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DEPARTEMENT MOBILITEIT EN OPENBARE WERKEN
WATERBOUWKUNDIG LABORATORIUM

Langdurige metingen Deurganckdok: Opvolging en analyse aanslibbing

Bestek 16EB/05/04

Survey vessel Veremans (left) & Deurganckdok (right)



Deelrapport 2.3 13u meting springtij – ingang Deurganck – 22/03/2006 - Veremans

Report 2.3 Through Tide Measurement Sediview springtide 22/03/2006 Veremans

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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)'[1].

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.

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
- 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 focusses 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

[1] Uitbreiding studie densiteitsstromingen in de Beneden Zeeschelde in het kader van LTV Meetcampagne naar hooggeconcentreerde slibsuspensies

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 is essential for understanding sediment transport between the dock and the Scheldt river.

1.3. Overview of the study

1.3.1. Reports

Reports of the project 'Opvolging aanslibbing Deurganckdok' are summarized in Table 1-1.

Reports of the measurement campaign HCBS2 for which the winter campaign has been carried out simultaniously with measurements in this report are listed in APPENDIX I.

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)
Factors contributing to salt and sediment distribution in Deurganckdok: Salt-Silt (OBS3A) & Frame measurements, Through tide measurements (SiltProfiling & ADCP)	
2.1	Through tide measurement Siltprofiler 21/03/2006 Laure Marie (I/RA/11283/06.087/WGO)
2.2	Through tide measurement Siltprofiler Autumn 26-29/09/2006 (I/RA/11283/06.068/MSA)
2.3	Through tide measurement Sediview spring tide 22/03/2006 Veremans (I/RA/11283/06.110/BDC)
2.4	Through tide measurement Sediview spring tide 26-29/09/2006 (I/RA/11283/06.119/MSA)
2.5	Through tide measurement Sediview neap tide (to be scheduled) (I/RA/11283/06.120/MSA)
2.6	Salt-Silt distribution Deurganckdok 13/3/2006 – 31/05/2006 (I/RA/11283/06.121/MSA)
2.7	Salt-Silt distribution Deurganckdok 15/07/2006 – 31/10/2006 (I/RA/11283/06.122/MSA)
2.8	Salt-Silt distribution Deurganckdok 15/01/2007 – 15/03/2007 (I/RA/11283/06.123/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 1/4/2006 – 30/06/2006 (I/RA/11283/06.124/MSA)
3.2	Boundary conditions: Three monthly report 1/7/2006 – 30/09/2006 (I/RA/11283/06.125/MSA)
3.3	Boundary conditions: Three monthly report 1/10/2006 – 31/12/2006 (I/RA/11283/06.126/MSA)
3.4	Boundary conditions: Three monthly report 1/1/2007 – 31/03/2007 (I/RA/11283/06.127/MSA)
3.5	Boundary condtions: Annual report (I/RA/11283/06.128/MSA)

Report	Description
Analysis	
4	Analysis of Siltation Processes and Factors (I/RA/11283/06.129/MSA)

1.3.2. 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, Zanvliet 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.

1.4. Structure of the report

This report is the factual data report of the through tide measurements at Deurganckdok on the 22th of March, 2006. The first chapter comprises an introduction. The second chapter describes the measurement campaign and the equipment. Chapter 3 describes 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. THE MEASUREMENT CAMPAIGN

2.1. 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 2-1).

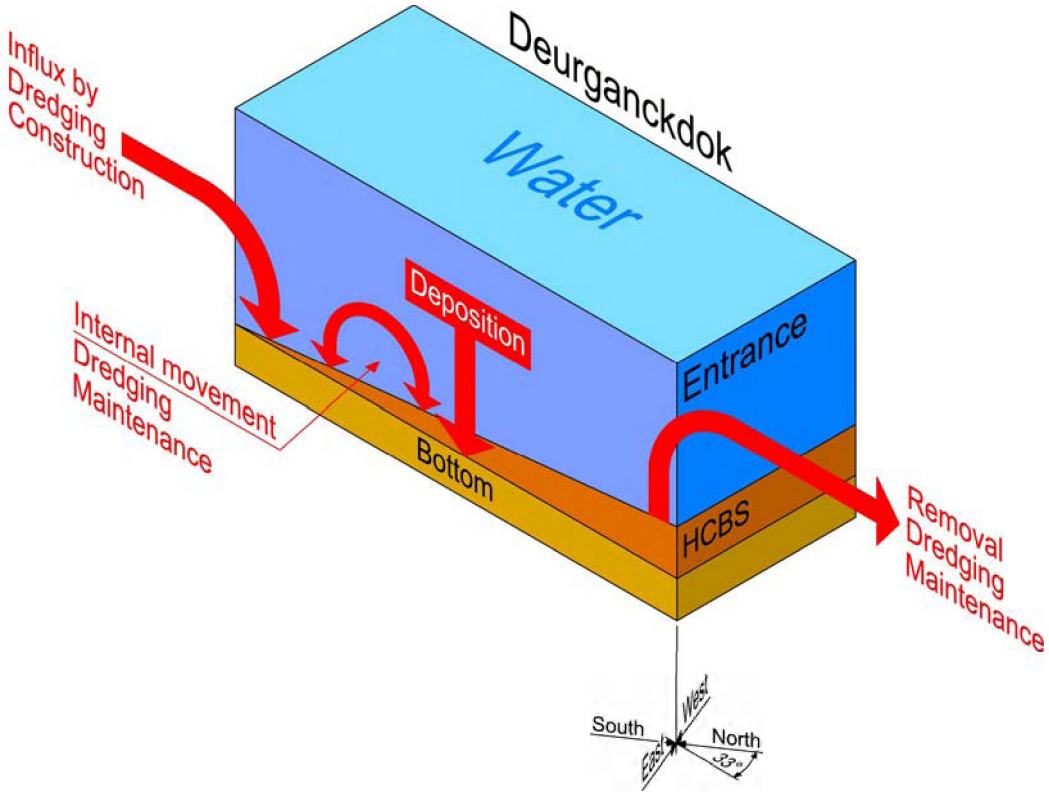


Figure 2-1: Elements of the sediment balance

A net deposition can be calculated from a comparison with a chosen initial condition t_0 (Figure 2-2). 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.

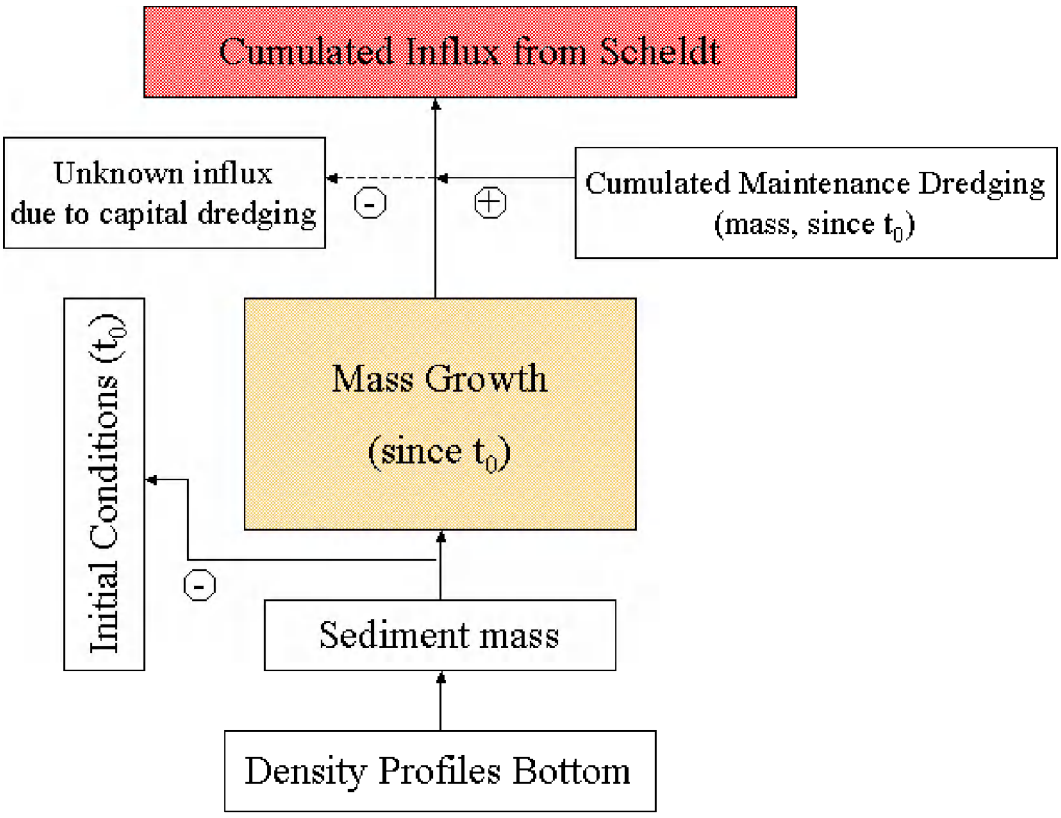


Figure 2-2: Determining a sediment balance

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

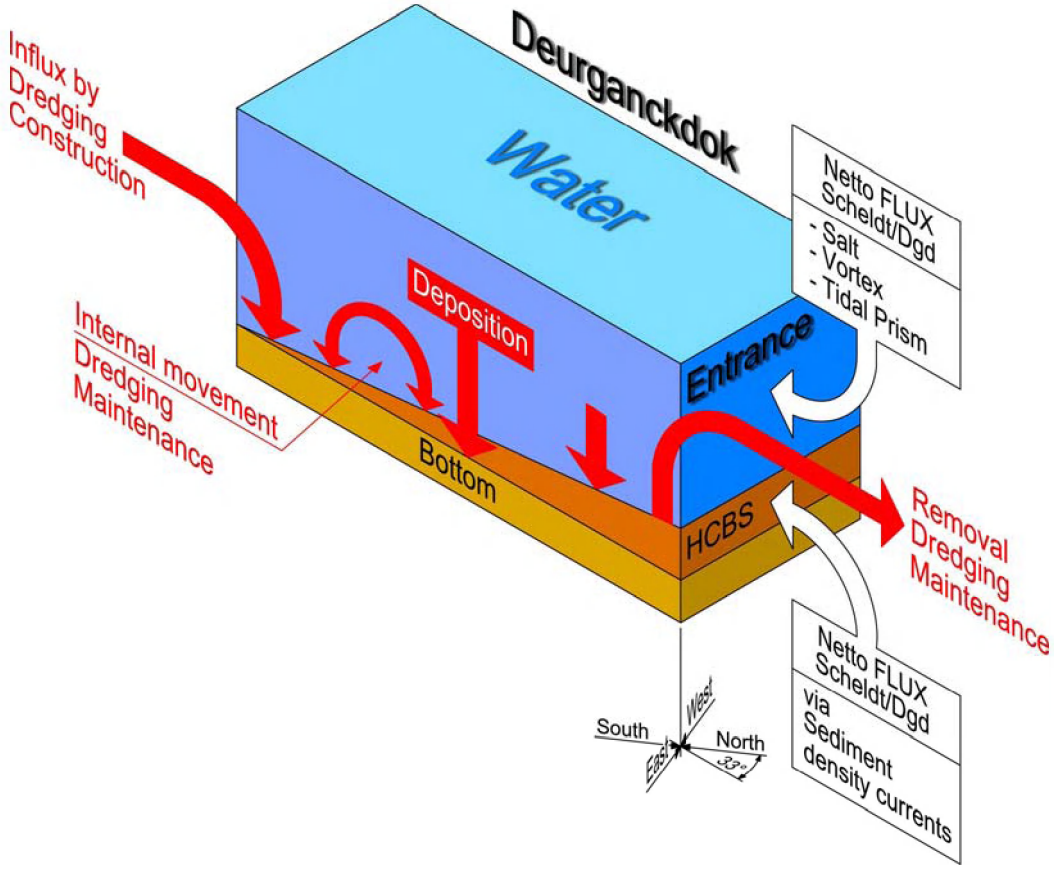


Figure 2-3: Transport mechanisms

These aspects of hydrodynamics and sediment transport have been landmark in determining the parameters to be measured during the project. Measurements will be focussed on three types of timescales: 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 Lillo, 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.

2.2. Description of the measurement campaign on March 22nd

Flow velocity, Turbidity, Salinity and Temperature measurements were conducted on the 22th of March from 8h30 MET until 21h15 MET.

The purpose of the measurements was to determine the cross-section distribution of the suspended sediment concentration, the sediment flux and flow velocity during a complete tidal cycle. For measurements in Deurganckddok the terms 'left bank' and 'right bank' will be used to address the North quay wall and South quay wall respectively.

From the survey vessel Veremans a measurement cycle was completed every 15 minutes. The vessel with a mounted ADCP sailed a fixed transect from the left bank to the right bank and vice versa (Table 2-1). Profiles were gathered to calibrate the ADCP transects for temperature, salinity and suspended sediment concentration to be used in Sediview.

Two calibration profiles were collected for each transect (Table 2-2):

- One before sailing the transect at the bank where the start of the transect was (Left bank during the flood; Right bank during the ebb)
- One after sailing the transect at the bank where the transect ended (Right bank during flood, left bank during the ebb).

During these calibrations, a fish with a CTD-OBS was lowered to the bottom. The downcast was interrupted at two depths, one in the upper half of the water column (between 4 and 7 m from the water surface), and one at 4 meters above the bottom. At these depths samples were taken for calibration, and are used as 'ground truth' for all suspended sediment concentration measurements (OBS and Sediview). The other instruments logged continuously during the downcast. Conductivity, Temperature and Depth was logged by the CTD-probe, while turbidity was recorded by the OBS.

Table 2-1Transect of the Flow Measurements (UTM31 ED50)

Measurement location	***Left Bank Easting***	***Left Bank Northing***	***Right Bank Easting***	***Right Bank Northing***	***Avg Length [m]***	***Avg Course [degr.]***
Transect DGD	588765	5684056	588541	5684527	521	334.6

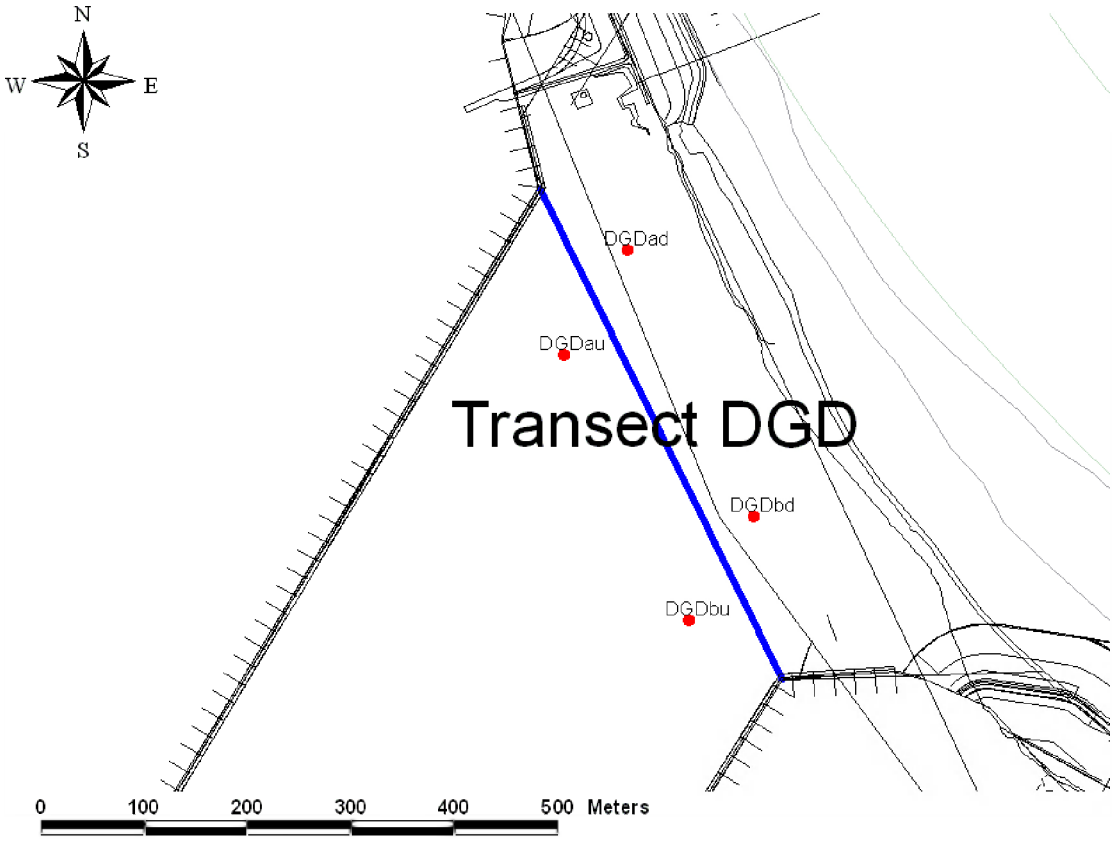


Figure 2-4: Map of sailed transect and calibration points

Table 2-2: Positions of the calibration points for March 22nd 2006 at Deurganckdok.

Measurement point	***Bank***	***Easting (UTM31 ED50)***	***Northing (UTM31 ED50)***
Flood			
DGDau	Left	588561	5684369
DGDbu	Right	588682	5684113
Ebb			
DGDad	Left	588623	5684470
DGDbd	Right	588745	5684214

2.3. The equipment

2.3.1. ADCP

The current measurements were conducted using an RD Instruments ADCP 600 kHz Workhorse. For positioning the dGPS onboard the vessel Veremans was used. For the measurement of the heading a gyrocompass was installed.

This 600 KHz ADCP system was mounted on a steel pole underneath the central axis of the vessel The transducer set was looking vertically downwards to the bottom. Transceiver unit and computer system were connected to peripherals such as the differential GPS-receiver, the heave compensator and the gyrocompass.

During the measurements the ADCP constantly measured upstream from the vessel. The acquisition software of Winriver was used. The main settings are given in Table 2-3. Correction on acoustic attenuation is carried out afterwards in Sediview by using vertical salinity profiles.

Table 2-3: Main Configuration Settings of ADCP 600kHz Workhorse

Main configuration settings:
Cell depth : 0.5 m
Number of Water pings per ensemble: 2
Number of Bottom Track pings per ensemble: 2
Time between ensembles: 0
Averaging: None
Speed of Sound: Fixed 1500 m/s
Salinity 0 psu
3-beam solution: enabled

2.3.2. OBS - CTD

A D&A type OBS 5 was used to measure depth, conductivity, temperature and turbidity.

Measured parameters by the OBS 5 sensor:

- temperature (°C), conductivity (µS/cm), absolute pressure (m), turbidity (NTU)

On the Veremans, the OBS 3A device was mounted on a towfish. The resulting record is filled-up with GPS-time, sample number, and planimetric position of the GPS-receiver. CTD-data are logged together with GPS-time reference (UTC). Sampling frequency is 1 reading per second.

The technical details on the ADCP and CTD-OBS are described in IMDC (2006a)

2.3.3. Pump Sampler

A water sampler was attached nearby the turbidity sensor taking water samples. Samples were collected in 1 litre sampling bottles. The pumping speed of the water sampler was tested at the start of the measurement campaign on board. Dye was used to time the duration between the intake of the dye and exit at the sampling end of the sampler on board. The duration between intake and exit at the end was 32 seconds.

3. COURSE OF THE MEASUREMENTS

3.1. Measurement periods

At Deurganckdok ADCP tracks were sailed once every 15 minutes for 13 hours, in total 50 cross-sections.

Calibration profiles were taken at 2 locations (left bank, right bank). During every cycle, 1 calibration profile was taken serving as the second calibration of the previous transect and as the first calibration point of the current transect, resulting in a total of 53 profiles. APPENDIX A gives the start and end points of the tracks, the sailed length and the course.

3.2. Hydro-meteorological conditions during the measurement campaign

3.2.1. Vertical tide during the measurements

The vertical tide was measured at the Hansweert, Liefkenshoek and Schelle tidal gauges. Graphs of the tide at Hansweert, Liefkenshoek and Schelle on the 22th of March can be found in APPENDIX B. Table 3-1 gives the most important characteristics (high and low tide) of the tide at those gauges on the 22th of March 2006.

Table 3-1: High and low tide at Handsweert, Liefkenshoek and Schelle on 22/03/2006

	Time [hh:mm MET]			*Water level [m TAW]*		
	Hansweert	Liefkenshoek	Schelle	Hansweert	Liefkenshoek	Schelle
22/03/2006						
LW (1)	00:50	01:50	02:40	0.34	0.13	0.09
HW (2)	07:20	07:40	08:30	4.4	4.86	5.1
LW (3)	13:20	14:00	15:10	0.37	0.18	0.12
HW (4)	19:30	20:10	21:00	4.07	4.56	4.84

In the tidal characteristics of the tide on the 22th of March are compared to the average tide over the decade 1991-2000 (AMT, 2003).

Table 3-2: Comparision of the tidal characteristics of 22/03/2006 with the average tide, the average neap tide and the average spring tide over the decade 1991-2000 for Liefkenshoek (Lie) and Schelle (Sch)

	Neap Tide (1991-2000)			***Avg Tide (1991-2000)***			***Spring Tide (1991-2000)***			***Tide 21/03/2006***		
Water level [mTAW]	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**
LW (1)	0.61	0.39	0.34	0.27	0.05	0.03	0.02	-0.18	-0.18	0.2	-0.02	-0.02
HW (2)	4.29	4.63	4.95	4.76	5.19	5.45	5.11	5.63	5.83	4.5	4.96	5.22
LW (3)	-	-	-	-	-	-	-	-	-	0.16	-0.06	-0.07
HW (4)	-	-	-	-	-	-	-	-	-	4.33	4.84	5.1
Tidal difference [m]	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**
Rising (1→2)	3.68	4.24	4.61	4.49	5.14	5.42	5.09	5.81	6.01	4.3	4.98	5.24
Falling (2→3)	3.68	4.24	4.61	4.49	5.14	5.42	5.09	5.81	6.01	4.34	5.02	5.29
Rising (3→4)	-	-	-	-	-	-	-	-	-	4.17	4.9	5.17
Duration [hh:mm]	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**
Rising (1→2)	6:14	5:59	5:53	6:02	5:34	5:30	5:54	5:16	5:15	6:10	5:50	5:40
Falling (2→3)	6:25	6:40	6:46	6:23	6:50	6:55	6:26	7:02	7:04	6:10	6:30	6:40
Rising (3→4)	-	-	-	-	-	-		-	-	6:10	5:50	5:40
Tide (1→3)	12:39	12:39	12:39	12:25	12:24	12:25	12:20	12:18	12:19	12:20	12:20	12:20
Tide (2→4)	-	-	-	-	-	-	-	-	-	12:20	12:20	12:20
Tidal coefficient	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**	**Han**	**Lie**	**Sch**
Rising (1→2)	0.82	0.82	0.85	1	1	1	1.11	1.13	1.11	0.96	0.97	0.97
Falling (2→3)	0.82	0.82	0.85	1	1	1	1.11	1.13	1.11	0.97	0.98	0.98
Rising (3→4)	-	-	-	-	-	-	-	-	-	0.93	0.95	0.95

The tidal coefficients from 0.85 up to 0.92 for the measured tide of the 22nd of March indicate that this tide has a smaller tidal range than the average tide for the decade of 1991-2000.

