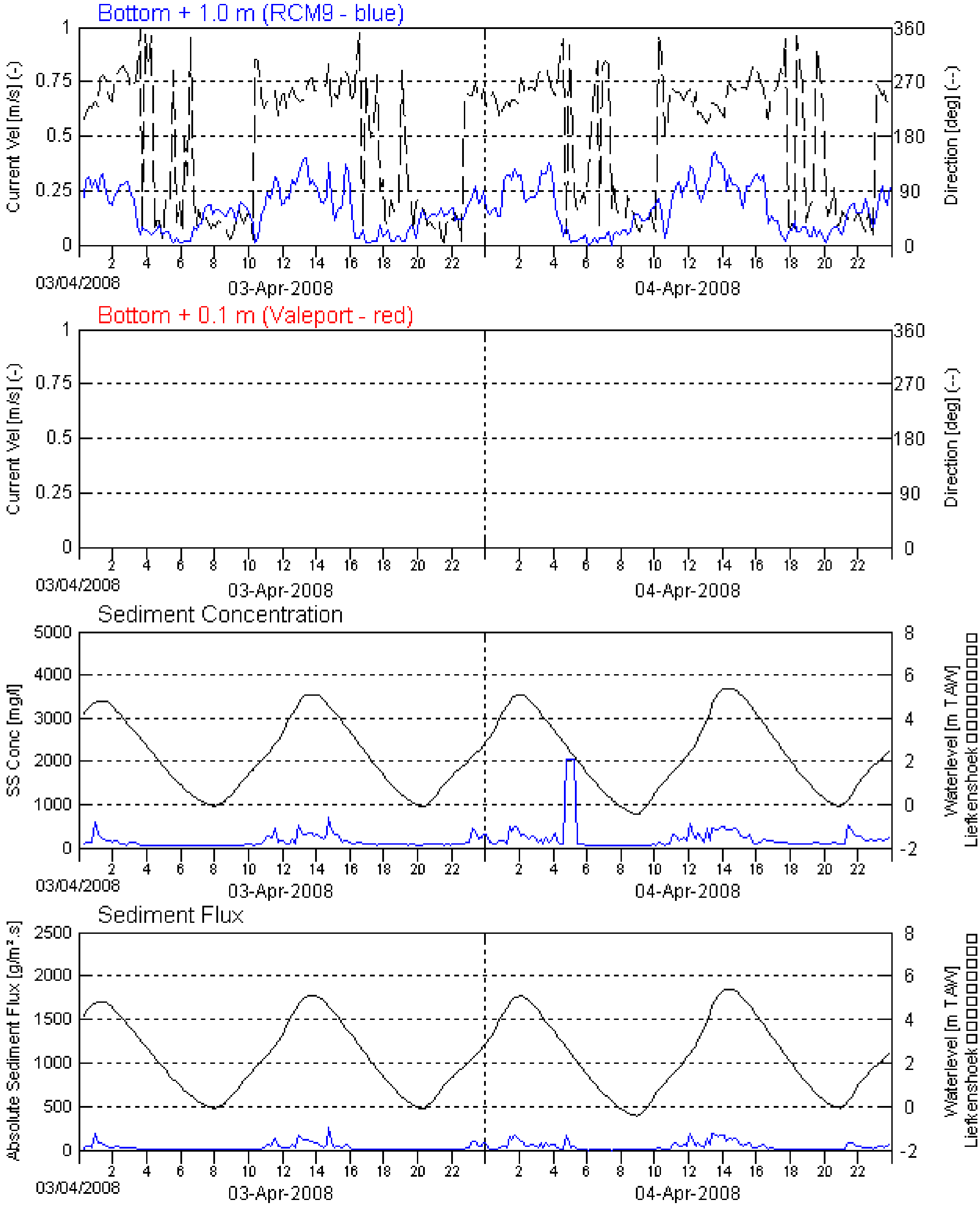
I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



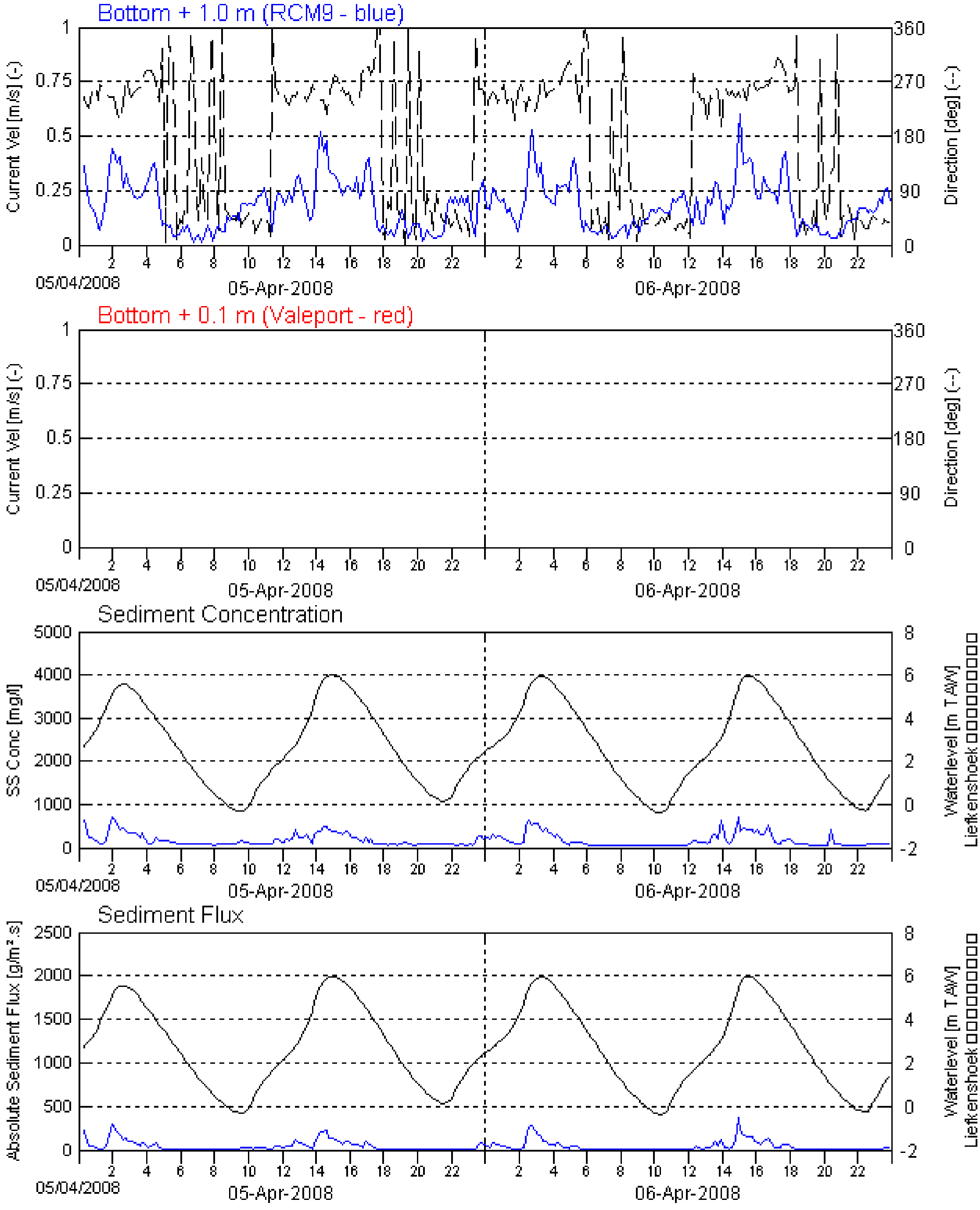
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 01/04/2008– 02/04/2008	In association with: WL delft hydraulics, GEMS International
		I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



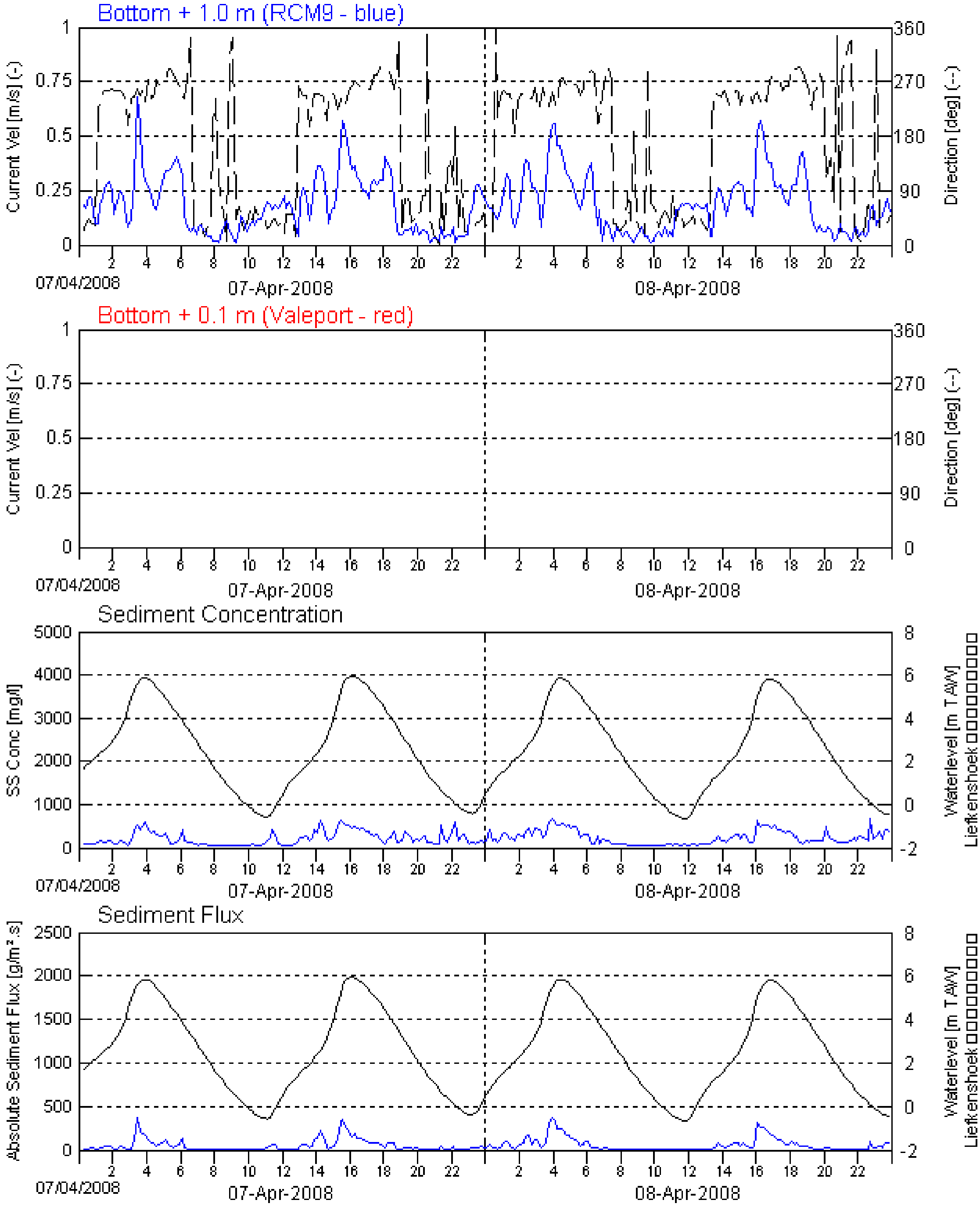
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 03/04/2008– 04/04/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



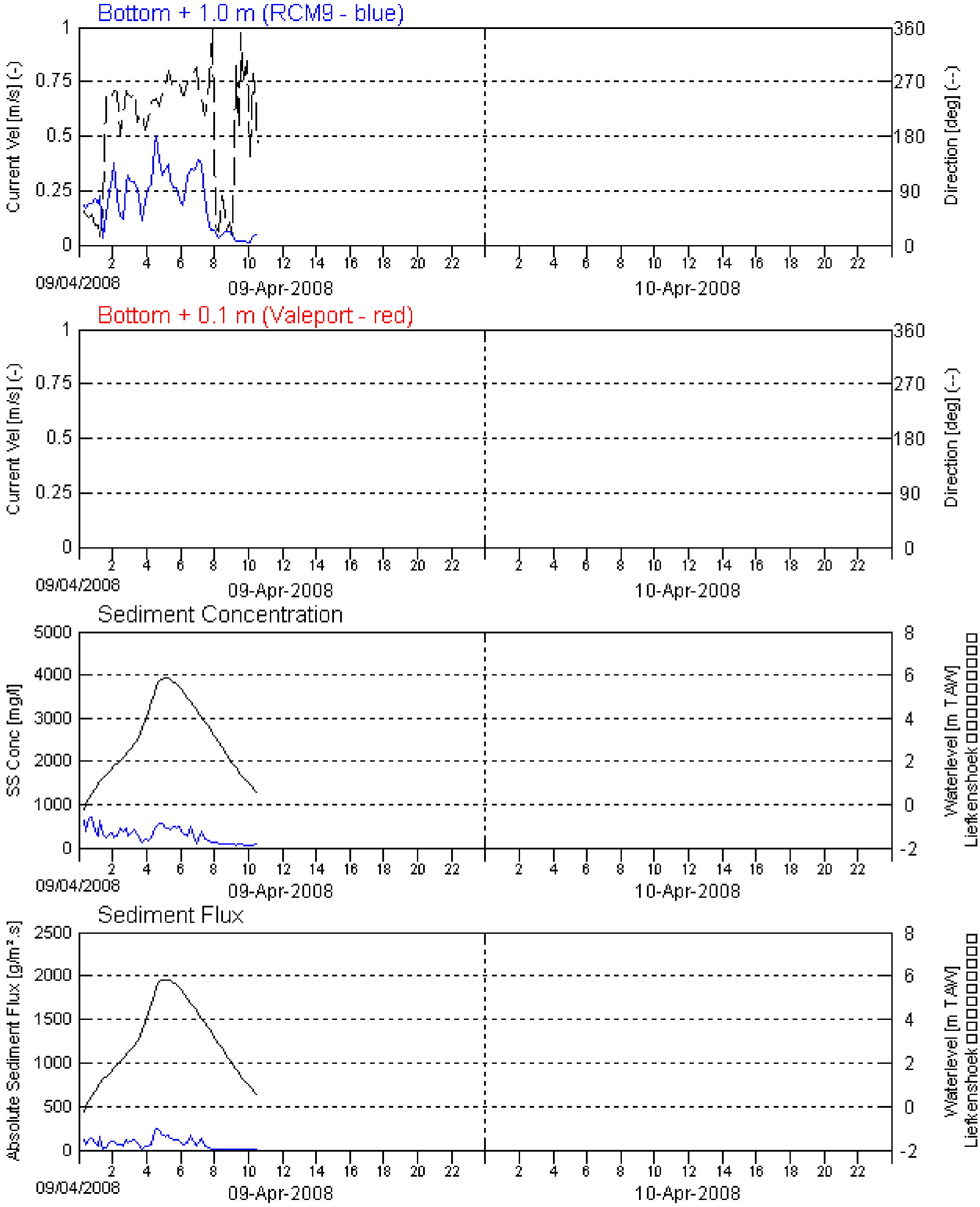
Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: 05/04/2008– 06/04/2008	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07/094/MSA*

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 07/04/2008– 08/04/2008	In association with: WL | delft hydraulics, GEMS International I/RA/11283/07/094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		Data processed by: IMDC
Location: Deurganckdok Sill	Date: 09/04/2008	In association with: WL | delft hydraulics, GEMS International
		I/RA/11283/07/094/MSA

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080227	1	LW to HW	4.5	0.2	269.9	-	-	288.9	4037.7	58.9	-
20080228	1	HW to LW	5.2	0.2	339.2	-	-	130.9	1950.2	29.7	-
20080228	2	LW to HW	4.7	0.2	265.8	-	-	223.8	2701.6	47.2	-
20080228	2	HW to LW	4.8	0.2	351.7	-	-	132.7	1424	26.3	-
20080228	3	LW to HW	4.7	0.2	268.3	-	-	251.3	2495.9	57.9	-
20080229	3	HW to LW	4.4	0.1	355.6	-	-	153.4	1134	27.4	-
20080229	4	LW to HW	4.5	0.2	281.8	-	-	256.8	1619.9	57.4	-
20080229	4	HW to LW	4.4	0.2	359.4	-	-	147.1	989.7	30.9	-
20080229	5	LW to HW	3.9	0.2	303.1	-	-	190.5	1180.7	39.1	-
20080301	5	HW to LW	3.2	0.2	279.7	-	-	145.4	779.1	31.5	-
20080301	6	LW to HW	4.6	0.2	245.7	-	-	203.7	1006.6	39.4	-
20080301	6	HW to LW	3.4	0.2	325.6	-	-	159	1917.5	35.1	-
20080301	7	LW to HW	2.1	0.2	19.2	-	-	112.8	2090.9	20.2	-
20080302	7	HW to LW	3	0.1	30.3	-	-	59.3	582.4	5.7	-
20080302	8	LW to HW	2.8	0.1	22.8	-	-	231.8	-	33.9	-
20080302	8	HW to LW	3.2	0.2	26.4	-	-	86.3	-	14.4	-
20080302	9	LW to HW	3.2	0.2	339.4	-	-	132.3	-	21.3	-
20080303	9	HW to LW	3.5	0.2	7.4	-	-	74.2	-	14.8	-
20080303	10	LW to HW	4	0.2	261.3	-	-	256	-	42.8	-
20080303	10	HW to LW	3.8	0.2	357.6	-	-	161.2	-	27	-
20080304	11	LW to HW	3.4	0.2	330.6	-	-	218	-	38.4	-
20080304	11	HW to LW	4	0.1	352.3	-	-	135.3	-	19.5	-
20080304	12	LW to HW	4.3	0.2	291.4	-	-	222.6	-	41.9	-
20080304	12	HW to LW	4.1	0.2	3	-	-	180.8	-	28.5	-
20080305	13	LW to HW	4	0.2	279.1	-	-	182.9	-	27.4	-
20080305	13	HW to LW	4.8	0.2	23.5	-	-	156	-	25.4	-
20080306	14	LW to HW	5.1	0.2	342.7	-	-	198.8	-	45	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080306	14	HW to LW	5	0.2	349.6	-	-	217.3	-	51.9	-
20080306	15	LW to HW	5.5	0.2	263.2	-	-	298.5	-	79.6	-
20080306	15	HW to LW	5.5	0.2	347.8	-	-	141.4	-	33.1	-
20080307	16	LW to HW	5.3	0.2	260.4	-	-	303.3	-	73.3	-
20080307	16	HW to LW	5.6	0.2	341.6	-	-	151.8	-	31.1	-
20080307	17	LW to HW	5.9	0.2	250.6	-	-	316	-	90.2	-
20080307	17	HW to LW	5.6	0.2	337.1	-	-	199.4	-	46.9	-
20080308	18	LW to HW	5.5	0.2	265	-	-	336.8	-	88.1	-
20080308	18	HW to LW	5.9	0.2	351.1	-	-	177.2	-	43.1	-
20080308	19	LW to HW	6.1	0.3	250.5	-	-	355.7	-	106.1	-
20080308	19	HW to LW	6.1	0.2	322.7	-	-	188.6	-	44.7	-
20080309	20	LW to HW	5.9	0.2	249.3	-	-	381.2	-	104.6	-
20080309	20	HW to LW	5.9	0.2	333	-	-	220.9	-	49	-
20080309	21	LW to HW	6.5	0.3	254.3	-	-	388.2	-	120.1	-
20080309	21	HW to LW	6.1	0.2	343.5	-	-	246.6	-	62.8	-
20080310	22	LW to HW	5.8	0.2	263.8	-	-	401.4	-	111.1	-
20080310	22	HW to LW	6.7	0.2	336.1	-	-	205.4	-	48.6	-
20080310	23	LW to HW	6.1	0.3	282.5	-	-	414.9	-	145.7	-
20080310	23	HW to LW	5.3	0.2	342.4	-	-	312.2	-	66.4	-
20080311	24	LW to HW	6.3	0.3	258.2	-	-	516.5	-	139.7	-
20080311	24	HW to LW	6.1	0.2	336.9	-	-	206.2	-	54	-
20080311	25	LW to HW	5.8	0.2	289.4	-	-	279.1	-	75	-
20080312	25	HW to LW	5.4	0.2	336.8	-	-	266.6	-	66.4	-
20080312	26	LW to HW	5.9	0.2	315.2	-	-	318.1	-	92.5	-
20080312	26	HW to LW	5.5	0.2	324.3	-	-	258.7	-	62.3	-
20080312	27	LW to HW	5.4	0.2	287.8	-	-	378.7	-	92.8	-
20080313	27	HW to LW	5.5	0.2	351.4	-	-	179.2	-	43.4	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080313	28	LW to HW	5.4	0.2	317.3	-	-	326.7	-	76.8	-
20080313	28	HW to LW	5.9	0.2	6.5	-	-	242.3	-	54.5	-
20080313	29	LW to HW	5.3	0.2	348.6	-	-	277.1	-	60.1	-
20080314	29	HW to LW	5.7	0.2	3.9	-	-	190.7	-	44.9	-
20080314	30	LW to HW	5.5	0.2	269.2	-	-	488.4	-	119.6	-
20080314	30	HW to LW	5.2	0.2	358.1	-	-	180.1	-	39.9	-
20080314	31	LW to HW	4.9	0.2	293.6	-	-	235.3	-	56.7	-
20080315	31	HW to LW	5	0.2	333.1	-	-	337.1	-	62.3	-
20080315	32	LW to HW	4.8	0.2	285.4	-	-	359.1	-	80.6	-
20080315	32	HW to LW	4.8	0.2	349.1	-	-	157.5	-	34.7	-
20080315	33	LW to HW	4.4	0.2	299.3	-	-	198.8	-	43.9	-
20080316	33	HW to LW	4.2	0.2	357.9	-	-	142.4	-	30.3	-
20080316	34	LW to HW	4.5	0.2	278.9	-	-	223.5	-	53.3	-
20080316	34	HW to LW	4.2	0.2	354.9	-	-	134.8	-	29.7	-
20080316	35	LW to HW	3.7	0.2	355.6	-	-	91.8	-	19	-
20080317	35	HW to LW	4	0.2	14.1	-	-	89.8	-	18.2	-
20080317	36	LW to HW	4.5	0.2	300.3	-	-	171.5	-	33.1	-
20080317	36	HW to LW	4.4	0.2	18.6	-	-	215.1	-	30.2	-
20080318	37	LW to HW	4.3	0.2	305.4	-	-	149.8	-	30.9	-
20080318	37	HW to LW	4.7	0.2	1.2	-	-	99.7	-	20.1	-
20080318	38	LW to HW	5.2	0.2	275.6	-	-	214.7	-	50.1	-
20080318	38	HW to LW	5	0.2	355.2	-	-	144.6	-	31	-
20080319	39	LW to HW	4.9	0.2	283.9	-	-	188.1	-	42.1	-
20080319	39	HW to LW	5.1	0.2	5.7	-	-	133.6	-	31.4	-
20080319	40	LW to HW	5.5	0.2	275.4	-	-	322.2	-	76.4	-
20080319	40	HW to LW	5.4	0.2	353.2	-	-	128.4	-	28.8	-
20080320	41	LW to HW	5.1	0.2	271.8	-	-	216.5	-	54.5	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE											
Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080320	41	HW to LW	5.6	0.2	0.2	-	-	127.1	-	28.7	-
20080320	42	LW to HW	5.9	0.2	270.8	-	-	255	-	72.8	-
20080320	42	HW to LW	5.3	0.2	313.6	-	-	194	-	44.7	-
20080321	43	LW to HW	5.9	0.2	257.9	-	-	383	-	99.2	-
20080321	43	HW to LW	5.4	0.2	333.4	-	-	147.2	-	34.8	-
20080321	44	LW to HW	6	0.2	348.6	-	-	283.4	-	75.5	-
20080321	44	HW to LW	6	0.2	329	-	-	174.7	-	41	-
20080322	45	LW to HW	5.3	0.2	340.7	-	-	185.7	-	34.5	-
20080322	45	HW to LW	6.1	0.2	349.8	-	-	210.4	-	48.7	-
20080322	46	LW to HW	5.8	0.2	321.2	-	-	194.9	-	50.3	-
20080322	46	HW to LW	5.8	0.2	2	-	-	189.5	-	44.8	-
20080323	47	LW to HW	5.5	0.2	271.2	-	-	214.3	-	50.4	-
20080323	47	HW to LW	6.1	0.2	1	-	-	145.2	-	31.4	-
20080323	48	LW to HW	6.2	0.2	275	-	-	320.2	-	86.4	-
20080323	48	HW to LW	5.8	0.2	335.4	-	-	176.1	-	46.1	-
20080324	49	LW to HW	5.8	0.2	274.3	-	-	217.3	-	64.8	-
20080324	49	HW to LW	5.8	0.2	308.4	-	-	202.2	-	39.3	-
20080324	50	LW to HW	5.9	0.2	293.1	-	-	171.9	-	51.8	-
20080324	50	HW to LW	5.5	0.2	326.3	-	-	146.3	-	37.8	-
20080325	51	LW to HW	5.8	0.2	274.3	-	-	222.3	-	58.7	-
20080325	51	HW to LW	5.8	0.2	346.3	-	-	131.8	-	30.2	-
20080325	52	LW to HW	5.6	0.2	296.3	-	-	172.2	-	43.9	-
20080326	52	HW to LW	5.7	0.2	358.9	-	-	119.4	-	27.6	-
20080326	53	LW to HW	5.4	0.2	282.3	-	-	190.9	-	50.5	-
20080326	53	HW to LW	5.2	0.1	306.5	-	-	144.4	-	29	-
20080327	54	LW to HW	4.6	0.2	316.7	-	-	177.2	-	41.9	-
20080327	54	HW to LW	5.3	0.1	350.5	-	-	133.9	-	25.3	-

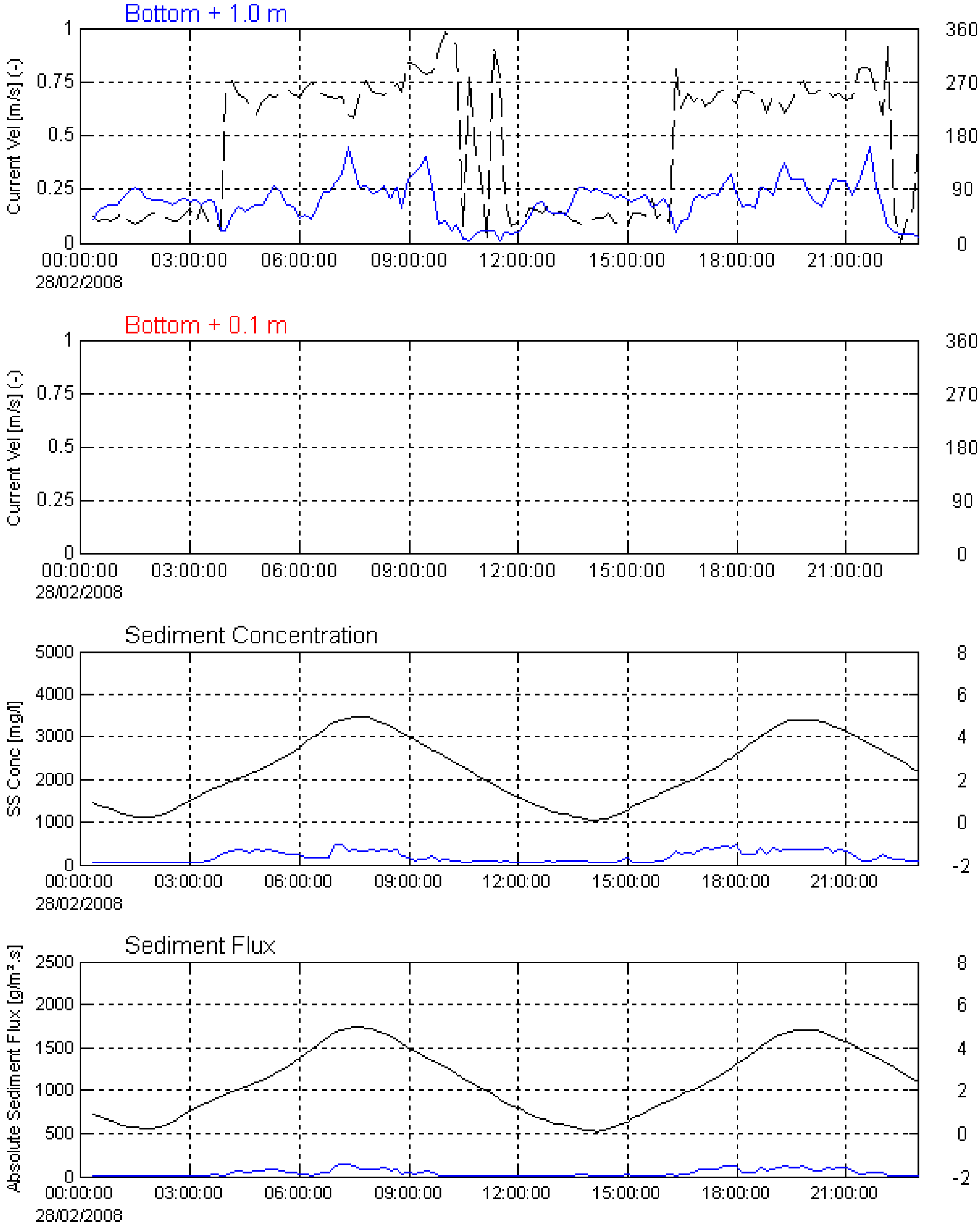
RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080327	55	LW to HW	5.2	0.2	318.3	-	-	238.9	-	58	-
20080328	55	HW to LW	5.1	0.1	282.5	-	-	179.9	-	25.6	-
20080328	56	LW to HW	4.9	0.2	286.4	-	-	205.2	-	47.4	-
20080328	56	HW to LW	5	0.1	1.9	-	-	112.4	-	17.6	-
20080328	57	LW to HW	4.2	0.2	295.4	-	-	260.2	-	60.4	-
20080329	57	HW to LW	3.6	0.1	42.6	-	-	103.2	-	14.7	-
20080329	58	LW to HW	4.4	0.2	262.5	-	-	207.4	-	45.9	-
20080329	58	HW to LW	4.1	0.1	303.1	-	-	89.5	-	10.3	-
20080329	59	LW to HW	3.8	0.2	264.5	-	-	166.5	-	35	-
20080330	59	HW to LW	4.3	0.1	14.5	-	-	90.7	-	12.8	-
20080330	60	LW to HW	3.8	0.2	301.1	-	-	138.3	-	32.9	-
20080330	60	HW to LW	3.5	0.1	22.8	-	-	74.4	-	10.2	-
20080330	61	LW to HW	3.8	0.2	271.3	-	-	135.9	-	25.9	-
20080331	61	HW to LW	3.5	0.1	334	-	-	72.6	-	7.6	-
20080331	62	LW to HW	3.5	0.1	308.3	-	-	111.8	-	18.4	-
20080331	62	HW to LW	3.6	0.1	6.6	-	-	109.9	-	10.2	-
20080331	63	LW to HW	3.1	0.1	341.5	-	-	93.1	-	16.3	-
20080401	63	HW to LW	3.5	0.1	356.7	-	-	81	-	7.1	-
20080401	64	LW to HW	3.5	0.2	311.4	-	-	104.3	-	19.7	-
20080401	64	HW to LW	3.4	0.1	259	-	-	69.7	-	9.6	-
20080401	65	LW to HW	3.9	0.2	272.3	-	-	160.4	-	36.4	-
20080402	65	HW to LW	3.6	0.1	301	-	-	78.2	-	9.6	-
20080402	66	LW to HW	4.3	0.2	277.2	-	-	124.3	-	22.8	-
20080402	66	HW to LW	4.7	0.1	0.5	-	-	113.8	-	11.7	-
20080403	67	LW to HW	4.4	0.2	283.6	-	-	219.1	-	49	-
20080403	67	HW to LW	4.9	0.1	354.7	-	-	80	-	12.4	-
20080403	68	LW to HW	5.1	0.2	293.9	-	-	159.5	-	41.8	-

RCM9 & VALEPORT AVERAGES FOR EVERY TIDAL PHASE

Date	Tide no.	Phase	Tidal Diff	UP Velocity (RCM9) Bottom +1.0m		DOWN Velocity (Valeport) Bottom +0.1m		SS Concentration [mg/l]		SS Flux [g/m²s]	
			[m]	Magnitude [m/s]	Direction [°]	Magnitude [m/s]	Direction [°]	UP (RCM9)	DOWN (Valeport)	UP (RCM9)	DOWN (Valeport)
20080403	68	HW to LW	5.2	0.1	289.8	-	-	148.2	-	25.9	-
20080404	69	LW to HW	5.1	0.2	279.5	-	-	179.5	-	42	-
20080404	69	HW to LW	5.5	0.1	332.8	-	-	304.4	-	25.9	-
20080404	70	LW to HW	5.8	0.2	245.9	-	-	229.9	-	67.4	-
20080404	70	HW to LW	5.5	0.1	301.4	-	-	159.6	-	29	-
20080405	71	LW to HW	5.6	0.2	269.7	-	-	287.9	-	76.5	-
20080405	71	HW to LW	5.9	0.1	348.5	-	-	147.2	-	26.2	-
20080405	72	LW to HW	6.3	0.2	273.4	-	-	213.1	-	62.3	-
20080405	72	HW to LW	5.8	0.1	354.4	-	-	147.1	-	30.3	-
20080406	73	LW to HW	5.8	0.2	265.8	-	-	213.7	-	58.8	-
20080406	73	HW to LW	6.3	0.1	351.3	-	-	112.1	-	21.2	-
20080406	74	LW to HW	6.3	0.2	276.6	-	-	201.1	-	58.6	-
20080406	74	HW to LW	6.2	0.2	352	-	-	149.2	-	30.8	-
20080407	75	LW to HW	6.1	0.2	310.6	-	-	147.4	-	45.4	-
20080407	75	HW to LW	6.4	0.1	347	-	-	141.7	-	30.2	-
20080407	76	LW to HW	6.4	0.2	265	-	-	288.1	-	89.7	-
20080407	76	HW to LW	6.3	0.1	354.8	-	-	252.1	-	40	-
20080408	77	LW to HW	6.2	0.3	256.3	-	-	312.9	-	98	-
20080408	77	HW to LW	6.5	0.1	353.9	-	-	163.1	-	33	-
20080408	78	LW to HW	6.5	0.2	263.3	-	-	221	-	70.1	-
20080408	78	HW to LW	6.3	0.2	323	-	-	258.6	-	43.1	-
20080409	79	LW to HW	6.2	0.2	243.1	-	-	389.2	-	97.8	-

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



Current Velocity and Direction upper (RCM9) and lower (Valeport) EMC, OBS SS Conc. & flux and waterlevel		*Data processed by:* IMDC
Location: Deurganckdok Sill	Date: Avg Tide 28/02/08	*In association with:* WL | delft hydraulics, GEMS International
		I/RA/11283/07.094/MSA

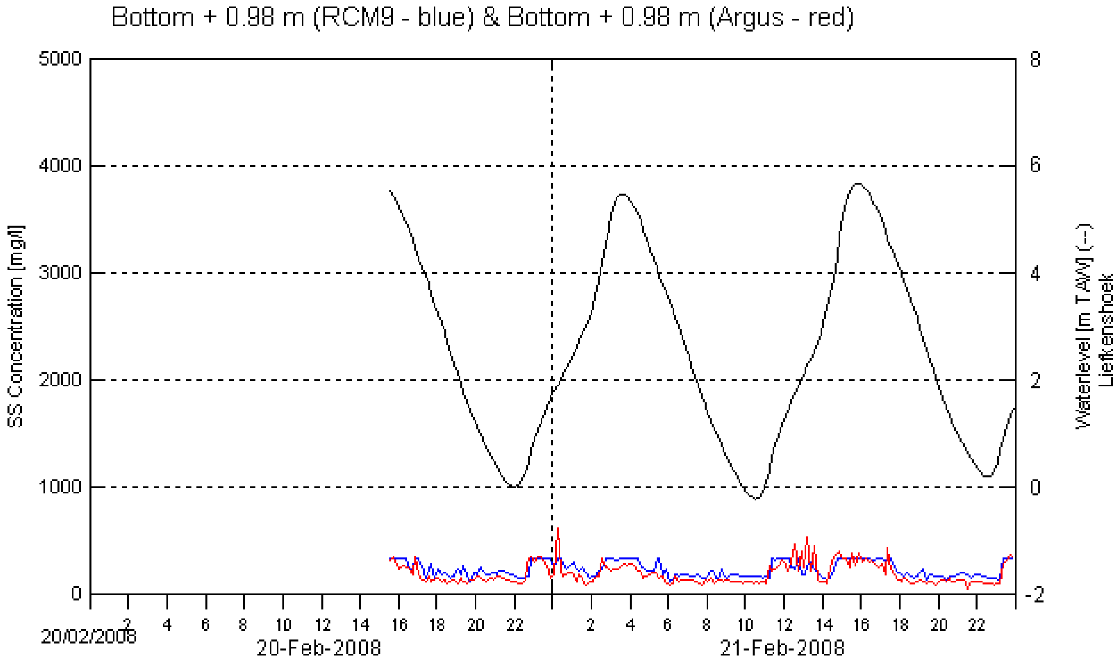
APPENDIX F.