3.2.2. Meteorological data

Meteorological data at Deurne meteorological station for 22/03/2006 was obtained from KMI (Koninklijk Meteorologisch Instituut = Royal Meteorological Institute of Belgium).

On the 22th of March 2006, the air temperature varied between –1.2 and 7.6°C. The wind blew from NNE-NE at an average velocity of 14 km/h. The sky was almost clear and no rainfall occured.

3.3. Navigation information

An overview of the navigation at the measurement location is given in APPENDIX C.

3.4. Remarks on data

Data covering four transects is shown only partially in contour plots in APPENDIX F due to rejected measured profiles. This rejection has been the result of unacceptable error levels caused by high vessel speeds compared to the current velocity. The discharge and sediment flux during the measurement of these specific transects have not been incorporated in flux and discharge timeseries plots and tables.

Transects for which such event occurred are those with serial numbers 2056DGDt, 2058DGDt, 2060DGDt and 2100DGDt.

4. PROCESSING OF DATASETS

4.1. Calibration of the turbidity sensors

A crucial aspect of the accuracy and reliability of the data concerns the calibration of the instruments before the measurement campaign. These calibration procedure is described in Report 6.1 Winter calibration.

4.2. Methodology of processing of the ADCP data with Sediview

DRL Software's Sediview was used to process the ADCP data. Sediview is designed to derive estimates of suspended sediment concentration throughout the water column using acoustic backscatter data obtained by ADCPs manufactured by RD Instruments of San Diego, California.

4.2.1. Acoustic backscatter theory

The acoustic theory governing backscatter from particles suspended in the water column is complex, but the following simplified formula serves to introduce the main factors that are relevant:

$$E = SL + SV + Constant - 20\log(R) - 2\alpha_w R$$

Where:

- E = echo intensity,
- SL = transmitted power,
- SV = backscatter intensity due to the particles suspended in the water column,
- α_w = a coefficient describing the absorption of energy by the water,
- R = the distance from the transducer to the measurement bin.

The term 20log(R) is a simple geometric function which accounts for the spherical spreading of the beam. The constant is required because each ADCP has specific performance characteristics.

In order to measure the suspended sediment concentration in the water column it is necessary to relate the backscattered sound intensity to the mass concentration in the water. For the purposes of measuring solids concentration on site, it can be shown that the relationship is as follows (derived from Thorne and Campbell, 1992 and Hay, 1991 in DRL (2003)):

$$Log_{10}M_r = \{dB + 2r(\alpha_w + \alpha_s) - K_s\}S^{-1}$$

Where:

- $M(r)$ = mass concentration per unit volume at range, r
- S = relative backscatter coefficient
- K_s = site and instrument constant
- dB = the measured relative backscatter intensity (corrected for beam spreading)
- α_w = water attenuation coefficient
- α_s = sediment attenuation coefficient, which is a function of the effective particle size

In this expression there are four unknowns: S, Ks, α_w and α_s. These parameters are to be determined within Sediview.

4.2.2. Water sampling and transect sailing

To calibrate Sediview for suspended sediment concentration, two water samples are taken at the beginning and at the end of each transect (see 3.1). Both samples are taken within the range of reliable data of the ADCP. For the near-surface sample this means in bin 3 or 4, for the near-bed sample this means at about one or two meter above the sidelobe.

Water sampling is done together with CTD-OBS measurement in order to have two independent suspended sediment concentration measurements for each sample. . OBS measurements were compared to the water samples and recalibrated as mentioned in § 4.1. These OBS SS concentrations were recalibrated using the conversion equations in 4.1. The water samples were used for Sediview calibration, while cross-calibrated OBS measurements were used as a back up check. The salinity and temperature was used to compute the acoustic water absorption (water attenuation coefficient). All water samples were analysed as is described in 4.2.3.1.

4.2.3. Calibration for suspended sediment concentration within Sediview

4.2.3.1. Calibration workset

The calibration workset consists of ADCP-files, sampling times, sampling depths, SSC obtained from water samples and SSC, temperature and salinity obtained from CTD-OBS readings.

The suspended sediment concentration of the water samples was determined. One-litre samples were filtered over a preweighed desiccated 0.45 micron filter, after which the filter is dried in an oven at 105°C, cooled and weighed (NEN 6484).

4.2.3.2. SSC calibration per ensemble pair

In the Sediview calibration process the following parameters must be defined: the site and instrument constant (Ks), the relative backscatter coefficient (S) and the effective particle size per ensemble-pair (near-surface sample and near-bed sample) in order to fit the Sediview-estimate with the suspended sediment concentration of the water samples. These parameter sets may not differ too much from the previous parameter sets, as the environmental conditions will not change that much over a small time interval. To obtain a smooth progress in time of Ks, S and effective particle size an iterative approach is used.

4.2.4. Sediview configuration

4.2.4.1. Discharge and suspended sediment concentration estimates

The ADCP measures most of the water column from just in front of the ADCP to 6% above the bottom. The shallow layer of water near the bottom is not used to compute discharge and suspended sediment concentration due to side-lobe interference. When the ADCP sends out an acoustic pulse, a small amount of energy is transmitted in side lobes rather than in the direction of the ADCP beam. Side lobe reflection from the bottom can interfere with the water echoes and can give erroneous data. The thickness of the side lobe layer is 6% of the distance from the transducers to the bottom.

Near the banks the water depth is too shallow for the ADCP to profile.

For each of those unmeasured regions, Sediview will make an estimate of the discharges and suspended sediment concentration. The measured and unmeasured regions in the cross section are shown in Figure 4-1 and Figure 4-2.

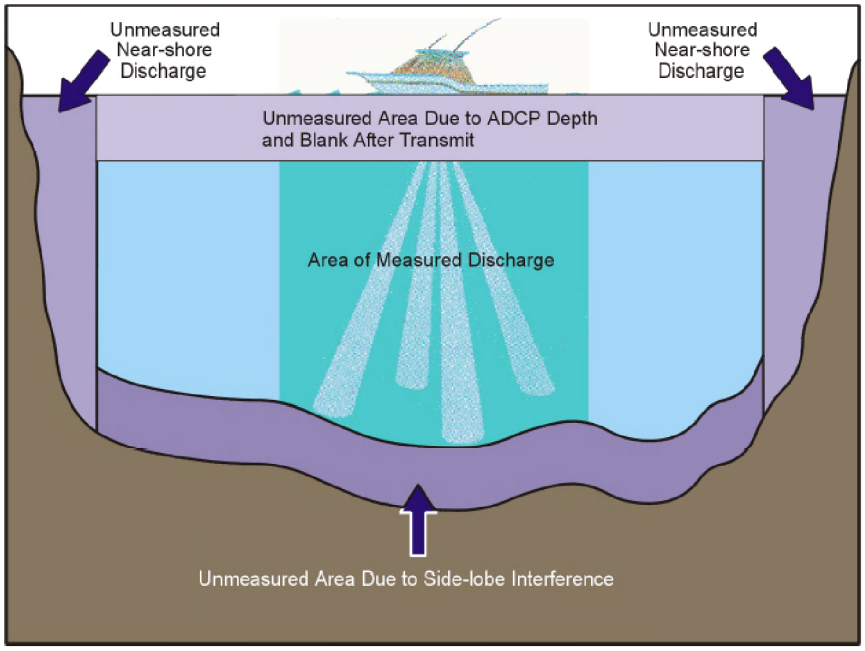


Figure 4-1: Unmeasured regions in the cross section (from RD Instruments, 2003)

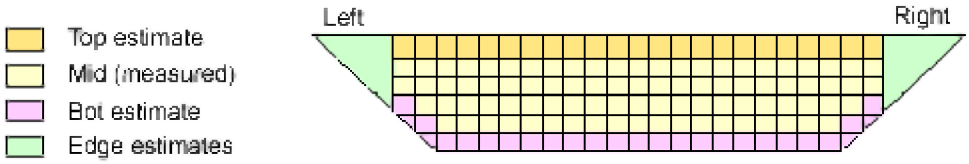


Figure 4-2: Measured and estimated discharges and sediment fluxes within Sediview (DRL, 2005)

4.2.4.1.1 Top/bottom estimates

The sediment concentration and discharge at the top of the water column is assumed to be the same as the concentration and discharge in the first measured bin.

The sediment concentration between the bottom and the lowest valid bin is assumed to be 125% of the lowest valid bin. Siltprofiles taken by the SiltProfiler on board the Oostende XI near Deurganckdok (IMDC, 2005b) and on board the Laure Marie near Deurganckdok (IMDC 2006d) show that the bottom value of the SSC is approximately 150% of the SSC-value at 2 meter above the bottom (position of the sidelobe). As the concentration grows approximately linear from the lowest valid bin to the bottom, and as Sediview uses a constant concentration factor for these deepest bins, we use a concentration factor of 125% (Figure 4-3).

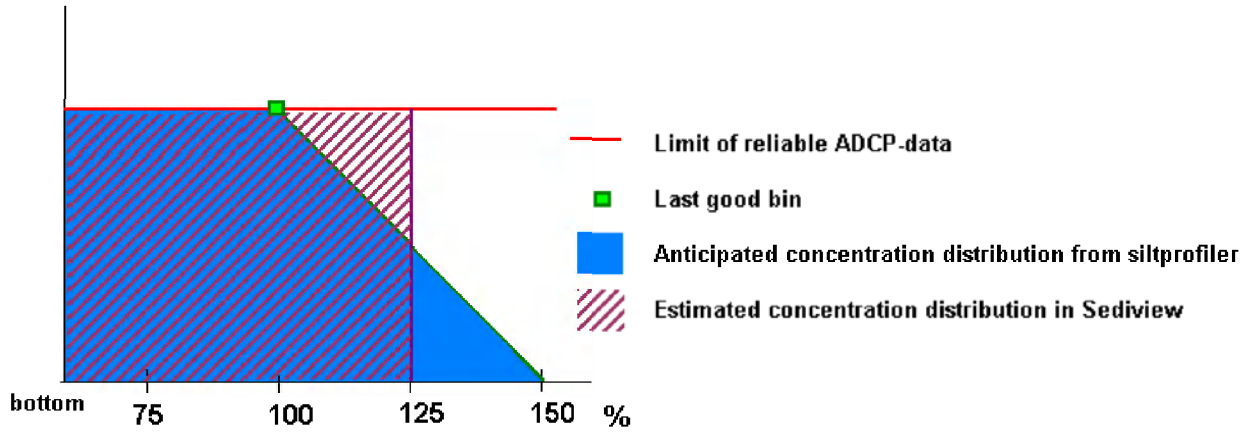


Figure 4-3: Bottom estimate of the sediment concentration

Table 4-1: Extrapolation methods for top and bottom variables

Variable	***Top***	***Bottom***
Discharge Method	Constant	Power
Concentration factor	100%	125%

The discharge for the bottom water layer is estimated by using the power method. Chen (1991) discusses the theory of power laws for flow resistance. Simpson and Oltmann (1990) discuss Chen's power law equivalent of Manning's formula for open channels (with b=1/6) (RD Instruments, 2003).

$$u / u* = 9.5(z / z_0)^b$$

Where:

- z = Distance to the channel bed [m]
- u = Velocity at distance z from bed [m/s]
- u* = Shear velocity [m/s]
- z_0 = Bottom roughness height [m]
- b = Exponent (1/6)

4.2.4.1.2 Edge estimates

The shape of the edges of the cross section is assumed to be near-rectangular due to the quay walls of Deurganckdok. Five data ensembles are to be averaged to determine the left and right bank mean velocities used for calculation of edge estimates.

The distance from start- and endpoint to the bank is calculated from the theoretical start- and endpoint at the bank to the effective start- and endpoint. The theoretical points are taken at the quay walls

Table 4-2: Reference points at the end of the mud flats on left and right bank

Coordinates (UTM31 ED50)	***Easting Left bank***	***Northing Left bank***	***Easting Right bank***	***Northing Right bank***
Zandvliet	586906	5688634	587757	5689950

The formula for determining the near shore discharge is:

$$Q_{shore} = CV_m Ld_m \text{ [m}^3\text{/s]}$$

Where:

C = Coefficient (0.35 for triangular, 0.91 for rectangular shape)

V_m = Mean water velocity in the first or the last segment [m/s]

L = distance from the shore to the first or the last segment specified by the user [m]

d_m = Depth of the first or the last segment [m]

The coefficient (C) has been set to 0.91 (rectangular shape of Deurganckdok quay walls).

4.2.4.2. Contour plots of the transects

All contour plots show perpendicular and parallel projected values on the straightened sailed transects. The heading of the straightened sailed transect is defined by picking 2 points in the straight part of the line after having corrected the heading of the ADCP compass. The compass offset is derived from a comparison of the ADCPs bottom track with the external GPS data.

4.2.5. Output

General transect information containing start-stop coordinates of each sailed transects with stop time, track length and heading is given in APPENDIX A.

In APPENDIX F, four contourplots were generated for each transect showing the distribution of suspended sediment concentration & sediment flux as well as the flow velocity perpendicular and parallel to the transect. The following conventions were used:

- Distances on the X-axis were referenced to the starting point of the transect, the start of the sailed transect is always at distance equal to zero.
- Left bank is always shown left, right bank on the right side. For Deurganckdok, left bank was taken to be the western quay wall and the right bank to be the eastern quay wall considering the dock as being a tributuary to the Scheldt river.
- Perpendicular flow velocities and fluxes are positive for downstream flow (ebb, out of Deurganckdok), negative for upstream flow (flood, inbound).
- Parallel flow velocities are positive for flow going from the left bank to the right bank, and negative for flow going from the right bank to the left bank.
- Absolute Depth is given in meters above TAW.

Also a depth-averaged velocity plot was generated for the flow velocity perpendicular to the transect. (See APPENDIX F).

Tables in APPENDIX G give the values for discharges, sediment fluxes and sediment concentrations for the total cross-section:

- Mid = measured part of the cross-section
- Top = top part of the cross-section
- Bottom = bottom part underneath the sidelobe
- Edge (left, right) = edge estimates to left & right bank
- Total = Mid+Top+Bottom+ Edge values

The graph in APPENDIX H gives the temporal variation of the total flux and total discharge for the whole through tide measurement at Zandvliet.

5. PRELIMINARY ANALYSIS OF THE DATA

5.1. March 22nd 2006 survey

As Deurganckdok is situated along the part of the Scheldt river under tidal influence, it is subject to complex current fields near its entrance. The measured current field shows a vortex pattern dependend on the tidal phase. During ebbing tide the vortex at the entrance of the dock is a counter-clockwise one and during rising tide it is a clockwise one. This is shown in the contour plots by inflow (negative) on the western side (left) and outflow on the eastern side of the entrance during ebbing tide and vice versa for flooding tide. (APPENDIX F).

During slack water we see a current field with opposing current directions in the upper part of the water column compared to the lower part of the water column. For high water we see inflow (negative) near the bottom and outflow (positive) near the surface. This particular pattern is probably an example of the expected salt density currents occurring near the entrance of Deurganckdok. The same event is seen at low water when the dock contains waters of higher salinity than the river, here we see an outflow near the bottom and inflow near the surface.

From the backscatter interpretation into suspended sediment concentration we see in general a higher concentration during slack water and during rising tide compared to during ebbing tide. Especially at about 3 hours after low water a sudden increase in suspended sediment concentration is observed.

5.2. Intercomparison with earlier survey on November 17th 2005

On November 17th the same transect has been sailed during through tide measurements, a description is given by IMDC (2006j). Conditions near the entrance of Deurganckdok have been simulated in Delft3D and processed by IMDC (2006k) in order to compare simulation with observed data.

The same circulation pattern as described above is found to have occurred at that day. In Figure 5-1 both measurements have been compared for about 3h after high water, sediment distribution as well as current pattern in the cross section are almost identical. Current velocity is about 0.2-0.4 m/s on the right bank side and in the upper part of the water column and about –0.2 m/s on the left bank side. Suspended sediment concentration ranges from 50 to 100 mg/l going up from top right side towards bottom left side.

In Figure 5-2 the circulation pattern and sediment concentration have been compared for the same days but at about 1h after high water. Again the current pattern is almost identical on both days with a salt wedge intruding near the bottom of the dock and compensatory outflow of fresher water near the surface. Sediment distribution ranges for both measurements between 50 and 150 mg/l with a very similar pattern across the cross section at the dock's entrance.

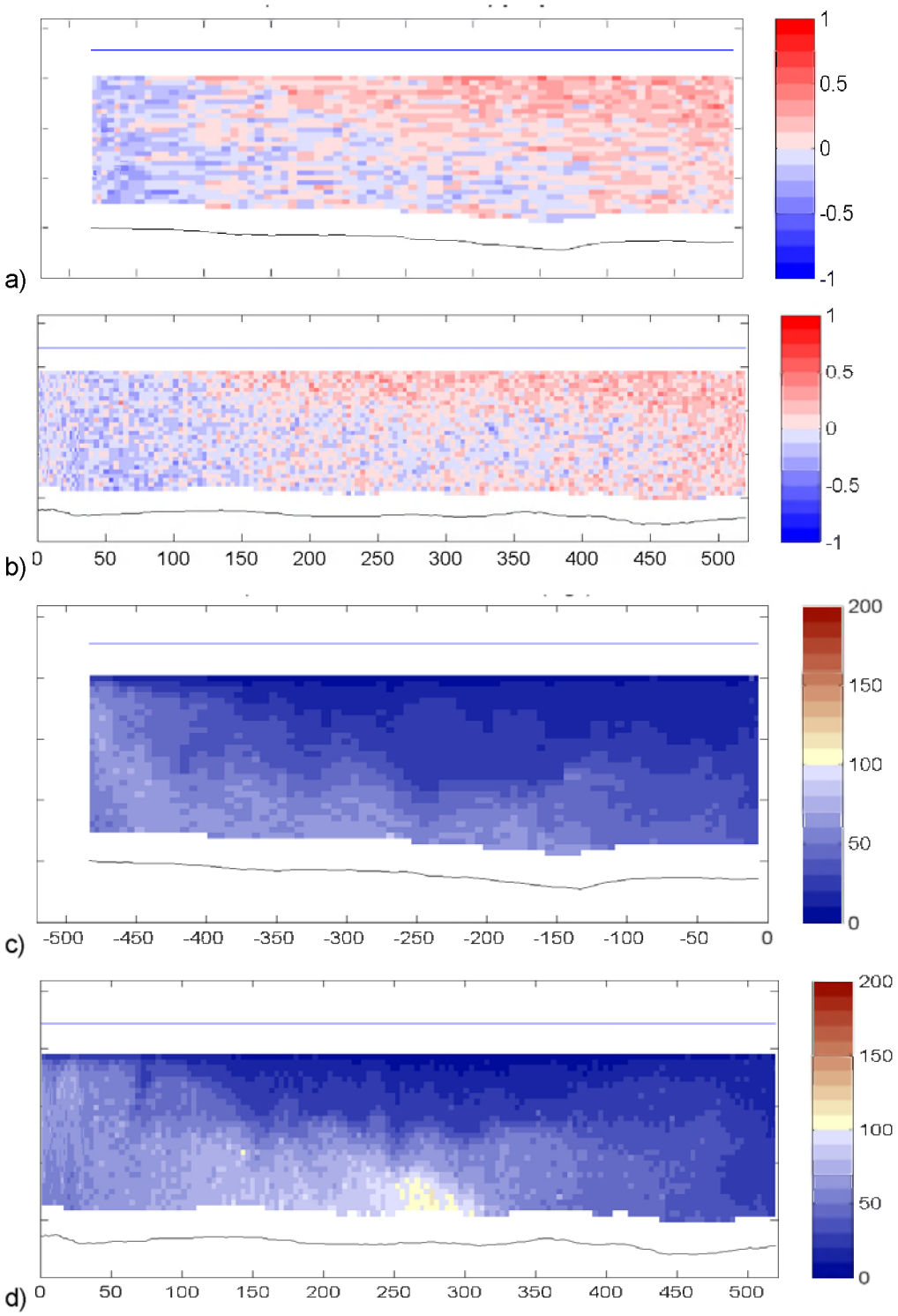


Figure 5-1: a) Perpendicular current velocity(m/s) on 22/03/2006 and b) On 17/11/2005 c) Suspended sediment concentration (mg/l)n on 22/03/2006 and d) On 17/11/2005) at 3h after high water

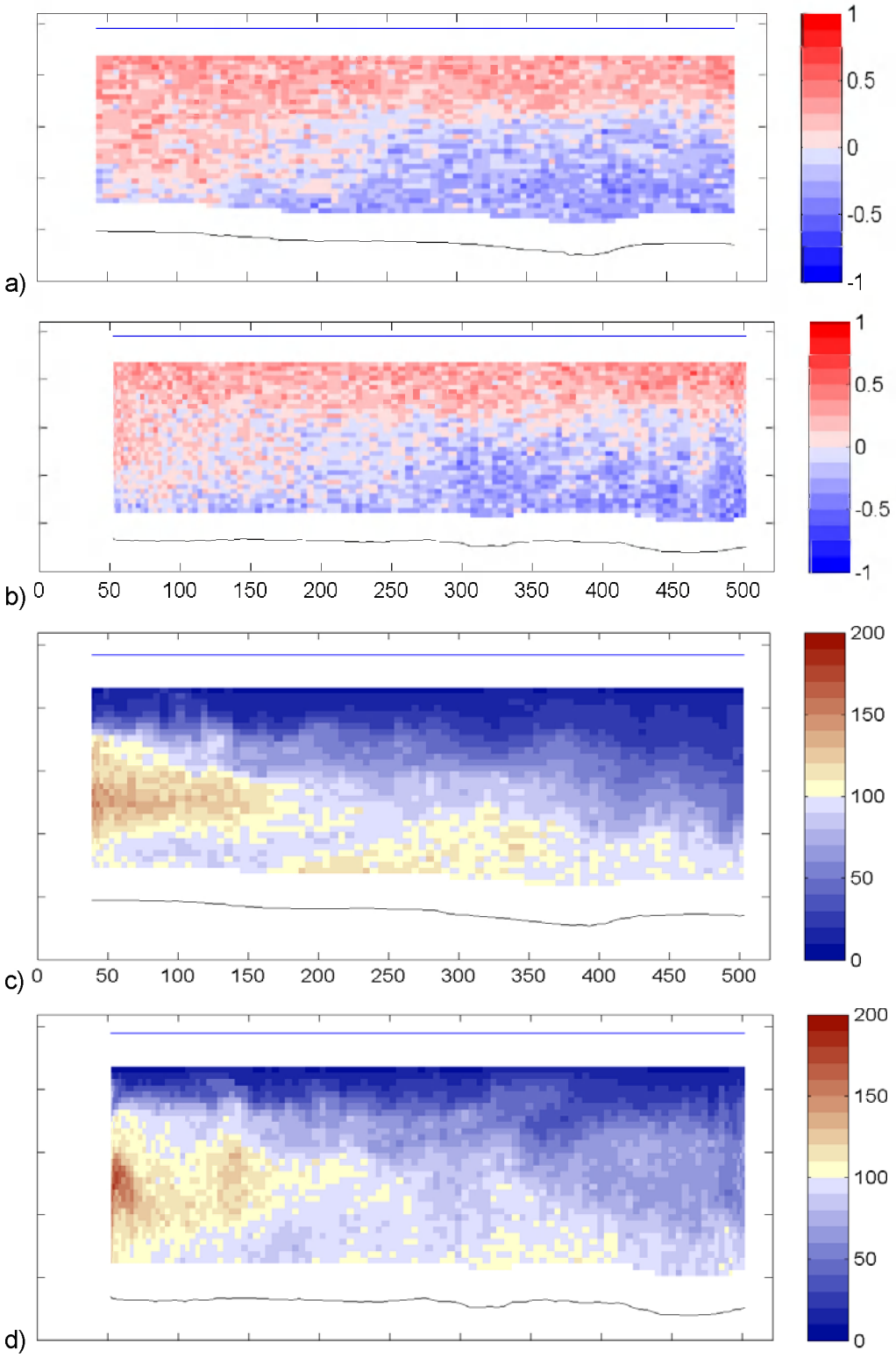


Figure 5-2: a) Perpendicular current velocity (m/s) on 22/03/2006 and b) On 17/11/2005 c) Suspended sediment concentration (mg/l) on 22/03/2006 and d) On 17/11/2005) at 1h after high water

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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).

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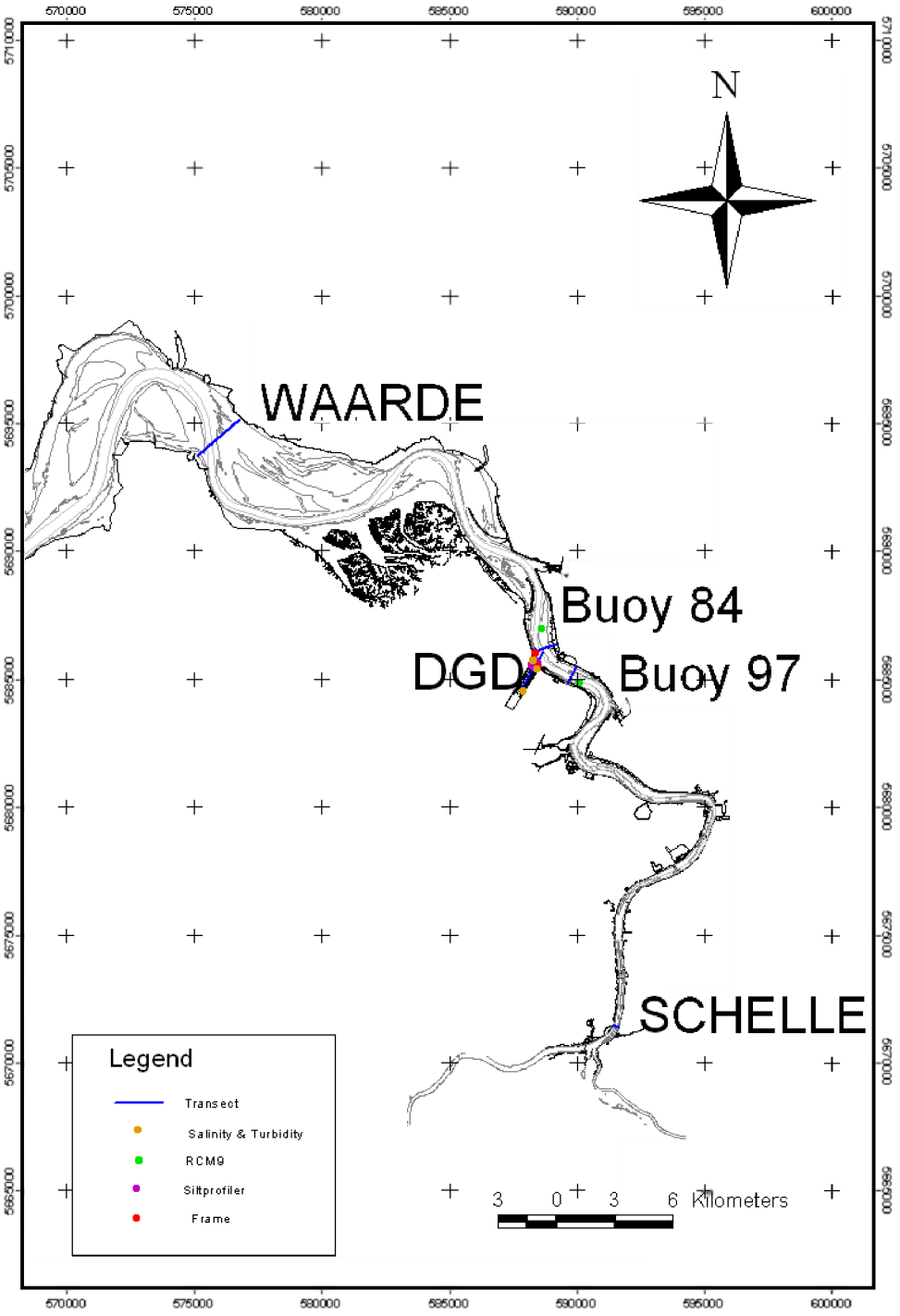
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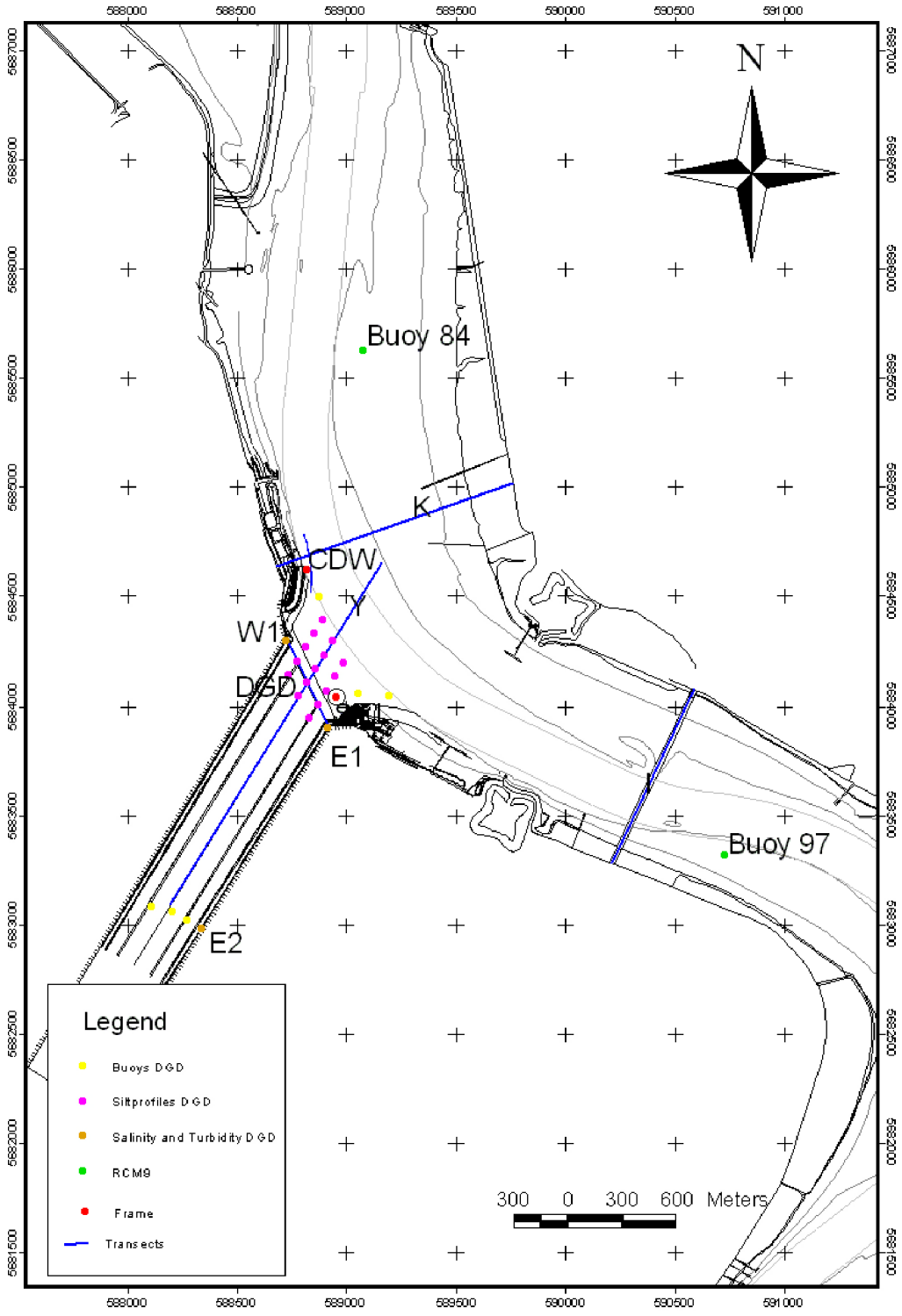
APPENDIX A.

OVERVIEW OF MEASUREMENTS

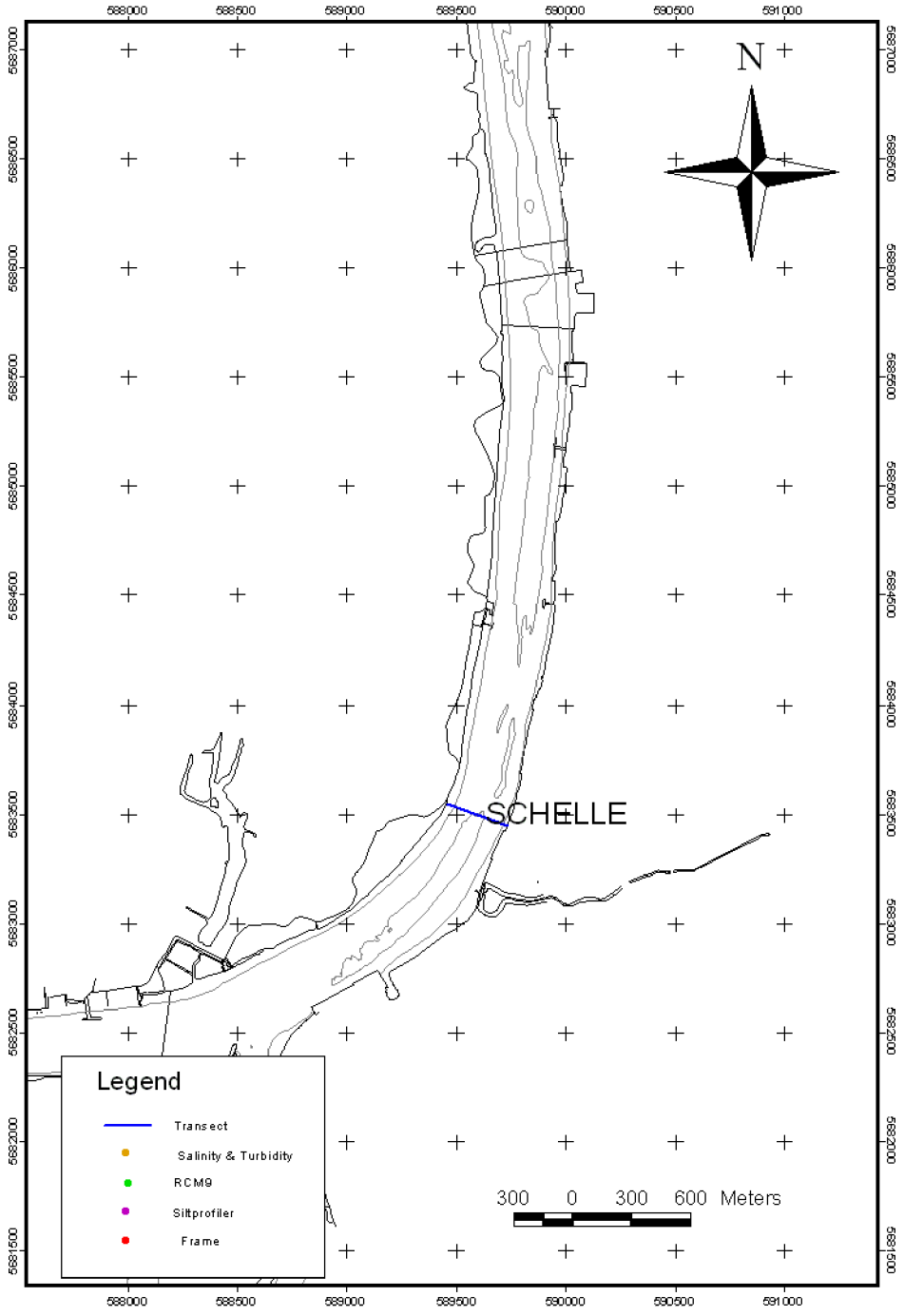
A.1 Overview of the measurement locations for the whole HCBS2 measurement campaign



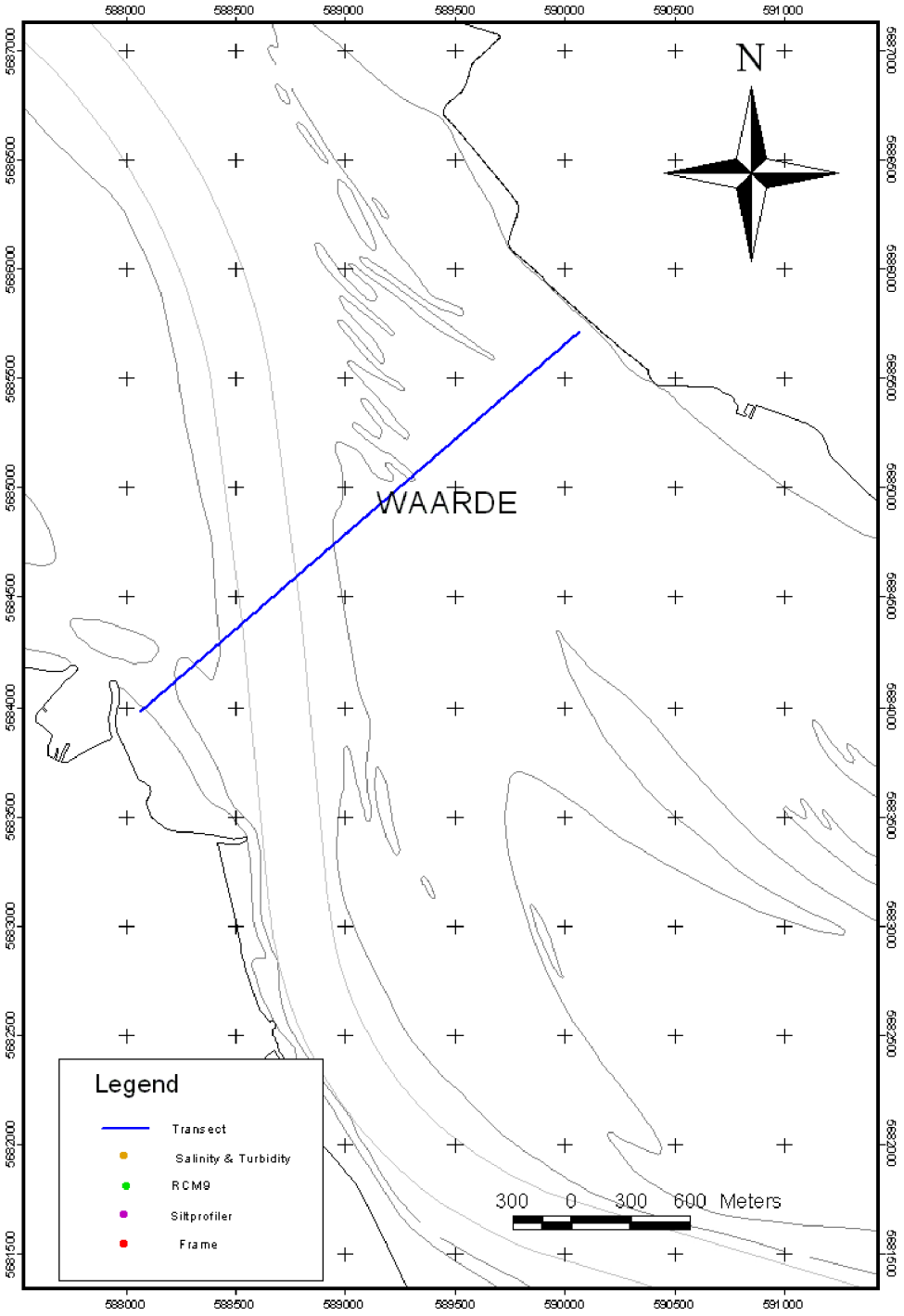
Overview of the measurement locations



Overview of the measurement locations at Deurganckdok



Theoretical transect in Schelle



Theoretical transect in Waarde

A.2 Overview of all measurement locations HCBS measurement campaign 21/3-23/3

Table with coordinates of theoretical transects

Transect	Start Easting	Start Northing	End Easting	End Northing
I	590318.00	5683302.00	590771.00	5684257.00
K	588484.00	5684924.00	589775.00	5685384.00
SCHELLE	592645.07	5665794.06	592952.68	5665682.28
DGD	588764.88	5684056.49	588540.95	5684526.94
Y	589059.09	5684948.36	587898.76	5683076.56
WAARDE	573541.00	5696848.20	571318.00	5694932.90

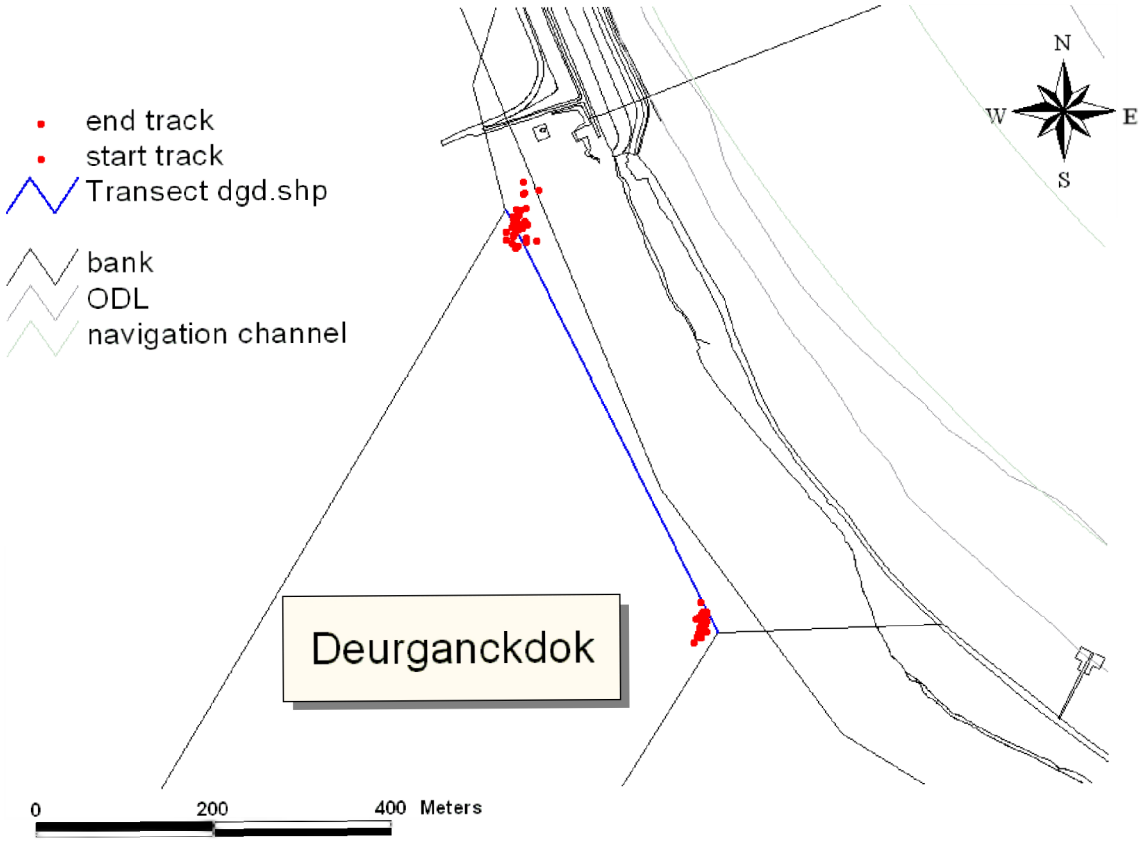
Table with coordinates of SiltProfiler gauging locations

SP	EASTING	NORTHING
1	588737	5684638
2	588690	5684562
3	588643	5684486
4	588596	5684411
5	588549	5684335
6	588606	5684217
7	588653	5684293
8	588700	5684368
9	588747	5684444
10	588793	5684520
11	588850	5684402
12	588803	5684326
13	588756	5684250
14	588709	5684174
15	588662	5684099