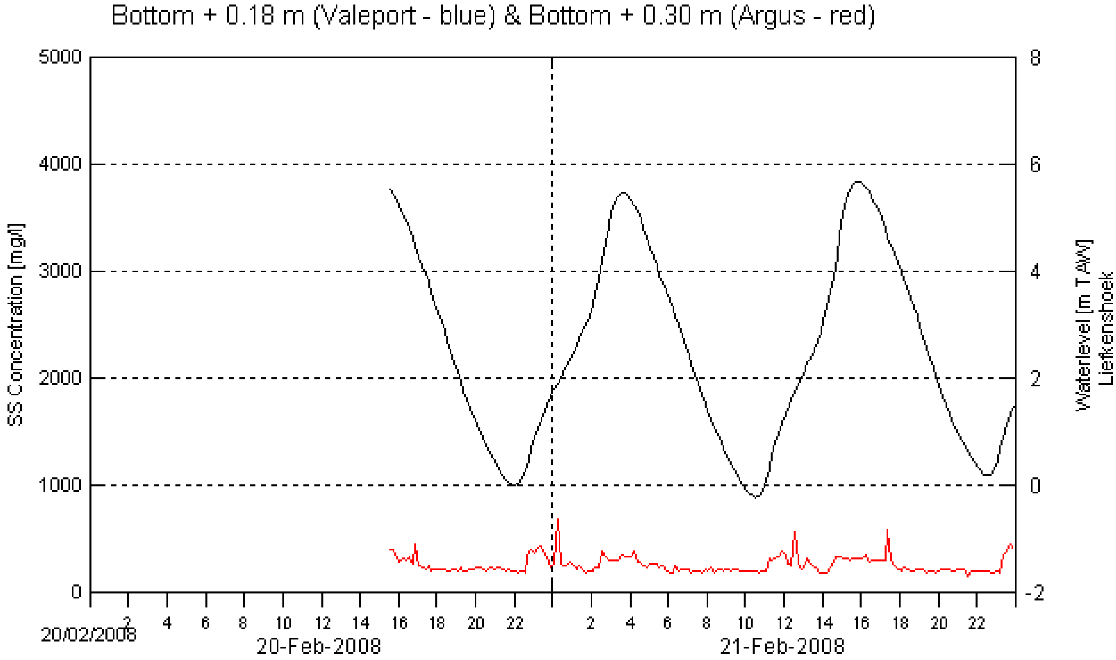
COMPARISON OF RCM9 & VALEPORT SENSORS

TO ARGUS SENSORS

F.1 CDW Frame

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Data processed by: IMDC

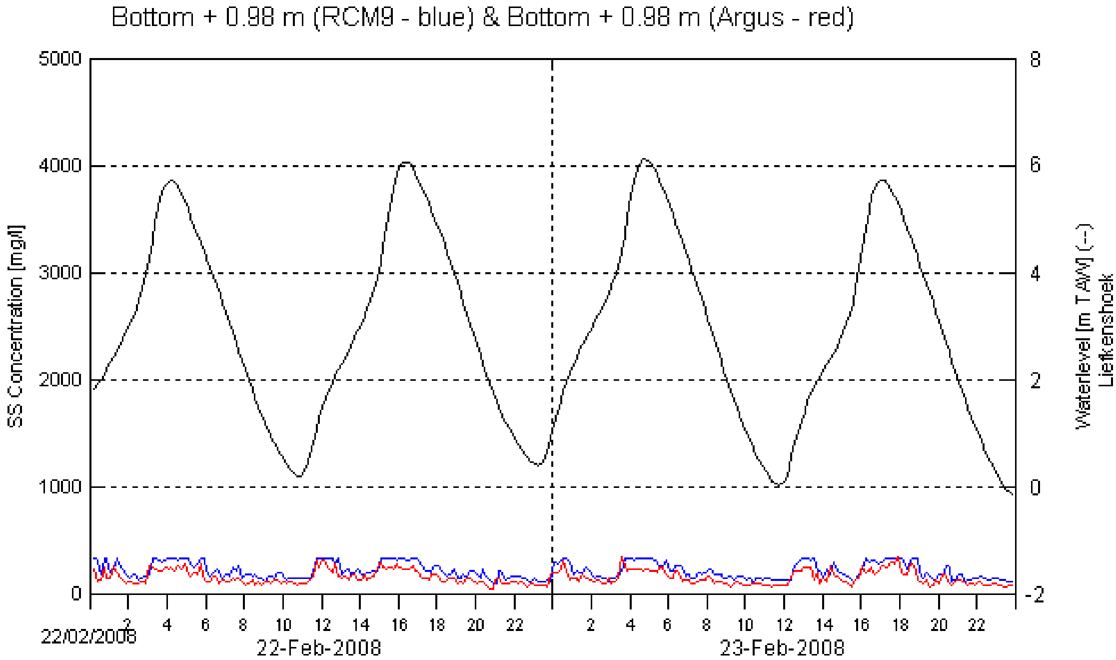
In association with: WL | delft hydraulics, GEMS International

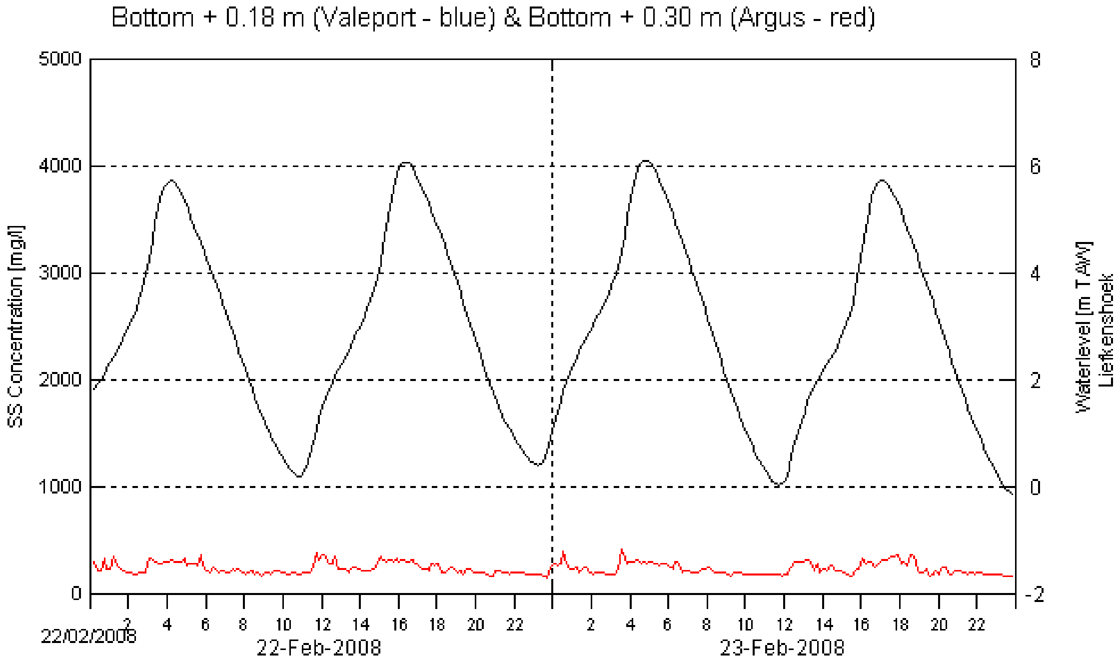
Location: Deurganckdok CDW

Date: 20/02/08 – 21/02/08

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Data processed by: IMDC

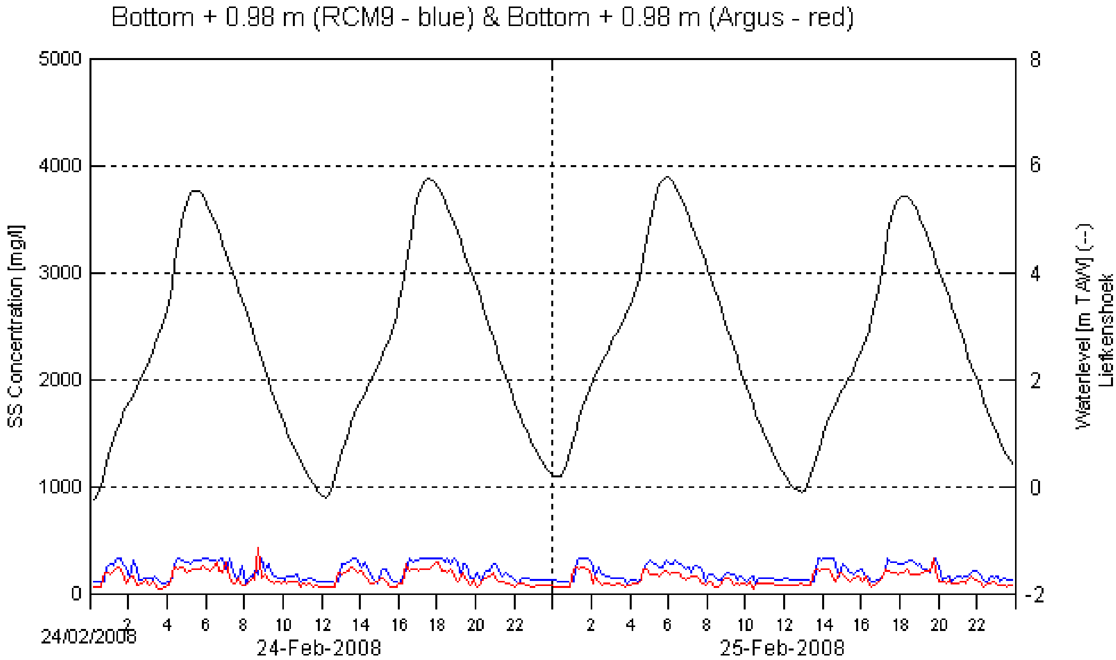
In association with: WL | delft hydraulics; GEMS International

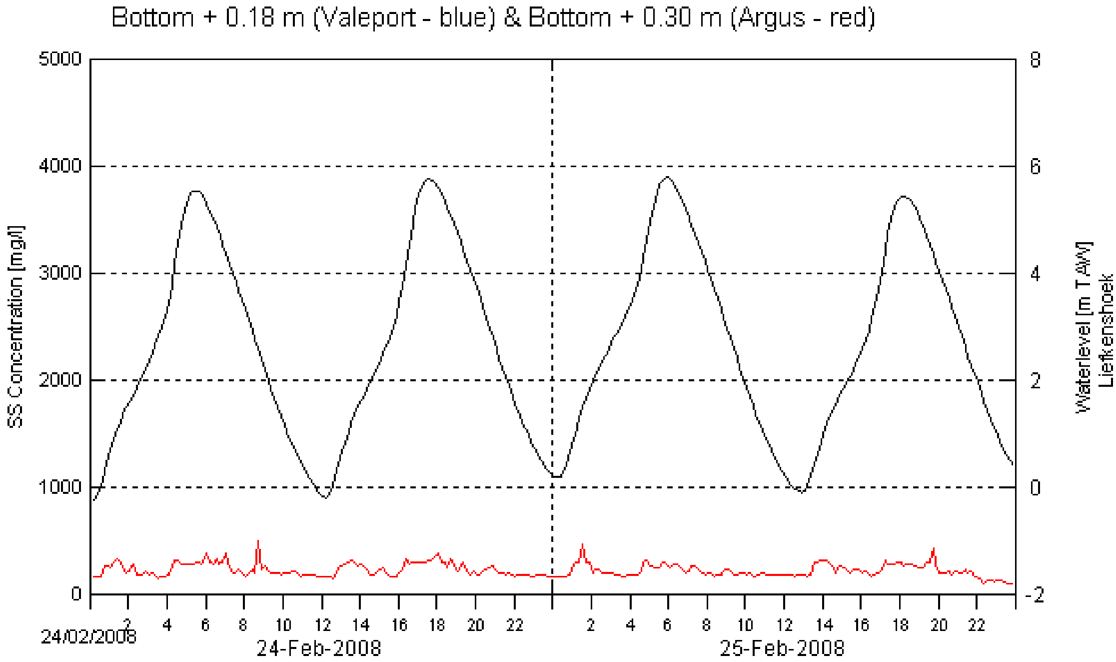
Location: Deurganckdok CDW

Date: 22/02/08 – 23/02/08

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW

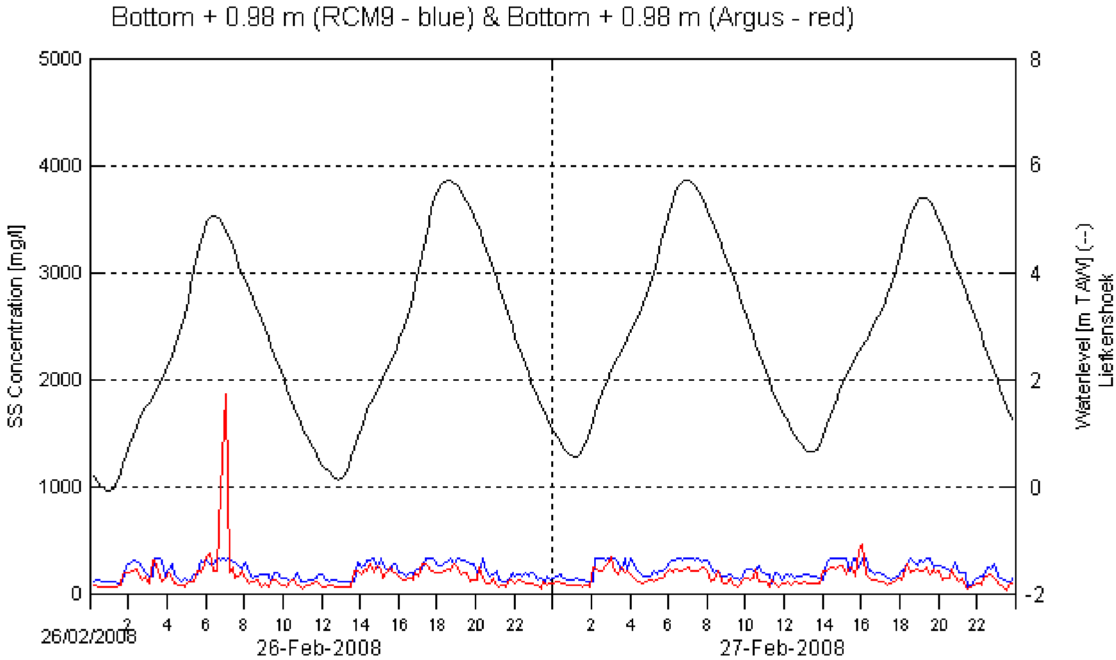
Date: 24/02/08 – 25/02/08

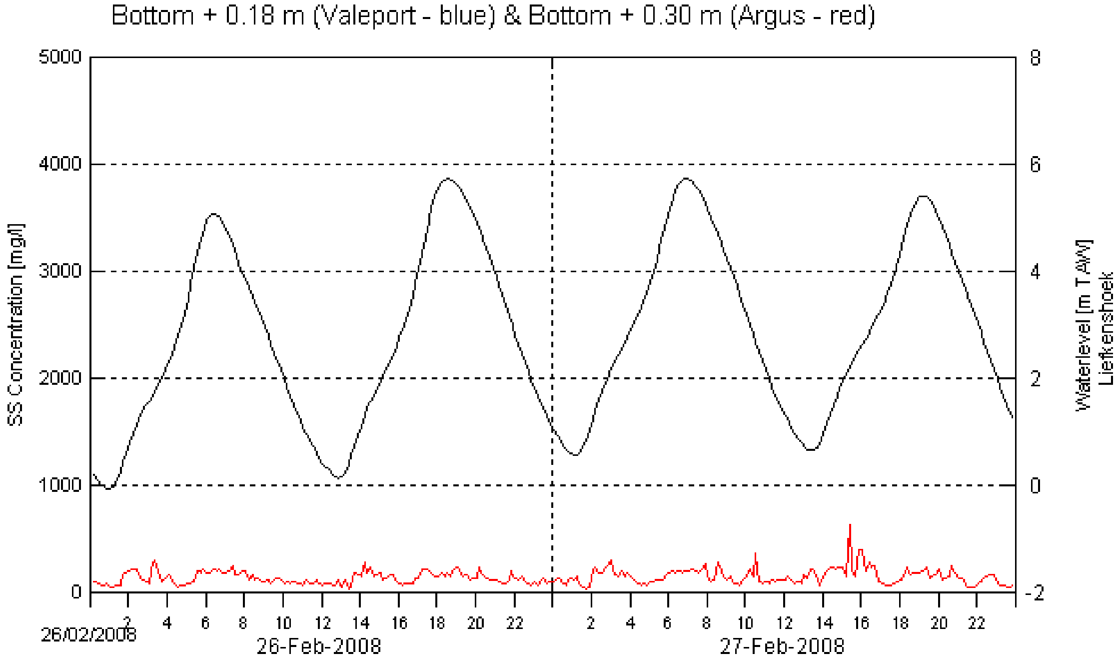
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW

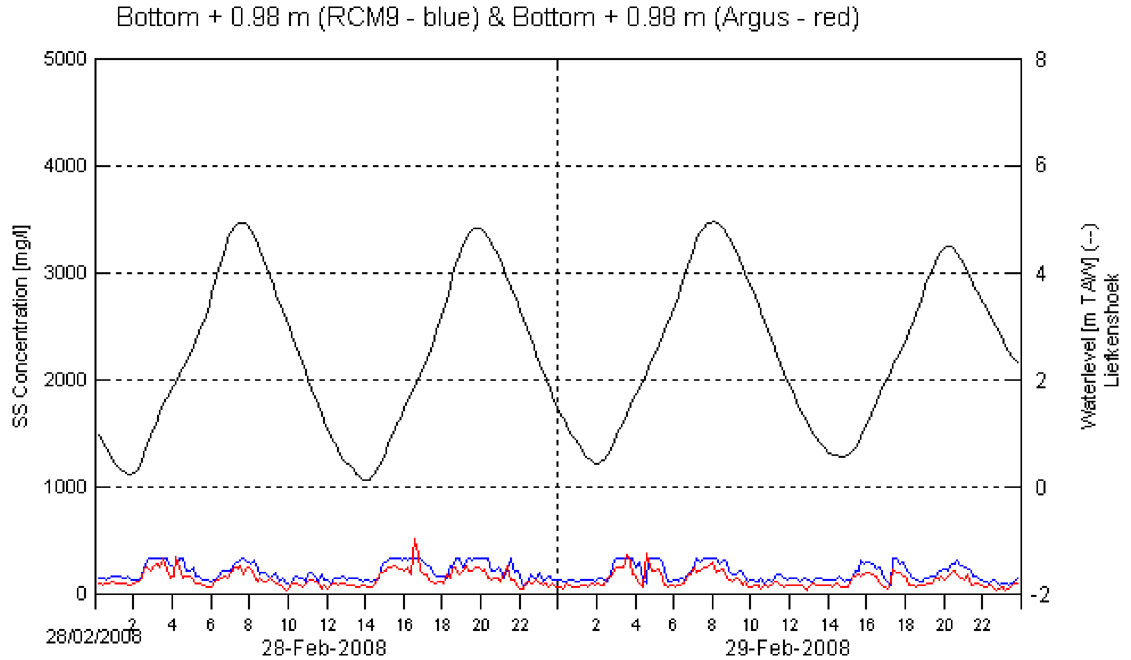
Date: 26/02/08 – 27/02/08

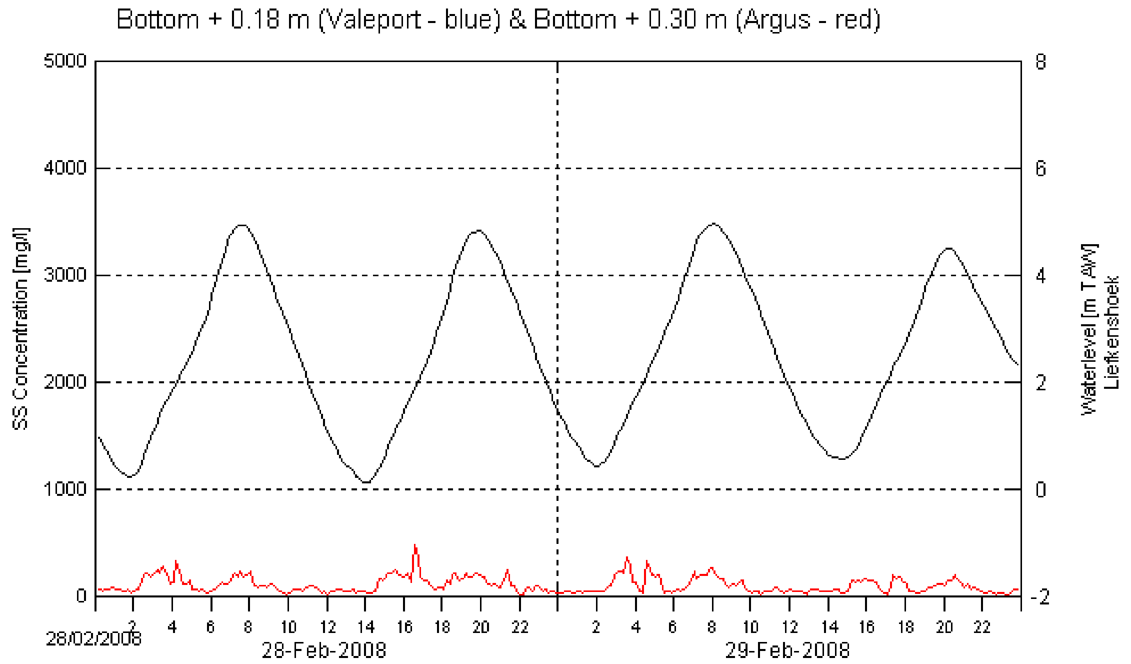
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Data processed by: IMDC

Location: Deurganckdok CDW

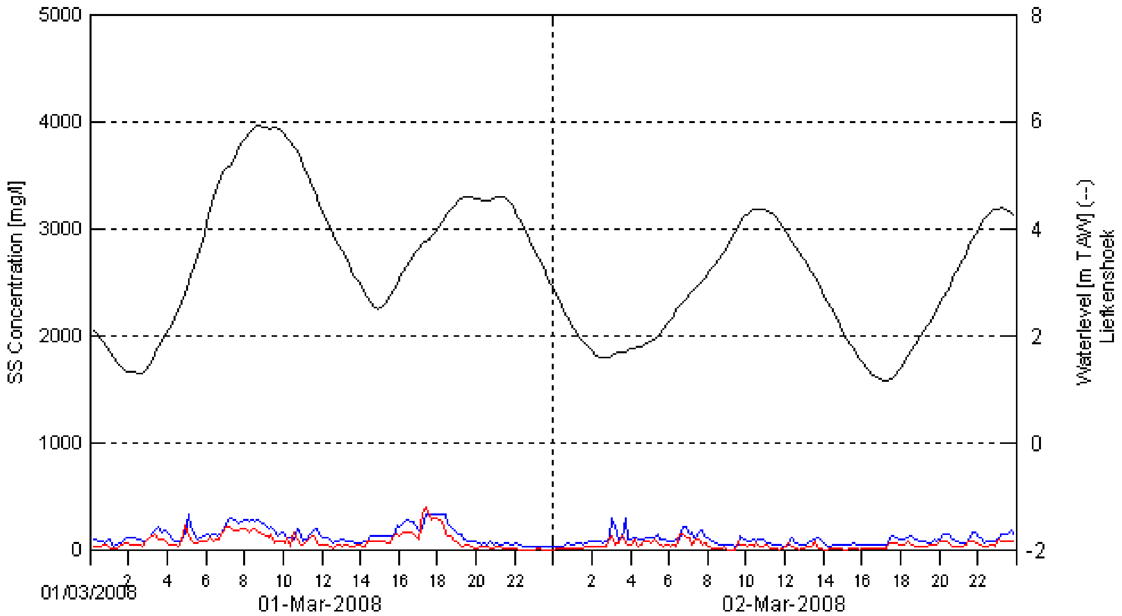
Date: 28/02/08 – 29/02/08

In association with: WL | delft hydraulics, GEMS International

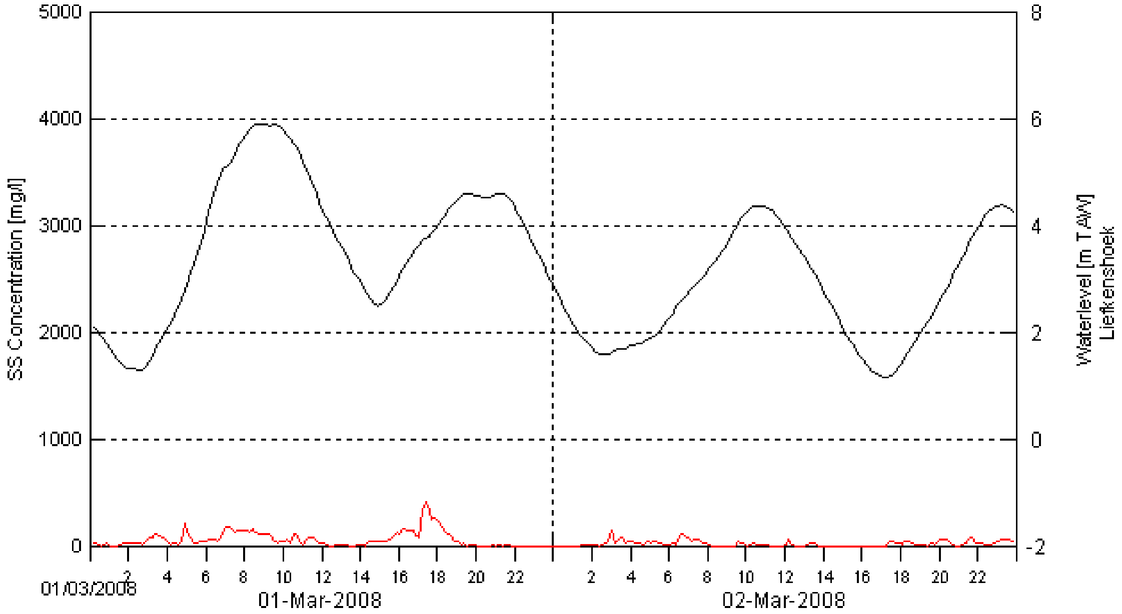
I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008

Bottom + 0.98 m (RCM9 - blue) & Bottom + 0.98 m (Argus - red)