A.3 Measurement overview Deurganckdok 22/03/2006

FileName	End time [hh:mm MET]	Time of HW [hh:mm]	Easting start (UTM31 ED50)	Northing start (UTM31 ED50)	Easting end (UTM31 ED50)	Northing end (UTM31 ED50)	Transect length [m]	Transect heading [°]
2002DGDt000r	8:30	0:50	588573	5684495	588745	5684106	425	156
2005DGDt000r	8:49	1:09	588549	5684488	588745	5684098	436	153
2008DGDt000rbis	9:08	1:28	588552	5684490	588744	5684103	432	154
2011DGDt000r2	9:41	2:01	588539	5684496	588741	5684115	432	152
2014DGDt000rsub2	10:12	2:32	588546	5684494	588746	5684104	438	153
2016DGDt000r	10:25	2:45	588755	5684059	588568	5684468	450	335
2018DGDt000rsub	10:41	3:01	588562	5684513	588751	5684084	469	156
2020DGDt000r	10:58	3:18	588754	5684052	588558	5684486	475	336
2022DGDt000r	11:12	3:32	588556	5684514	588743	5684114	441	155
2024DGDt000r	11:26	3:46	588749	5684070	588557	5684486	458	335
2026DGDt000r	11:41	4:01	588546	5684512	588754	5684084	476	154
2028DGDt000r	11:56	4:16	588755	5684076	588557	5684490	459	334
2030DGDt000rbis	12:09	4:29	588535	5684490	588746	5684098	445	152
2032DGDt000rbis	12:26	4:46	588754	5684074	588561	5684481	450	335
2034DGDt000rbissub	12:40	5:00	588544	5684500	588755	5684071	478	154
2036DGDt000rsub	12:52	5:12	588757	5684063	588559	5684484	465	335
2038DGDt000rbissub	13:11	5:31	588544	5684503	588751	5684092	460	153
2040DGDt000r	13:23	5:43	588755	5684066	588568	5684471	447	335
2042DGDt000rsub	13:40	6:00	588553	5684514	588745	5684098	459	155
2044DGDt000rsub	13:52	6:12	588754	5684090	588556	5684493	450	334
2046DGDt000rsub	14:11	-5:59	588547	5684502	588752	5684070	477	155
2048DGDt000r2	14:23	-5:47	588750	5684051	588558	5684490	479	336
2050DGDt000rsub	14:43	-5:27	588556	5684514	588751	5684085	472	155
2052DGDt000rbis	14:58	-5:12	588757	5684067	588555	5684499	477	335
2054DGDt000r	15:11	-4:59	588547	5684521	588749	5684098	469	154
2056DGDt000rbis	15:28	-4:42	588727	5684025	588555	5684491	496	340
2058DGDt000rbissub	15:39	-4:31	588555	5684505	588750	5684094	455	155
2060DGDt000rbis	15:51	-4:19	588730	5684035	588546	5684529	527	340
2062DGDt000rsub	16:15	-3:55	588556	5684512	588752	5684088	467	155
2064DGDt000rsub	16:27	-3:43	588753	5684055	588565	5684477	462	336
2066DGDt000r	16:40	-3:30	588538	5684506	588742	5684099	455	153
2068DGDt000rsub	16:54	-3:16	588752	5684052	588560	5684488	477	336
2070DGDt000rsub	17:10	-3:00	588551	5684520	588750	5684090	474	155
2072DGDt000rsub	17:22	-2:48	588755	5684057	588560	5684484	469	335
2074DGDt000rbis	17:39	-2:31	588543	5684507	588743	5684110	444	153
2076DGDt000rbis2	17:51	-2:19	588745	5684039	588562	5684490	486	338
2078DGDt000rbissub	18:10	-2:00	588550	5684513	588743	5684096	459	155
2080DGDt000rsub	18:23	-1:47	588760	5684056	588558	5684490	478	335
2082DGDt000r	18:41	-1:29	588559	5684562	588747	5684091	507	158
2084DGDt000r	18:55	-1:15	588753	5684060	588552	5684513	495	336

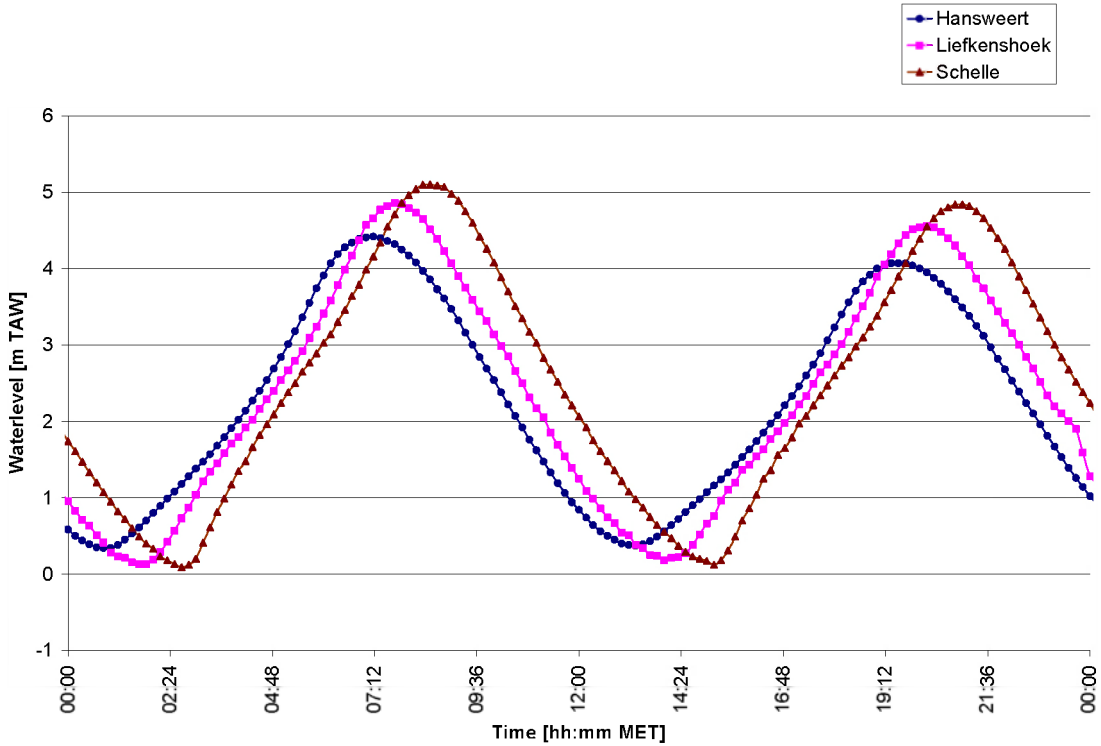
FileName	End time [hh:mm MET]	Time of HW [hh:mm]	Easting start (UTM31 ED50)	Northing start (UTM31 ED50)	Easting end (UTM31 ED50)	Northing end (UTM31 ED50)	Transect length [m]	Transect heading [°]
2086DGDt000rsub2	19:11	-0:59	588561	5684507	588744	5684112	436	155
2088DGDt000r	19:23	-0:47	588746	5684044	588555	5684488	483	337
2090DGDt000rsub2	19:40	-0:30	588559	5684501	588742	5684102	438	155
2092DGDt000r2	19:53	-0:17	588760	5684067	588558	5684508	484	335
2094DGDt000r2	20:10	0:00	588561	5684494	588758	5684090	449	154
2096DGDt000rsub	20:22	0:12	588758	5684070	588564	5684492	465	335
2098DGDt000rbis	20:41	0:31	588574	5684519	588754	5684098	458	157
2100DGDt000rbis	20:53	0:43	588758	5684072	588563	5684498	469	335
2102DGDt000rsub2	21:09	0:59	588576	5684552	588750	5684095	489	159
2104DGDt000rsub	21:22	1:12	588757	5684068	588556	5684526	500	336



Location of start en end points of the sailed tracks

APPENDIX B. TIDAL DATA

11283 - Winter 2006 SURVEY



Measured tide on 22/03/2006

Location:	Date:
River Scheldt	22/03/2006

Data processed by: IMDC

In association with: WL | delft hydraulics, GEMS International

I/RA/11283/06.110/BDC

APPENDIX C.

NAVIGATION INFORMATION AS RECORDED ON SITE

Ship:	**Veremans**
Location:	**Deurganckdok**

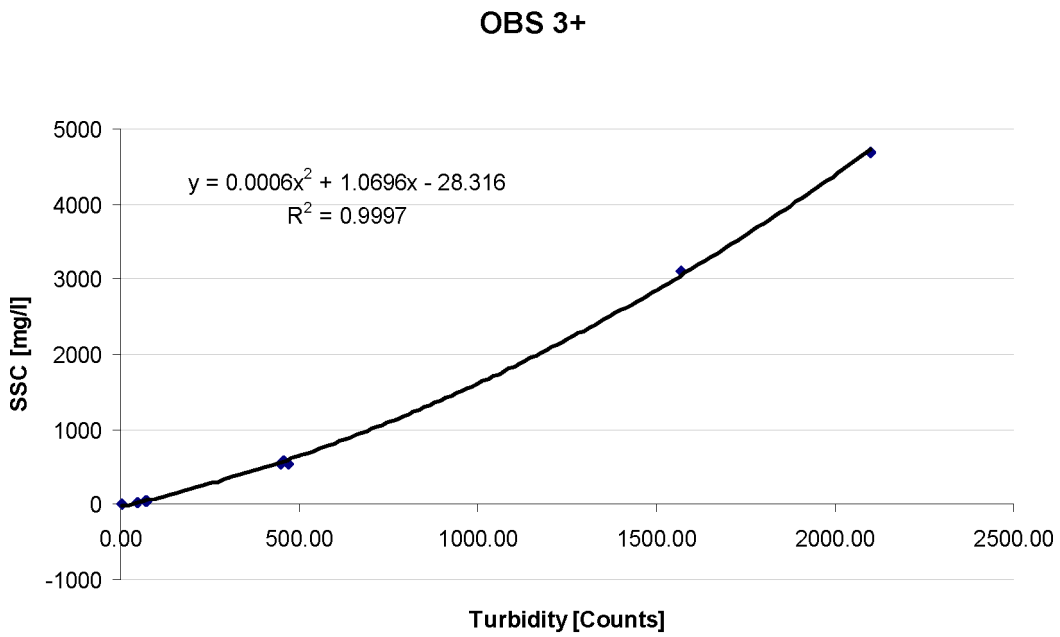
Nr.	***Tijdstip (MET)***	***Name schip***	***Direction***
1	8:14	Rijnstroom	IN
2	9:00	Hijnika	IN
3	9:01	Integro	OUT
4	9:08	Noordzee	OUT
5	9:09	Camaro	OUT
6	10:01	Setus	OUT
7	10:15	Rijnstroom	OUT
8	12:50	Hijnika	IN
9	13:30	Pictunia	IN
10	14:14	Orida	IN
11	15:50	Vitaja	IN
12	17:01	Orida	OUT
13	17:38	Karin	IN
14	18:50	Karin	OUT
15	19:09	Tarkana	IN
16	19:10	Riebel	OUT
17	21:15	Santina	IN

APPENDIX D.

CALIBRATION AND CROSS-CALIBRATION GRAPHS

FOR OBS DATA

11283 – March 2006 SURVEY



Calibration Graph of OBS-3+		Data processed by: IMDC
Location: Deurganckdok	Date: 15/03/2006	In association with: WL | delft hydraulics, GEMS International

I/RA/11283/06.110/BDC

APPENDIX E.

UNESCO PPS-78 FORMULA FOR CALCULATING SALINITY

Practical Salinity Scale (PPS 78) Salinity in the range of 2 to 42

Constants from the 19th Edition of Standard Methods

R cond.ratio	0.0117	$R = \frac{C}{42.914 mS/cm}$	
C Cond at t	**0.5**		**Input conductivity in mS/cm of sample**
t deg. C	**22.00**		**Input temperature of sample solution**
P dBar	**20**		**Input pressure at which sample is measured in decibars**
Rp	1.0020845	$R_p = 1 + \frac{p(e_1 + e_2 p + e_3 p^2)}{1 + d_1 t + d_2 t^2 + (d_3 + d_4 t)R}$	
rt	1.1641102	$r_t = c_0 + c_1 t + c_2 t^2 + c_3 t^3 + c_4 t^4$	
Rt	0.0099879	$R_t = \frac{R}{R_p \times r_t}$	
Delta S	-0.0010	$\text{Delta S} = \frac{(t-15)}{1+k(t-15)}(b_0 + b_1 R_t^{1/2} + b_2 R_t + b_3 R_t^{3/2} + b_4 R_t^2 + b_5 R_t^{5/2})$	
S = Salinity	**0.257**	$S = a_0 + a_1 R_t^{1/2} + a_2 R_t + a_3 R_t^{3/2} + a_4 R_t^2 + a_5 R_t^{5/2} + \text{delta S}$	

a0	0.0080	b0	0.0005	c0	0.6766097	d1	3.426E-02	e1	2.070E-04
a1	-0.1692	b1	-0.0056	c1	2.00564E-02	d2	4.464E-04	e2	-6.370E-08
a2	25.3851	b2	-0.0066	c2	1.104259E-04	d3	4.215E-01	e3	3.989E-12
a3	14.0941	b3	-0.0375	c3	-6.9698E-07	d4	-3.107E-03		
a4	-7.0261	b4	0.0636	c4	1.0031E-09				
a5	2.7081	b5	-0.0144						
		k	0.0162						

R = ratio of measured conductivity to the conductivity of the Standard Seawater Solution

Conductivity Ratio R is a function of salinity, temperature, and hydraulic pressure. So that we can factor R into three parts i.e.

R = Rt x Rp x rt

R = C(S,t,p)/C(35,15,0)

C = 42.914 mS/cm at 15 deg C and 0 dbar pressure ie C(35,15,0) where 35 is the salinity

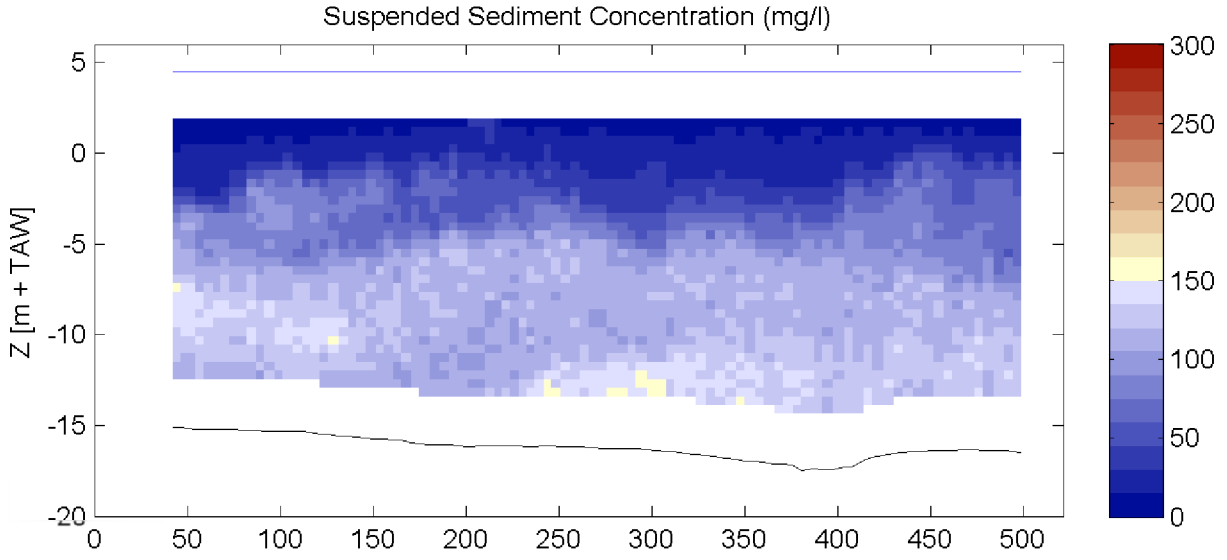
Ocean pressure is usually measured in decibars. 1 dbar = 10^-1 bar = 10^5 dyne/cm^2 = 10^4 Pascal.

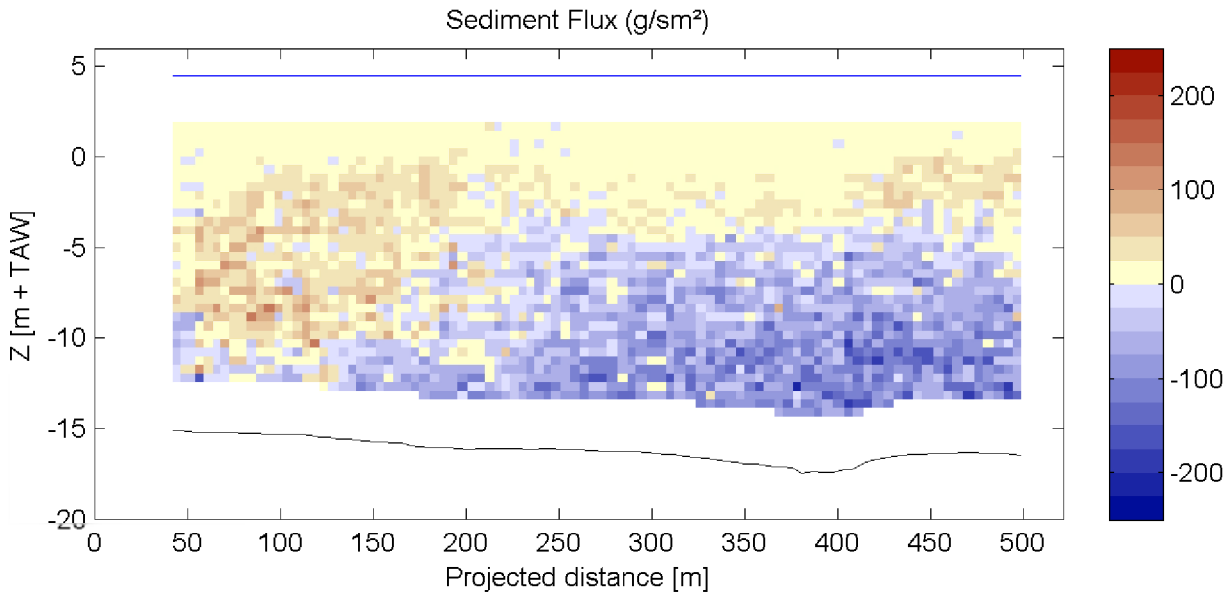
APPENDIX F.CONTOURPLOTS OF FLOW VELOCITIES, SEDIMENT CONCENTRATION AND SEDIMENT FLUX PER SAILED TRANSECT

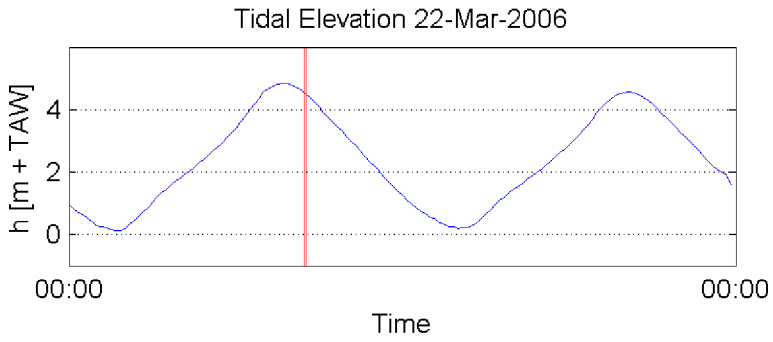
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Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2002DGDt000r.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

08:27:06 - 08:31:15

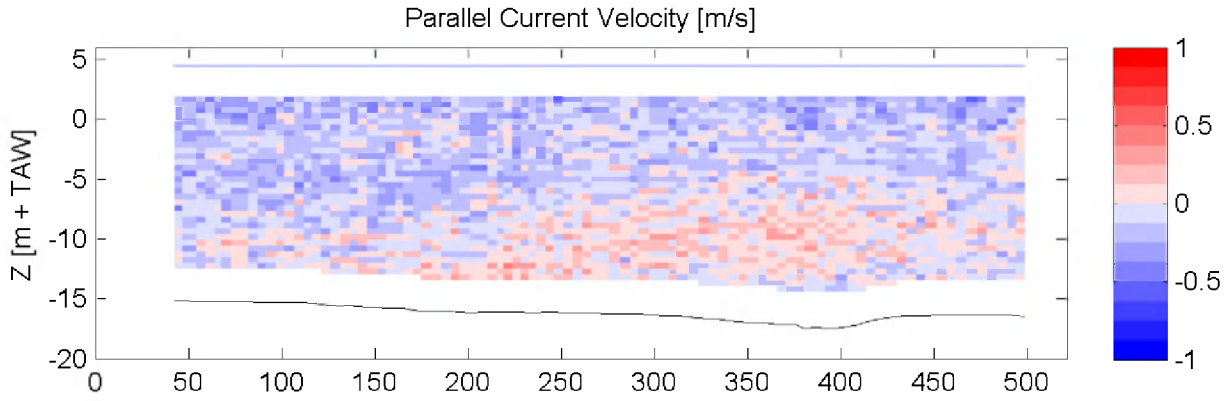
Data Processed by:

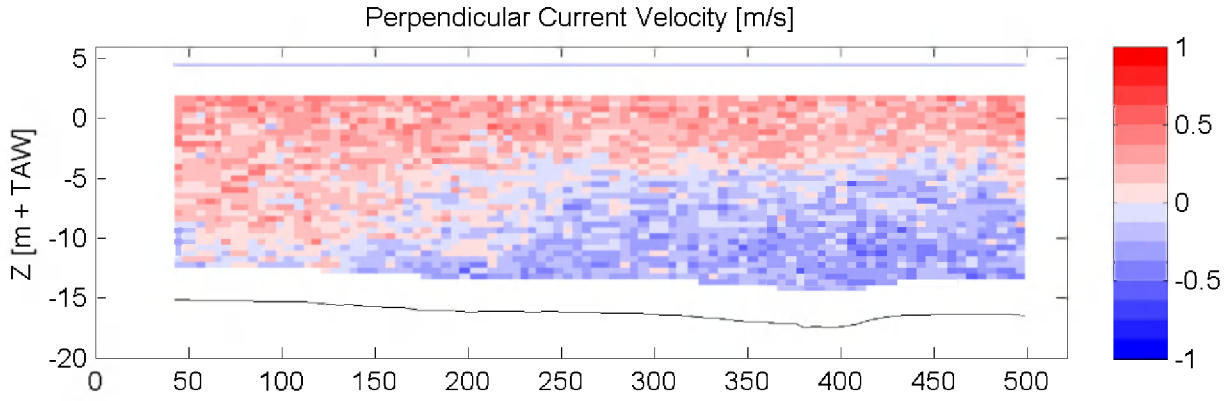
In association with :

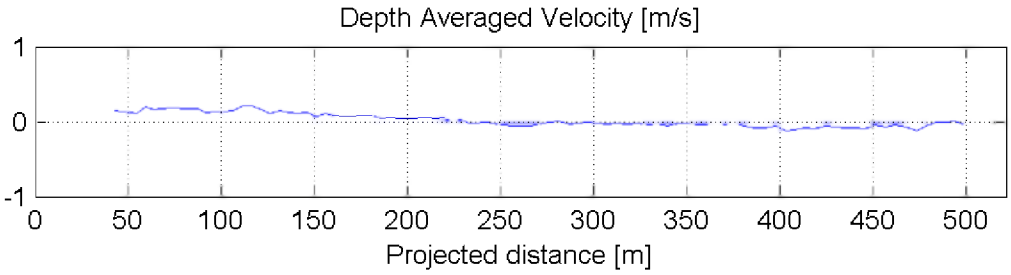
I/RA/11283/06.110/BDC

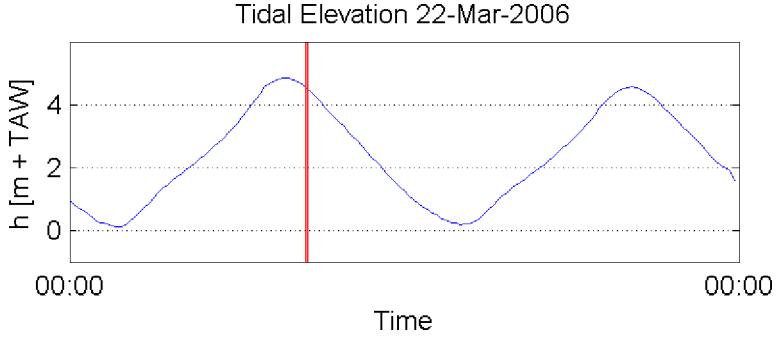
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2002DGDt000r.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

08:27:06 - 08:31:15

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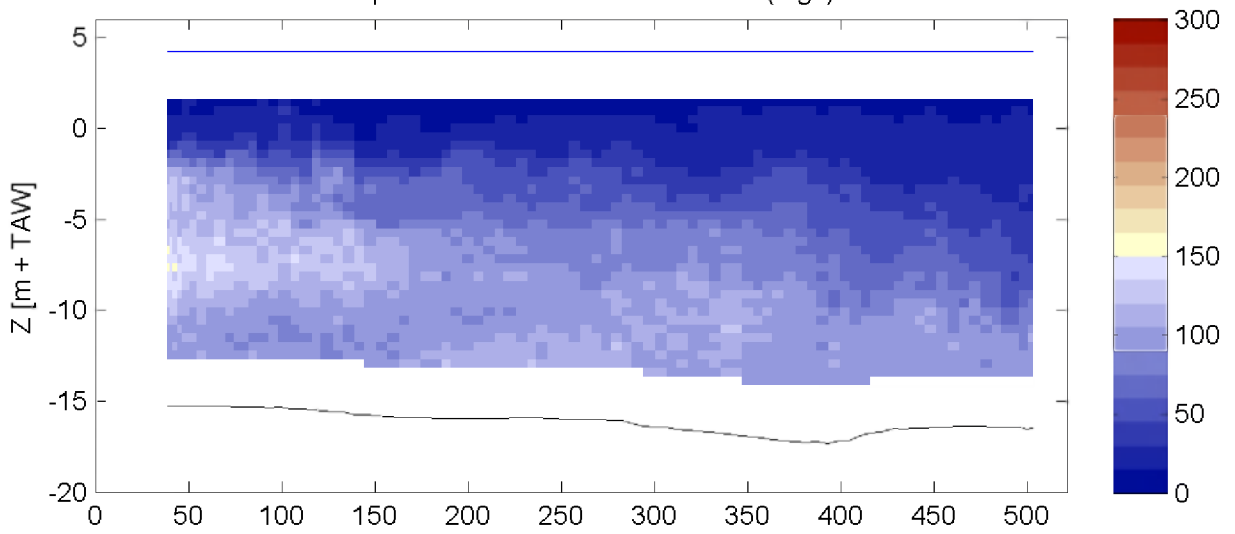
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I/RA/11283/06.110/BDC

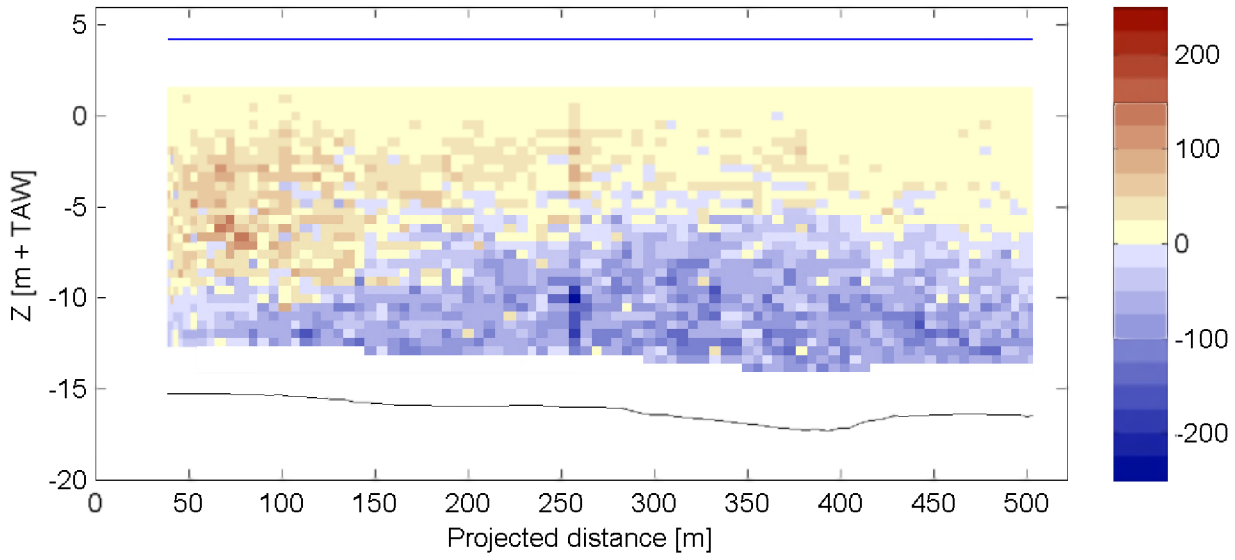
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2005DGDt000r.csv	Location: Transect DGD

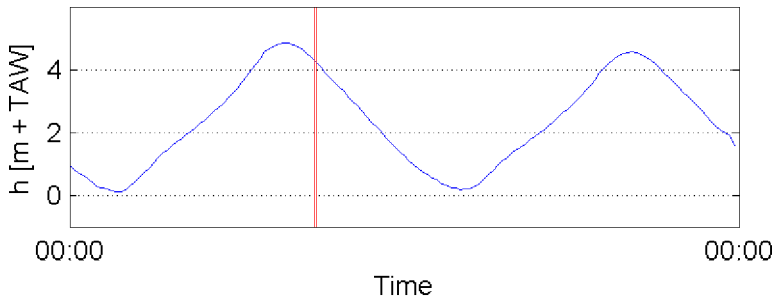
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

08:46:24 - 08:50:16

Data Processed by: IMDC

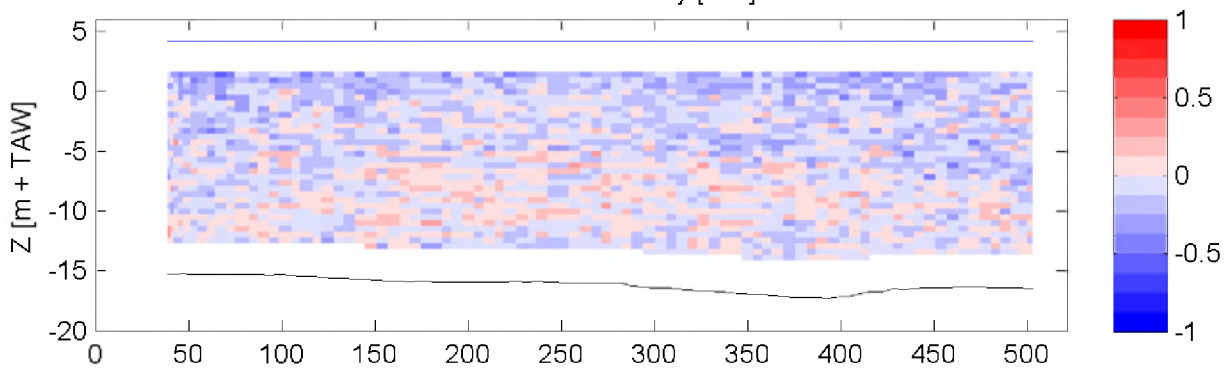
In association with :

I/RA/11283/06.110/BDC

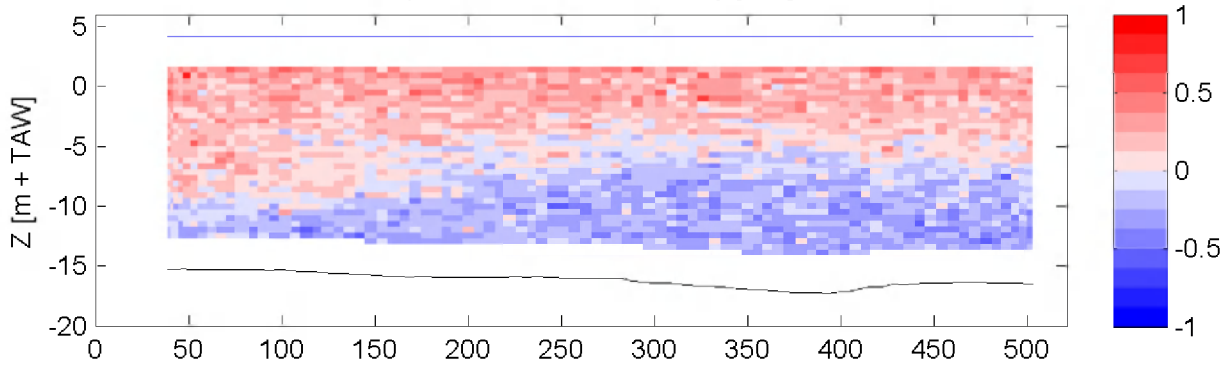
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2005DGDt000r.csv	Location: Transect DGD

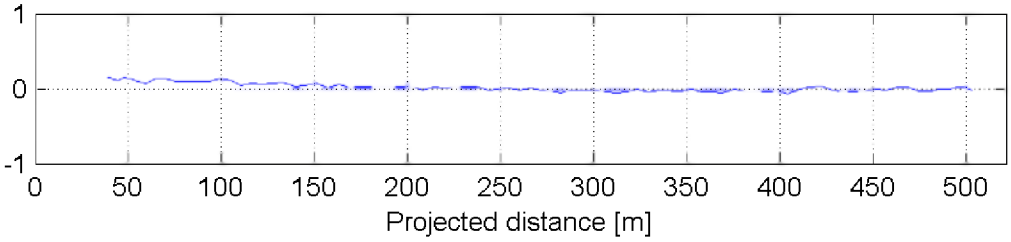
Parallel Current Velocity [m/s]



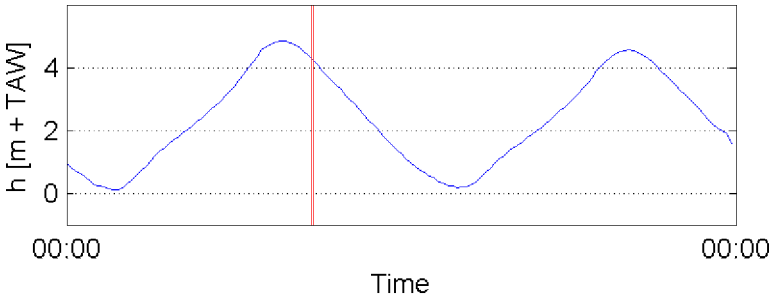
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

08:46:24 - 08:50:16

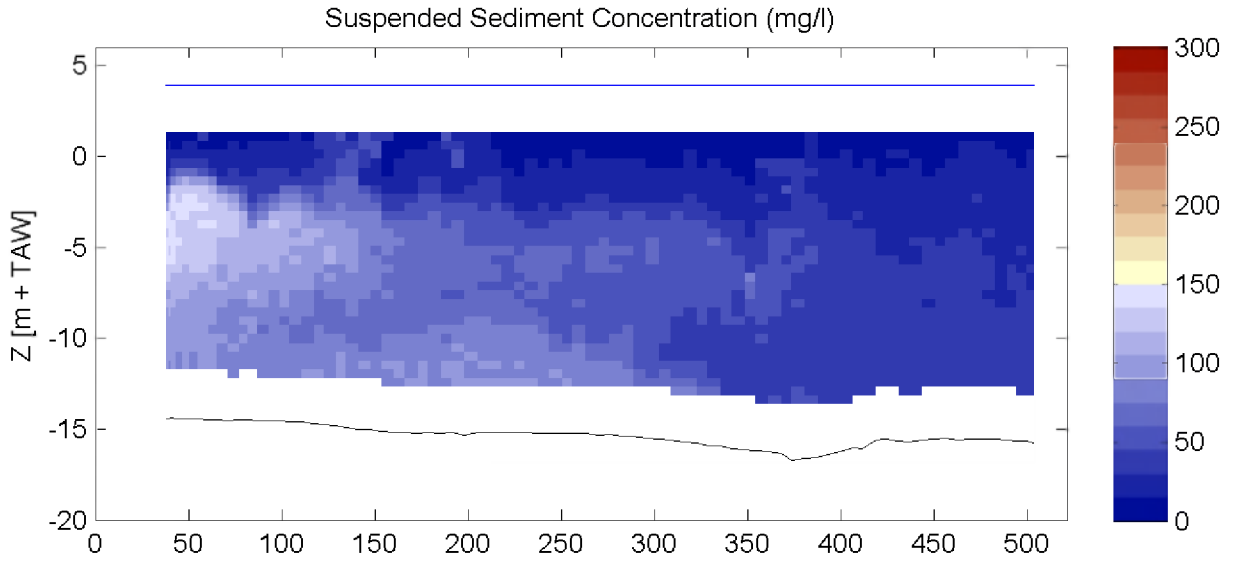
Data Processed by: IMDC

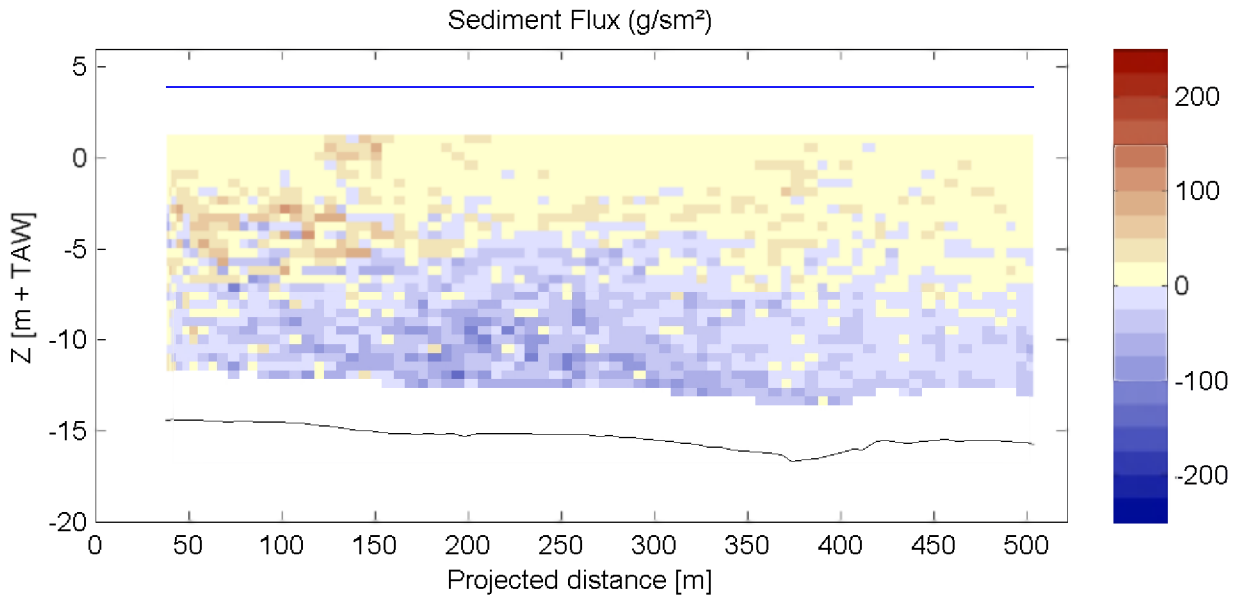
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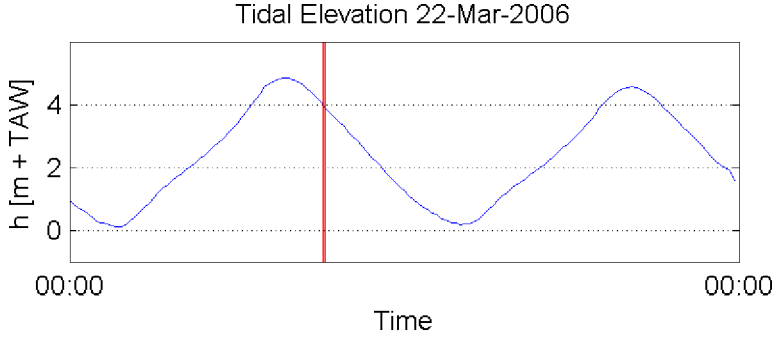
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2008DGDt000rbis.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

09:05:31 - 09:09:03

Data Processed by: IMDC

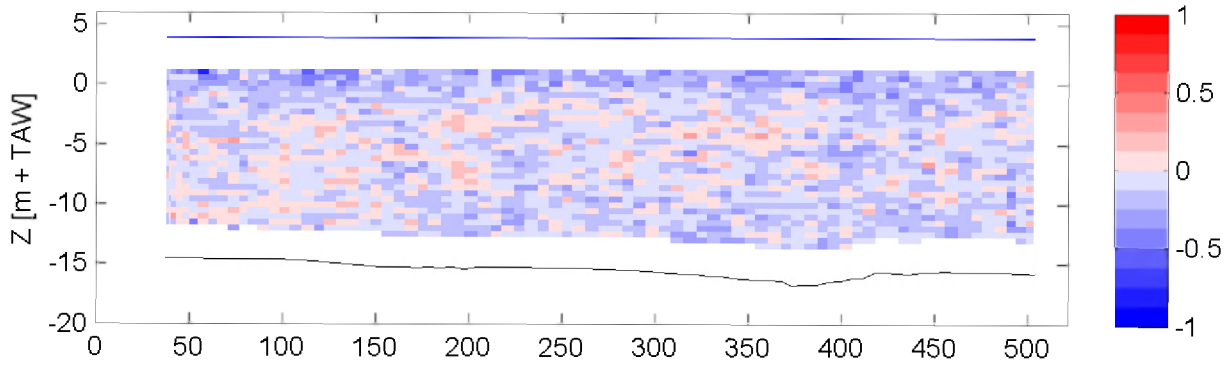
In association with :

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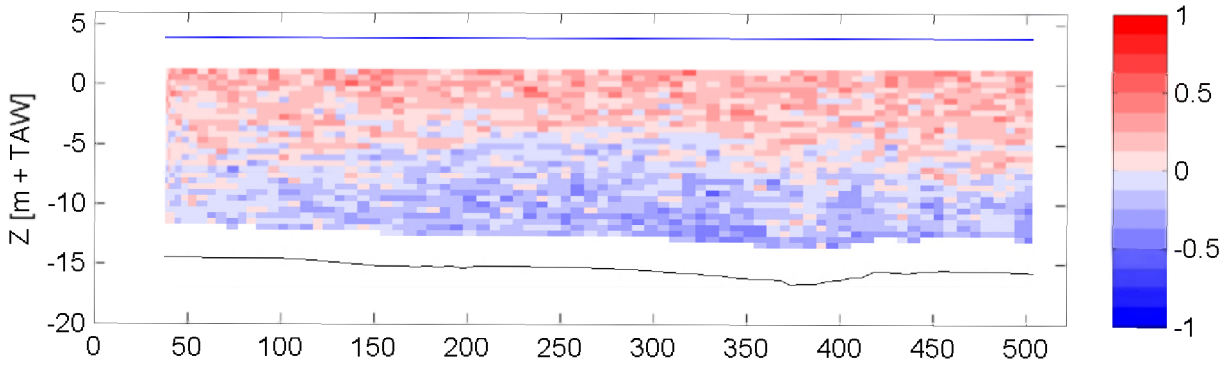
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2008DGDt000rbis.csv	Location: Transect DGD

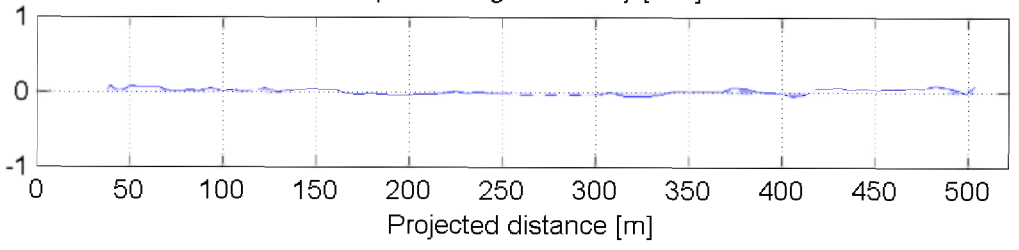
Parallel Current Velocity [m/s]



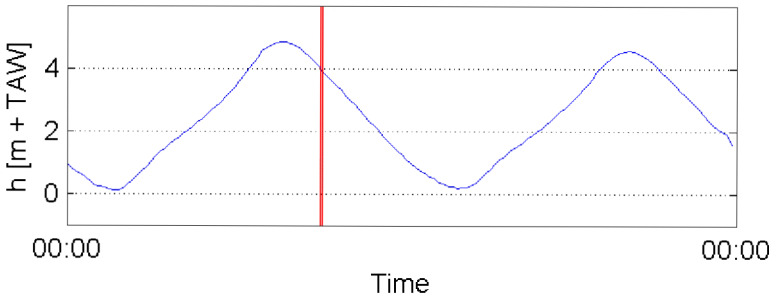
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

09:05:31 - 09:09:03

Data Processed by: IMDC

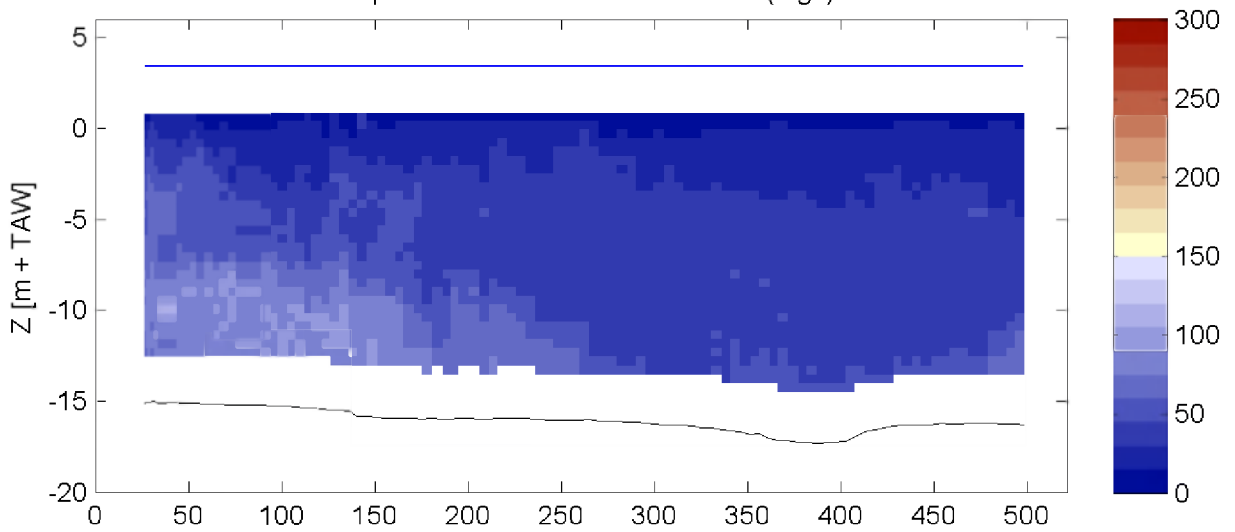
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I/RA/11283/06.110/BDC