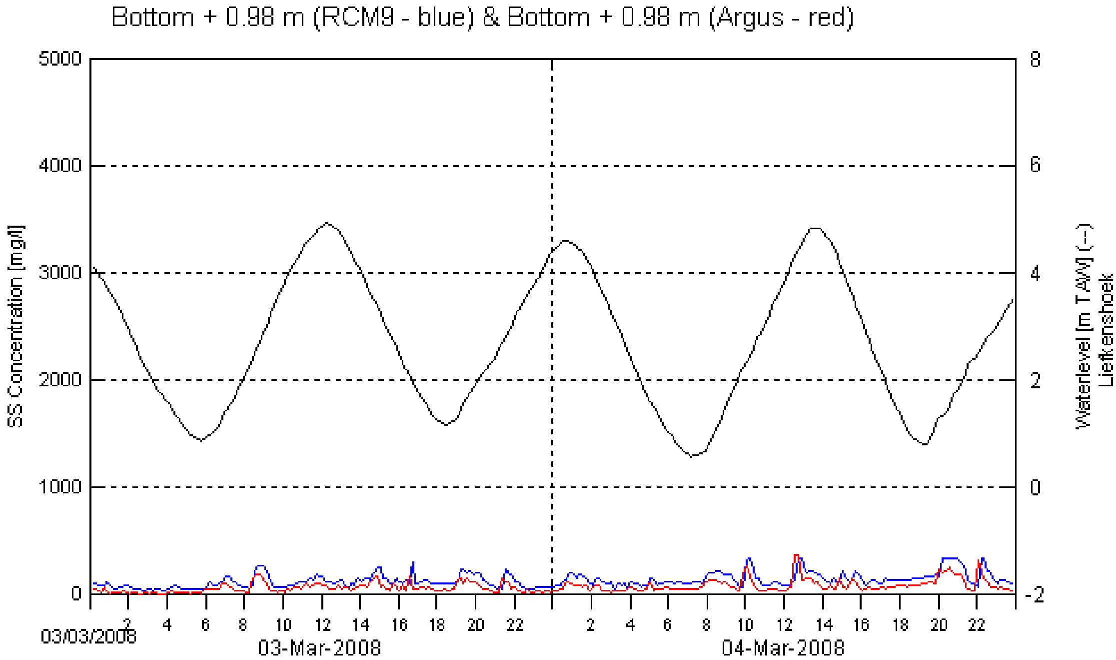


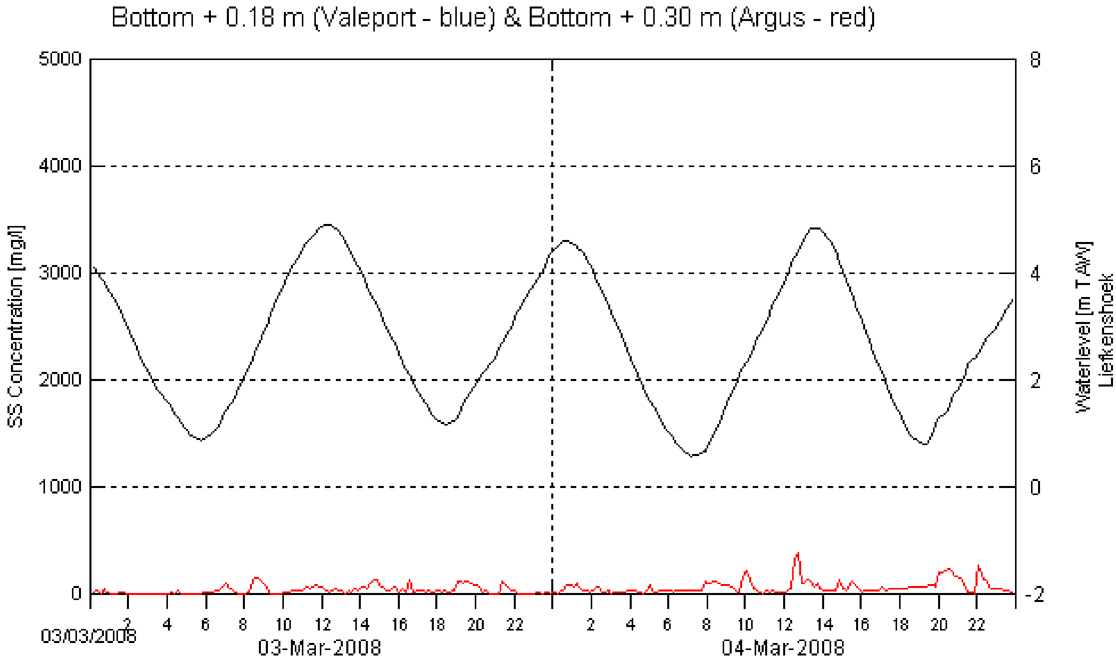
Bottom + 0.18 m (Valeport - blue) & Bottom + 0.30 m (Argus - red)



Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration		*Data processed by:* IMDC
Location: Deurganckdok CDW	Date: 01/03/08 – 02/03/08	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

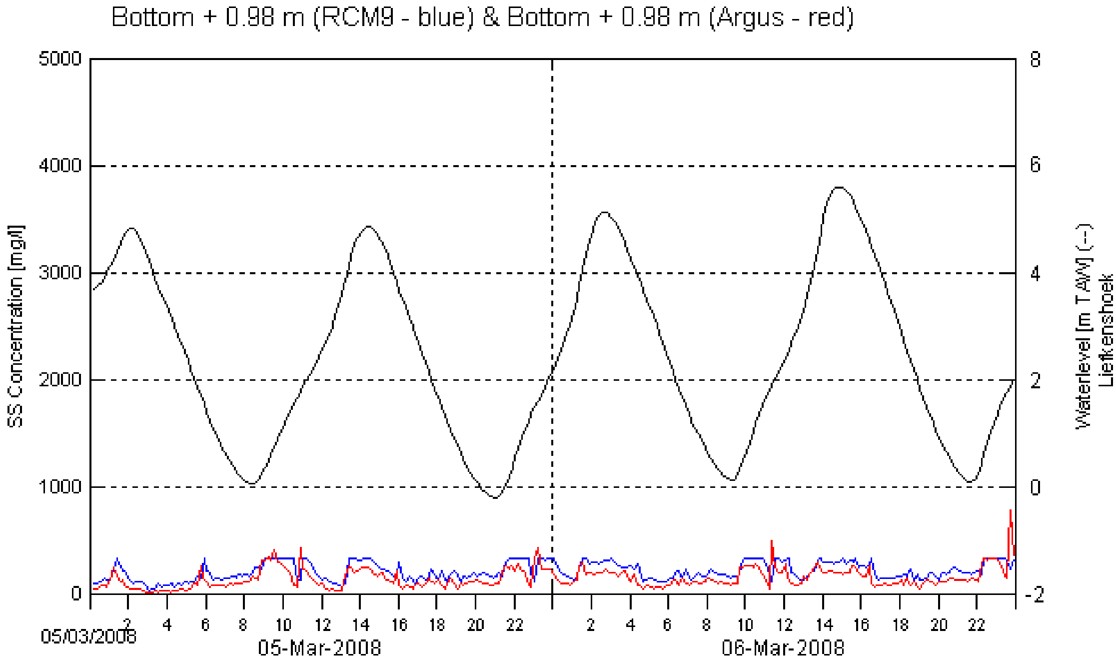
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008

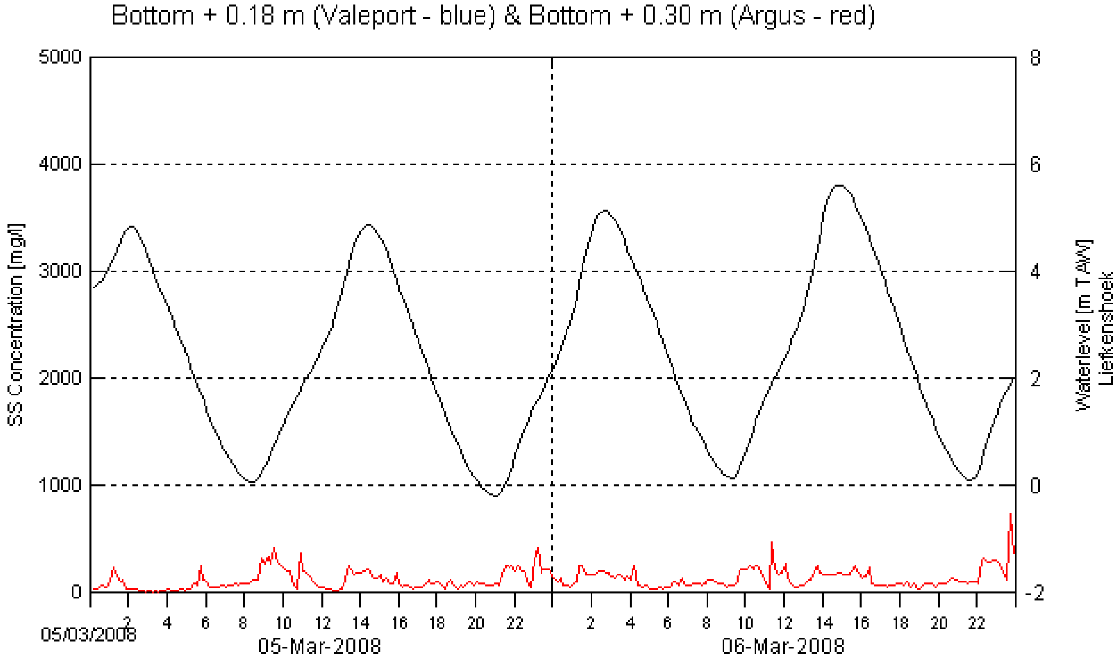




Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration		*Data processed by:* IMDC
Location: Deurganckdok CDW	Date: 03/03/08 – 04/03/08	*In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

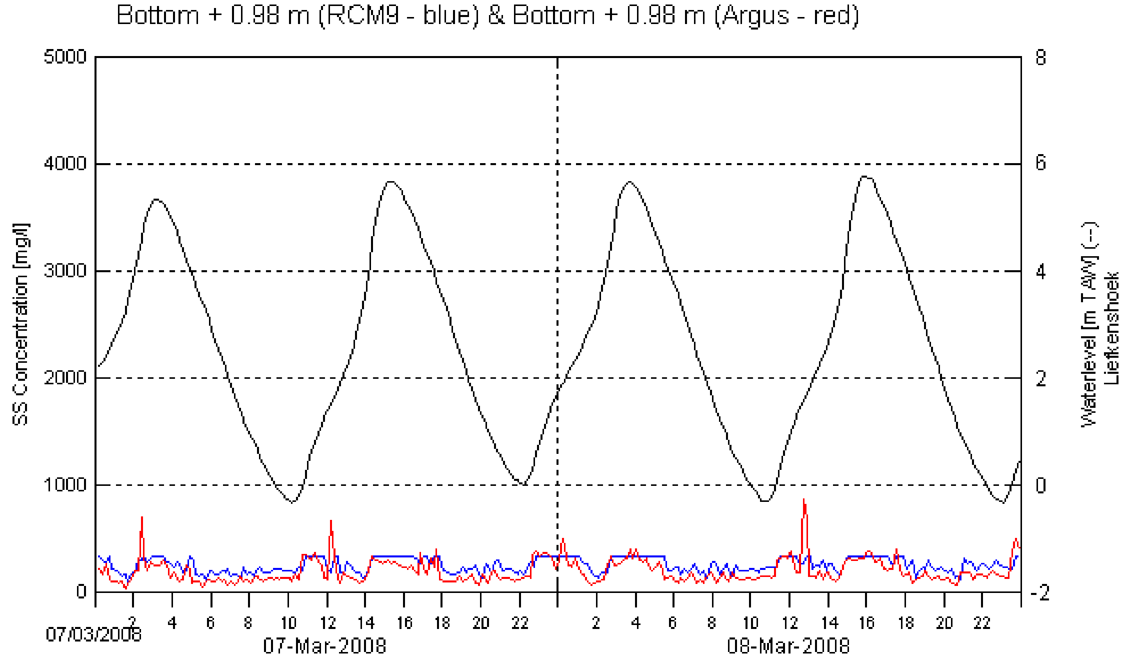
Location: Deurganckdok CDW	Date: 05/03/08 – 06/03/08

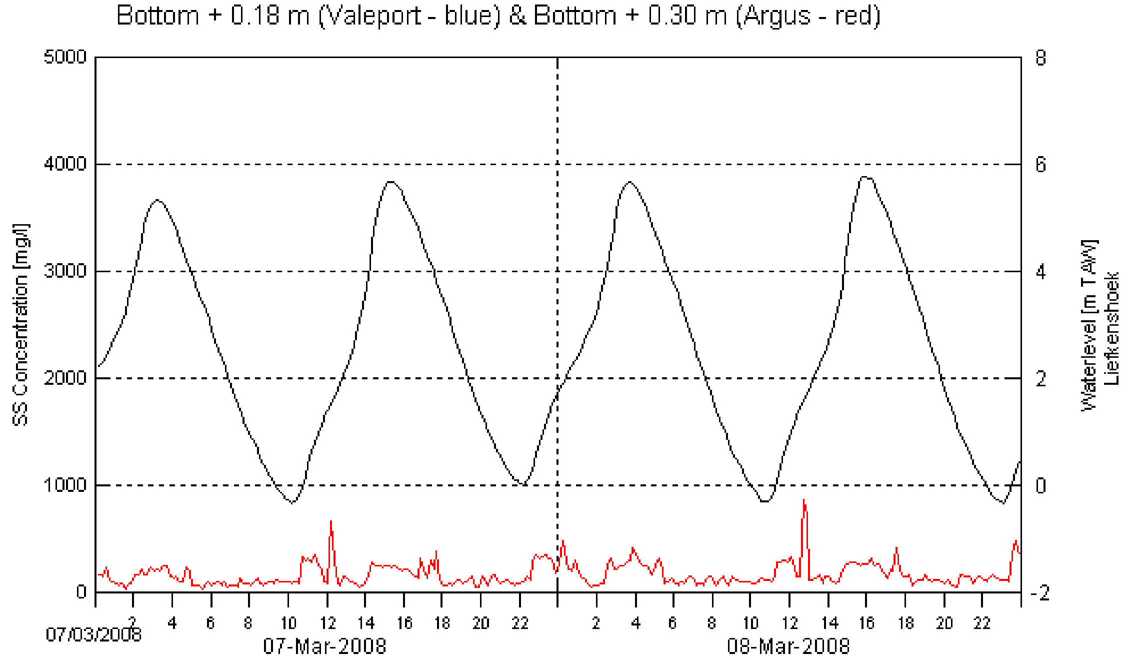
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Data processed by: IMDC

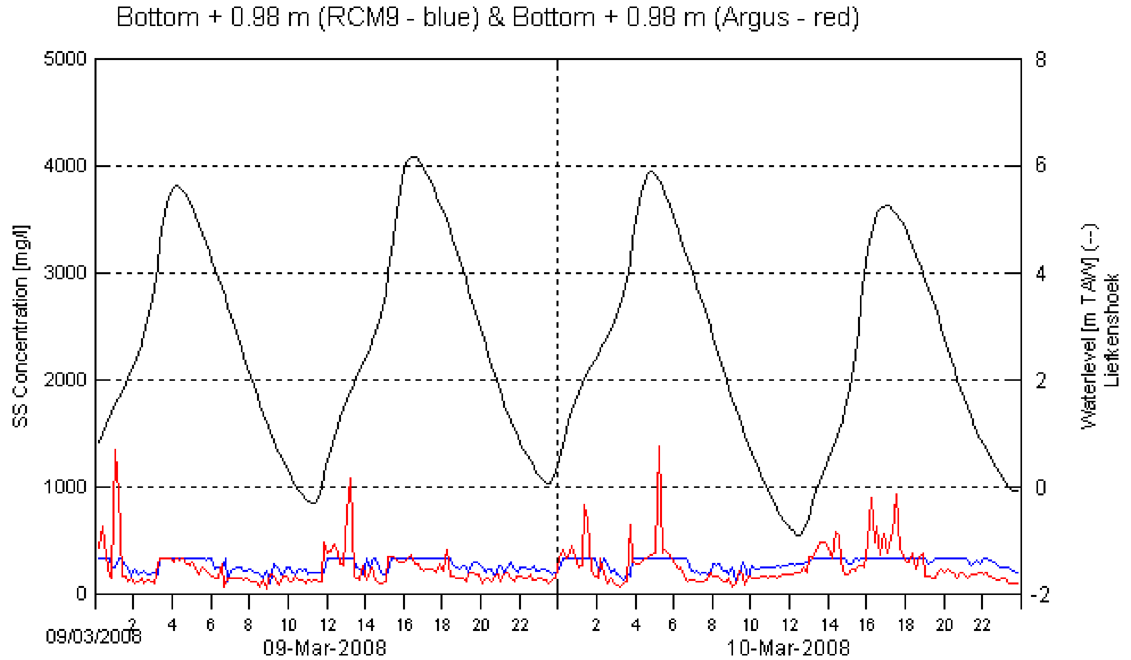
Location: Deurganckdok CDW

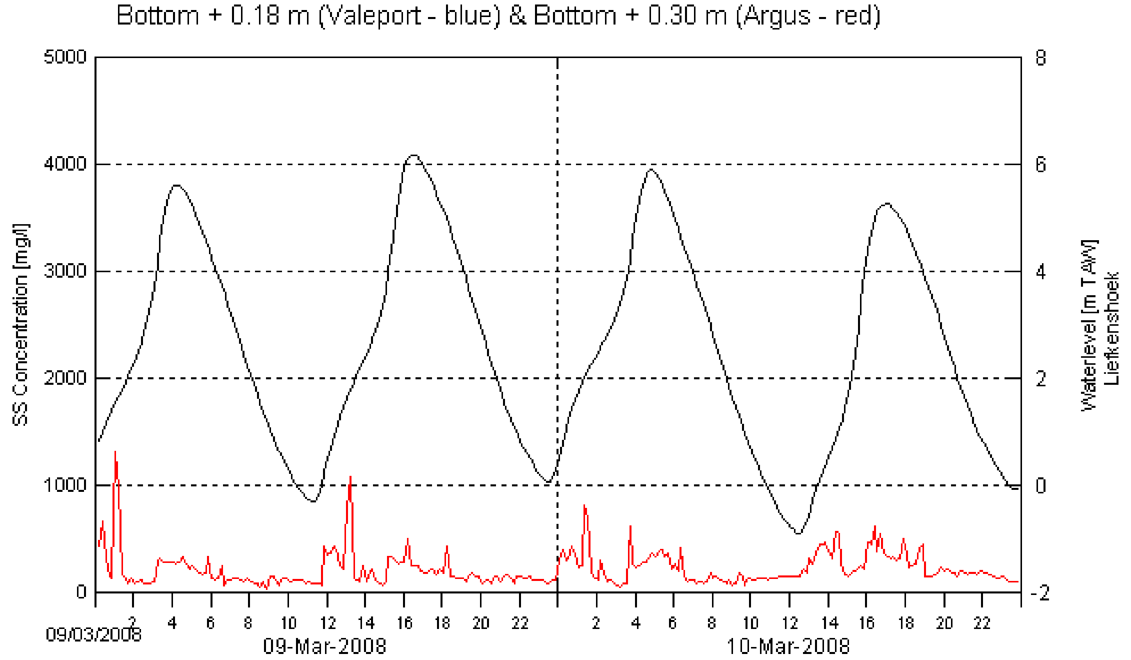
Date: 07/03/08 – 08/03/08

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Data processed by: IMDC

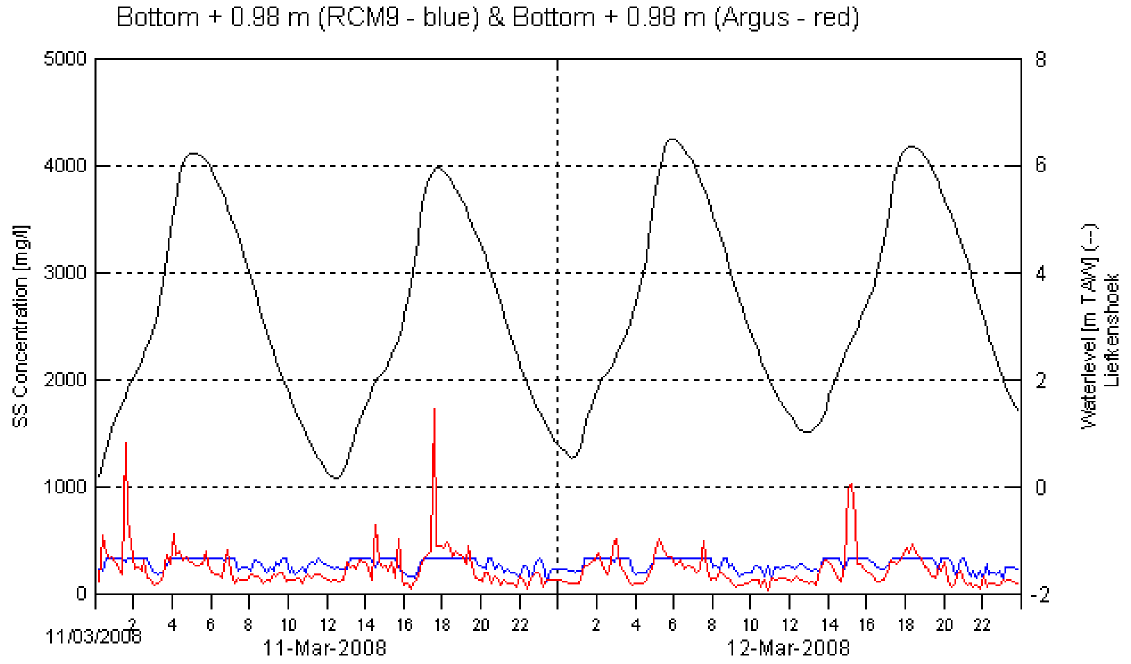
Location:
Deurganckdok
CDW

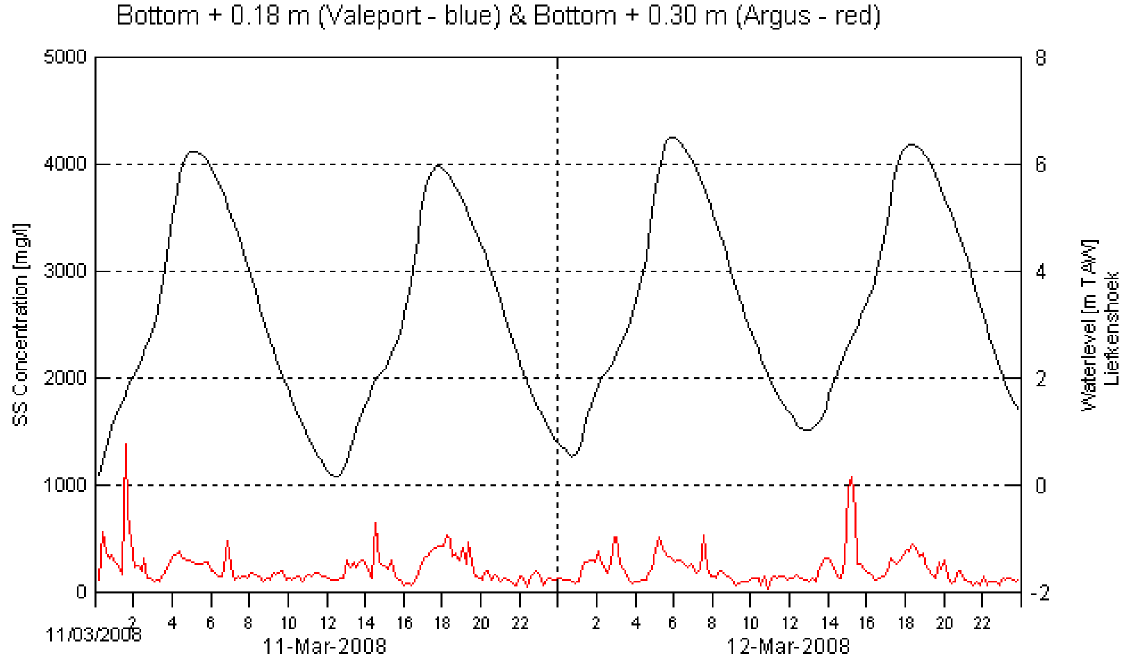
Date:
09/03/08 – 10/03/08

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Data processed by: IMDC

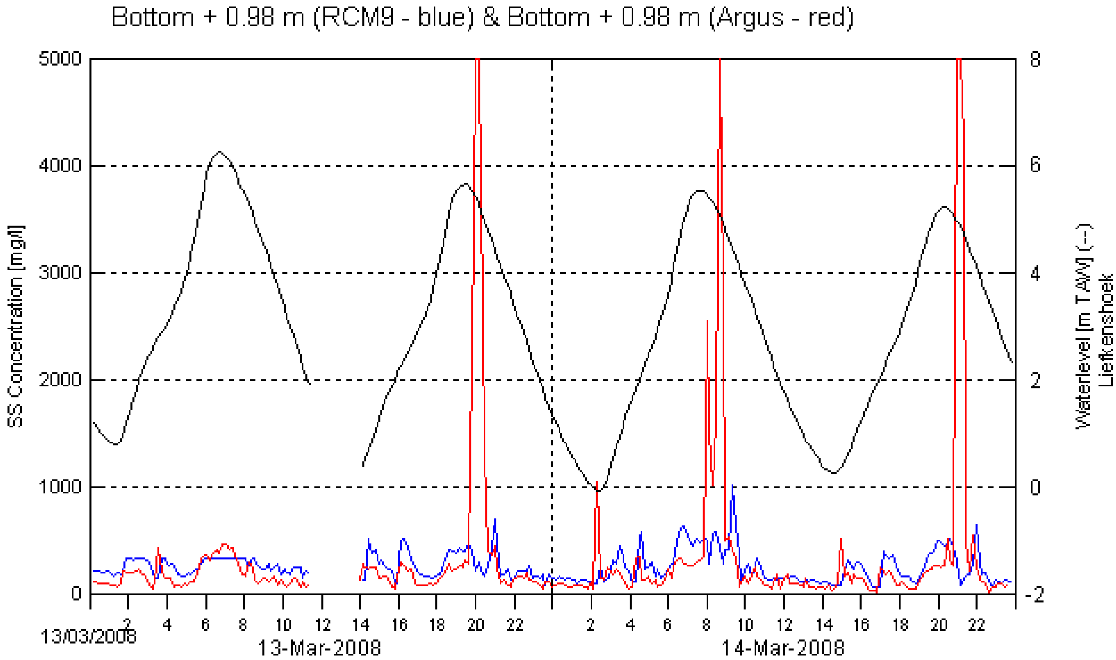
Location: Deurganckdok CDW

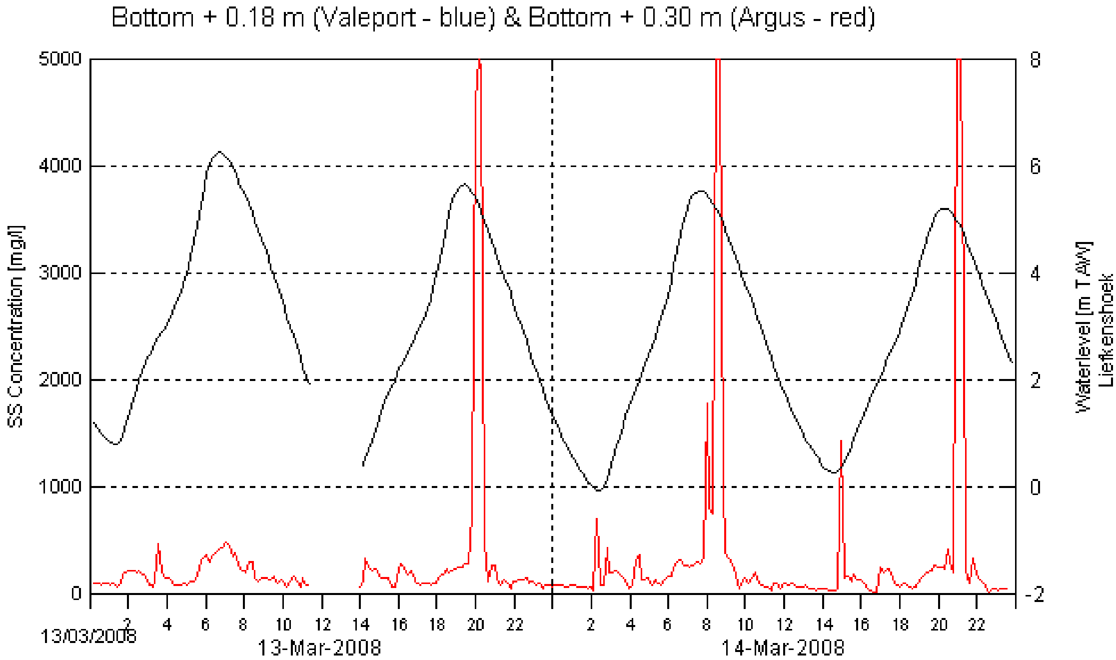
Date: 11/03/08 – 12/03/08

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Data processed by:

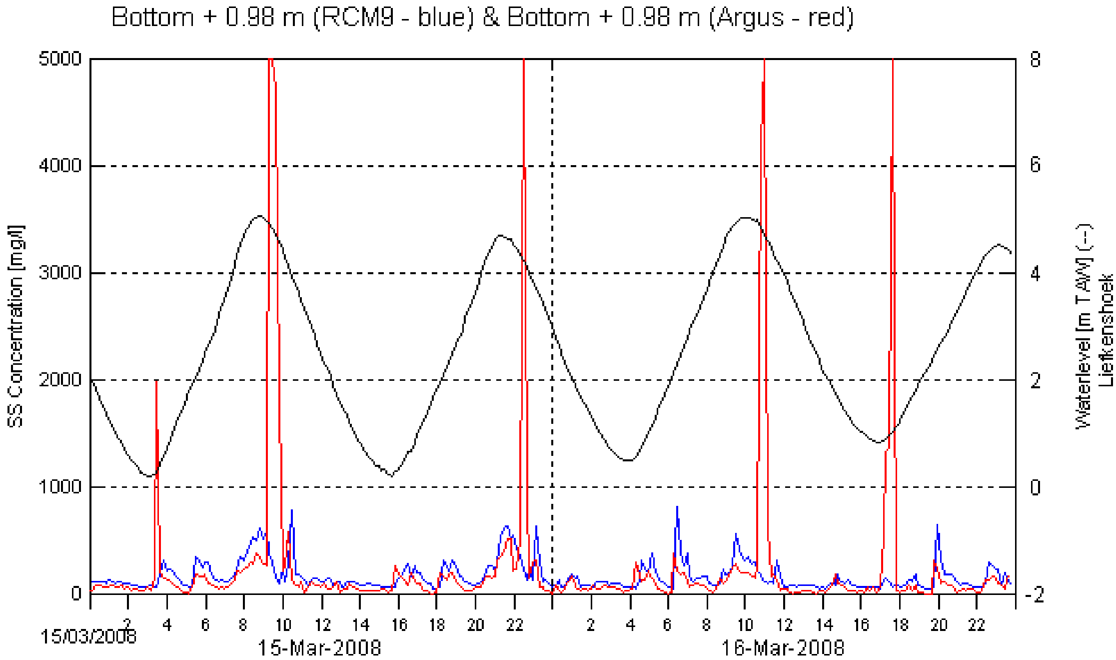
In association with:

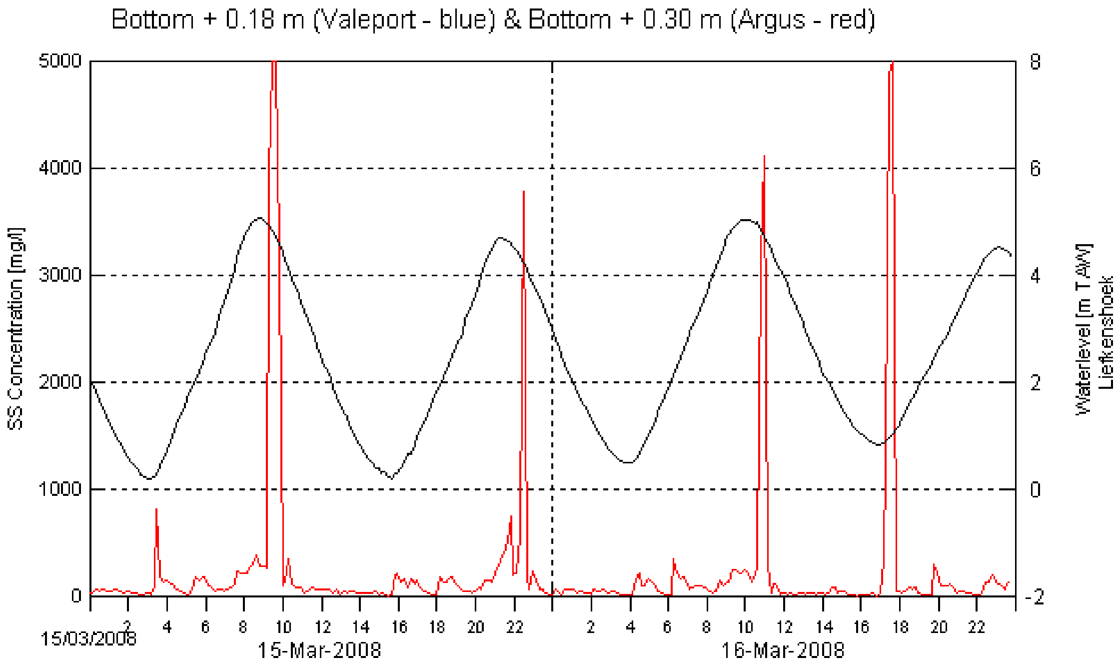
Location: Deurganckdok CDW

Date: 13/03/08 – 14/03/08

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW

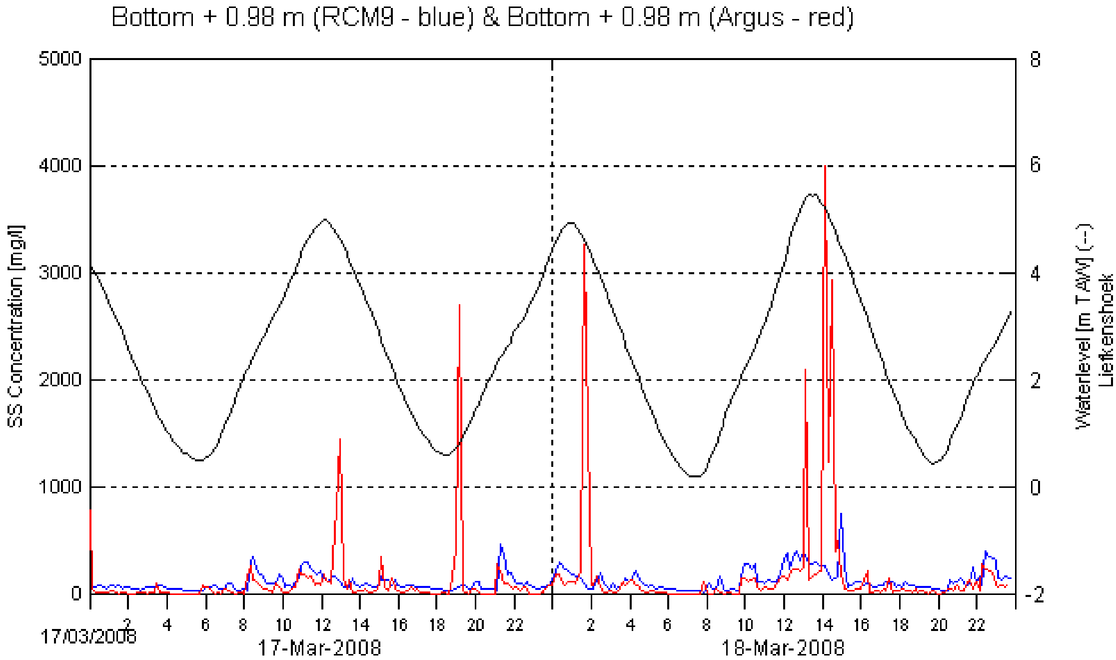
Date: 15/03/08 – 16/03/08

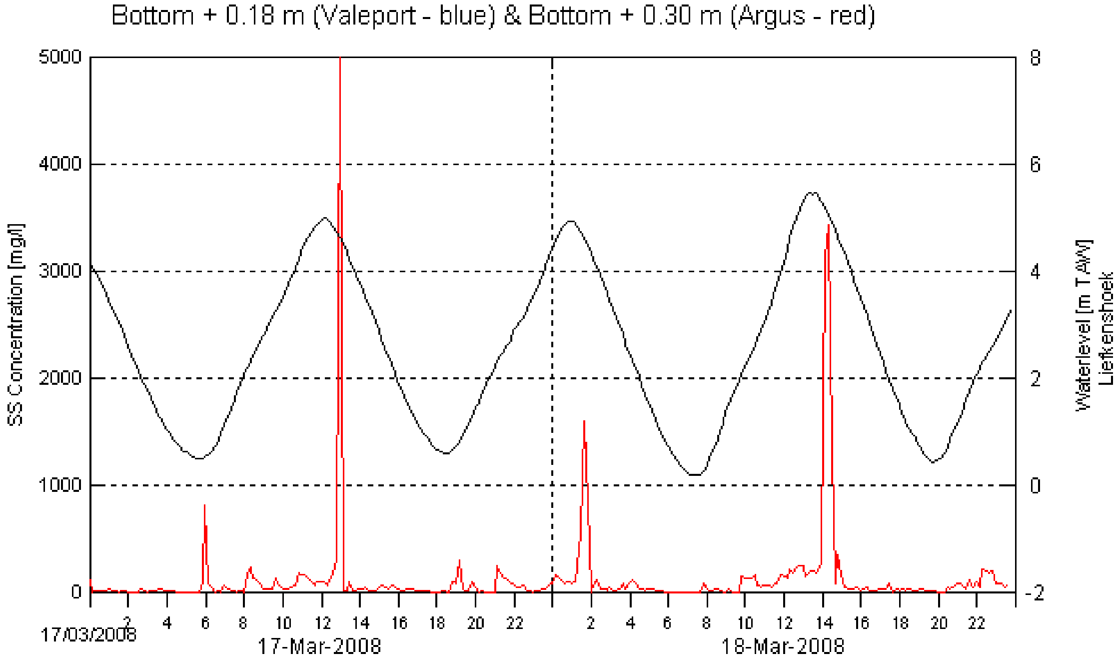
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

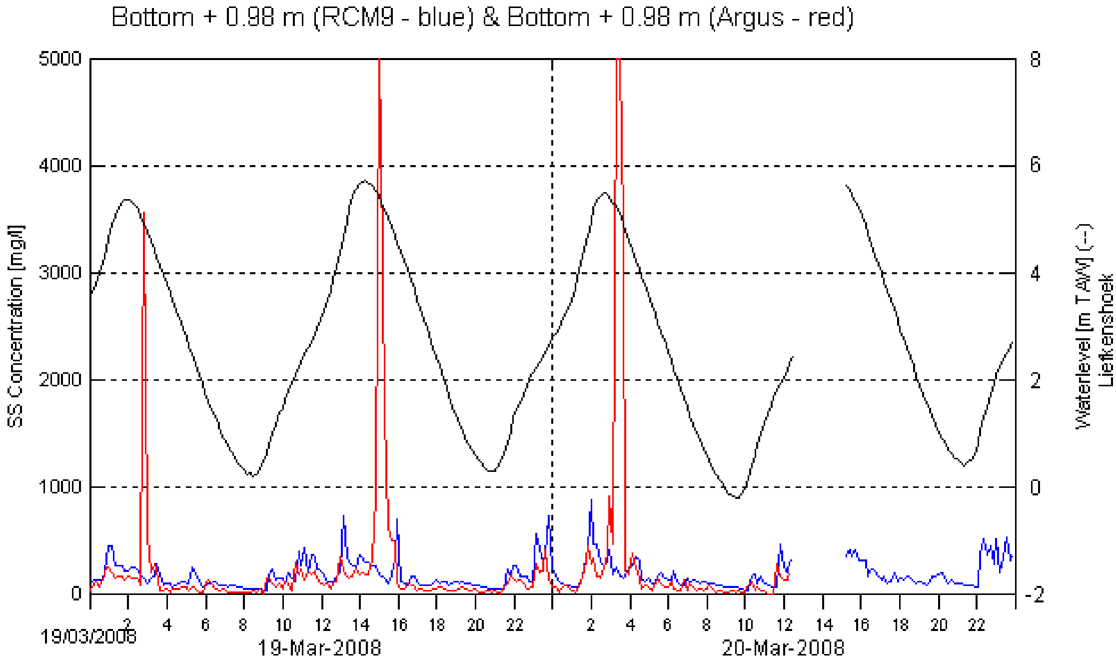
Location: Deurganckdok CDW	Date: 17/03/08 – 18/03/08

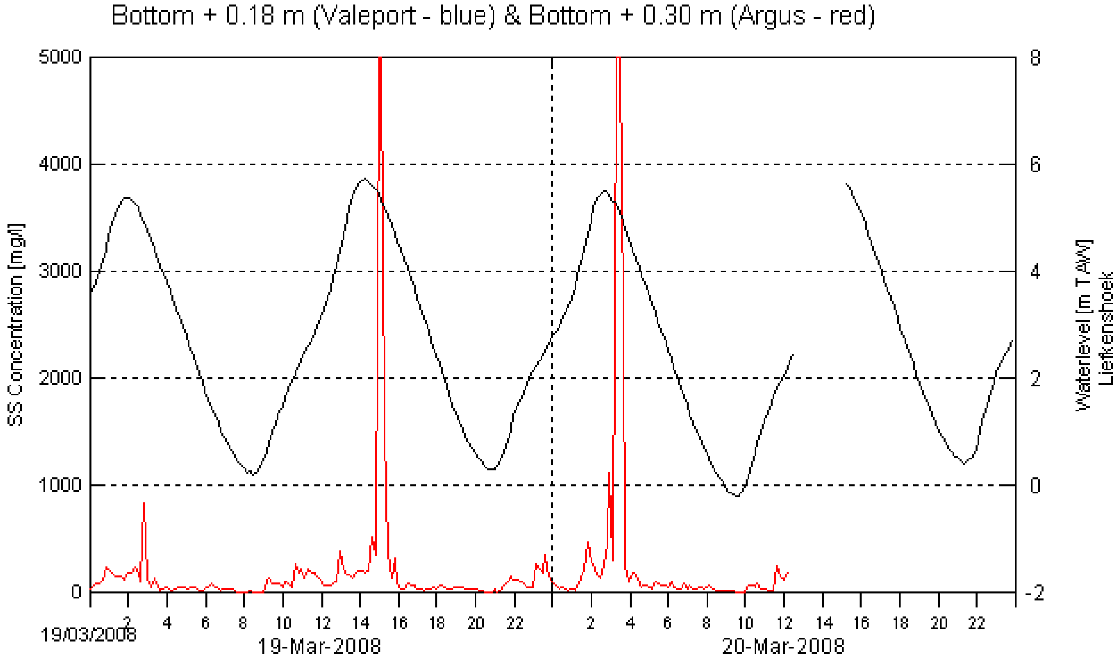
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW

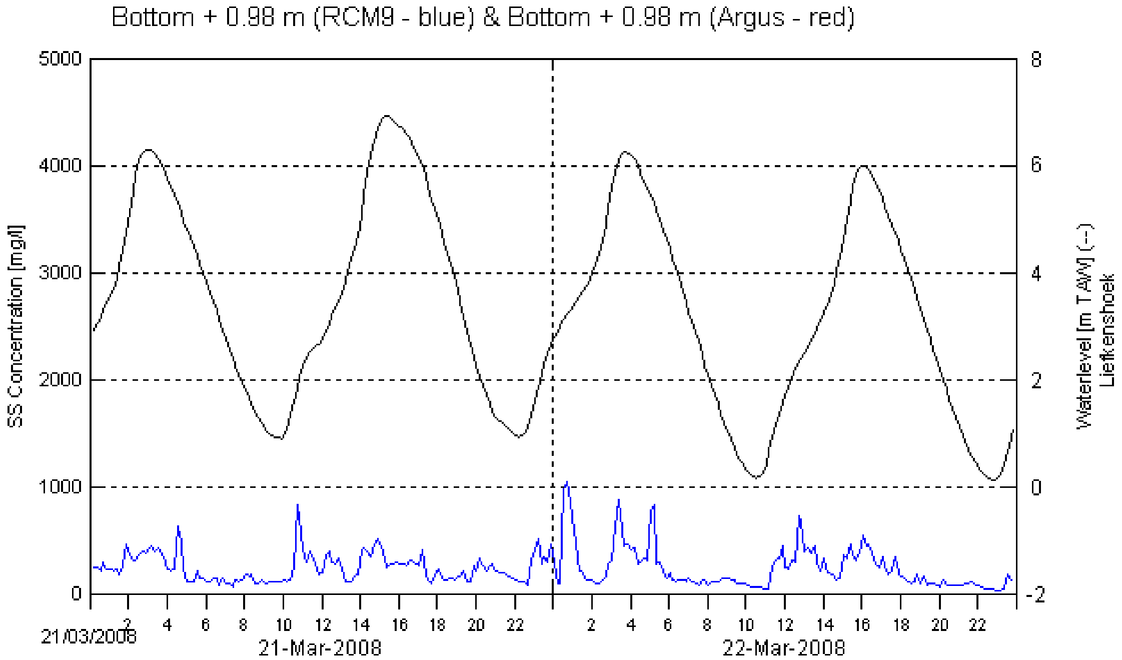
Date: 19/03/08 – 20/03/08

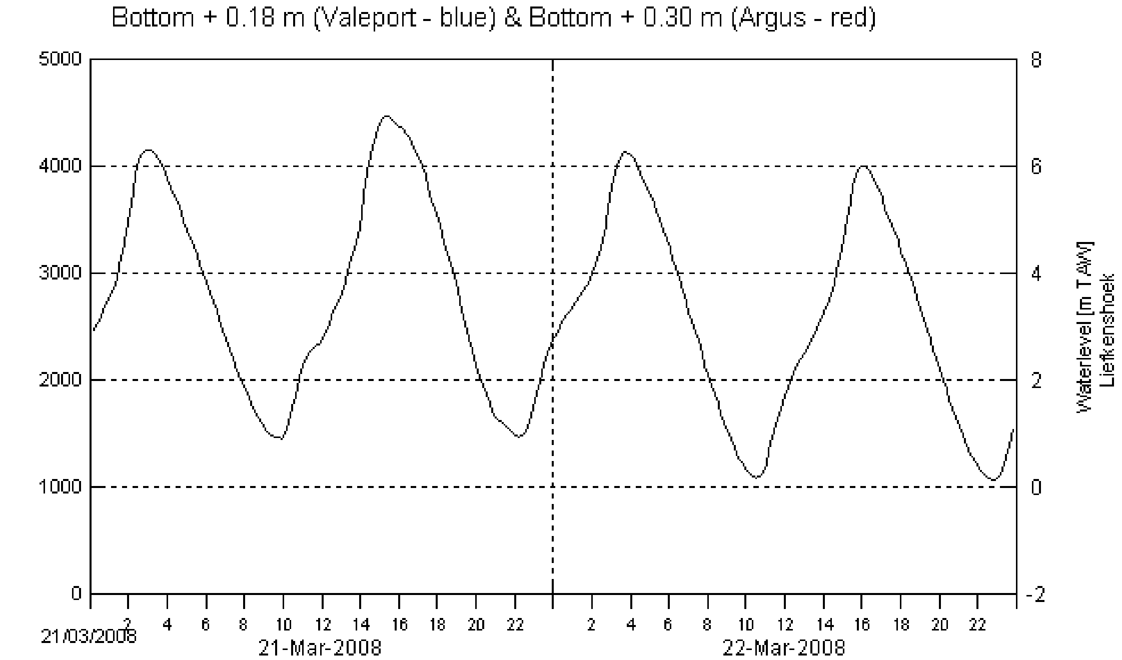
Data processed by: IMDC

In association with: WL | delft hydraulics; GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW

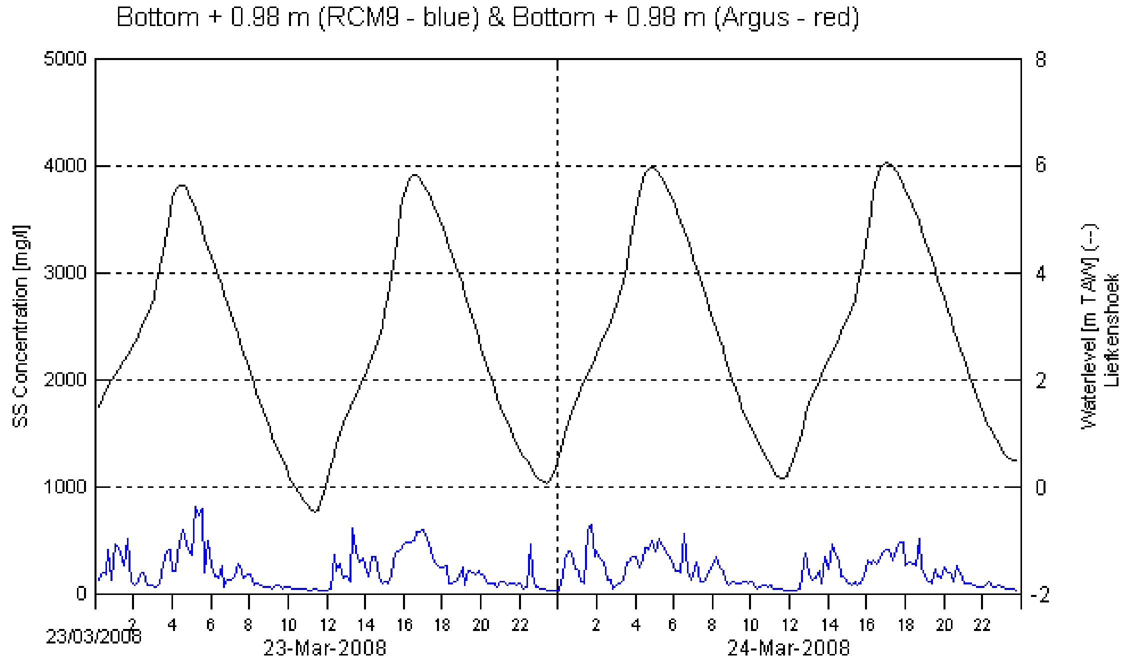
Date: 21/03/08 – 22/03/08

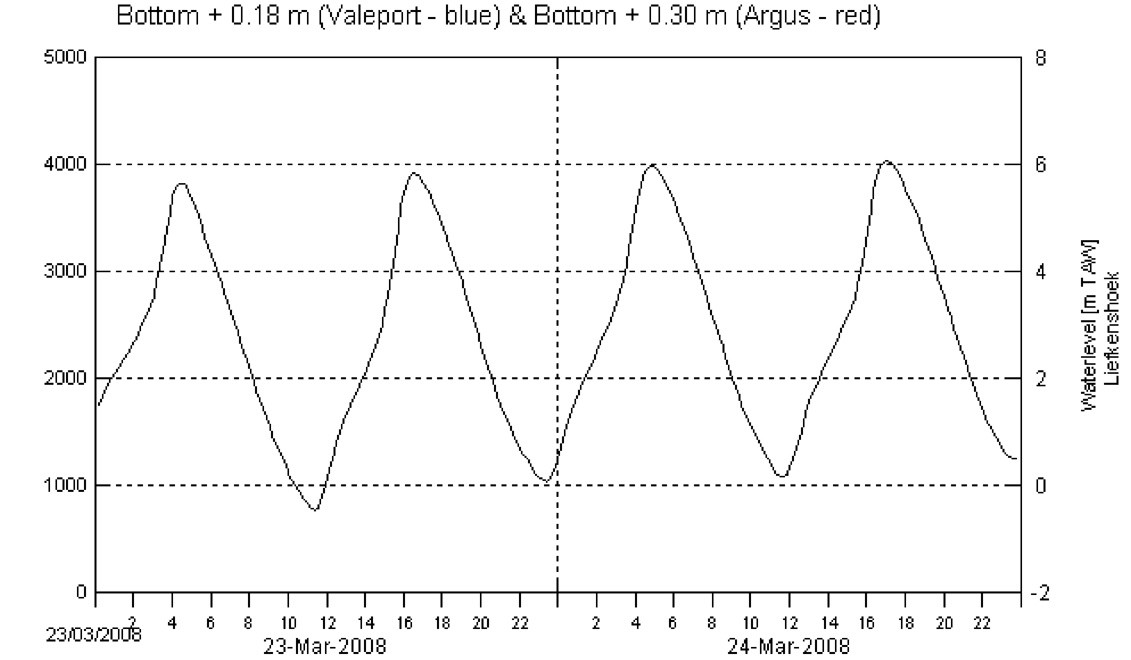
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW

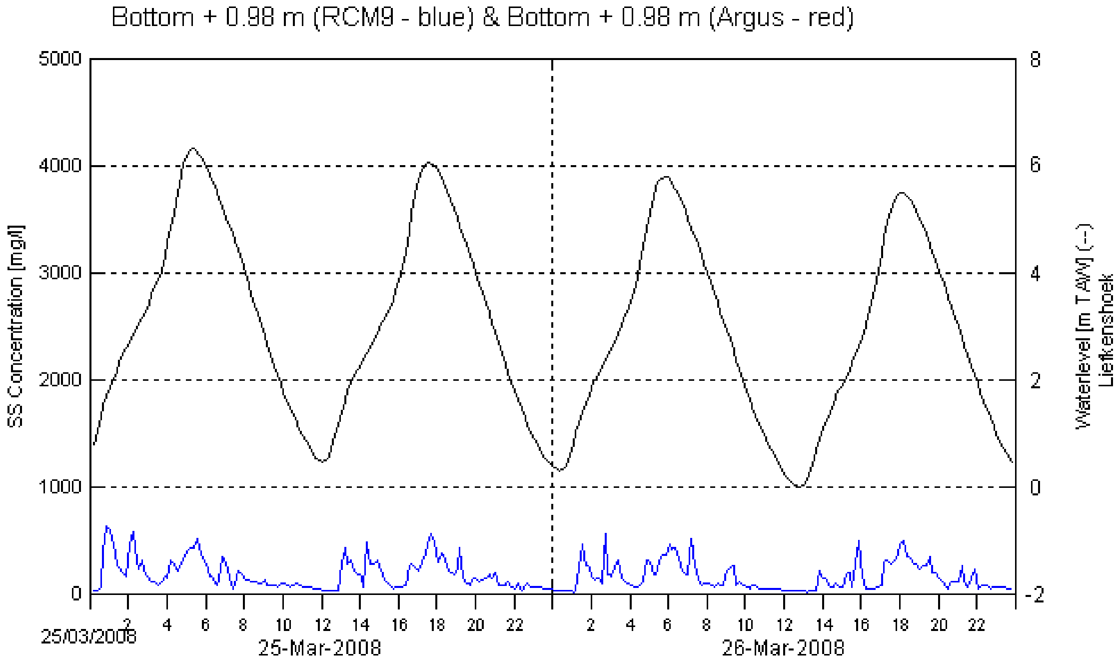
Date: 23/03/08 – 24/03/08

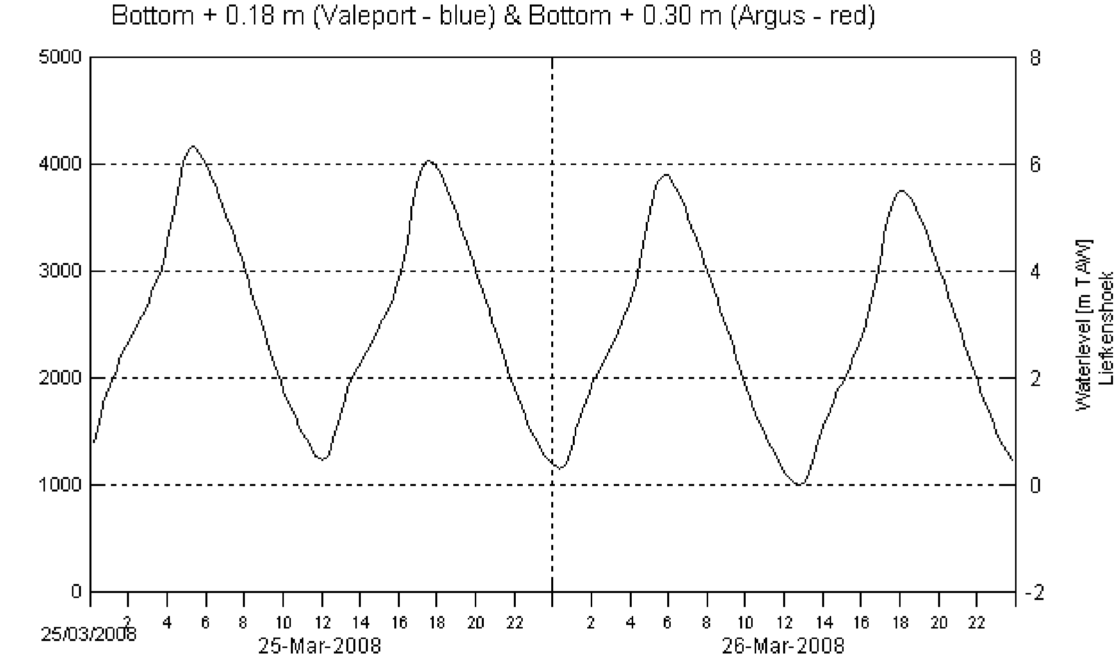
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

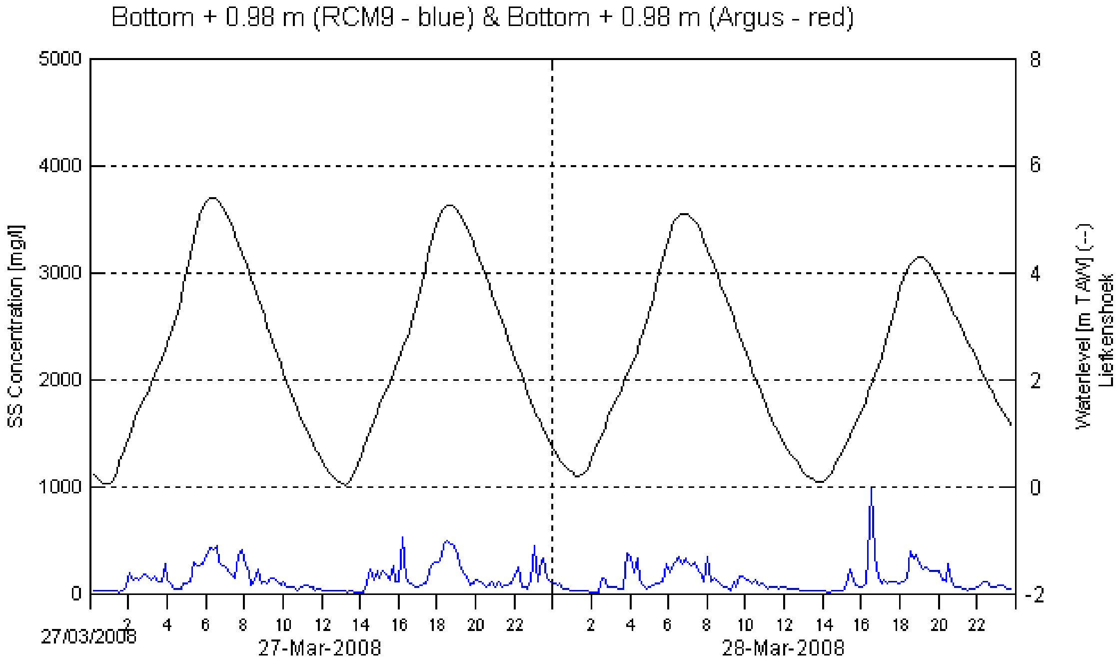
Location: Deurganckdok CDW	Date: 25/03/08 – 26/03/08

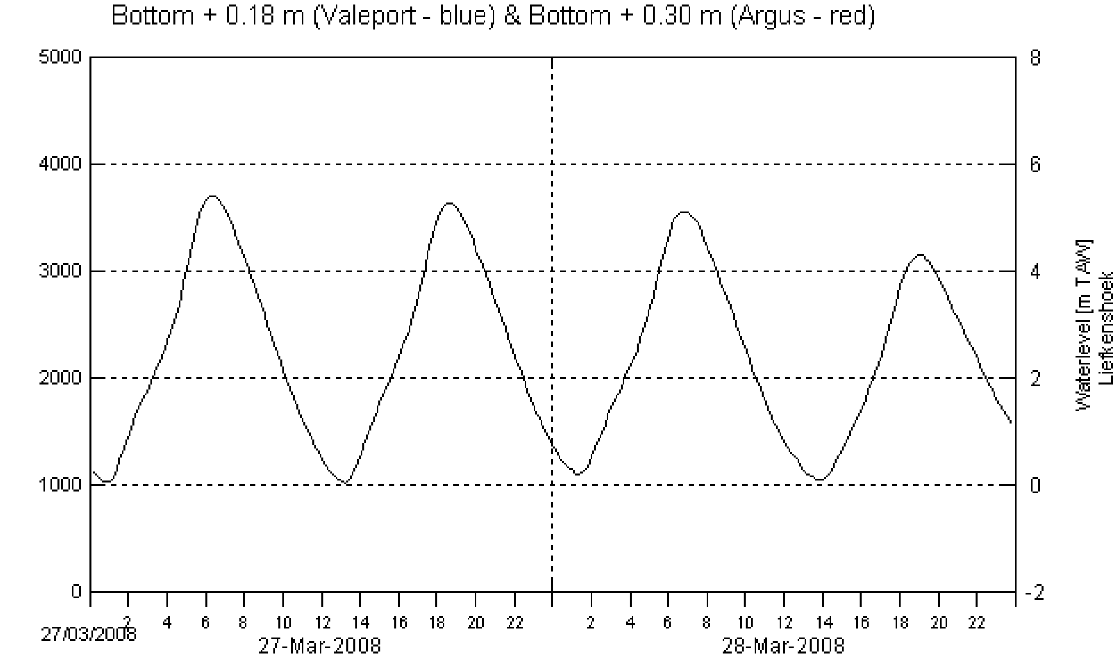
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

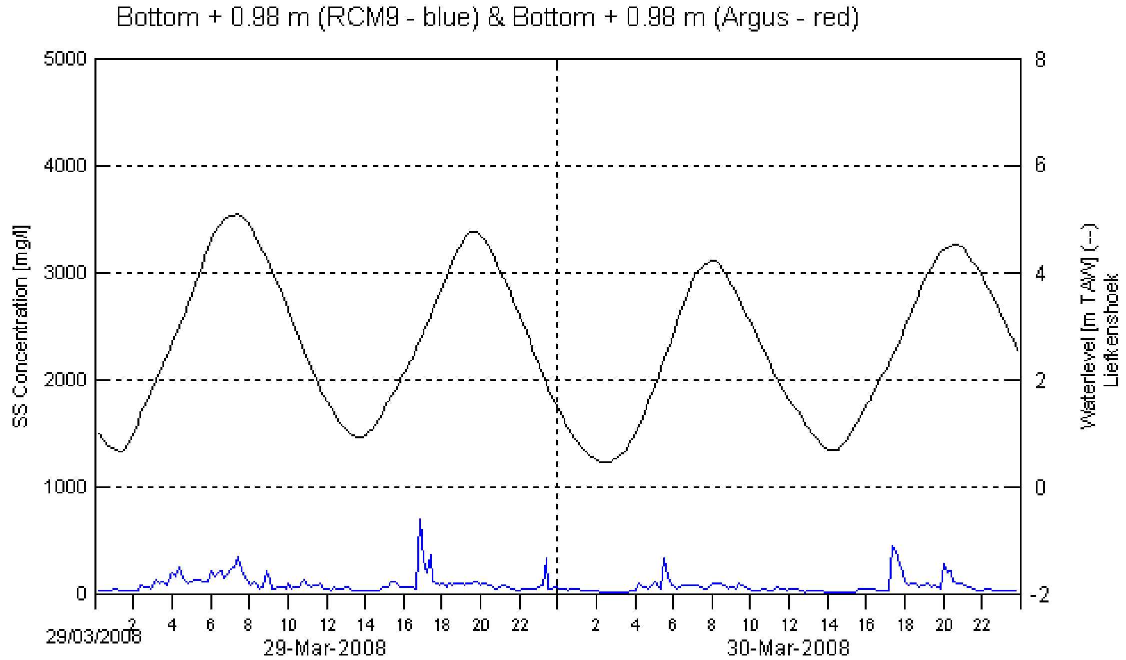
11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008

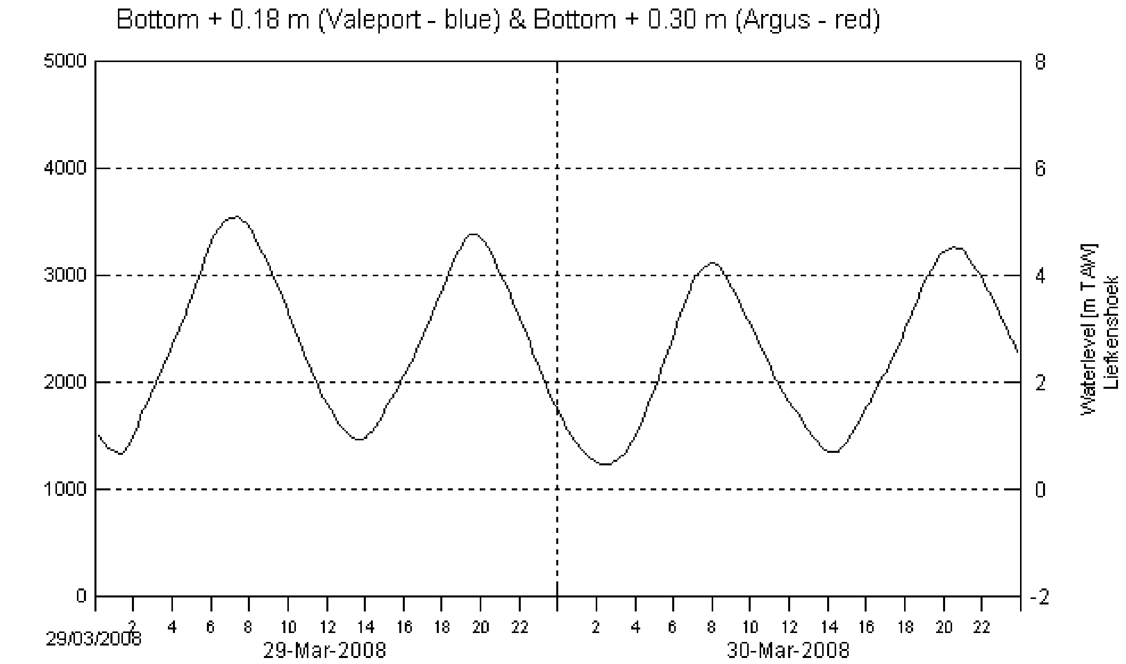




Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration		Data processed by: IMDC
Location: Deurganckdok CDW	Date: 27/03/08 – 28/03/08	In association with: WL | delft hydraulics, GEMS International I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008