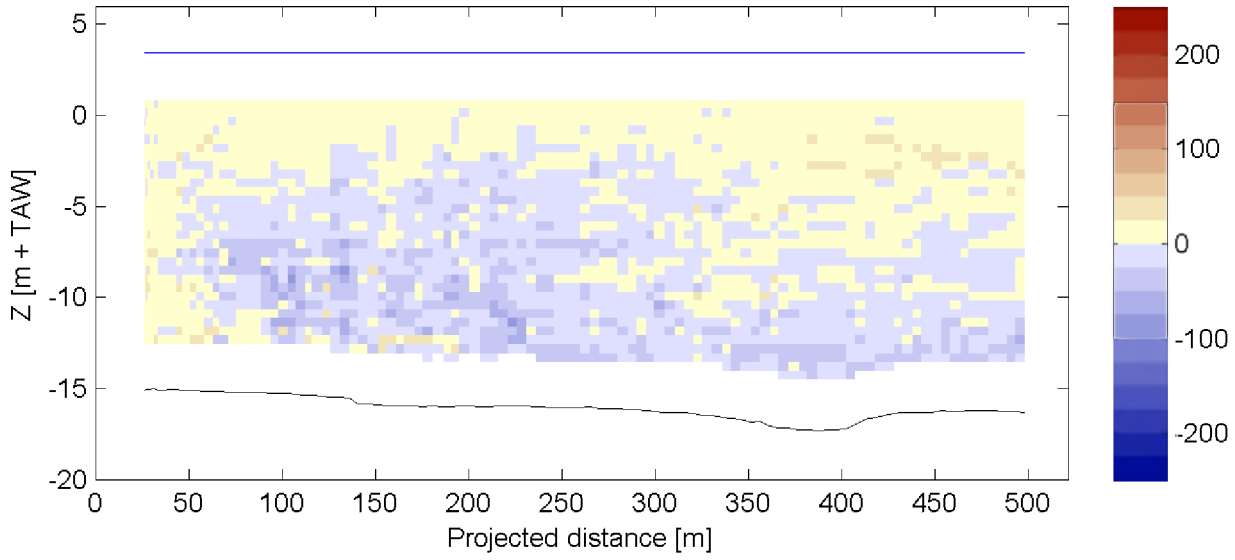
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2011DGDt000r2.csv	Location: Transect DGD

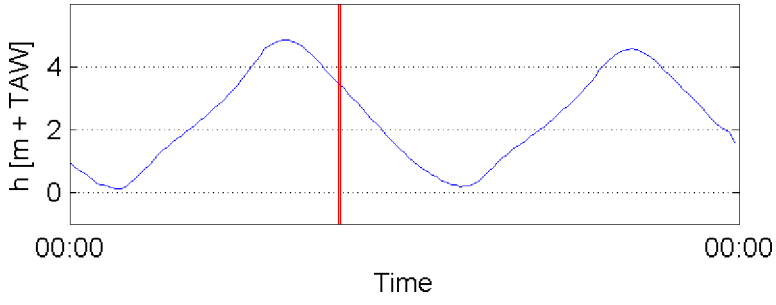
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

09:37:21 - 09:42:00

Data Processed by: IMDC

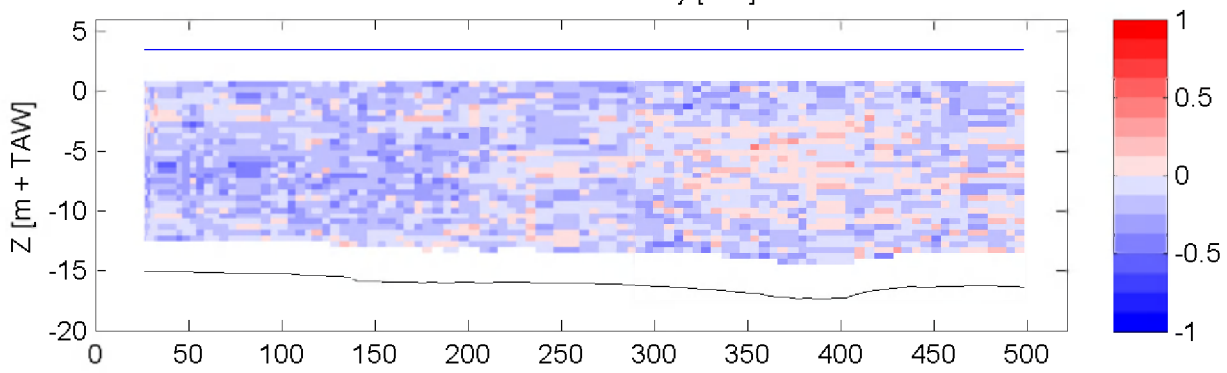
In association with :

I/RA/11283/06.110/BDC

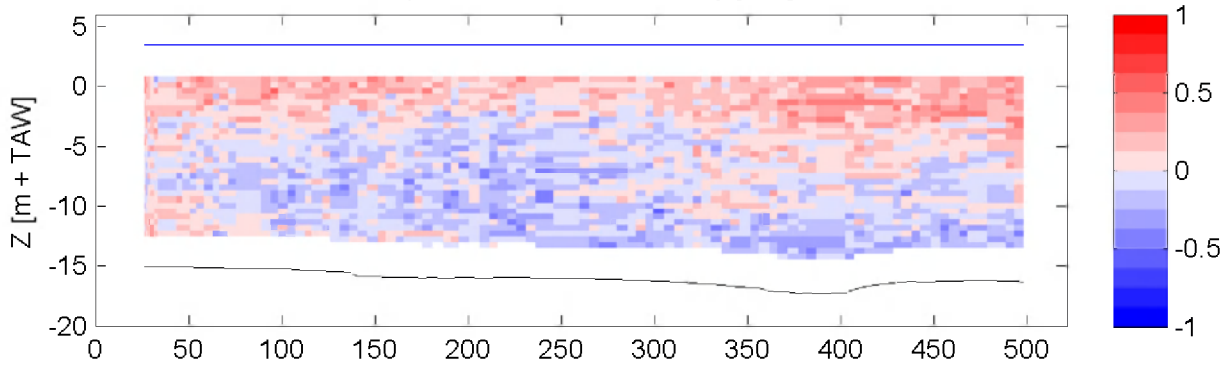
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2011DGDt000r2.csv	Location: Transect DGD

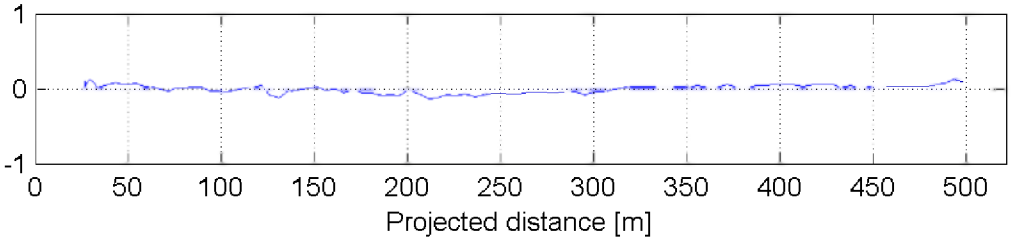
Parallel Current Velocity [m/s]



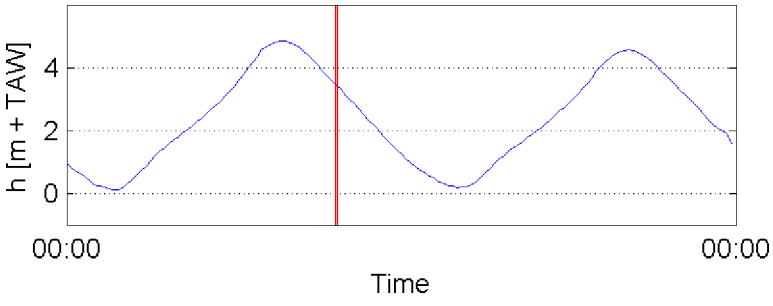
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

09:37:21 - 09:42:00

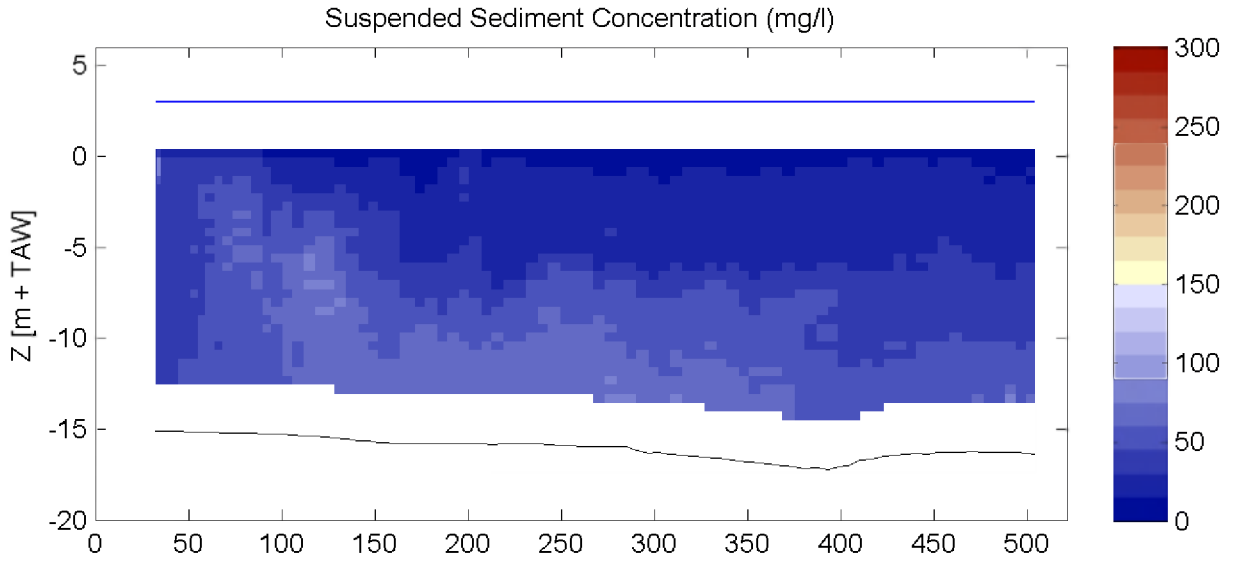
Data Processed by: IMDC

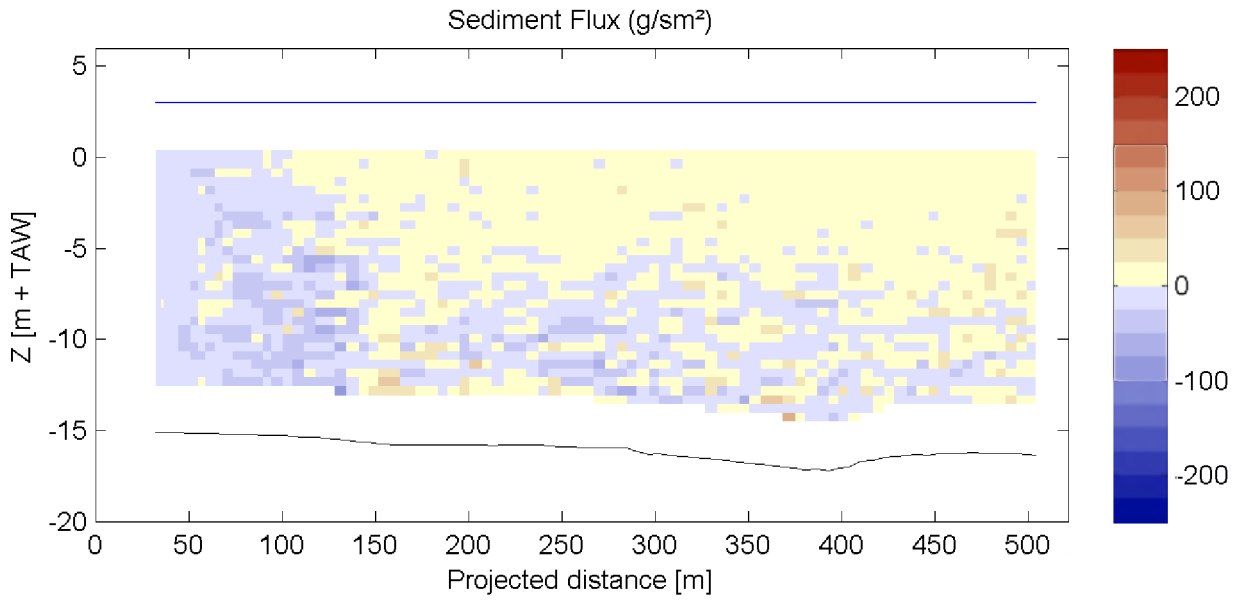
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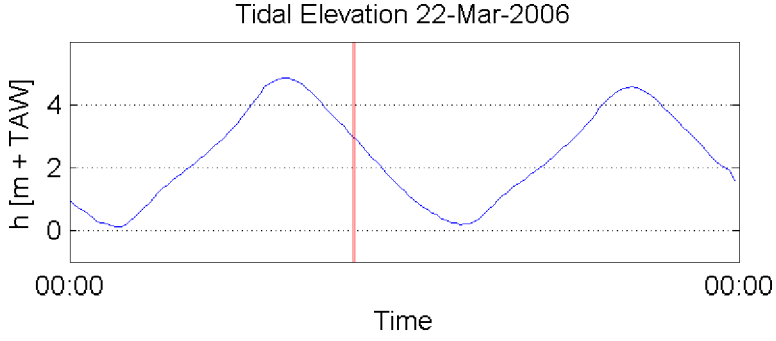
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2014DGDt000rsub2.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

10:08:41 - 10:12:36

Data Processed by: IMDC

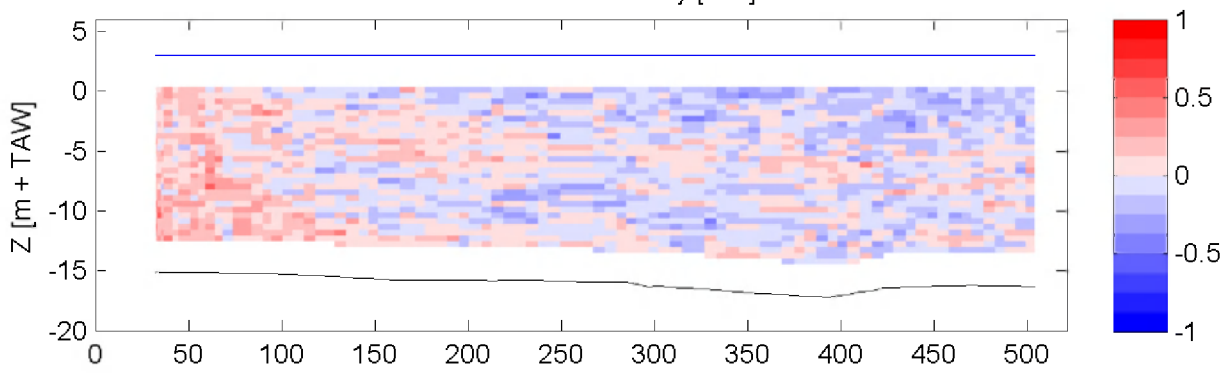
In association with :

I/RA/11283/06.110/BDC

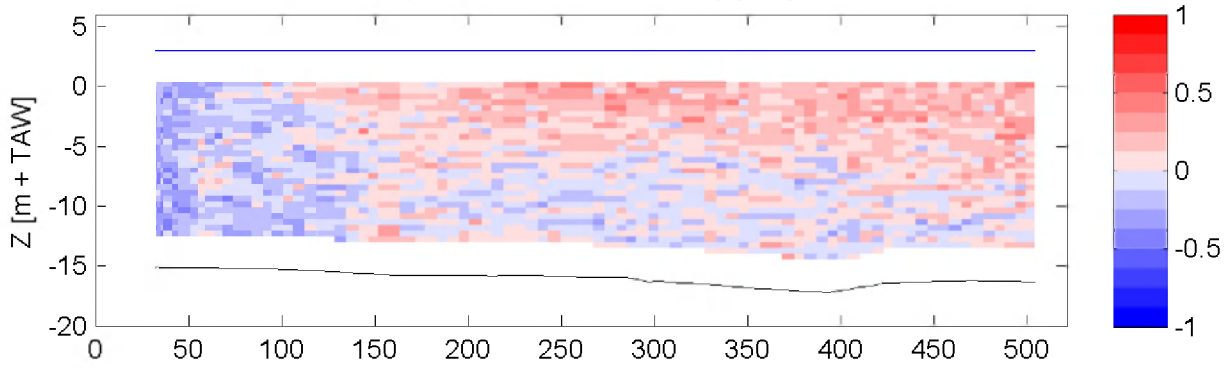
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2014DGDt000rsub2.csv	Location: Transect DGD

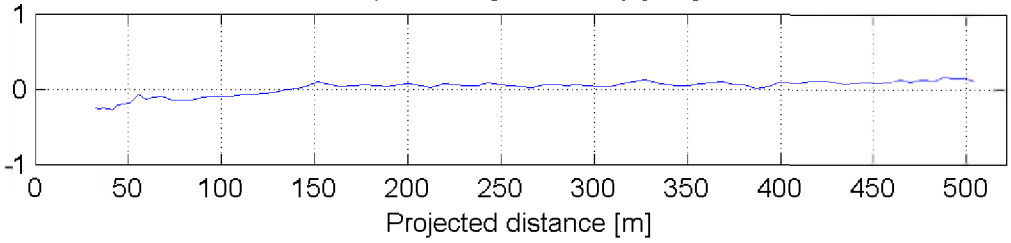
Parallel Current Velocity [m/s]



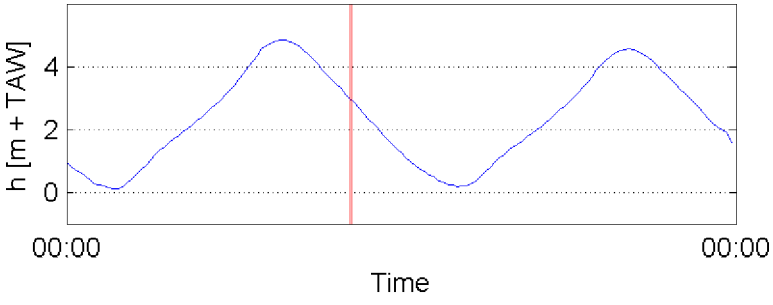
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

10:08:41 - 10:12:36

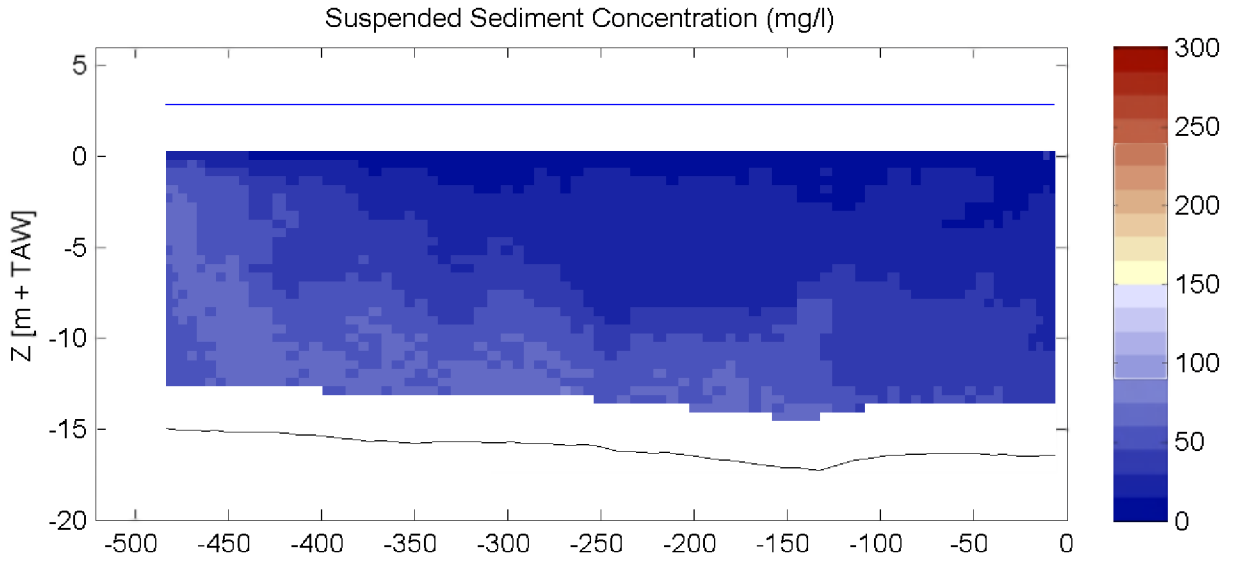
Data Processed by: IMDC

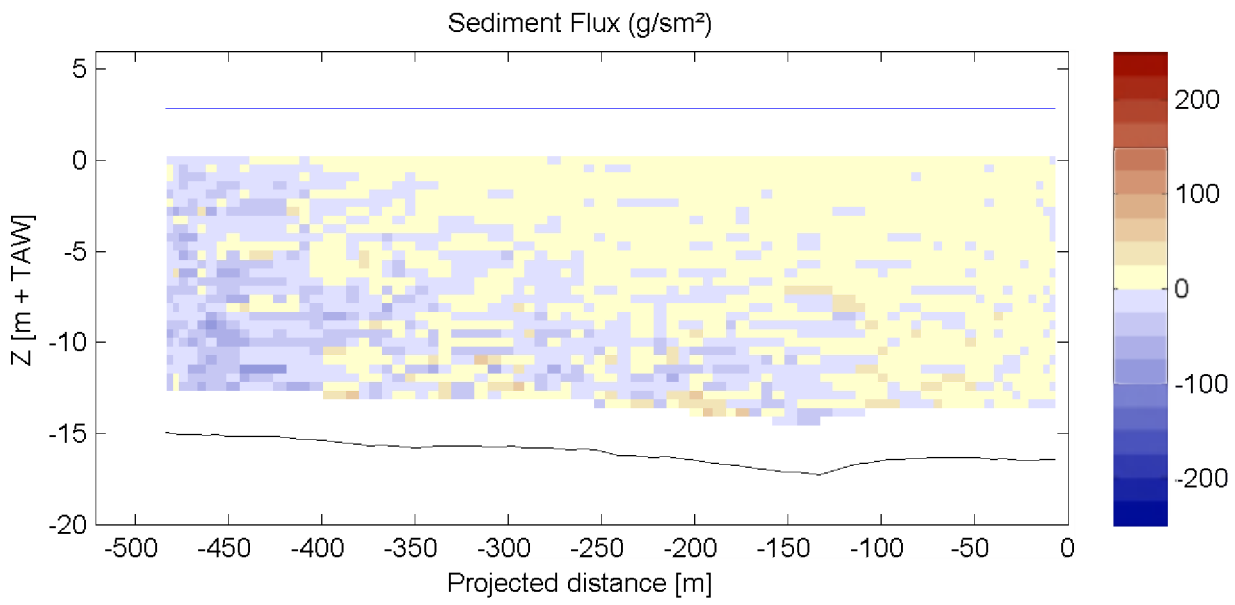
In association with :