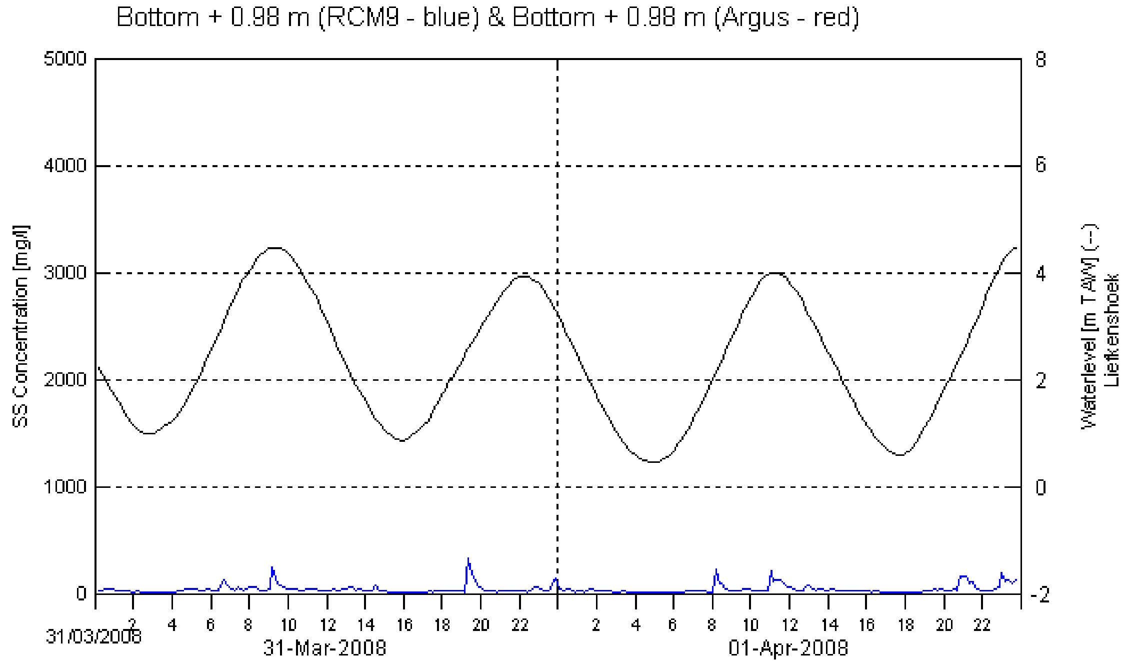


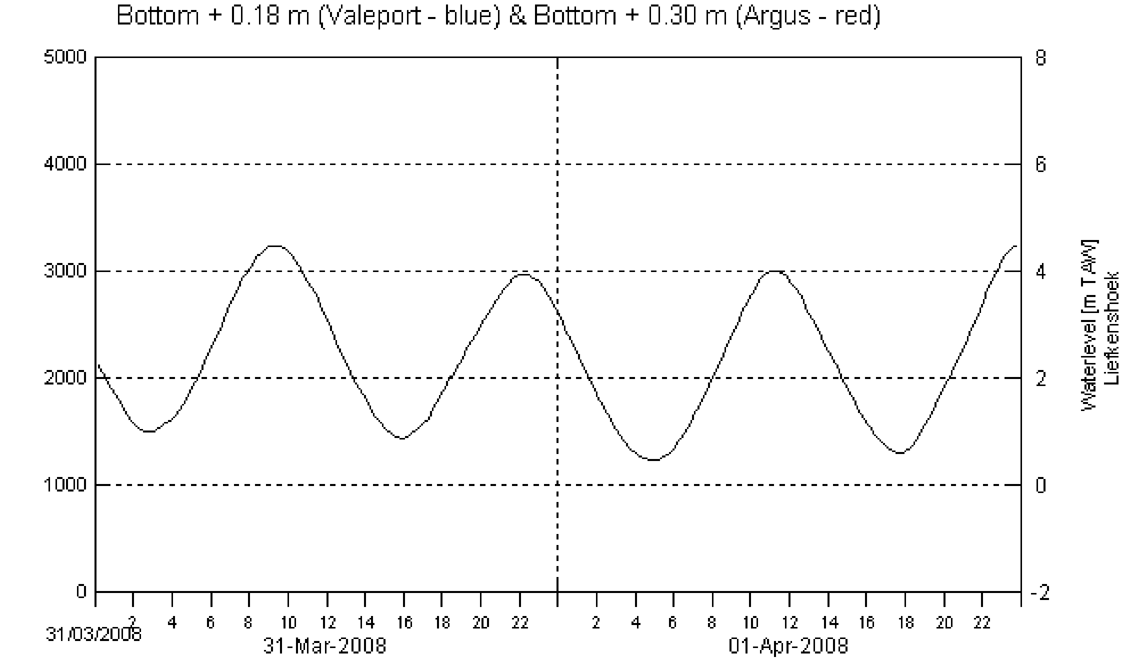
Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW	Date: 29/03/08 – 30/03/08	*Data processed by:* IMDC *In association with:* WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW

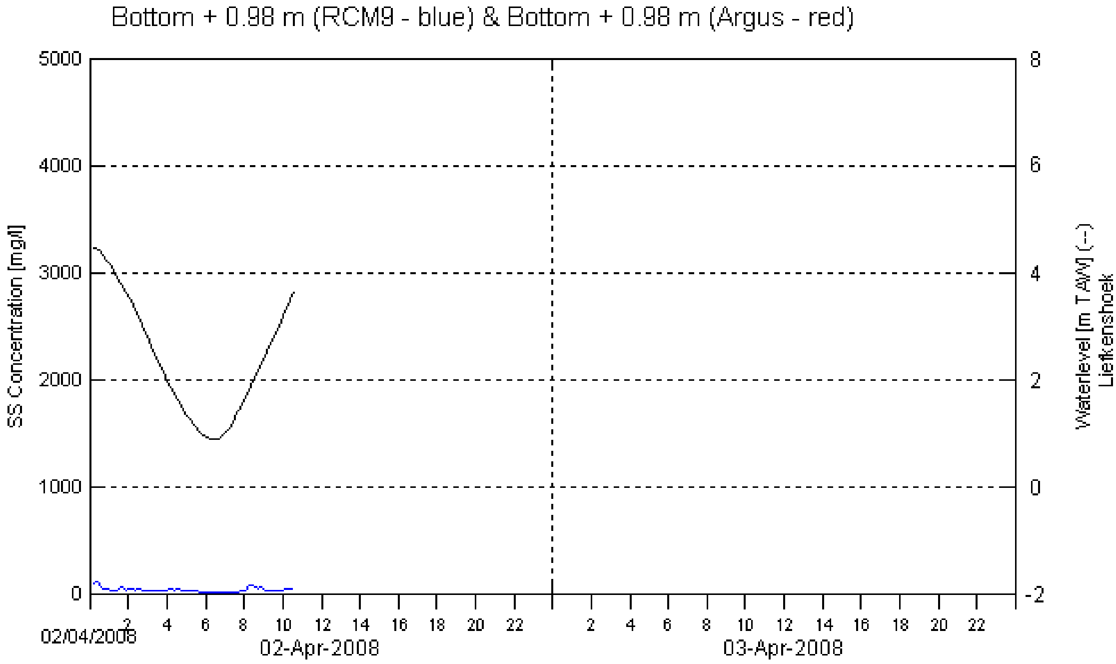
Date: 31/03/08 – 01/04/08

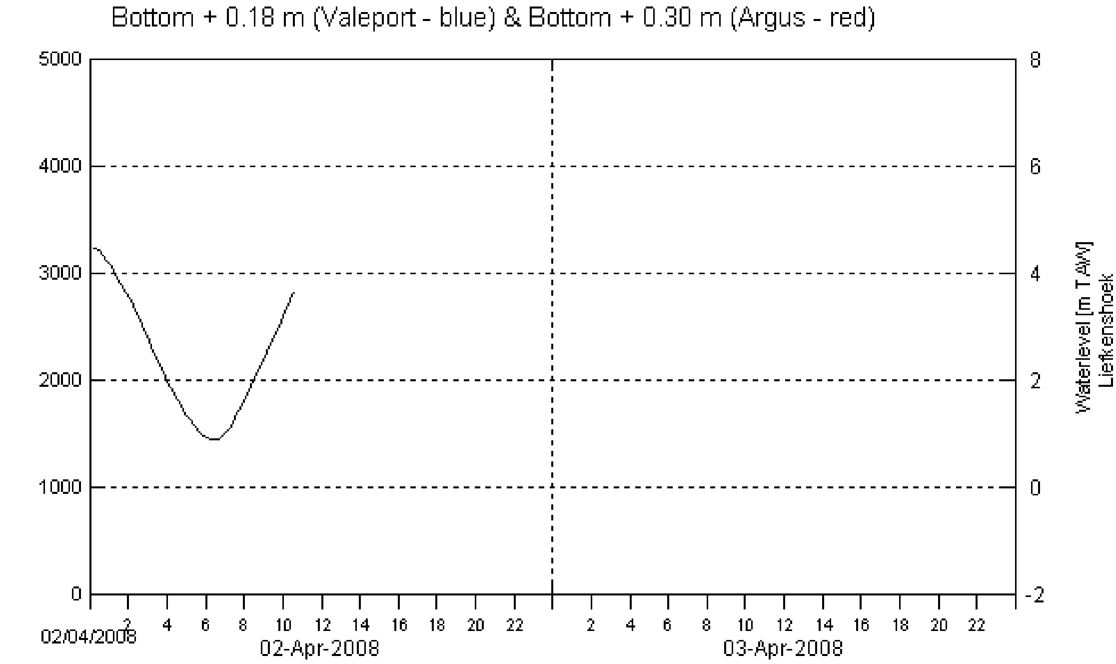
Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.98 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW

Date: 02/04/08

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/07.094/MSA

Comparison of SS concentrations during each tidal phase

Date	Tide No.	Phase	Tidal Diff	OBS SS Concentration [mg/l]		Argus SS Concentration [mg/l]	
			[m]	UP (RCM9)	DOWN (Valeport)	UP	DOWN
20080220	1	HW to LW	5.6	222.6	-	160.3	240.4
20080221	1	LW to HW	5.4	258.5	-	214.4	287.2
20080221	2	HW to LW	5.7	198.4	-	138.5	222
20080221	2	LW to HW	5.9	250.2	-	260.9	273.7
20080221	3	HW to LW	5.5	209.2	-	158.1	231.9
20080222	3	LW to HW	5.5	245	-	178.8	258.1
20080222	4	HW to LW	5.5	203	-	134.2	218.3
20080222	4	LW to HW	5.8	253.9	-	195.8	266
20080222	5	HW to LW	5.7	183.4	-	119.5	207.6
20080223	5	LW to HW	5.7	220	-	163.4	238.7
20080223	6	HW to LW	6.1	185.3	-	123.6	210.1
20080223	6	LW to HW	5.7	224.2	-	166.5	239.8
20080224	7	HW to LW	6	188.9	-	128.3	216.5
20080224	7	LW to HW	5.7	207.9	-	145.5	226.2
20080224	8	HW to LW	5.7	200.5	-	141.6	226.4
20080224	8	LW to HW	5.9	220.3	-	154.5	235.9
20080225	9	HW to LW	5.5	195.1	-	125.2	214.3
20080225	9	LW to HW	5.6	195.9	-	136	225.3
20080225	10	HW to LW	5.9	168.3	-	104.2	194.2
20080225	10	LW to HW	5.5	219.3	-	154.7	237.5
20080226	11	HW to LW	5.5	176.1	-	118.5	174.6
20080226	11	LW to HW	5.1	208.9	-	163.2	134.2
20080226	12	HW to LW	4.9	182	-	190.7	115.1
20080226	12	LW to HW	5.6	237.6	-	183.1	136.5
20080227	13	HW to LW	5.2	190.4	-	118	117.1
20080227	13	LW to HW	5.2	241.5	-	171.4	140.6
20080227	14	HW to LW	5.1	199.3	-	130.2	140.2
20080227	14	LW to HW	4.7	241.2	-	185.3	184
20080228	15	HW to LW	5.2	180.2	-	115.6	97.1
20080228	15	LW to HW	4.7	225.8	-	168.7	132.3
20080228	16	HW to LW	4.8	157.7	-	95.9	64.8
20080228	16	LW to HW	4.7	261.3	-	195.9	160.8
20080229	17	HW to LW	4.4	164.5	-	98.9	65.8
20080229	17	LW to HW	4.5	241.2	-	183.2	145.9
20080229	18	HW to LW	4.4	156.5	-	90.1	61.9
20080229	18	LW to HW	3.9	198.7	-	126.1	95.1
20080301	19	HW to LW	3.2	125.4	-	66.4	42.1
20080301	19	LW to HW	4.6	176.2	-	116.7	84
20080301	20	HW to LW	3.4	119.7	-	64.5	37.4
20080301	20	LW to HW	2.1	216.1	-	153.9	130.1
20080302	21	HW to LW	3	45.3	-	10	1.5
20080302	21	LW to HW	2.8	105.6	-	52.3	29.9
20080302	22	HW to LW	3.2	53.7	-	13.2	3.8
20080302	22	LW to HW	3.2	92	-	43.7	24.1
20080303	23	HW to LW	3.5	62.7	-	15.6	8.2

Comparison of SS concentrations during each tidal phase

Date	Tide No.	Phase	Tidal Diff [m]	OBS SS Concentration [mg/l] UP (RCM9)	OBS SS Concentration [mg/l] DOWN (Valeport)	Argus SS Concentration [mg/l] UP	Argus SS Concentration [mg/l] DOWN
20080303	23	LW to HW	4	111.7	-	58.5	36.1
20080303	24	HW to LW	3.8	119.2	-	58.8	37.4
20080304	24	LW to HW	3.4	105.6	-	50.9	31.4
20080304	25	HW to LW	4	105.6	-	46.7	25.8
20080304	25	LW to HW	4.3	153.1	-	94.5	72.9
20080304	26	HW to LW	4.1	131	-	67.4	44.1
20080305	26	LW to HW	4	182.4	-	109.1	88.6
20080305	27	HW to LW	4.8	120.6	-	62.9	43.7
20080305	27	LW to HW	4.8	244.7	-	184	157.2
20080305	28	HW to LW	5	175.8	-	103.4	77
20080306	28	LW to HW	5.3	260.9	-	188.8	165
20080306	29	HW to LW	5	183.3	-	106.8	83.2
20080306	29	LW to HW	5.5	252.6	-	193.9	157.3
20080306	30	HW to LW	5.5	197.3	-	120.9	92.9
20080307	30	LW to HW	5.3	262.3	-	232	186.7
20080307	31	HW to LW	5.6	200.8	-	122.1	97
20080307	31	LW to HW	6	259.5	-	225.7	194.5
20080307	32	HW to LW	5.6	240.1	-	162.2	134.9
20080308	32	LW to HW	5.6	282.2	-	245.6	217.2
20080308	33	HW to LW	5.9	234.4	-	156	135.7
20080308	33	LW to HW	6.1	276.2	-	253.3	226
20080308	34	HW to LW	6.1	245.2	-	171.4	143.5
20080309	34	LW to HW	5.9	265.2	-	303.7	280.5
20080309	35	HW to LW	5.9	240.1	-	157.3	134.4
20080309	35	LW to HW	6.5	278.1	-	292.5	268
20080309	36	HW to LW	6.1	259.1	-	170.9	143.9
20080310	36	LW to HW	5.8	273.2	-	280.6	256.6
20080310	37	HW to LW	6.7	250.4	-	204	156.5
20080310	37	LW to HW	6.2	317.9	-	376.3	331.8
20080310	38	HW to LW	5.3	302.2	-	233.8	205.7
20080311	38	LW to HW	6.3	290.1	-	313.6	299.5
20080311	39	HW to LW	6	273.8	-	168.7	165.8
20080311	39	LW to HW	5.8	279.7	-	286.9	225.4
20080312	40	HW to LW	5.4	257.2	-	187.1	188.3
20080312	40	LW to HW	5.9	286	-	252.6	250.8
20080312	41	HW to LW	5.5	259.2	-	155.6	158.3
20080312	41	LW to HW	5.4	294.1	-	291.5	291.2
20080313	42	HW to LW	5.5	235.8	-	135.2	139.7
20080313	42	LW to HW	5.4	259.7	-	189.7	187.9
20080313	43	HW to LW	5.8	255	-	181	186.2
20080313	43	LW to HW	5.1	286.8	-	170.6	164.2
20080314	44	HW to LW	5.7	199.8	-	550.5	477.4
20080314	44	LW to HW	5.5	317.9	-	187.3	183.9
20080314	45	HW to LW	5.3	245.5	-	472.2	434
20080314	45	LW to HW	4.9	235.5	-	143.7	162.3
20080315	46	HW to LW	5	159.1	-	469	395.9

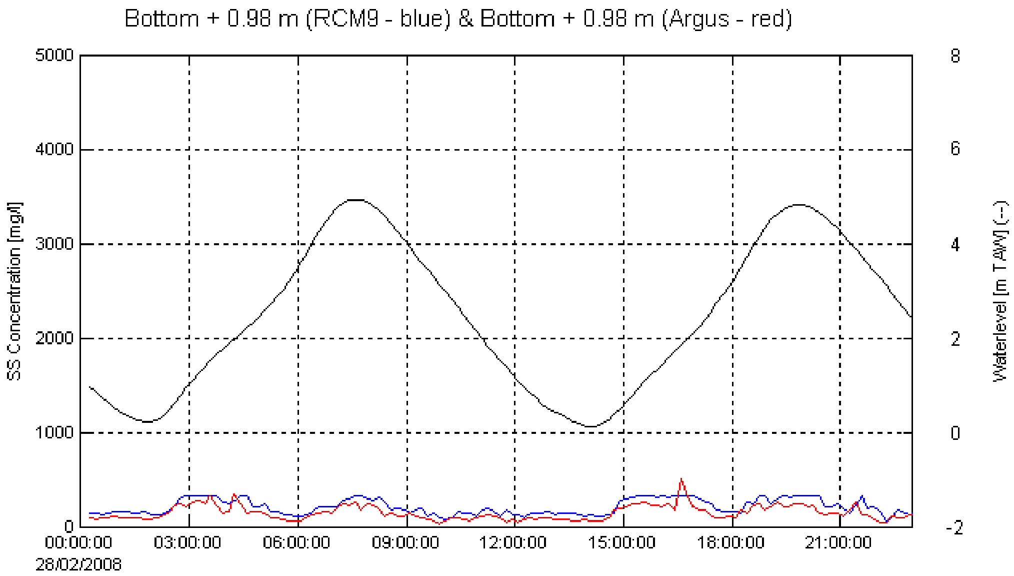
Comparison of SS concentrations during each tidal phase

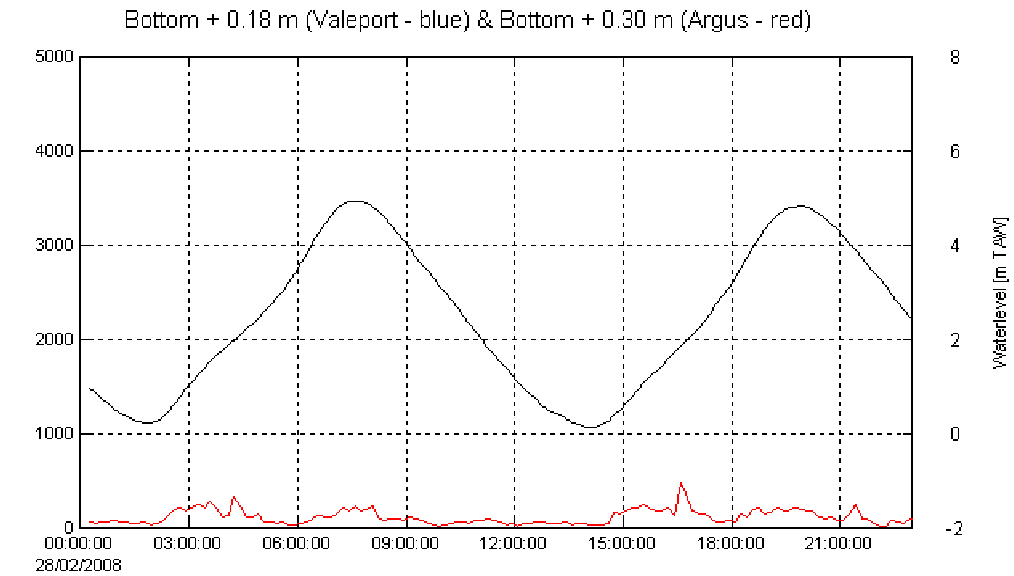
Date	Tide No.	Phase	Tidal Diff	OBS SS Concentration [mg/l]		Argus SS Concentration [mg/l]	
			[m]	UP (RCM9)	DOWN (Valeport)	UP	DOWN
20080315	46	LW to HW	4.9	221.7	-	175.9	137.5
20080315	47	HW to LW	4.8	158.9	-	489.3	480.6
20080315	47	LW to HW	4.4	177.3	-	105.4	101.6
20080316	48	HW to LW	4.2	188.9	-	281.9	216.3
20080316	48	LW to HW	4.6	197.4	-	109.2	101.1
20080316	49	HW to LW	4.2	110.8	-	295.3	228.4
20080316	49	LW to HW	3.7	128	-	269.8	357.8
20080317	50	HW to LW	4	55.2	-	106.2	145.3
20080317	50	LW to HW	4.5	122.9	-	64.8	81.3
20080317	51	HW to LW	4.4	78.1	-	113.5	167.1
20080318	51	LW to HW	4.3	113.2	-	131.5	60.2
20080318	52	HW to LW	4.7	79.5	-	173.1	112
20080318	52	LW to HW	5.3	155.5	-	129.7	77.9
20080318	53	HW to LW	5	131.5	-	292.8	263.2
20080319	53	LW to HW	4.9	169.6	-	93.7	85.5
20080319	54	HW to LW	5.1	117.8	-	172.1	72.7
20080319	54	LW to HW	5.5	206.8	-	121.1	113.3
20080319	55	HW to LW	5.4	135.3	-	399.8	378.9
20080320	55	LW to HW	5.2	226.4	-	117.2	107.7
20080320	56	HW to LW	5.7	143.1	-	440.2	403
20080321	56	LW to HW	6.5	208.7	-	70.2	64
20080321	57	HW to LW	5.4	191.2	-	-	-
20080321	57	LW to HW	6	301.5	-	-	-
20080321	58	HW to LW	6	206.6	-	-	-
20080322	58	LW to HW	5.3	353.5	-	-	-
20080322	59	HW to LW	6.1	194.6	-	-	-
20080322	59	LW to HW	5.8	302	-	-	-
20080322	60	HW to LW	5.9	147.9	-	-	-
20080323	60	LW to HW	5.5	206.5	-	-	-
20080323	61	HW to LW	6.1	186.7	-	-	-
20080323	61	LW to HW	6.3	249.8	-	-	-
20080323	62	HW to LW	5.7	190.1	-	-	-
20080324	62	LW to HW	5.9	251.8	-	-	-
20080324	63	HW to LW	5.8	182.3	-	-	-
20080324	63	LW to HW	5.8	201.5	-	-	-
20080324	64	HW to LW	5.5	180.4	-	-	-
20080325	64	LW to HW	5.8	249.6	-	-	-
20080325	65	HW to LW	5.8	132.3	-	-	-
20080325	65	LW to HW	5.6	192.7	-	-	-
20080326	66	HW to LW	5.7	145.5	-	-	-
20080326	66	LW to HW	5.5	180.6	-	-	-
20080326	67	HW to LW	5.8	131	-	-	-
20080326	67	LW to HW	5.5	141.9	-	-	-
20080327	68	HW to LW	5.4	136.1	-	-	-
20080327	68	LW to HW	5.3	137	-	-	-
20080327	69	HW to LW	5.3	127.1	-	-	-

Comparison of SS concentrations during each tidal phase

Date	Tide No.	Phase	Tidal Diff	OBS SS Concentration [mg/l]		Argus SS Concentration [mg/l]	
			[m]	UP (RCM9)	DOWN (Valeport)	UP	DOWN
20080327	69	LW to HW	5.2	174.2	-	-	-
20080328	70	HW to LW	5	131	-	-	-
20080328	70	LW to HW	4.9	130.2	-	-	-
20080328	71	HW to LW	5	105.3	-	-	-
20080328	71	LW to HW	4.2	157.8	-	-	-
20080329	72	HW to LW	3.6	87.5	-	-	-
20080329	72	LW to HW	4.4	122	-	-	-
20080329	73	HW to LW	4.1	76.4	-	-	-
20080329	73	LW to HW	3.8	99.9	-	-	-
20080330	74	HW to LW	4.3	51.2	-	-	-
20080330	74	LW to HW	3.8	62.2	-	-	-
20080330	75	HW to LW	3.5	40.8	-	-	-
20080330	75	LW to HW	3.8	87.2	-	-	-
20080331	76	HW to LW	3.5	33.4	-	-	-
20080331	76	LW to HW	3.5	40.5	-	-	-
20080331	77	HW to LW	3.6	34.7	-	-	-
20080331	77	LW to HW	3	36.5	-	-	-
20080401	78	HW to LW	3.5	25.9	-	-	-
20080401	78	LW to HW	3.5	37	-	-	-
20080401	79	HW to LW	3.4	34	-	-	-
20080402	79	LW to HW	3.9	55.1	-	-	-
20080402	80	HW to LW	3.6	30.6	-	-	-

11283 Accretion Deurganckdok – Near bed continuous monitoring – Winter 2008





Comparison of RCM9 & Valeport (blue) to Argus sensors (red) at 0.99 m and 0.18 m above the bottom for SS concentration

Location: Deurganckdok CDW	Date: Avg Tide 28/02/08	*Data processed by:* IMDC *In association with:* WL | delft hydraulics, GEMS International *I/RA/11283/07.094/MSA*

F.2 Sill Frame

No Argus ASM IV data available

APPENDIX G.

HCBS2 REPORTS

Report	Description
Ambient Conditions Lower Sea Scheldt	
5.3	Overview of ambient conditions in the river Scheldt – January-June 2006 (I/RA/11291/06.088/MSA)
5.4	Overview of ambient conditions in the river Scheldt – July-December 2006 (I/RA/11291/06.089/MSA)
~~5.5~~	~~Overview of ambient conditions in the river Scheldt : RCM-9 buoy 84 & 97 (1/1/2007 -31/3/2007) (I/RA/11291/06.090/MSA)~~*
5.6	Analysis of ambient conditions 21/09/05 - 31/3/2007 (I/RA/11291/06.091/MSA)
Calibration	
6.1	Winter Calibration (I/RA/11291/06.092/MSA)
6.2	Summer Calibration and Final Report (I/RA/11291/06.093/MSA)
Through tide Measurements Winter 2006	
7.1	21/3 Scheldewacht – Deurganckdok – Salinity Distribution (I/RA/11291/06.094/MSA)
7.2	22/3 Parel 2 – Deurganckdok (I/RA/11291/06.095/MSA)
7.3	22/3 Laure Marie – Liefkenshoek (I/RA/11291/06.096/MSA)
7.4	23/3 Parel 2 – Schelle (I/RA/11291/06.097/MSA)
7.5	23/3 Laure Marie – Deurganckdok (I/RA/11291/06.098/MSA)
7.6	23/3 Veremans Waarde (I/RA/11291/06.099/MSA)
HCBS Near bed continuous monitoring (Frames)	
8.1	Near bed continuous monitoring winter 2006 (I/RA/11291/06.100/MSA)
INSSEV	
9	Settling Velocity - INSSEV summer 2006 (I/RA/11291/06.102/MSA)

Cohesive Sediment	
10	Cohesive sediment properties summer 2006 (I/RA/11291/06.103/MSA)
Through tide Measurements Summer 2006	
11.1	Through Tide Measurement Sediview and Siltprofiler 27/9 Stream - Liefkenshoek (I/RA/11291/06.104/MSA)
11.2	Through Tide Measurement Sediview 27/9 Veremans - Raai K (I/RA/11291/06.105/MSA)
11.3	Through Tide Measurement Sediview and Siltprofiler 28/9 Stream - Raai K (I/RA/11291/06.106/MSA)
11.4	Through Tide Measurement Sediview 28/9 Veremans – Waarde (I/RA/11291/06.107/MSA)
11.5	Through Tide Measurements Sediview 28/9 Parel 2 - Schelle (I/RA/11291/06.108/MSA)
11.6	Through Tide measurement Longitudinal Salinity Distribution 26/9 Scheldewacht – Deurganckdok (I/RA/11291/06.161/MSA)
Analysis	
12	Report concerning the presence of HCBS layers in the Scheldt river (I/RA/11291/06.109/MSA)

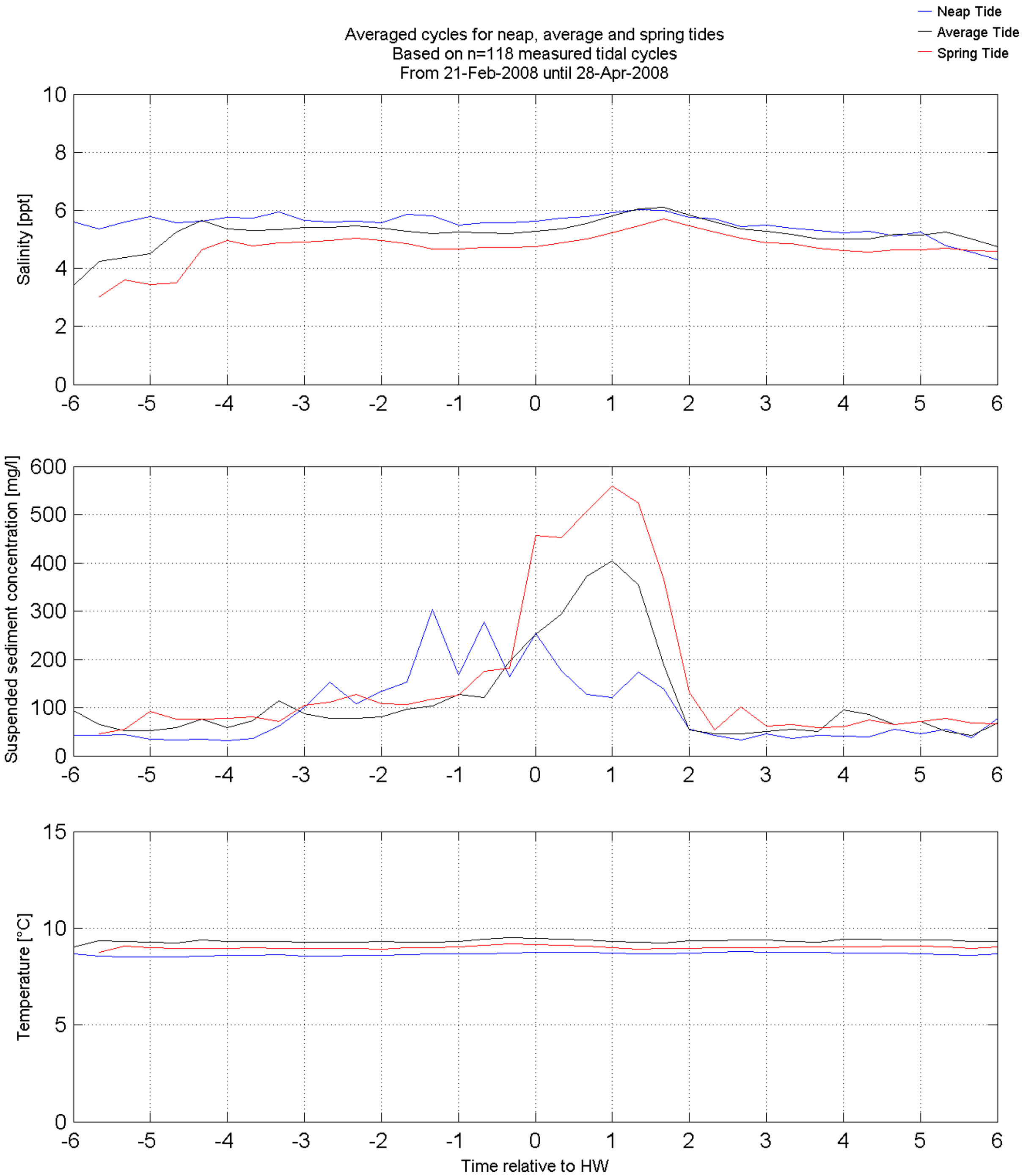
* Report 5.5 will be handled in report 3.1. Boundary conditions: Three monthly report 1/1/2007 – 31/03/2007 (I/RA/11283/06.127/MSA) including HCBS 2 report 5.5 (Deurganckdok).