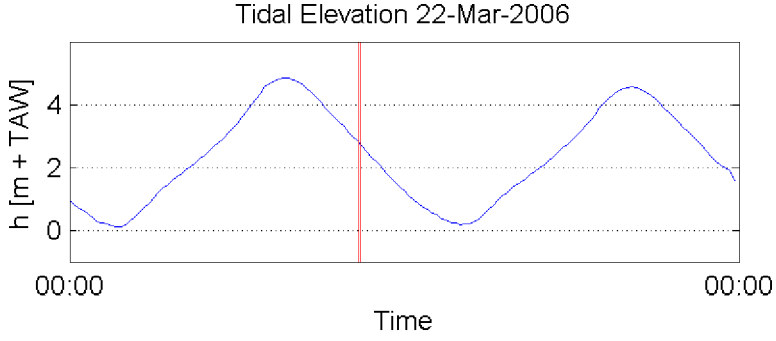
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2016DGDt000r.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

10:21:50 - 10:25:30

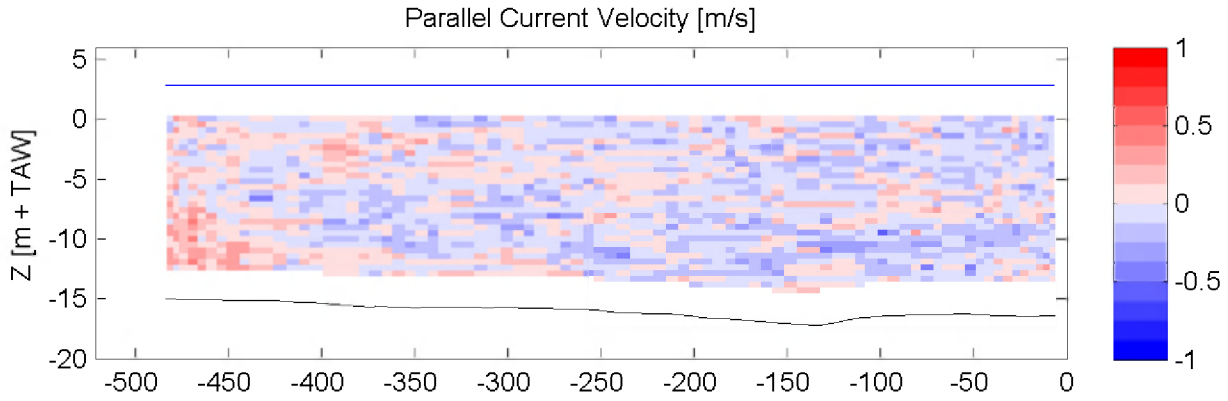
Data Processed by: IMDC

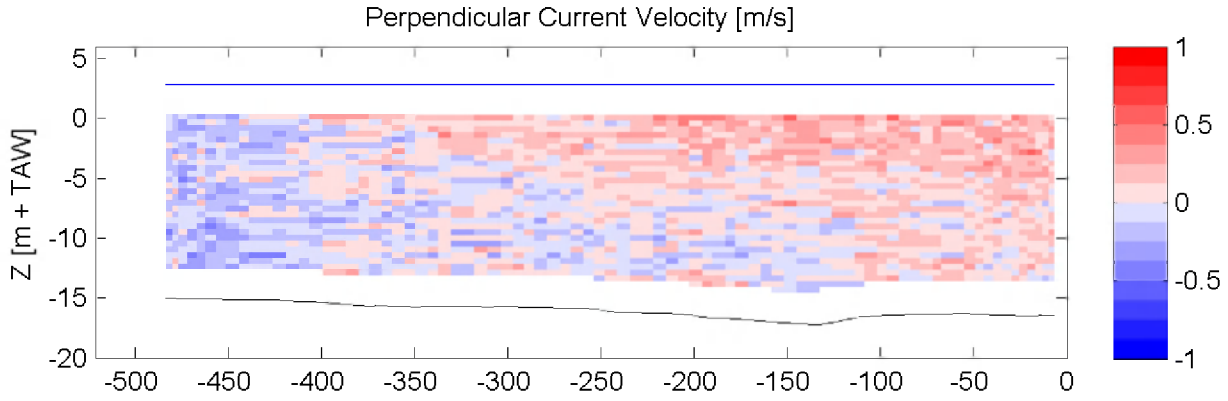
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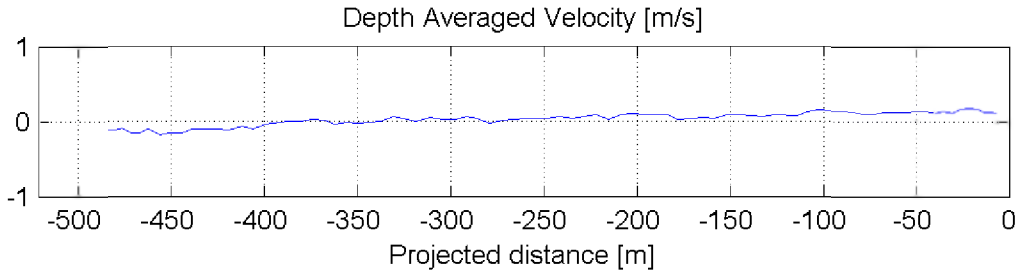
I/RA/11283/06.110/BDC

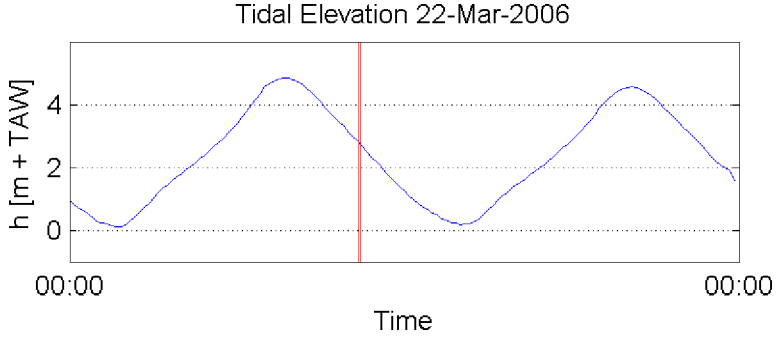
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2016DGDt000r.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

10:21:50 - 10:25:30

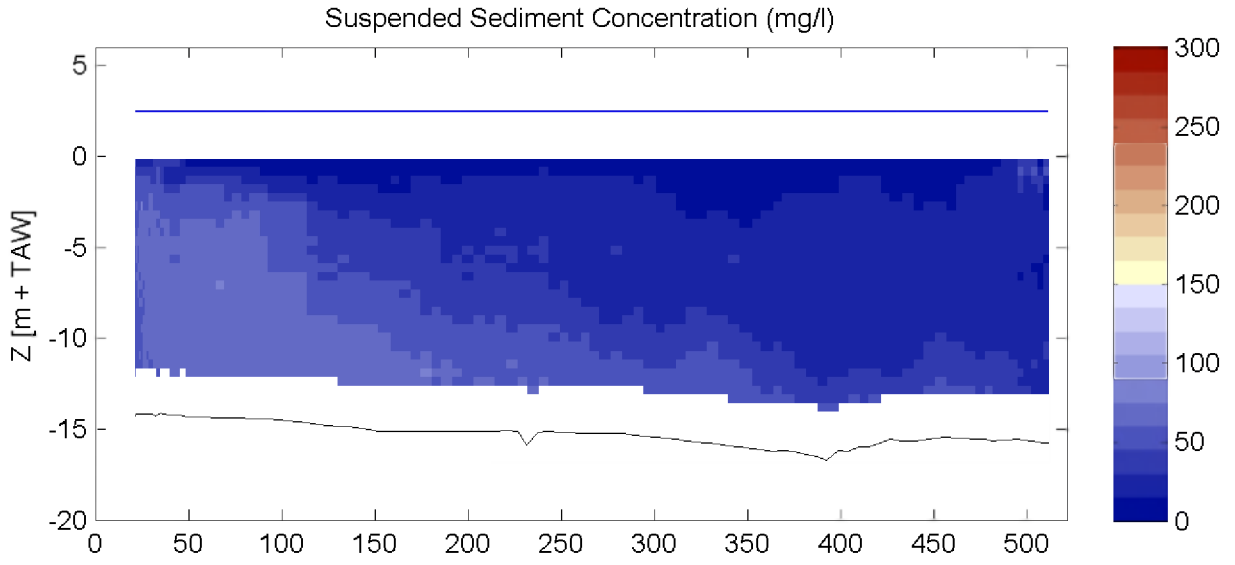
Data Processed by: IMDC

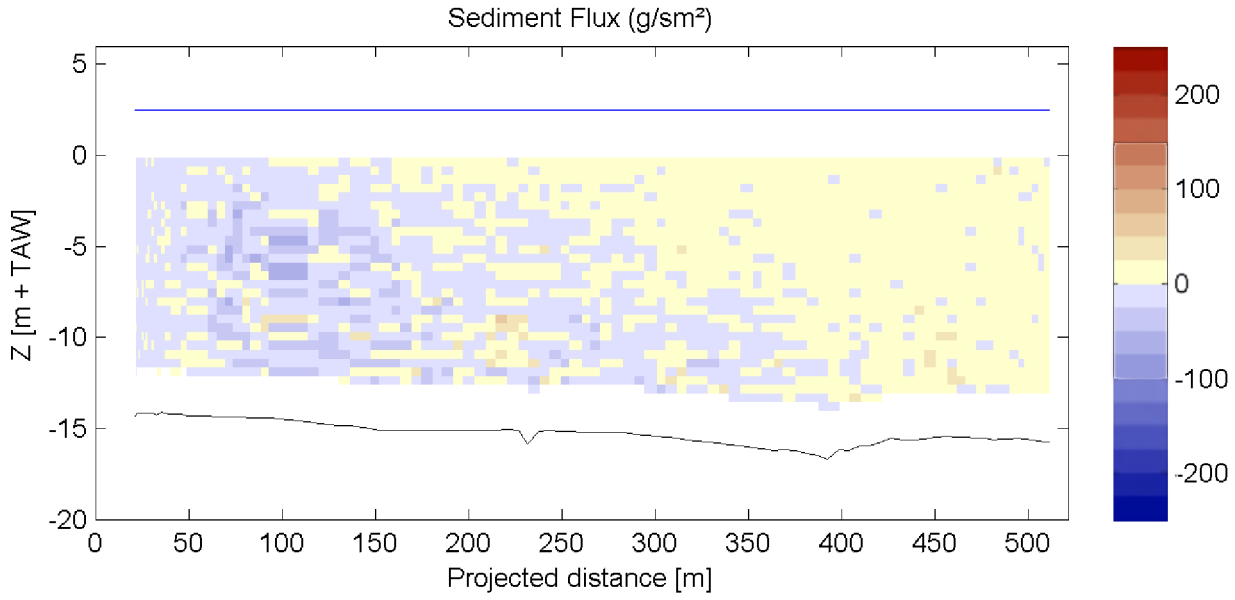
In association with : GEMS

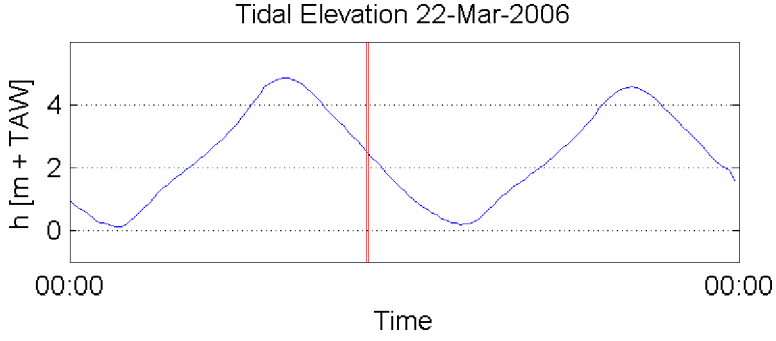
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2018DGDt000rsub.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

10:37:20 - 10:41:59

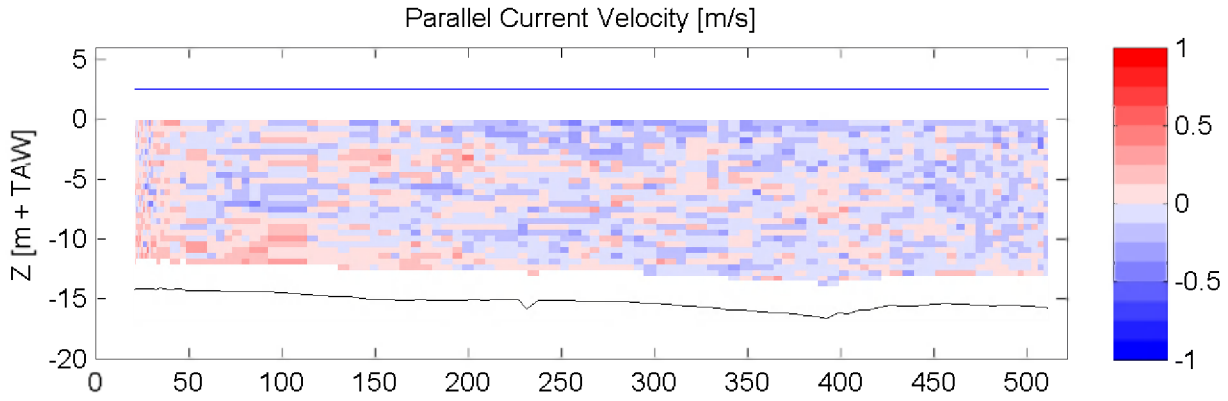
Data Processed by: IMDC

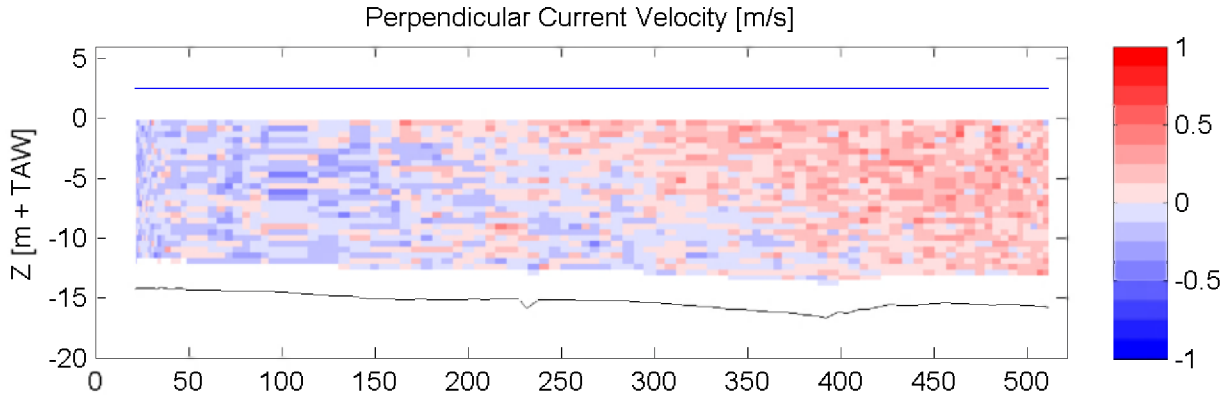
In association with : GEMS

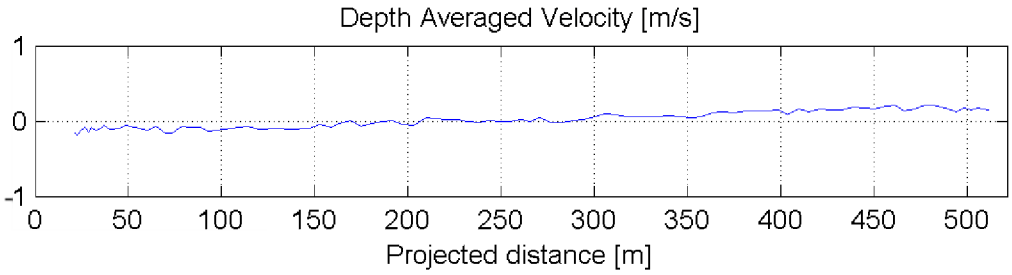
I/RA/11283/06.110/BDC

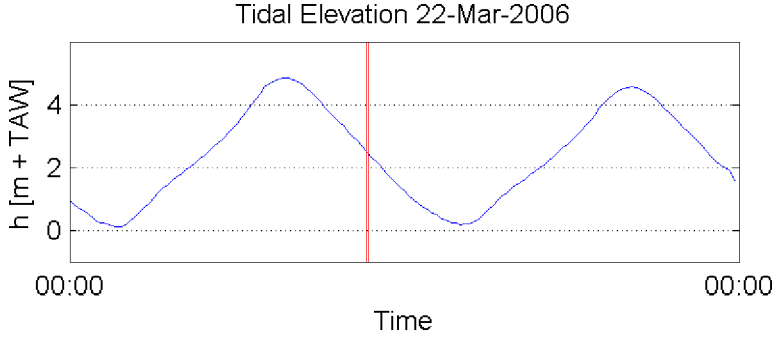
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2018DGDt000rsub.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

10:37:20 - 10:41:59

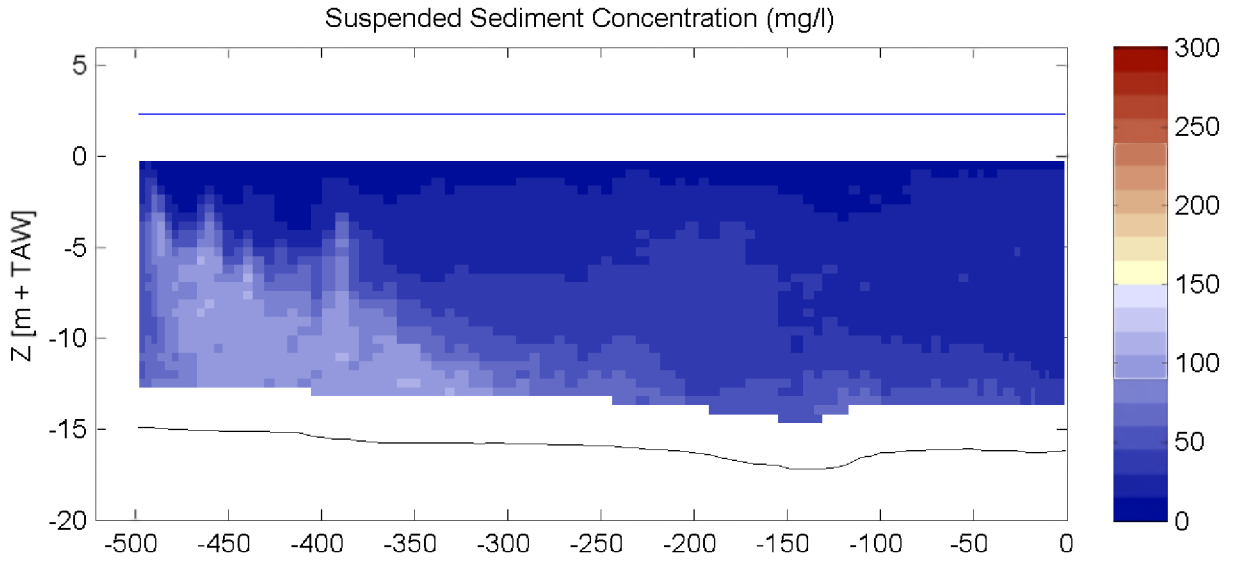
Data Processed by: IMDC

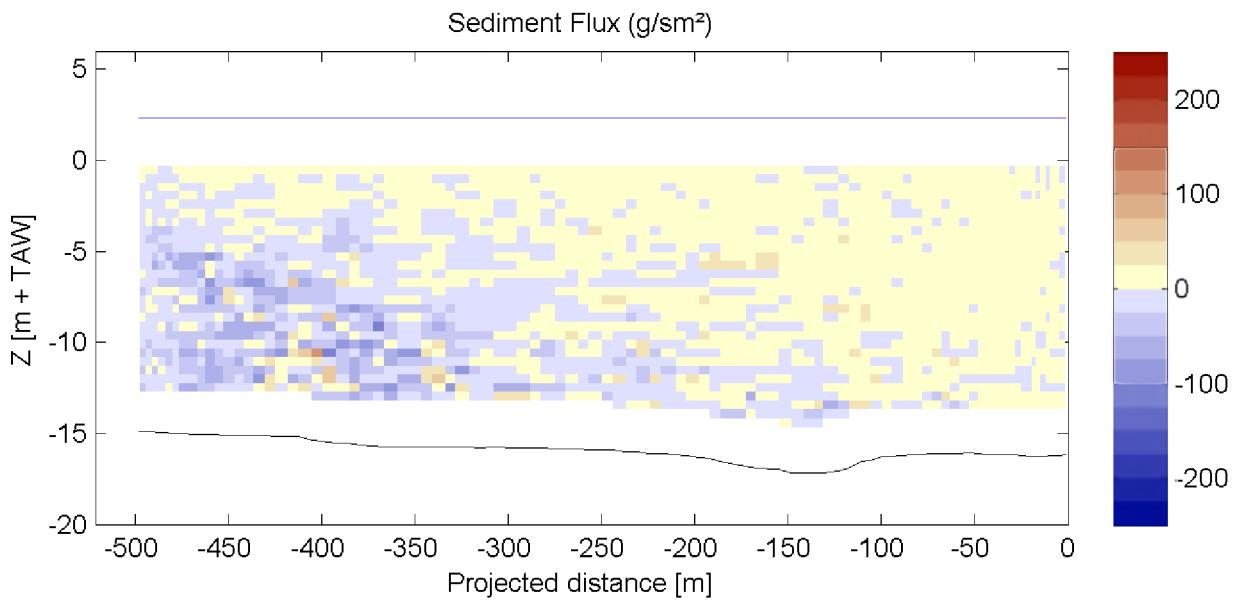
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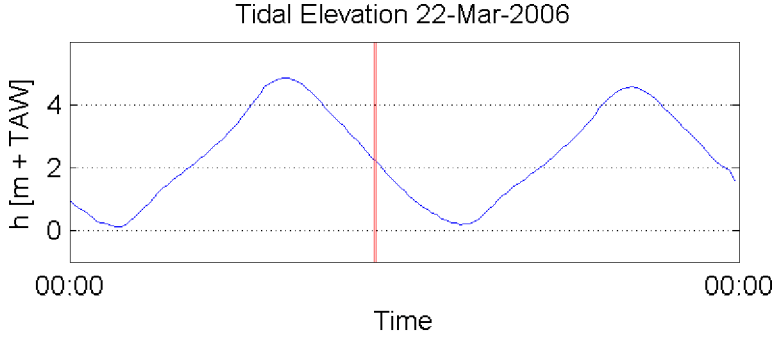
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2020DGDt000r.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