APPENDIX H. AVERAGE TIDAL CYCLES

H.1 Local parameters

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: N-ENTRANCE bottom



Absolute Parameters for averaged tidal cycle

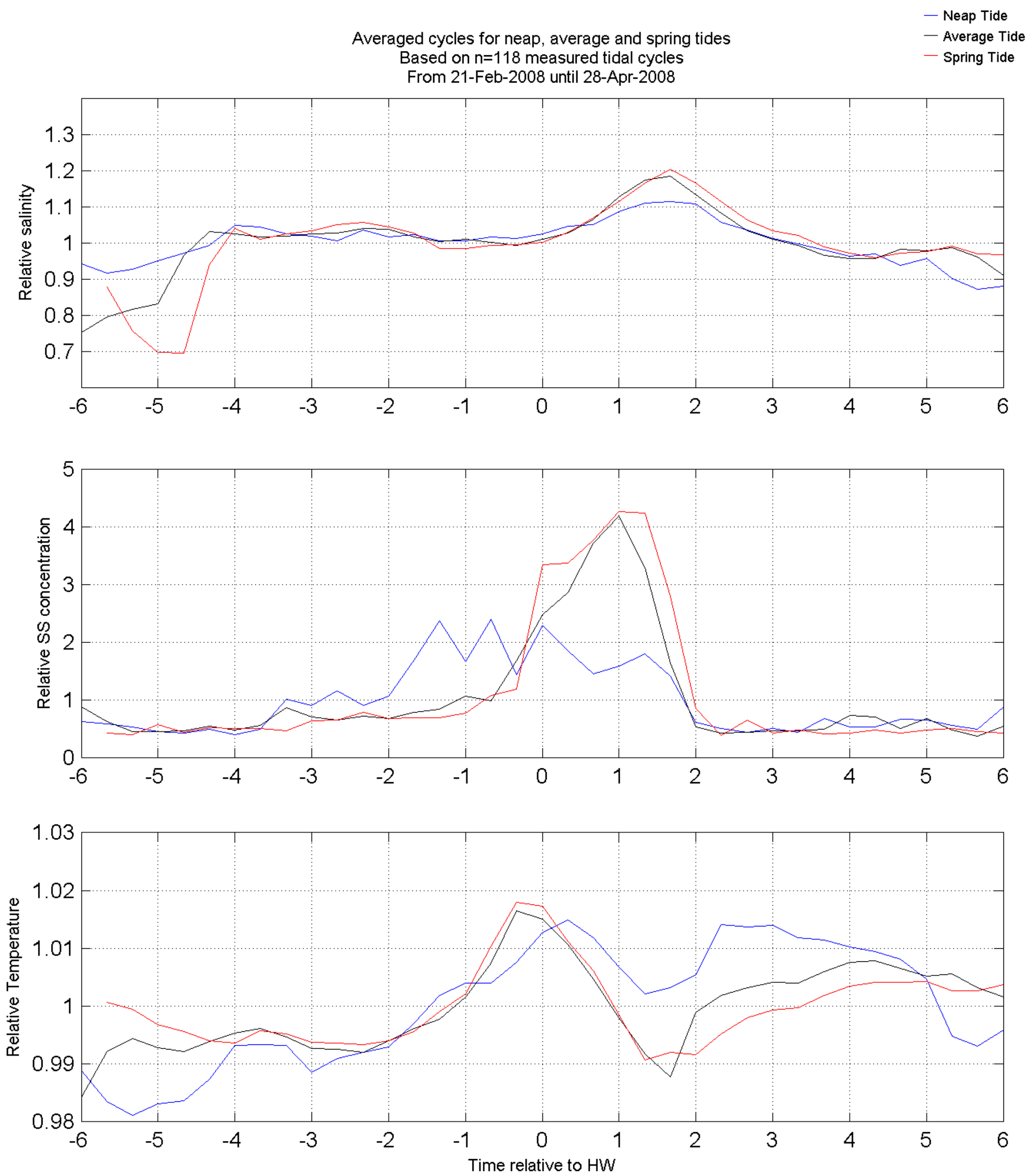
Data Processed by:

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: N-ENTRANCE bottom



Relative Parameters for averaged tidal cycle

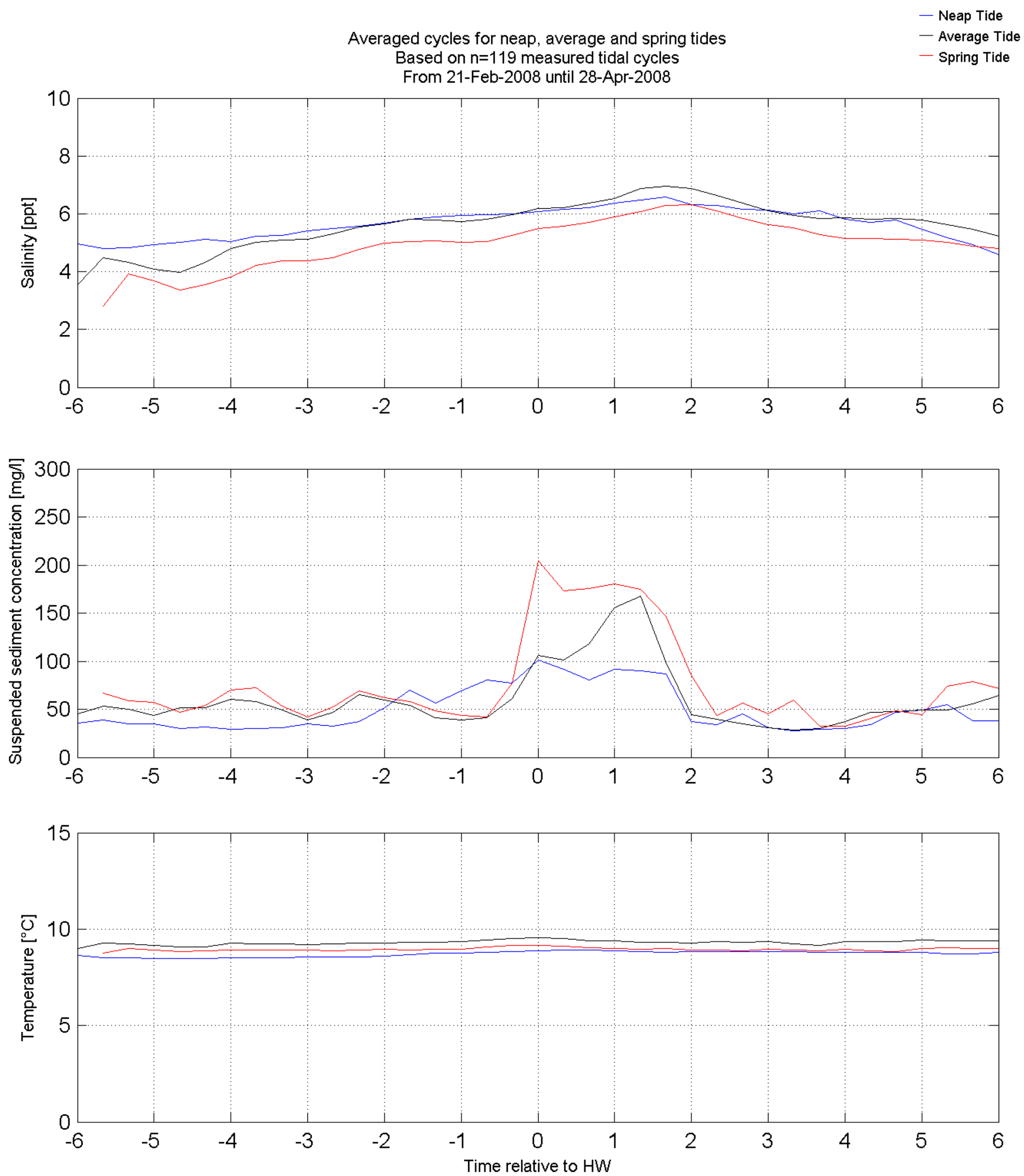
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: N-ENTRANCE top



Absolute Parameters for averaged tidal cycle

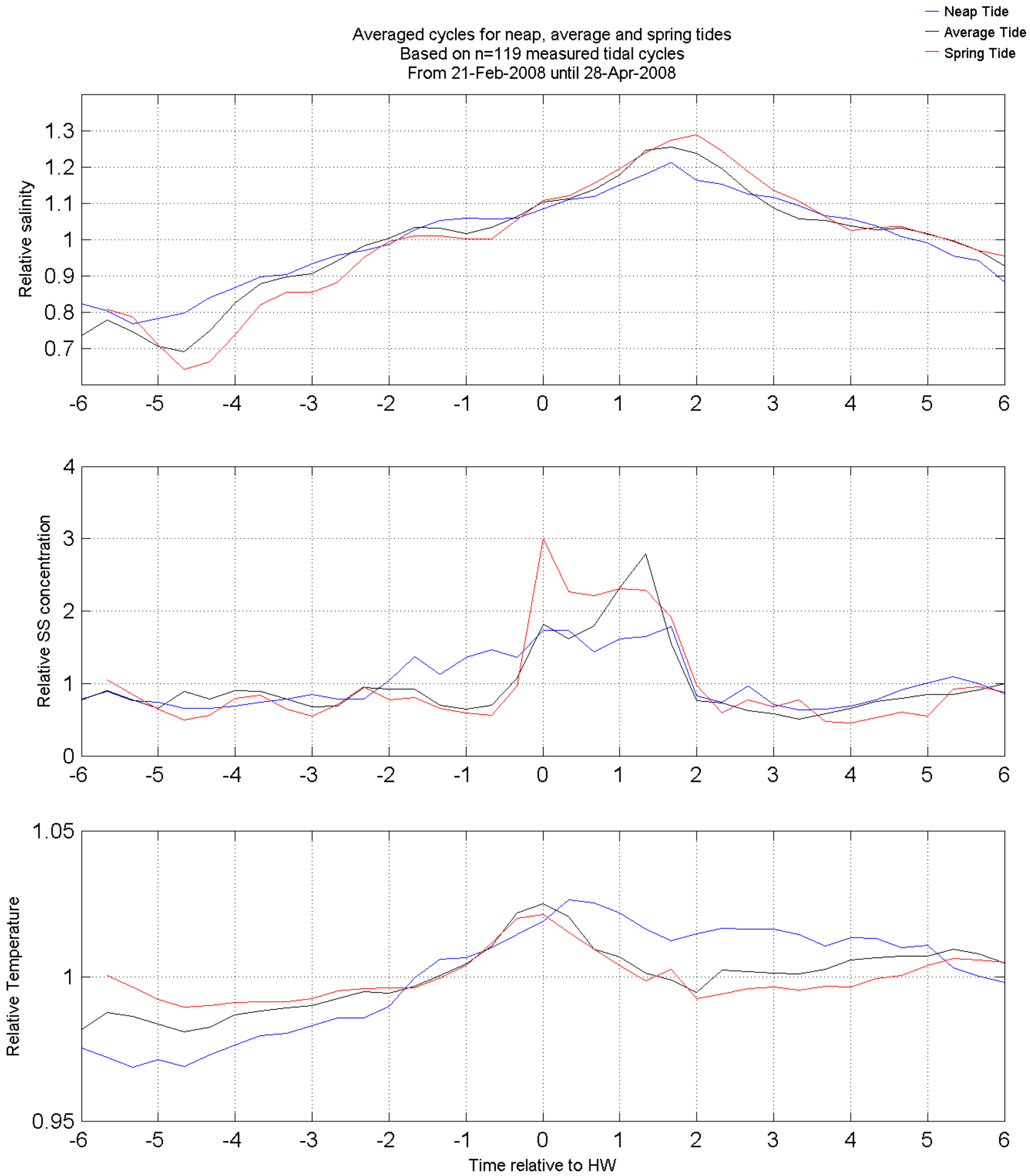
Data Processed by:

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: N-ENTRANCE top



Relative Parameters for averaged tidal cycle

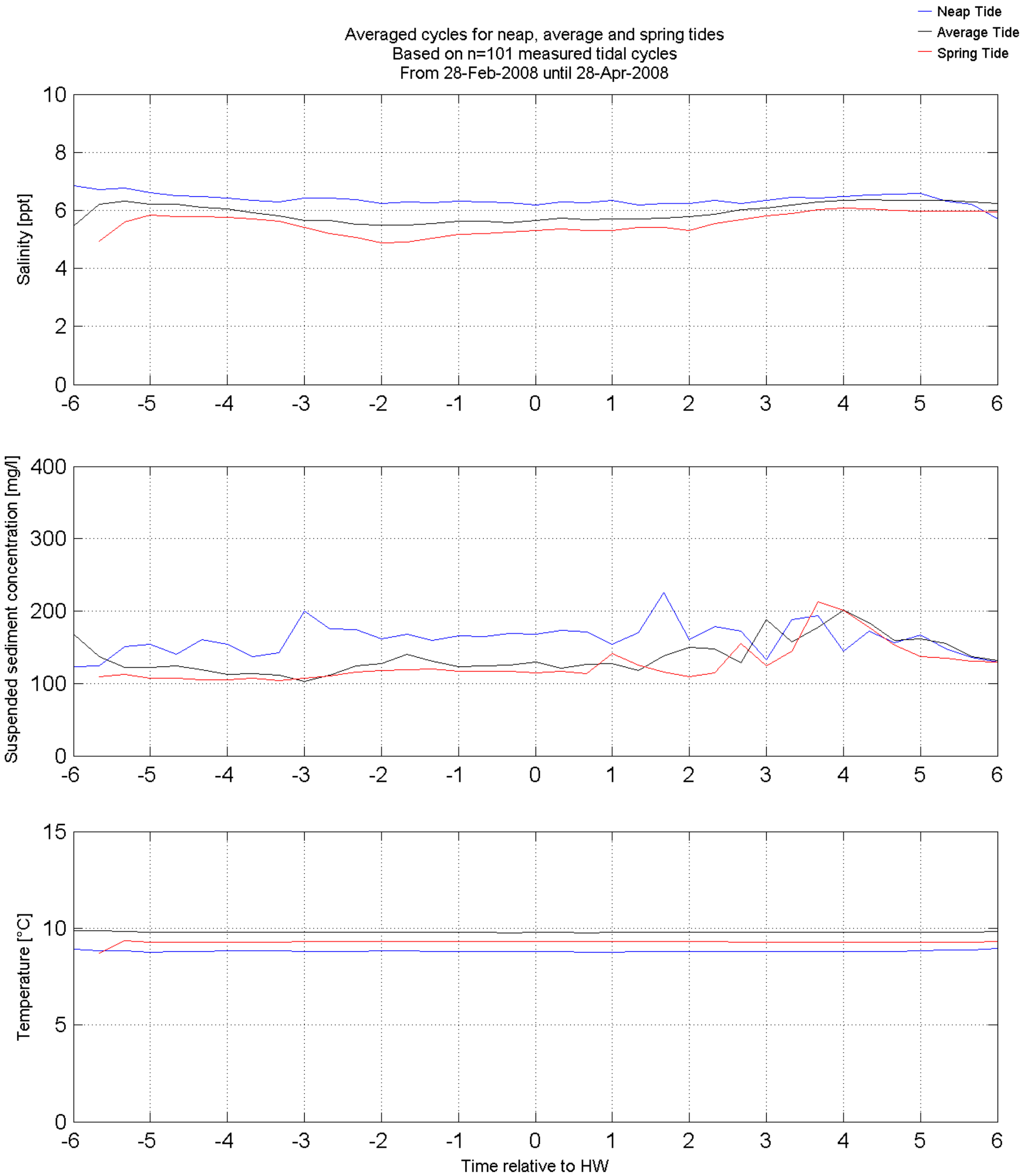
Data Processed by:

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-BACK bottom



Absolute Parameters for averaged tidal cycle

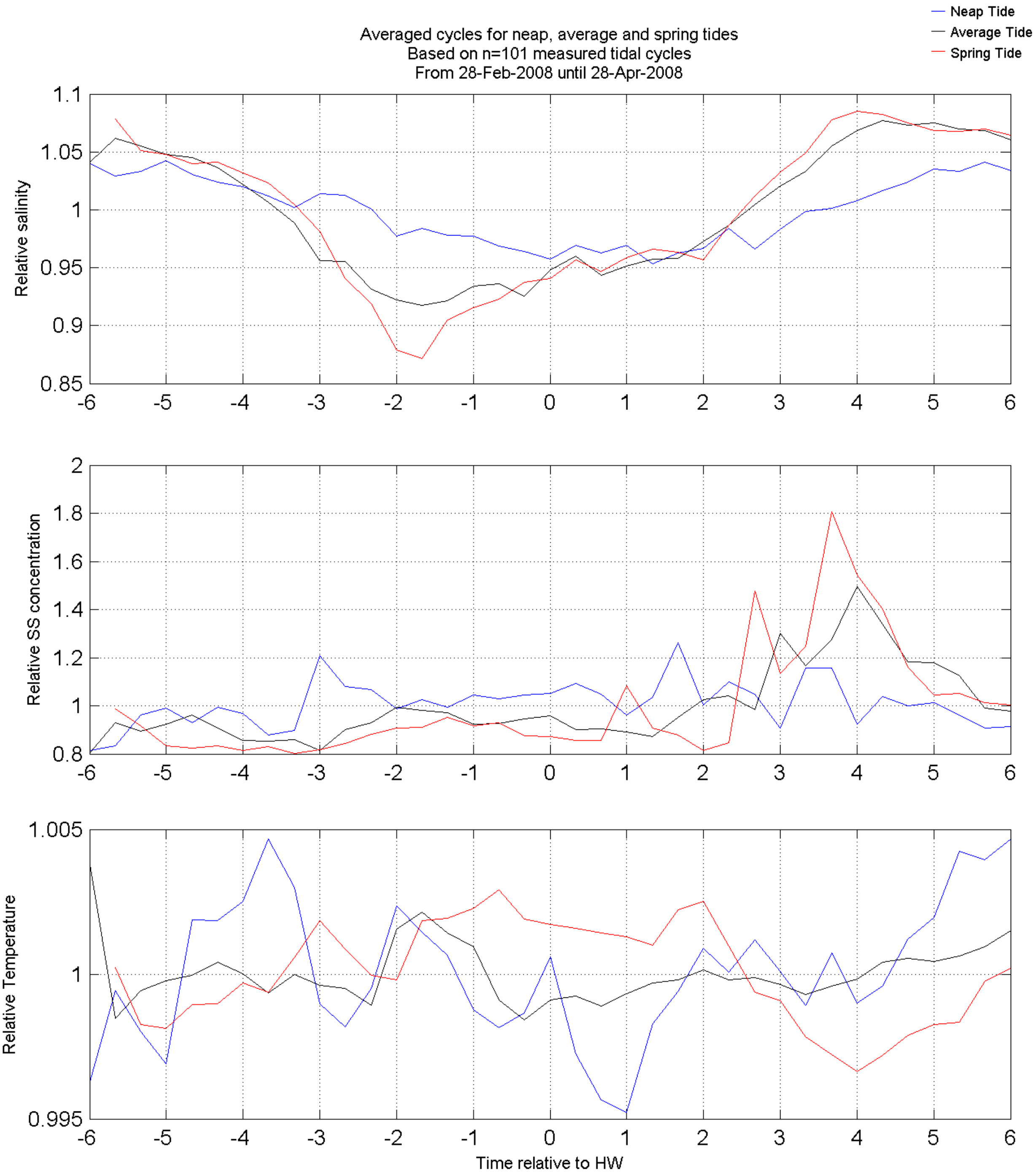
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-BACK bottom



Relative Parameters for averaged tidal cycle

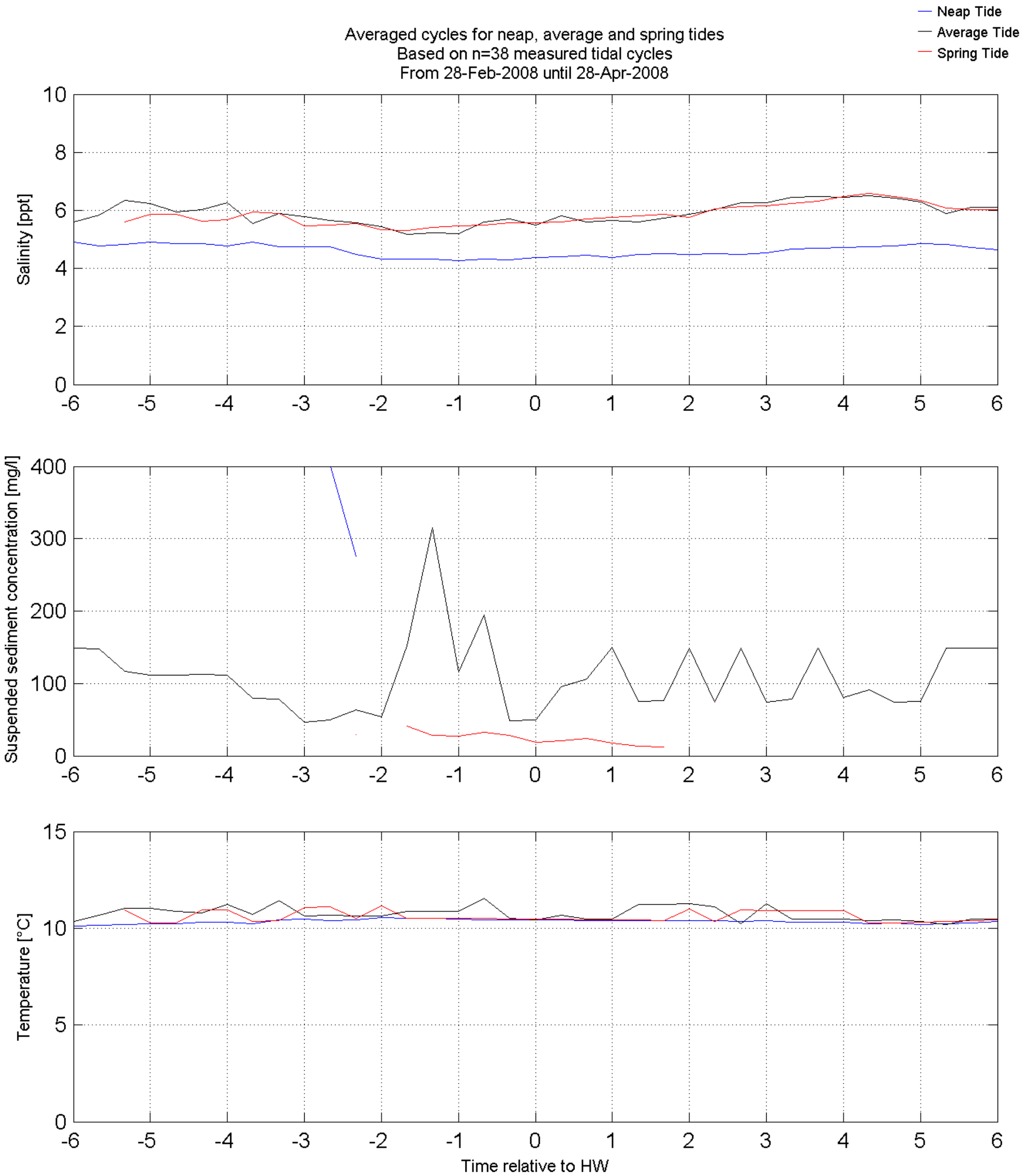
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-BACK top



Absolute Parameters for averaged tidal cycle

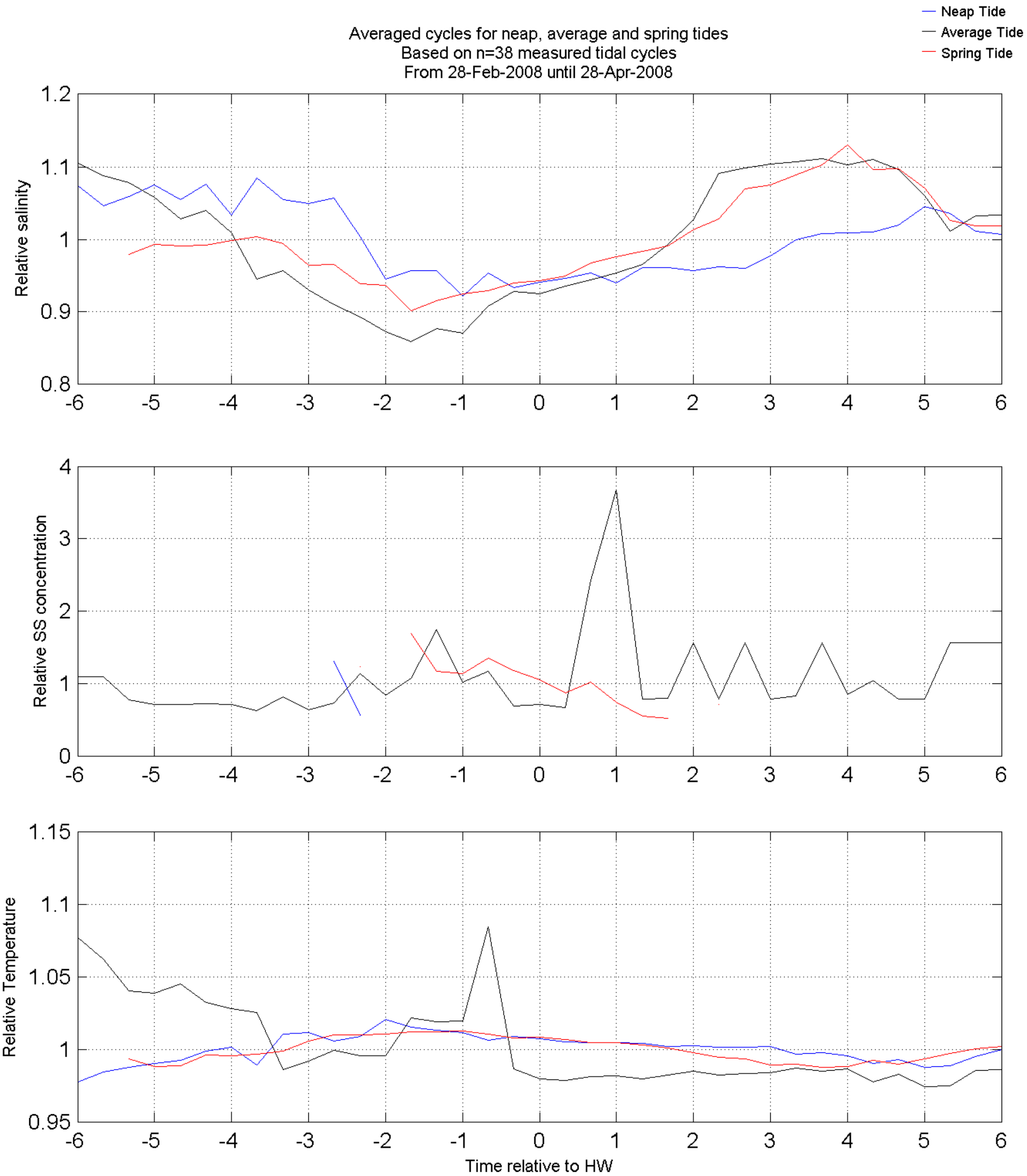
Data Processed by:

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-BACK top



Relative Parameters for averaged tidal cycle

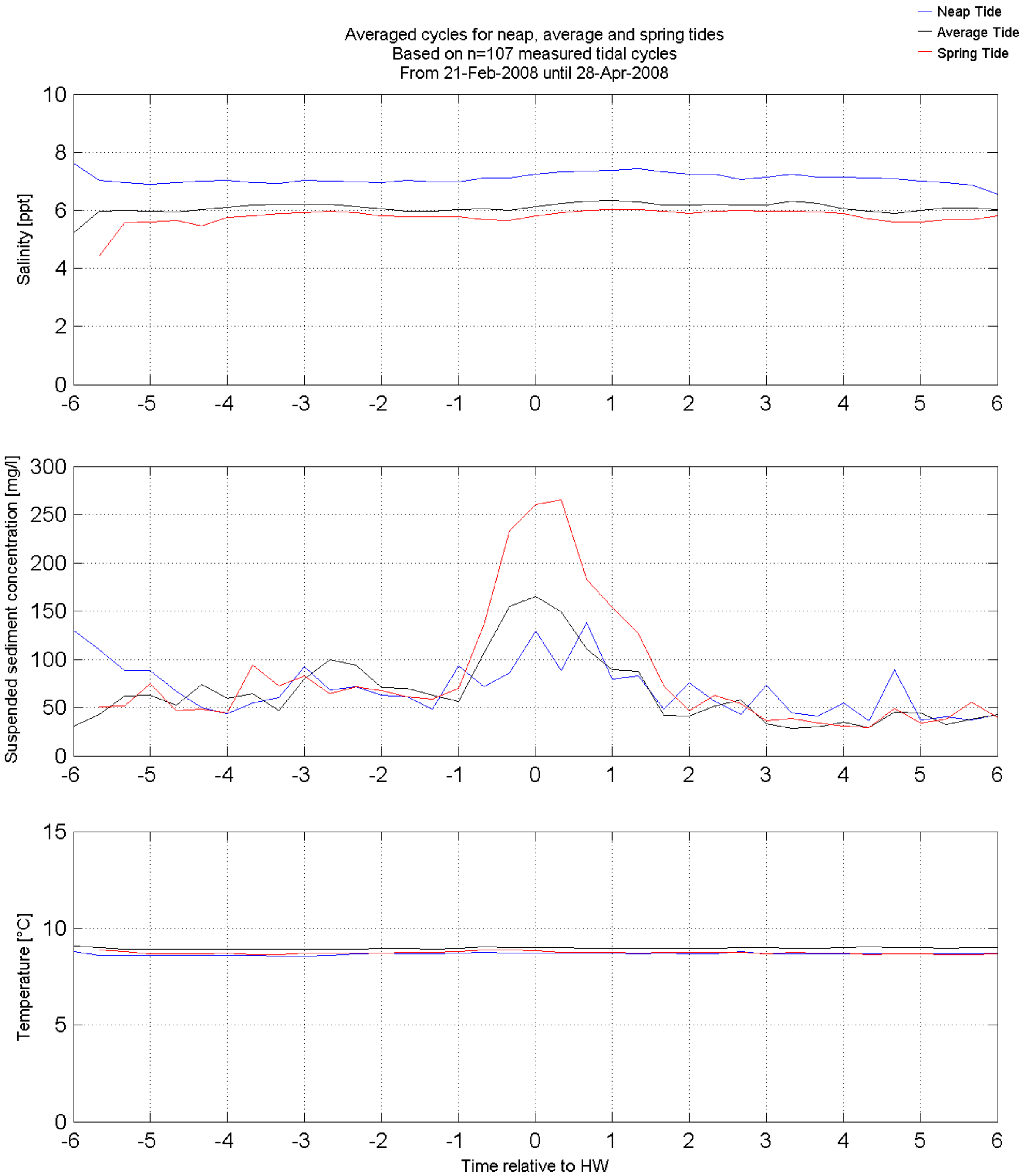
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-ENTRANCE bottom



Absolute Parameters for averaged tidal cycle

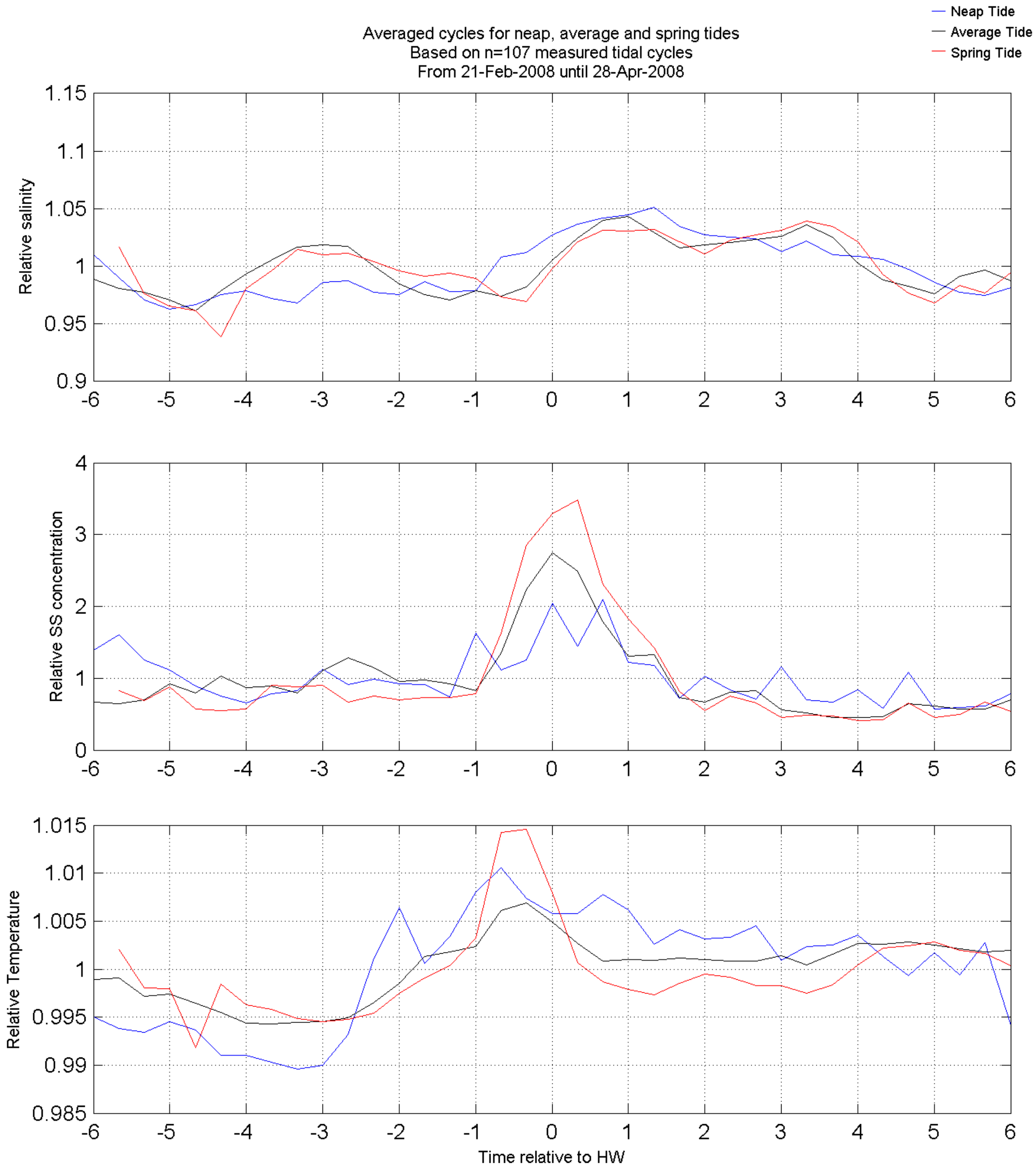
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-ENTRANCE bottom



Relative Parameters for averaged tidal cycle

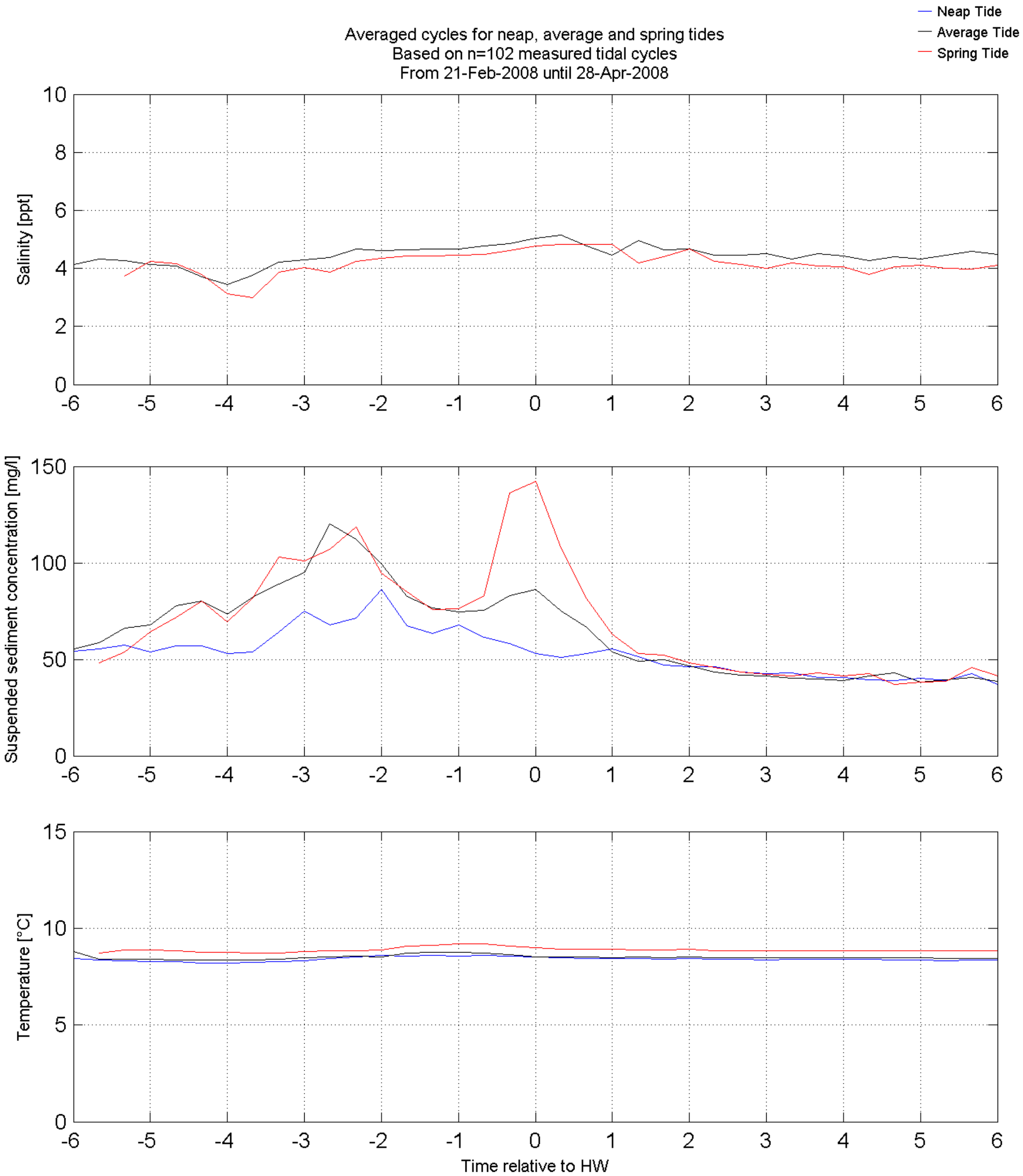
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-ENTRANCE top



Absolute Parameters for averaged tidal cycle

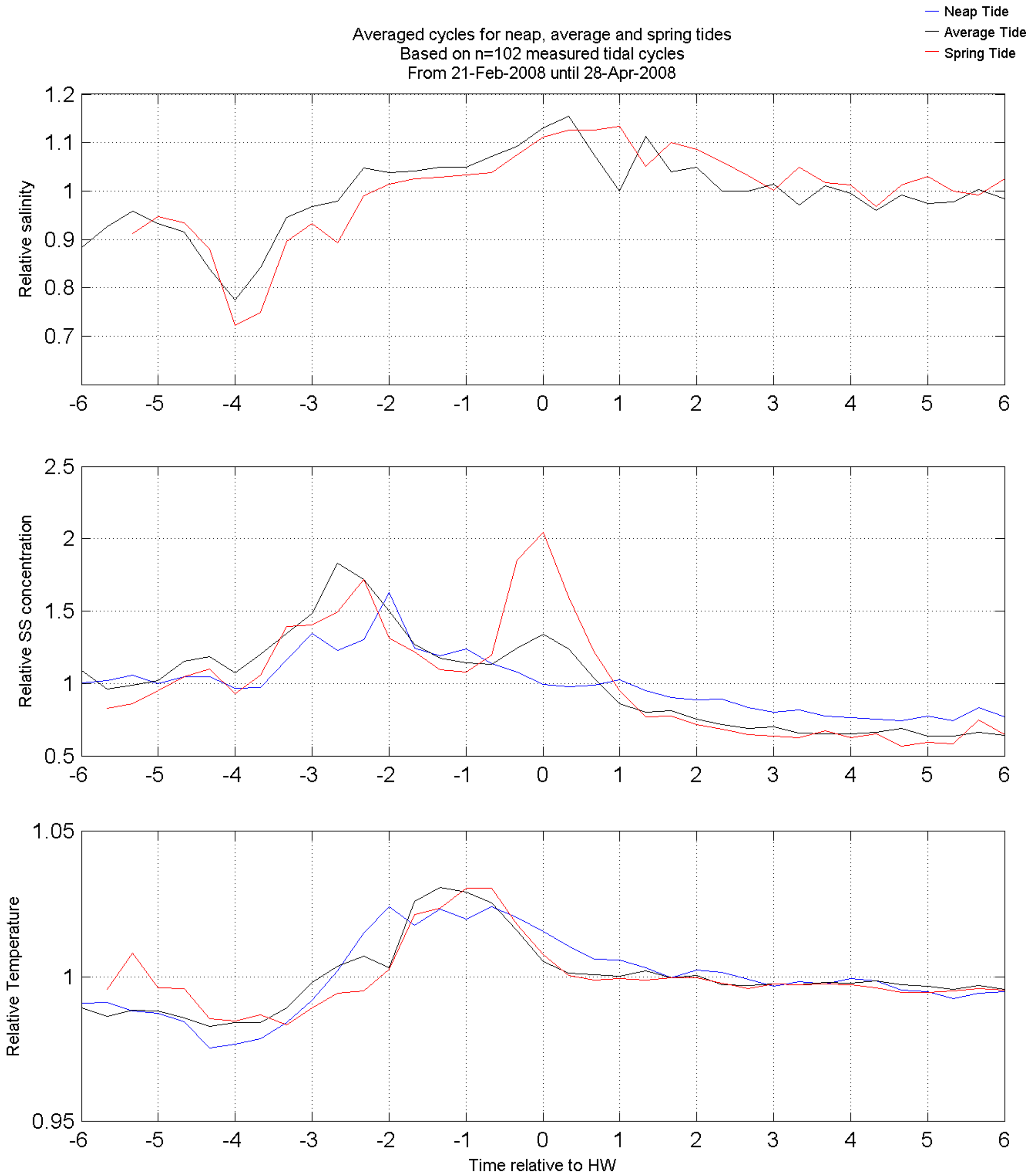
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-ENTRANCE top



Relative Parameters for averaged tidal cycle

Data Processed by:

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

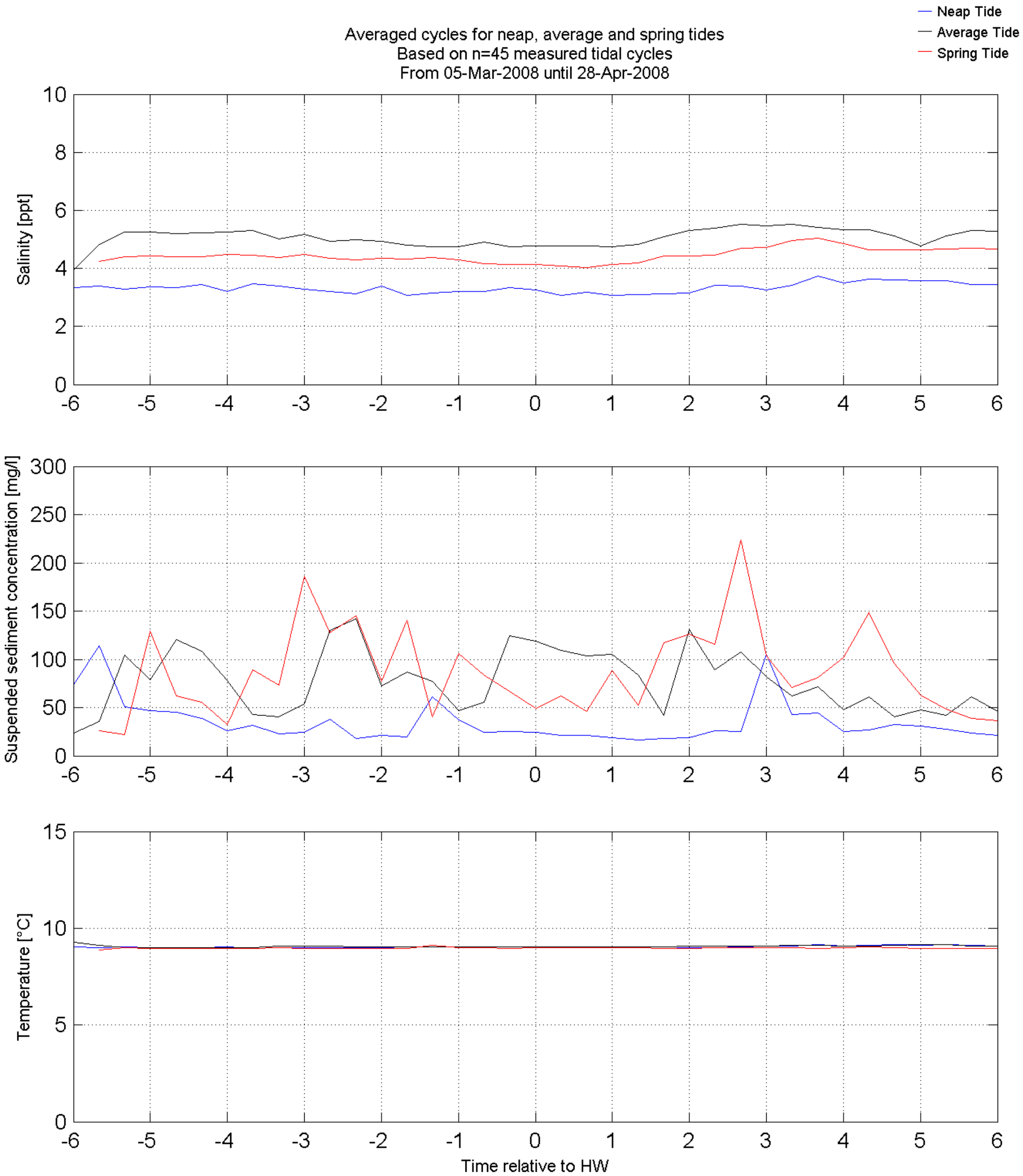
Spring 2008

Equipment(s):

OBS-3A

Location:

S-MIDDLE bottom



Absolute Parameters for averaged tidal cycle

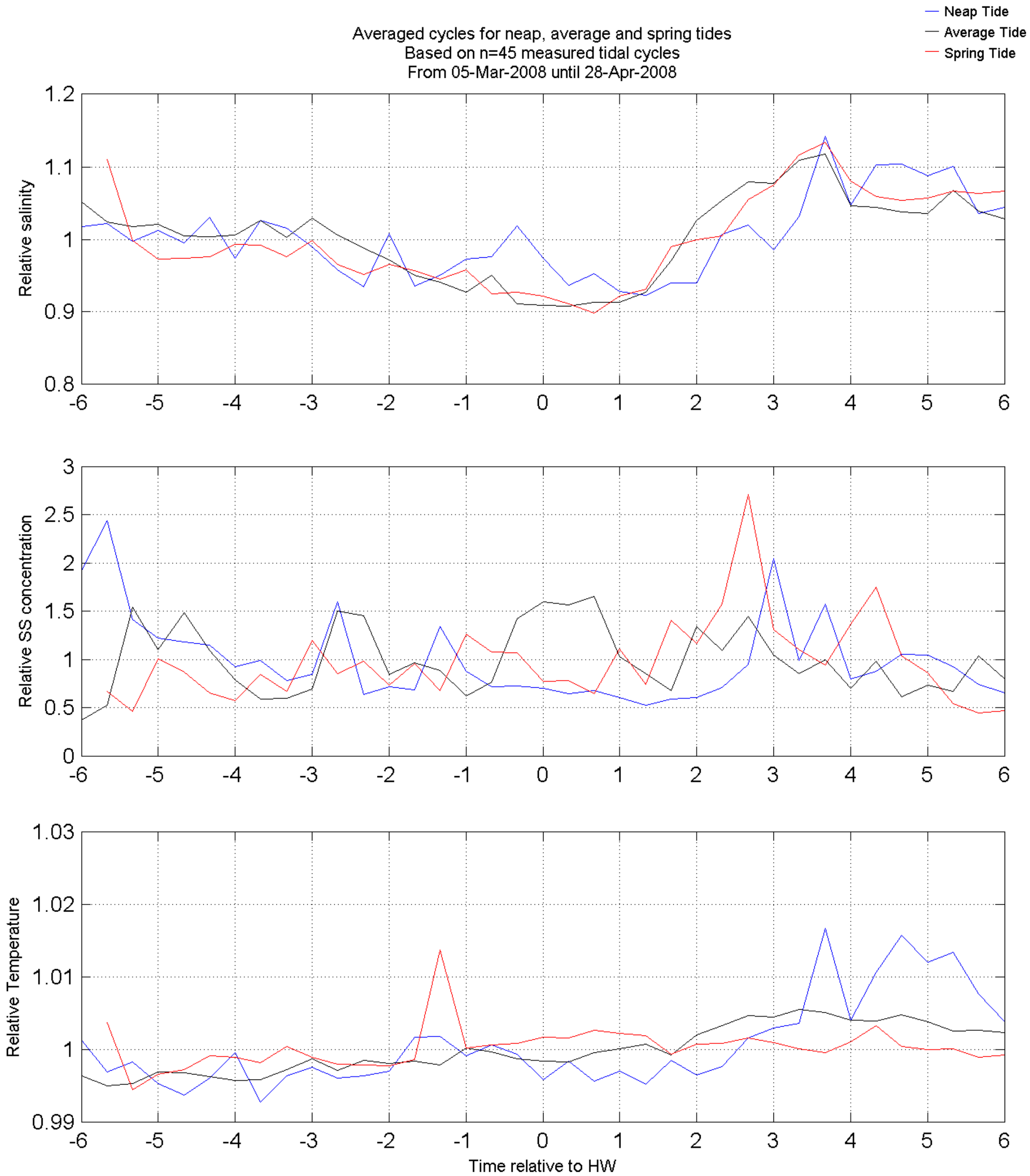
Data Processed by:

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-MIDDLE bottom



Relative Parameters for averaged tidal cycle

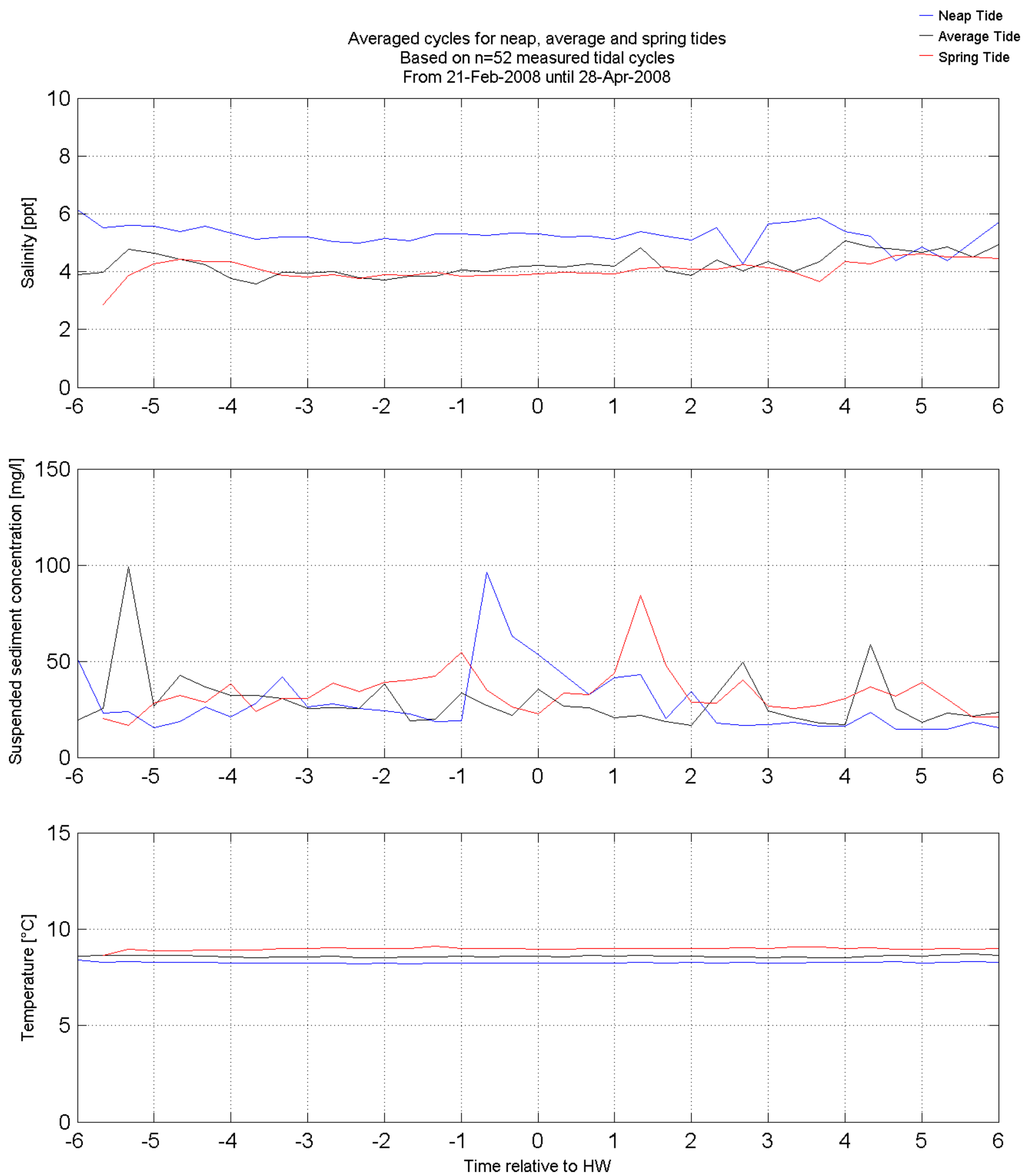
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-MIDDLE top



Absolute Parameters for averaged tidal cycle

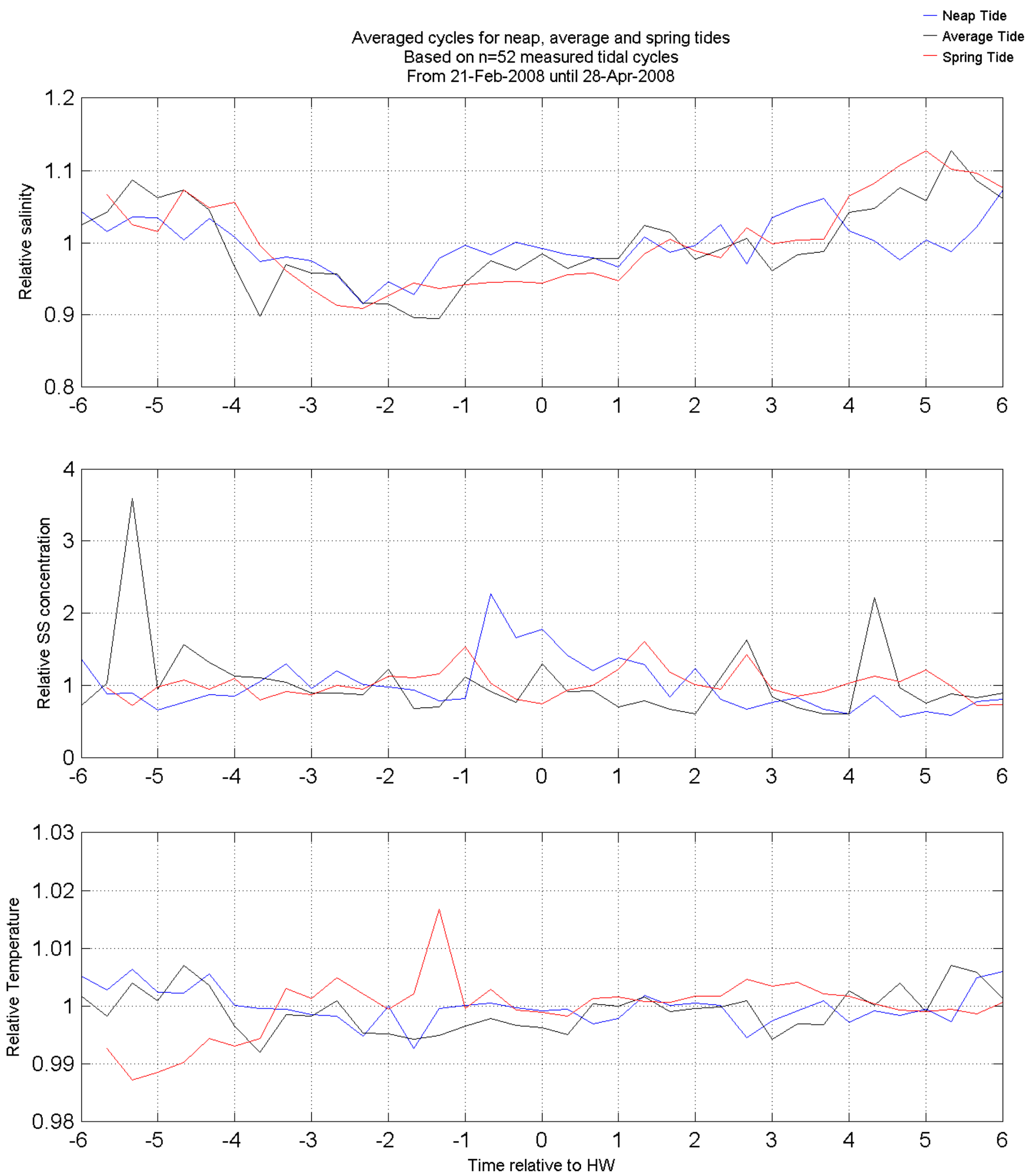
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS-3A
	Location: S-MIDDLE top



Relative Parameters for averaged tidal cycle

Data Processed by: IMDC

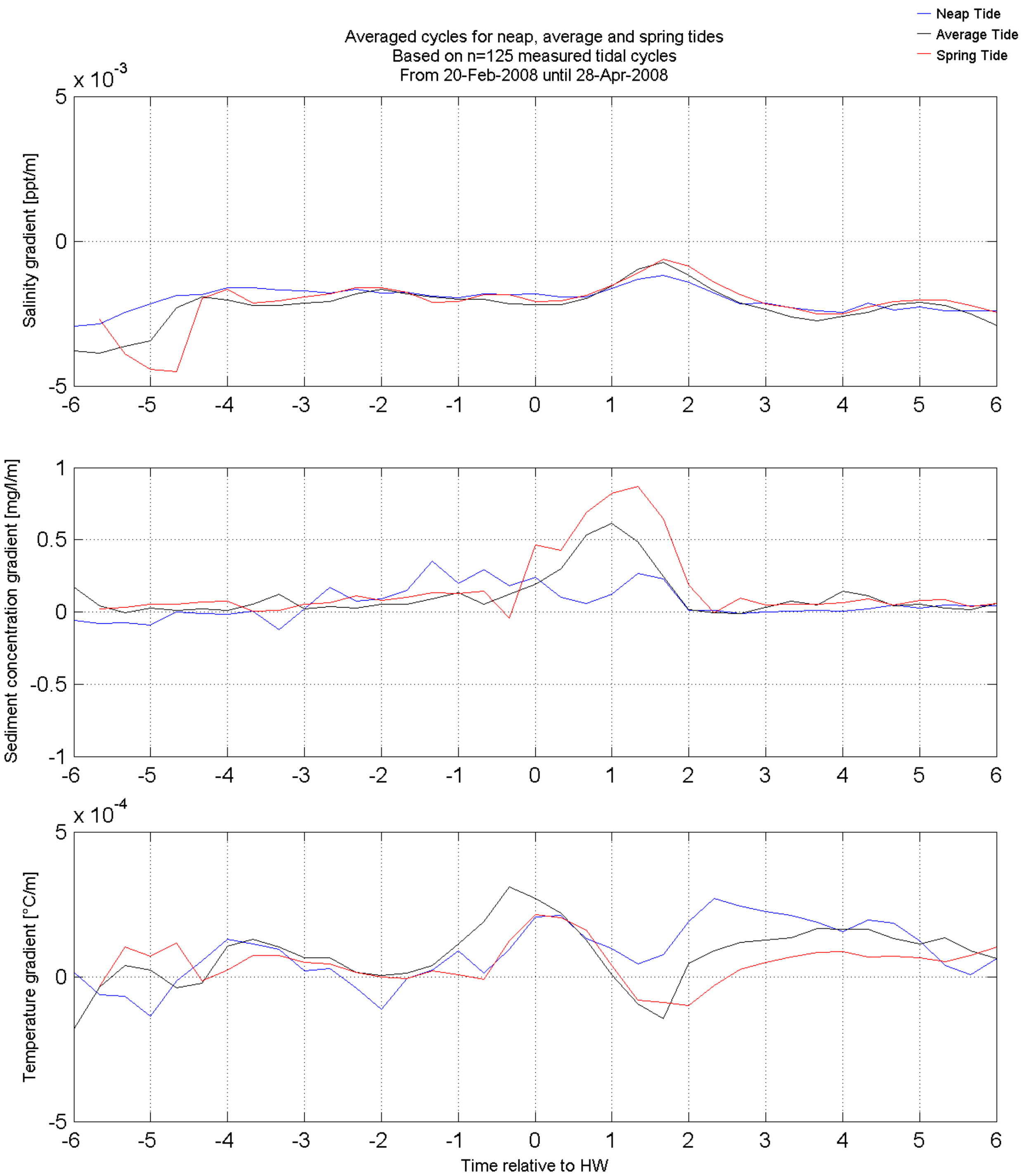
In association with :

I/RA/11283/07.094/MSA

H.2 Along-dock, cross-dock and vertical gradients

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-entrance



Horizontal gradient at -12.9m TAW =(N-ENTRANCE - S-ENTRANCE)/Δx

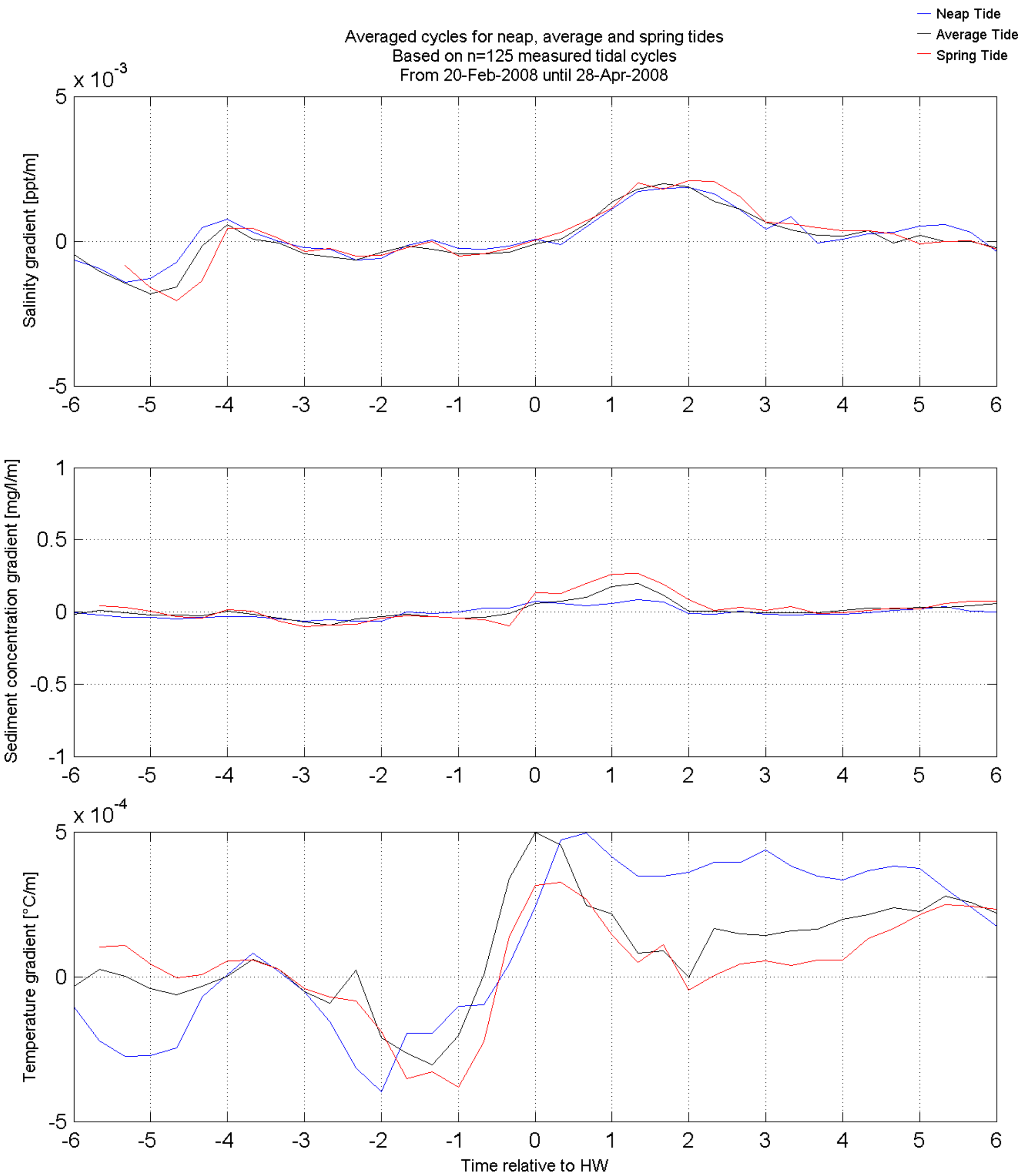
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-entrance



Horizontal gradient at -2.3m TAW =(N-ENTRANCE - S-ENTRANCE)/Δx

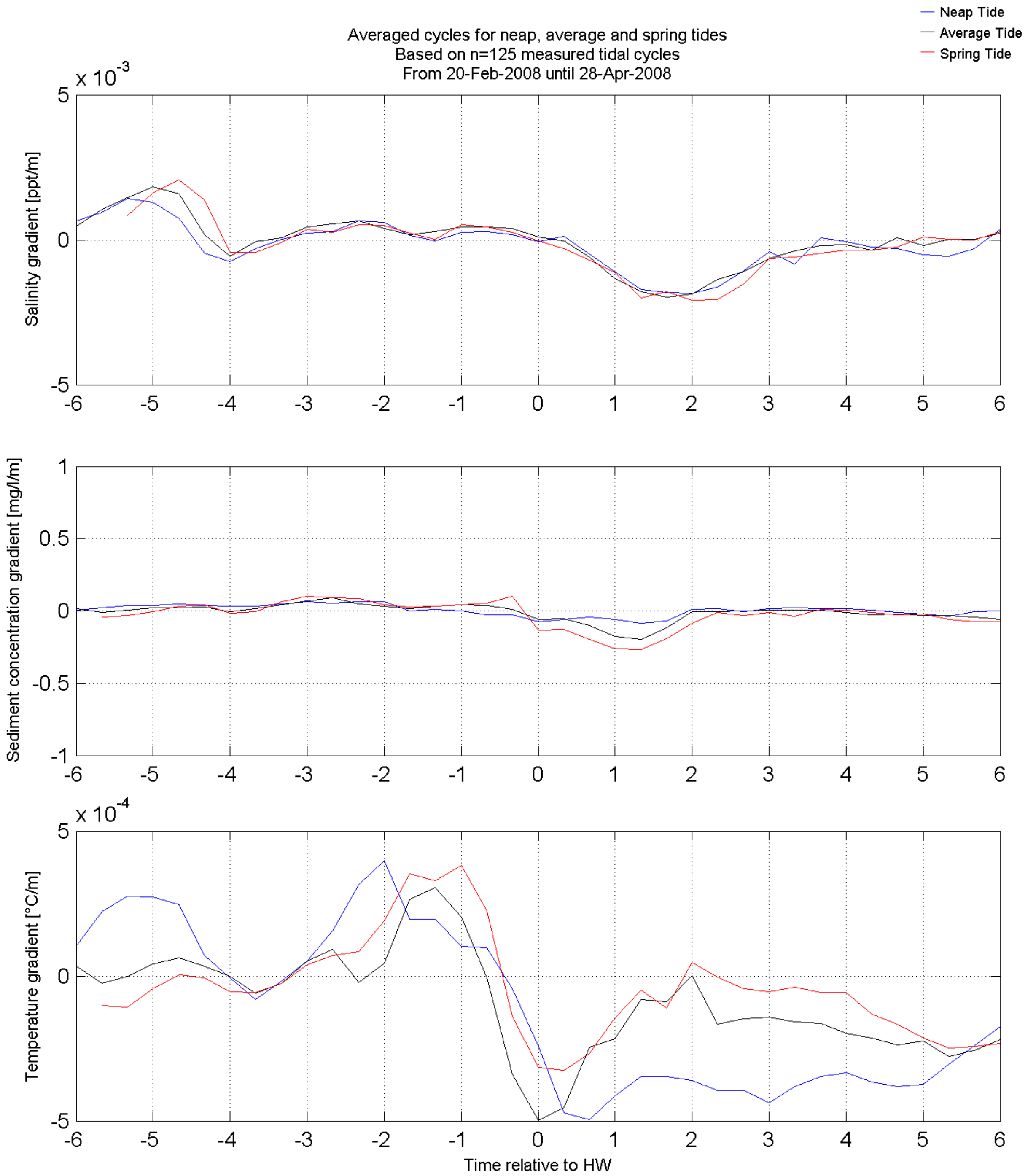
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-entrance



Horizontal gradient at -2.3m TAW =(N-ENTRANCE - S-ENTRANCE)/Δx

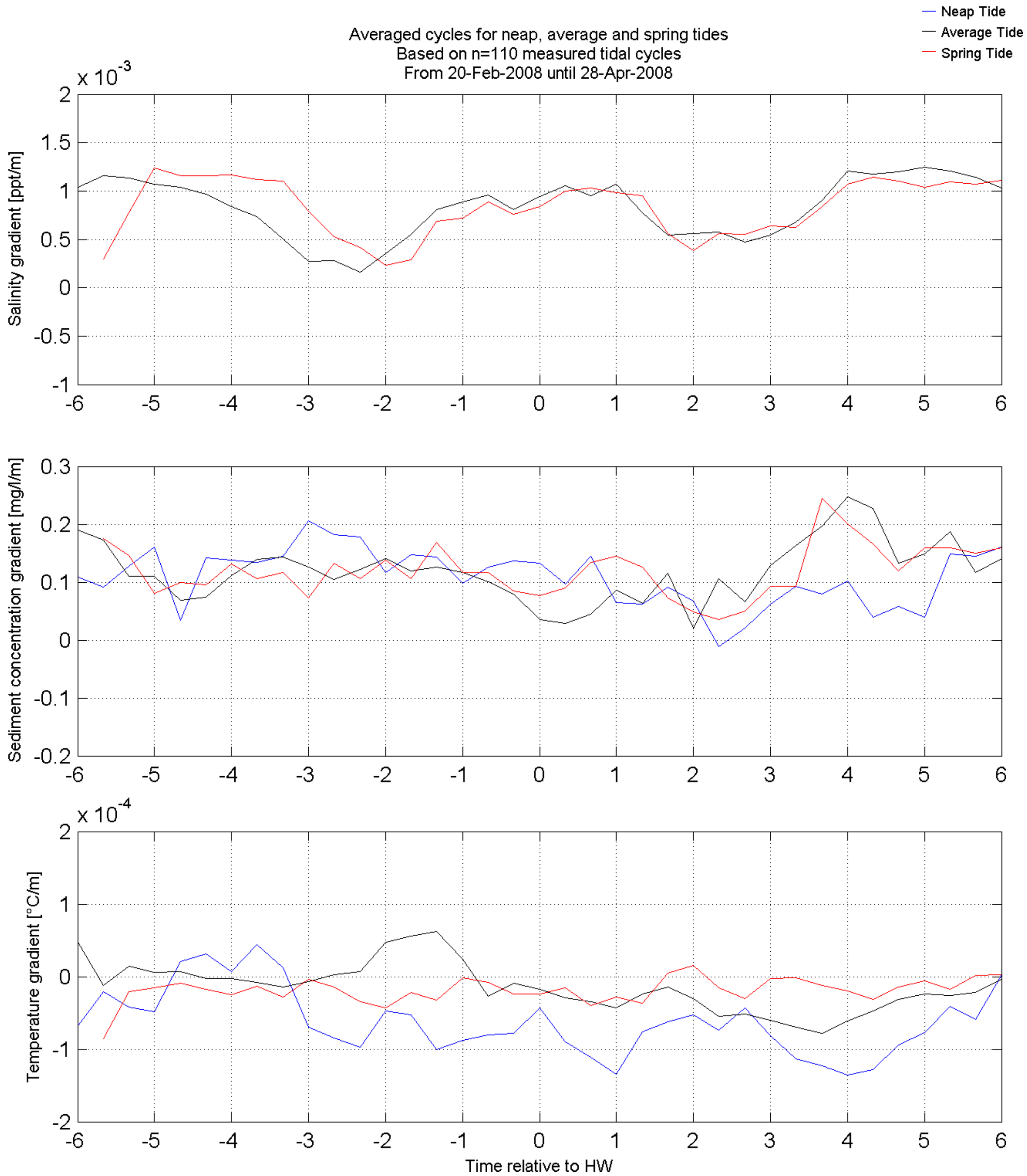
Data Processed by:

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-DB Ports (S)



Horizontal gradient at -12.3 m TAW =(S-BACK - S-MIDDLE)/Δx

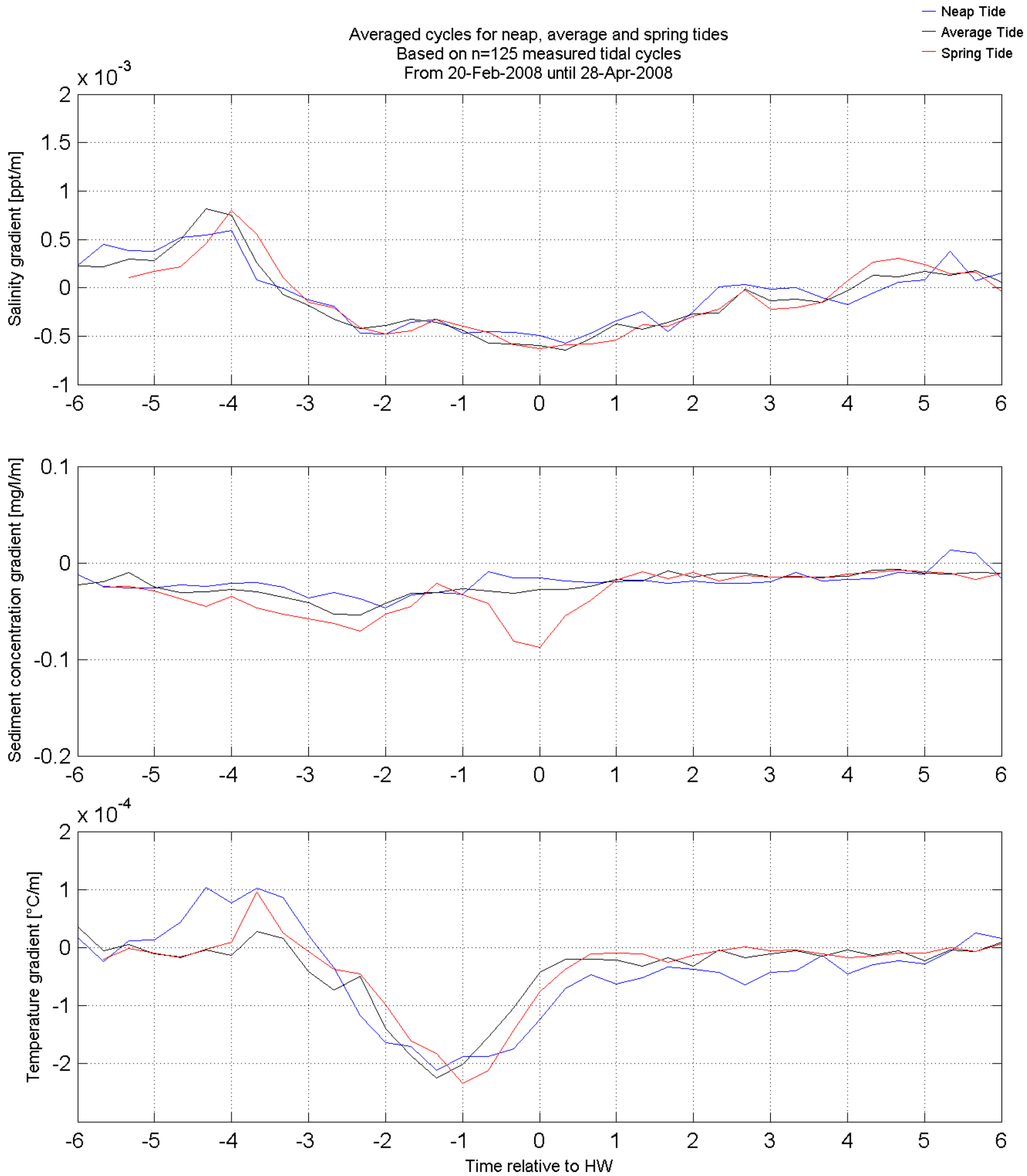
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-DB Ports (S)



Horizontal gradient at -2.3 m TAW =(S-MIDDLE - S-ENTRANCE)/Δx

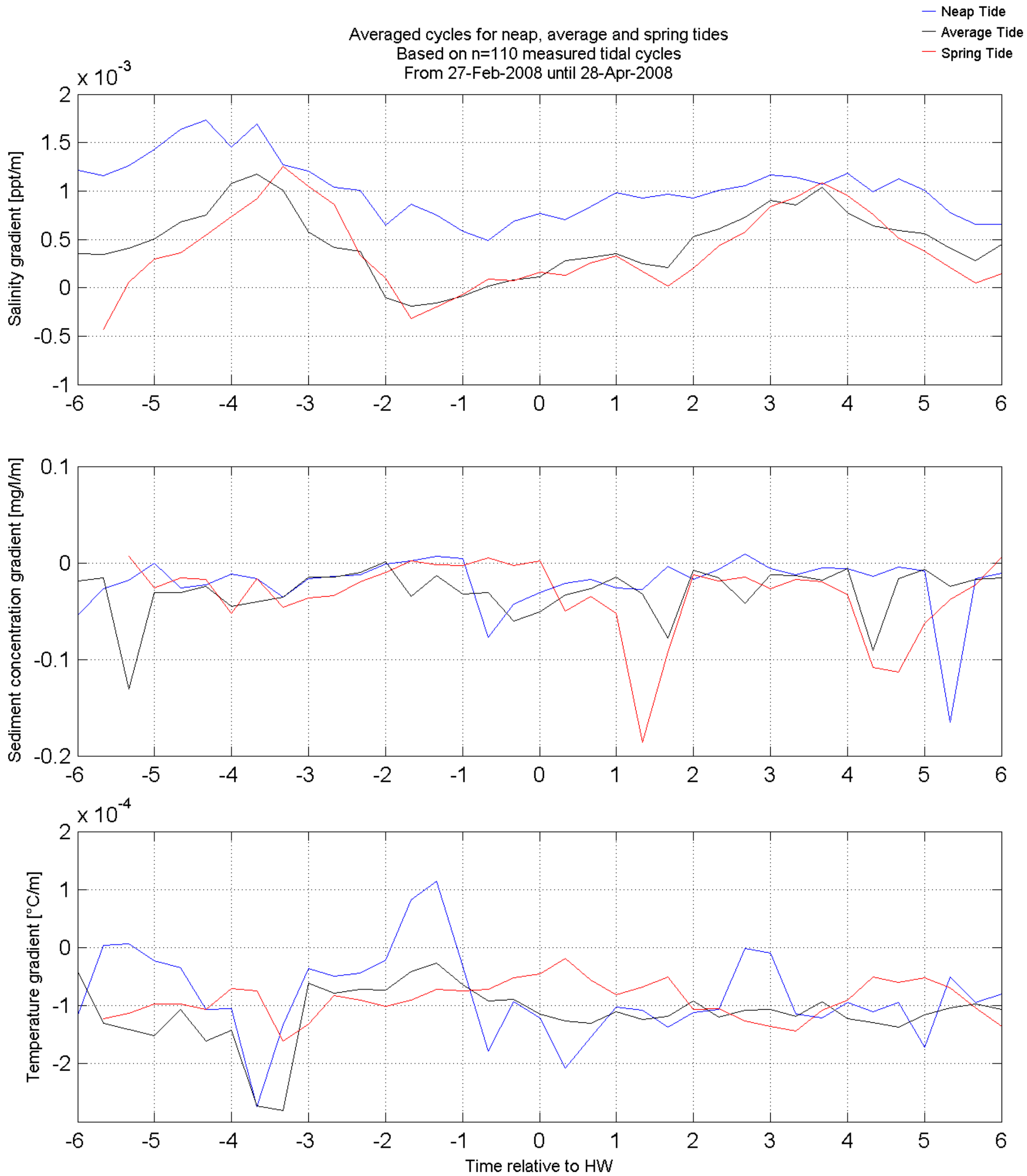
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-DB Ports (S)



Horizontal gradient at -2.4 m TAW =(S-BACK - S-MIDDLE)/Δx

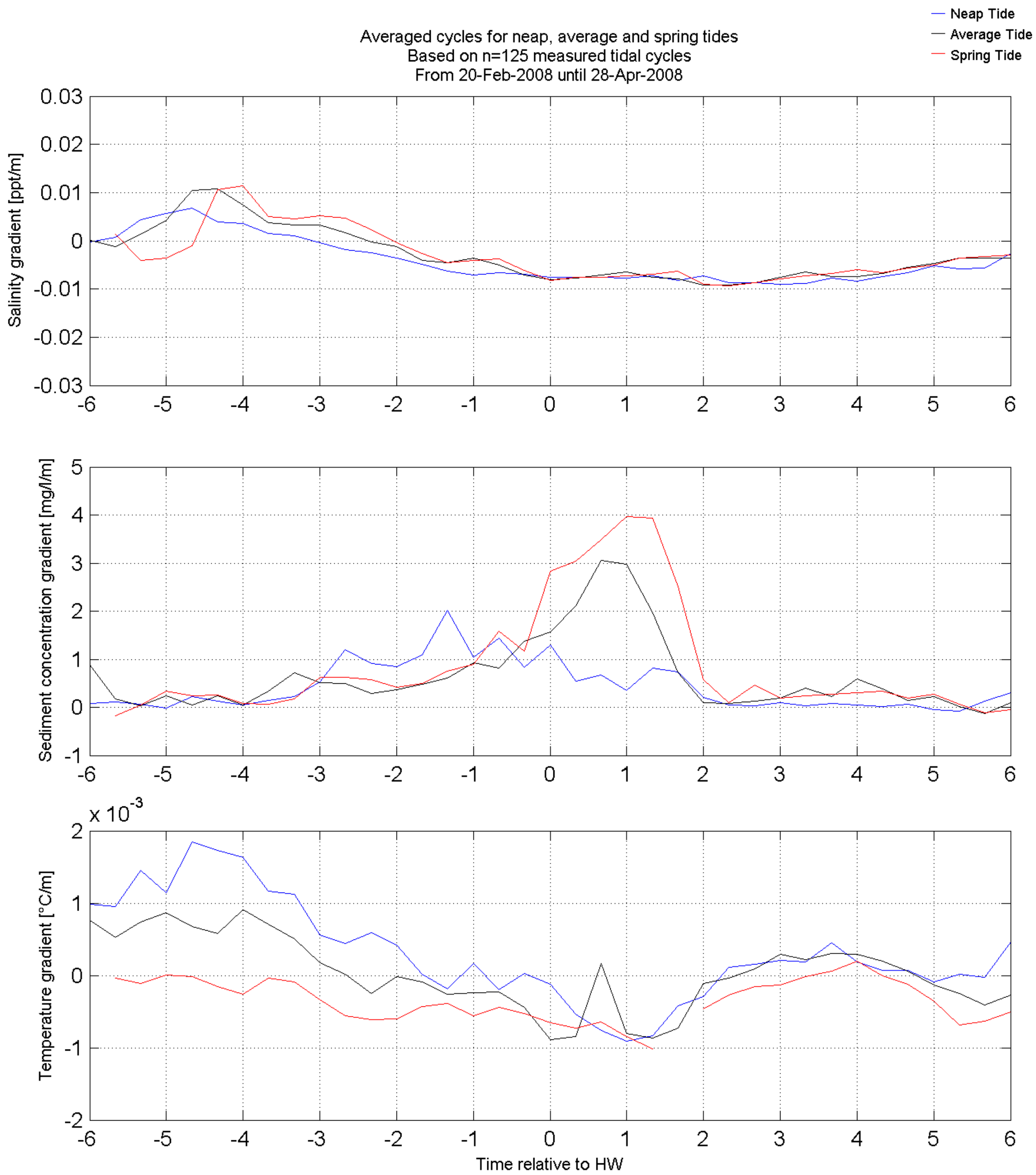
Data Processed by:

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-PSA HNN (N-entrance)



Vertical gradient at N-ENTRANCE =(data(-12.3m) - data(-2.3m))/Δz

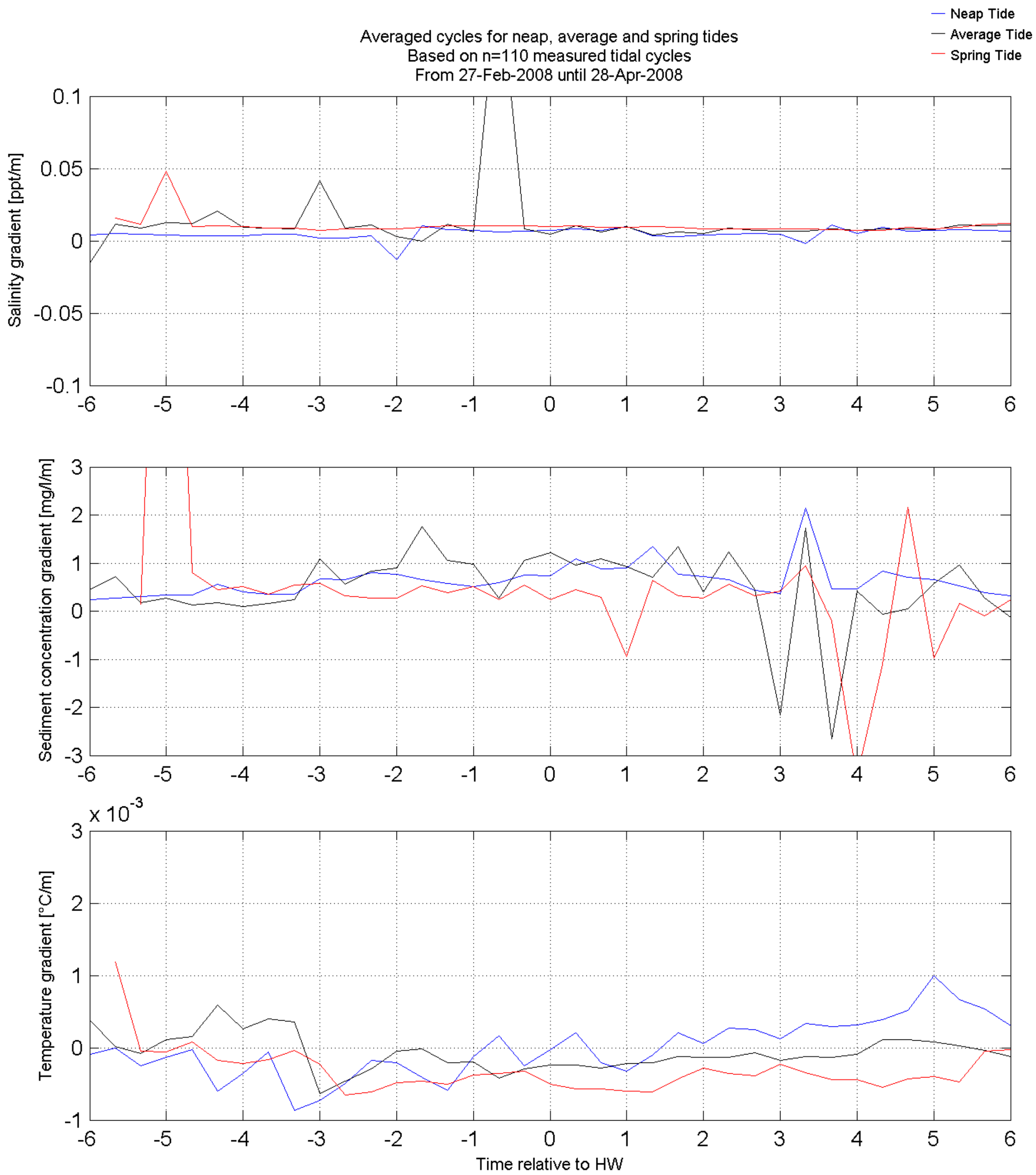
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-DB Ports (S-back)



Vertical gradient at S-BACK =(data(-12.4m) - data(-2.5m))/Δz

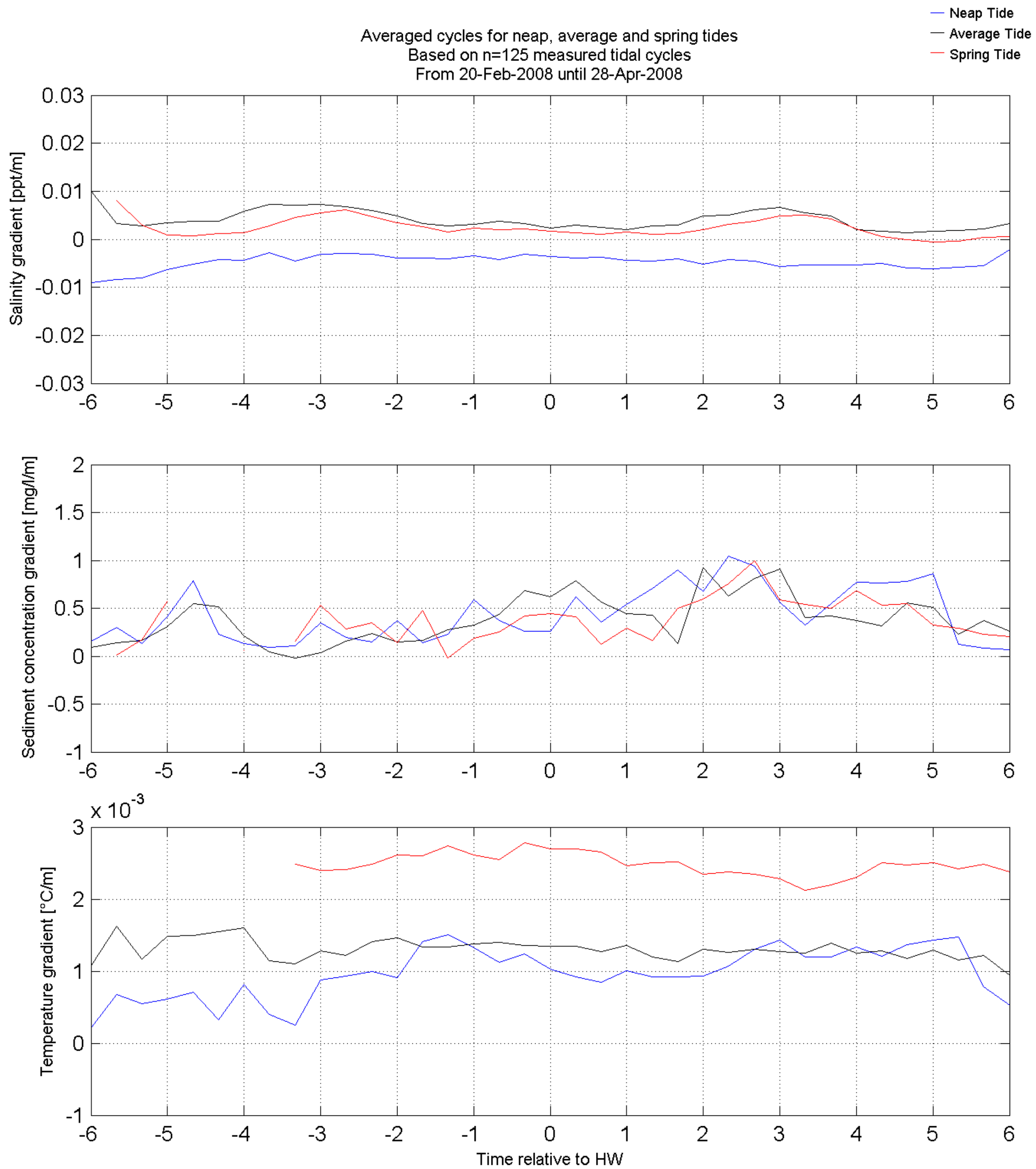
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-DB Ports (S-middle)



Vertical gradient at S-MIDDLE =(data(-12.2m) - data(-2.3m))/Δz

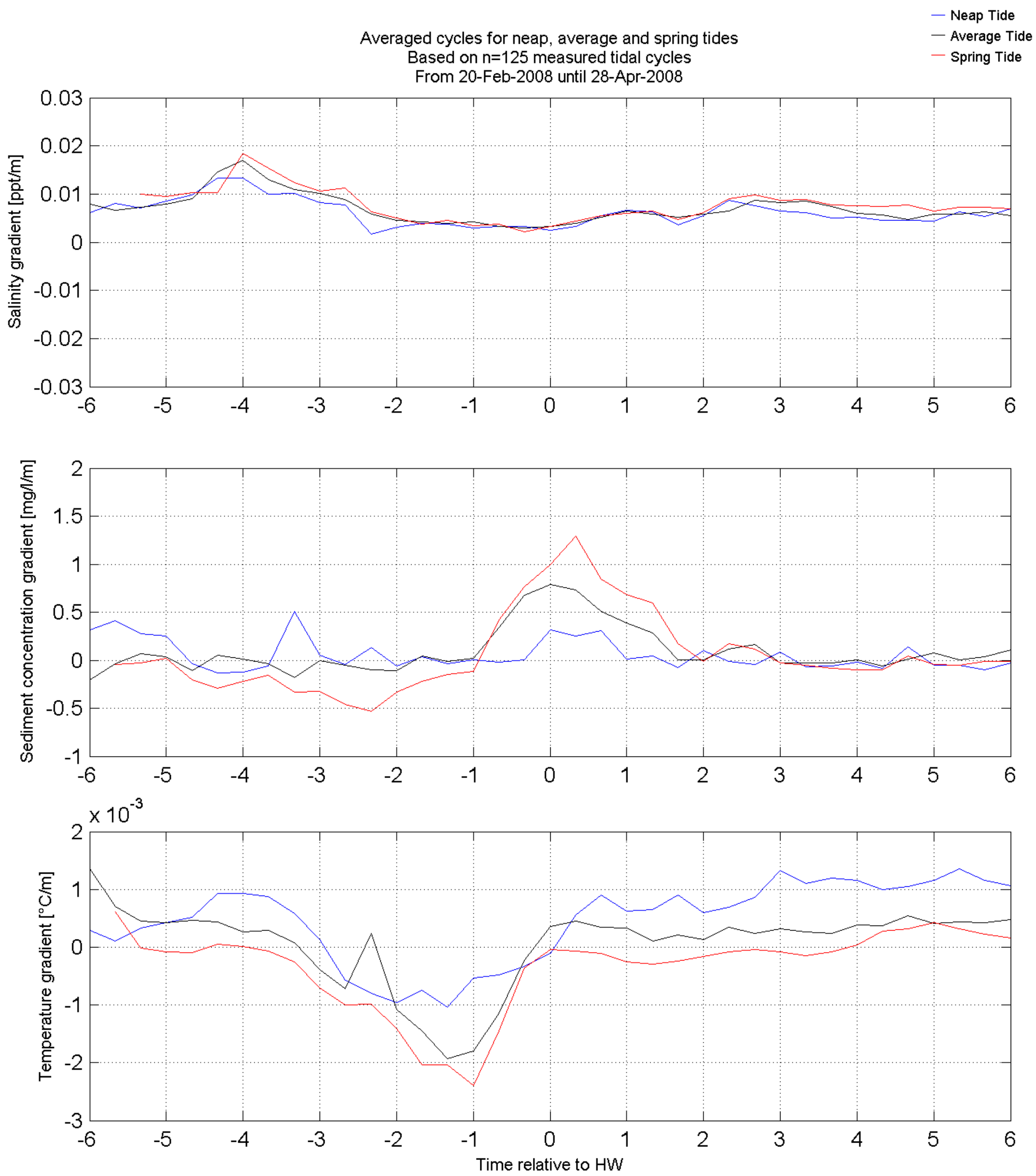
Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA

Long Term Monitoring Siltation Deurganckdok

Spring 2008	Equipment(s): OBS 3A
	Location: DGD-DB Ports (S-entrance)



Vertical gradient at S-ENTRANCE =(data(-13.5m) - data(-2.2m))/Δz

Data Processed by: IMDC

In association with :

I/RA/11283/07.094/MSA