10:54:35 - 10:58:45

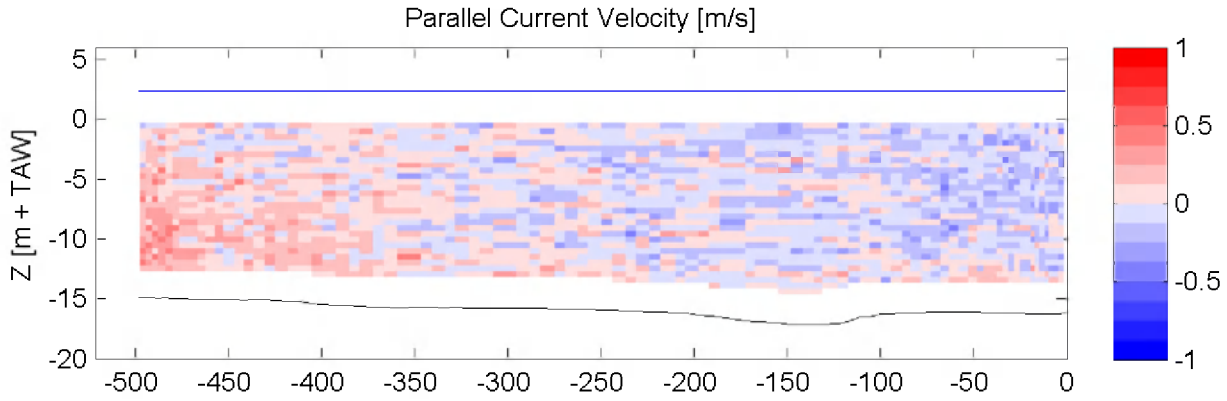
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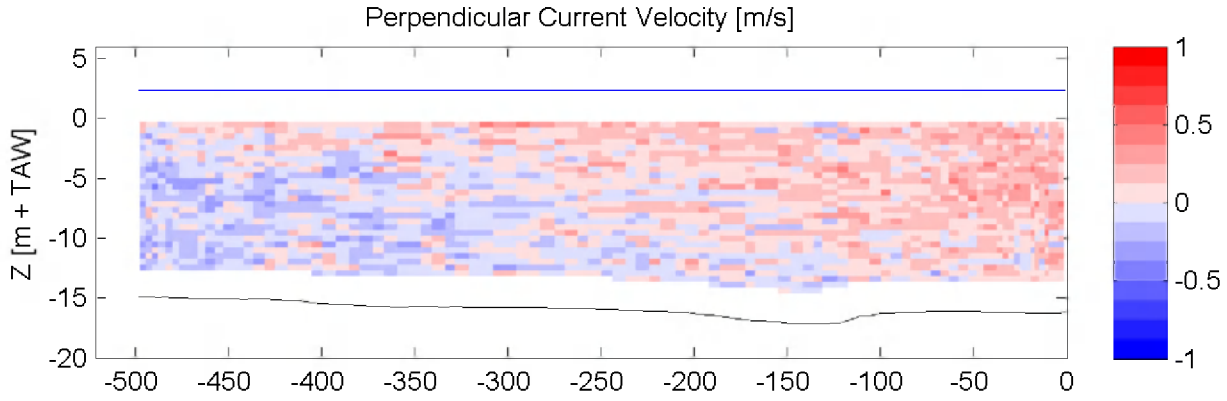
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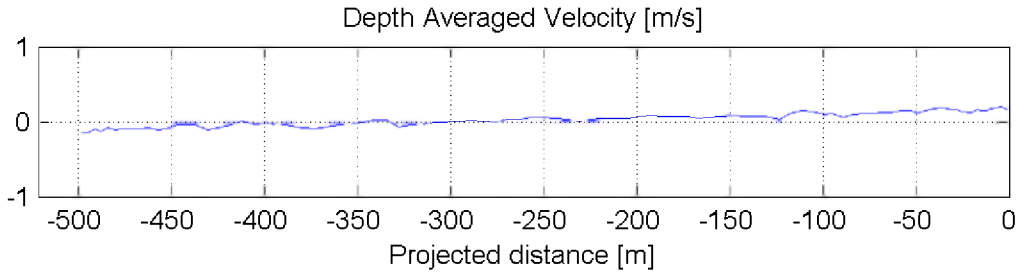
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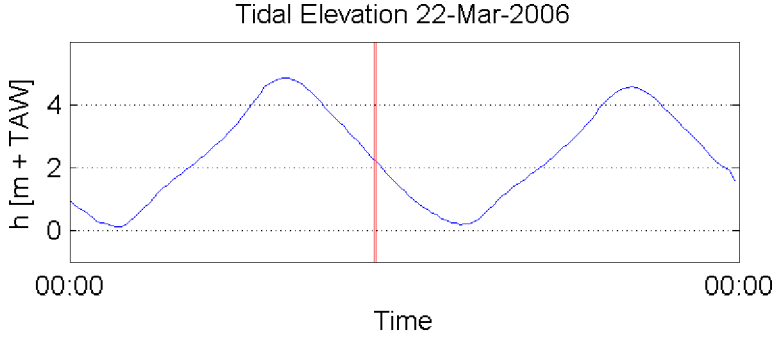
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2020DGDt000r.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

10:54:35 - 10:58:45

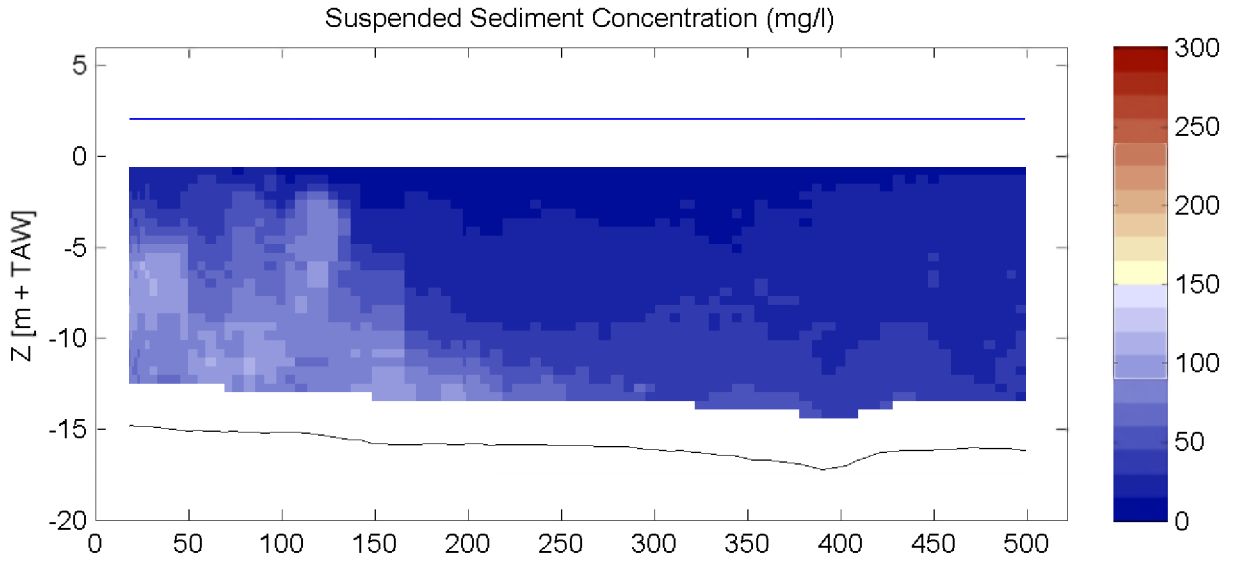
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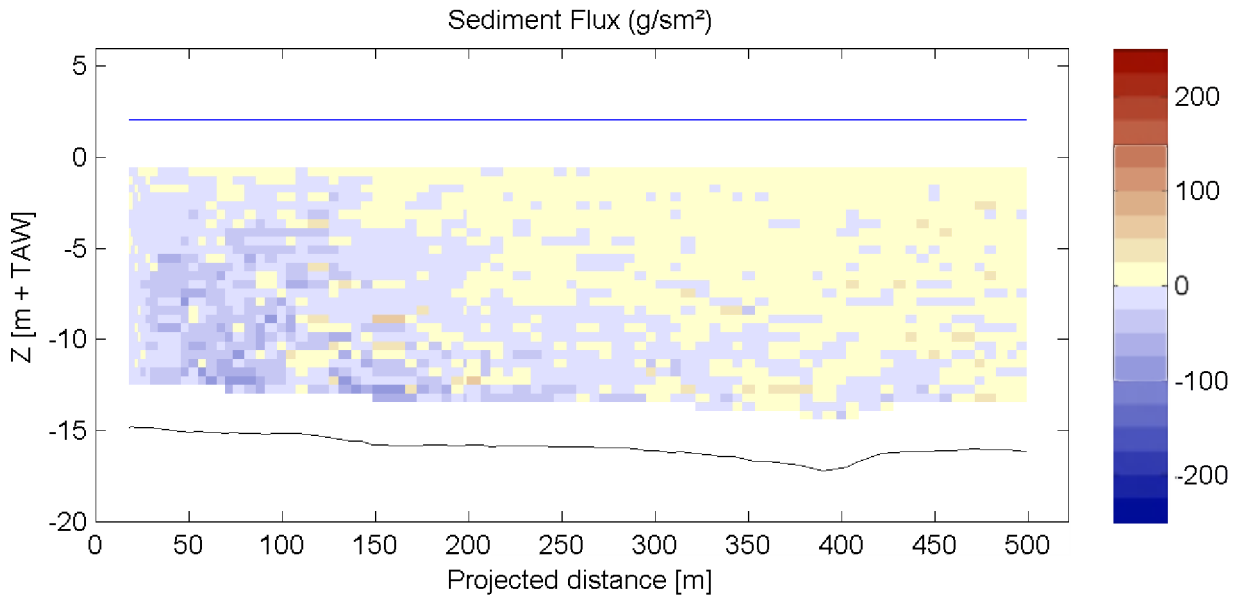
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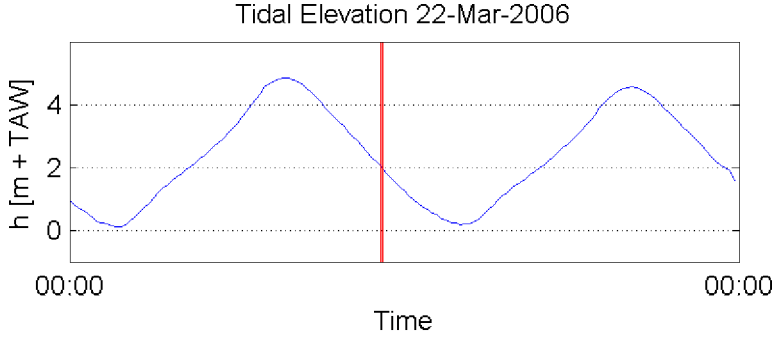
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2022DGDt000r.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

11:09:19 - 11:13:12

Data Processed by: IMDC

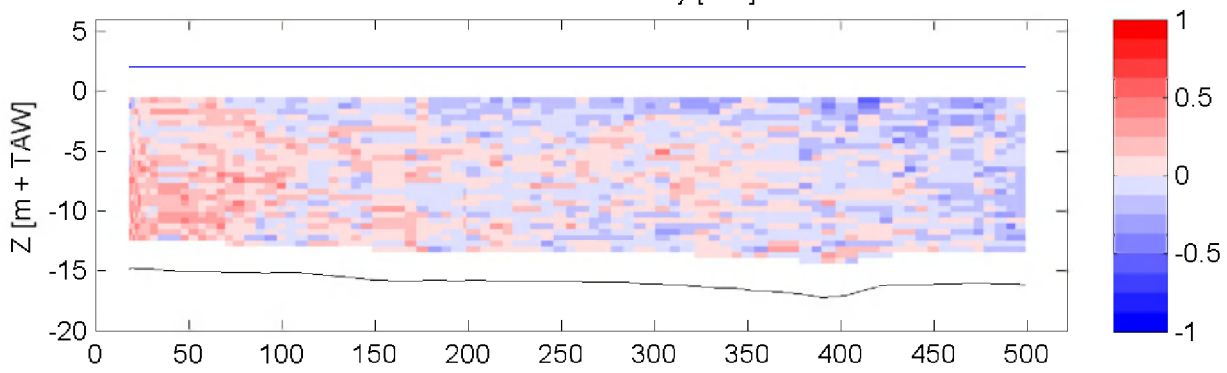
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I/RA/11283/06.110/BDC

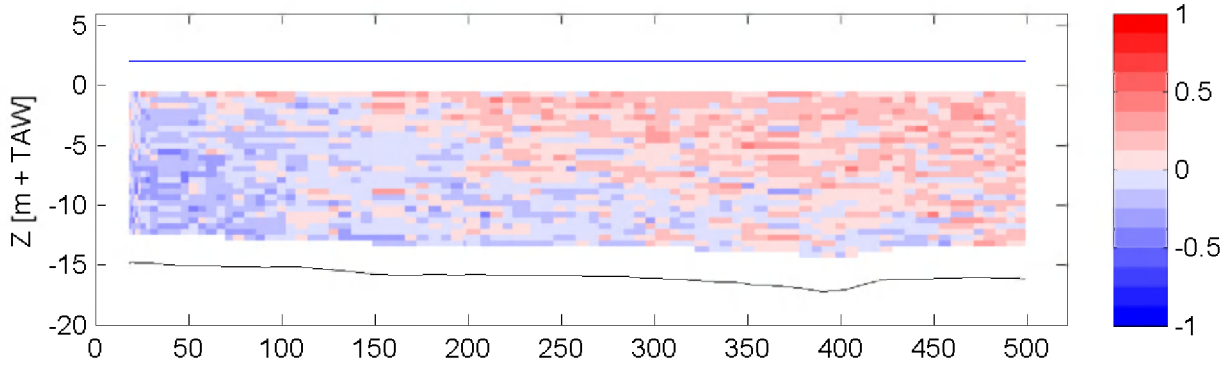
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2022DGDt000r.csv	Location: Transect DGD

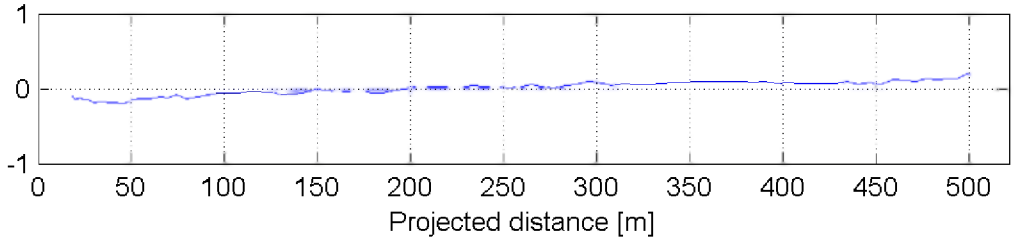
Parallel Current Velocity [m/s]



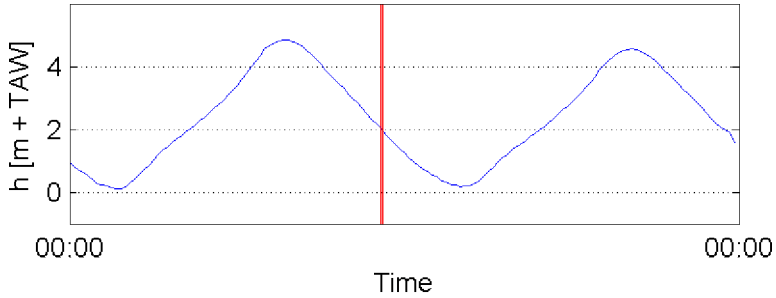
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

11:09:19 - 11:13:12

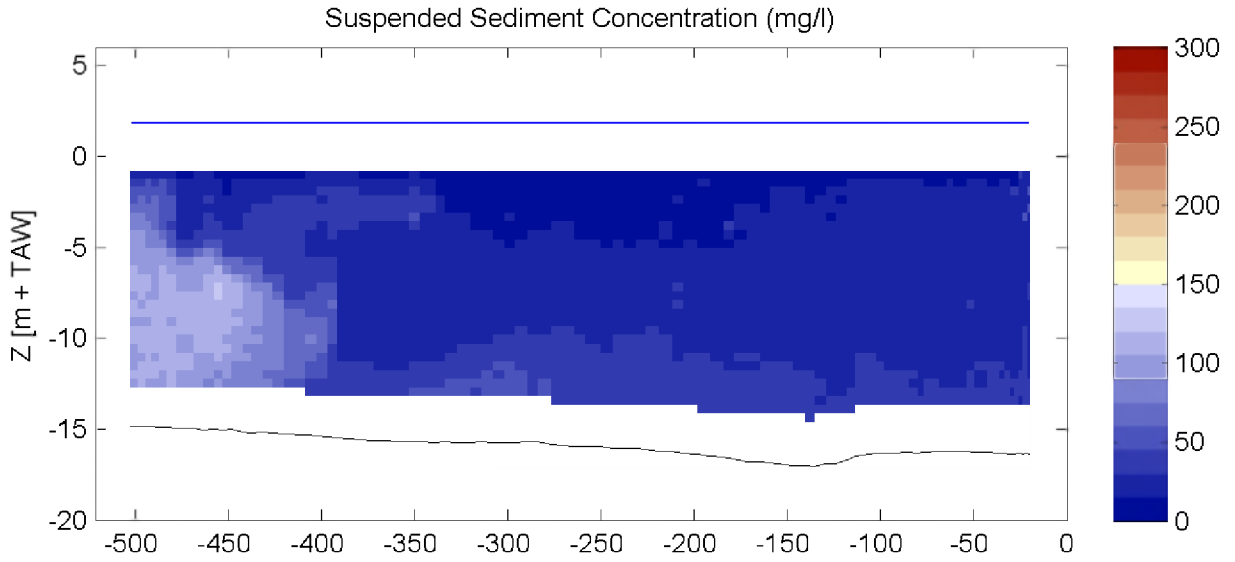
Data Processed by: IMDC

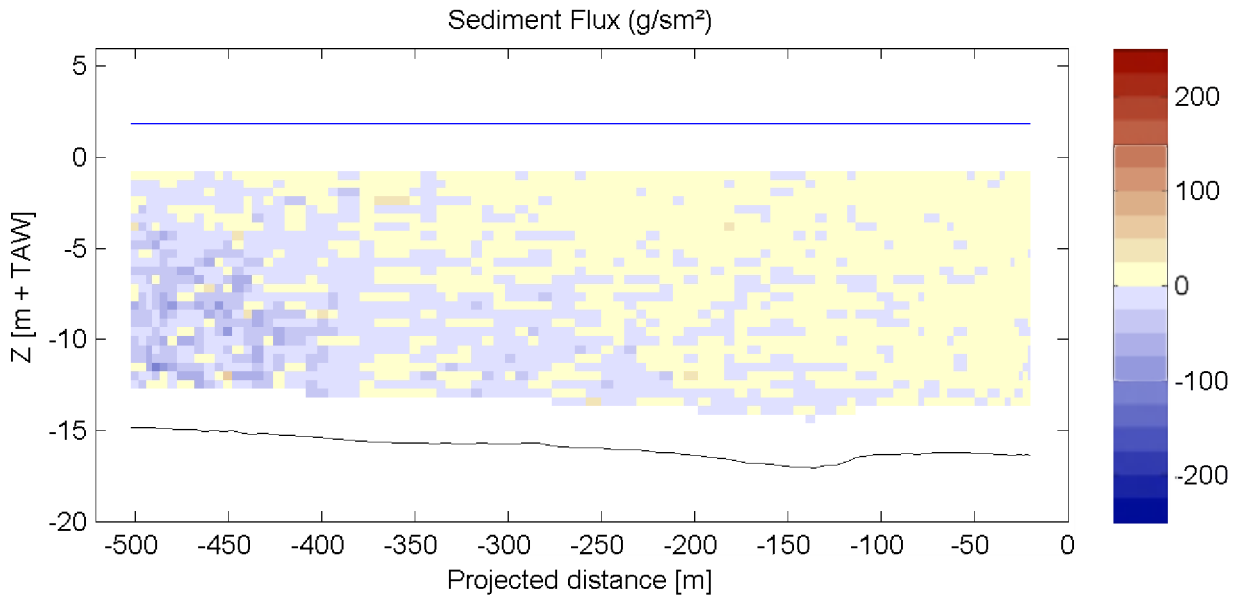
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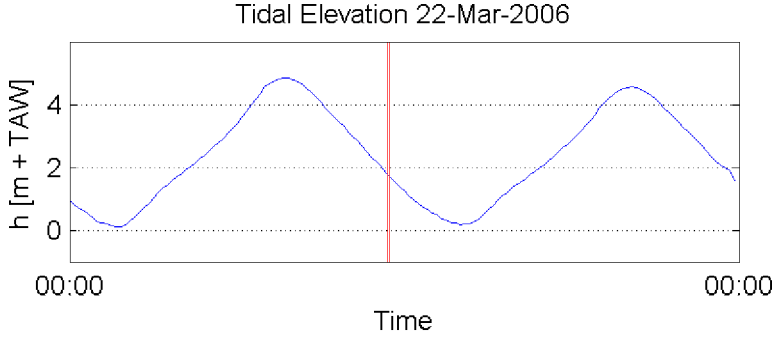
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2024DGDt000r.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

11:22:48 - 11:26:54

Data Processed by: IMDC

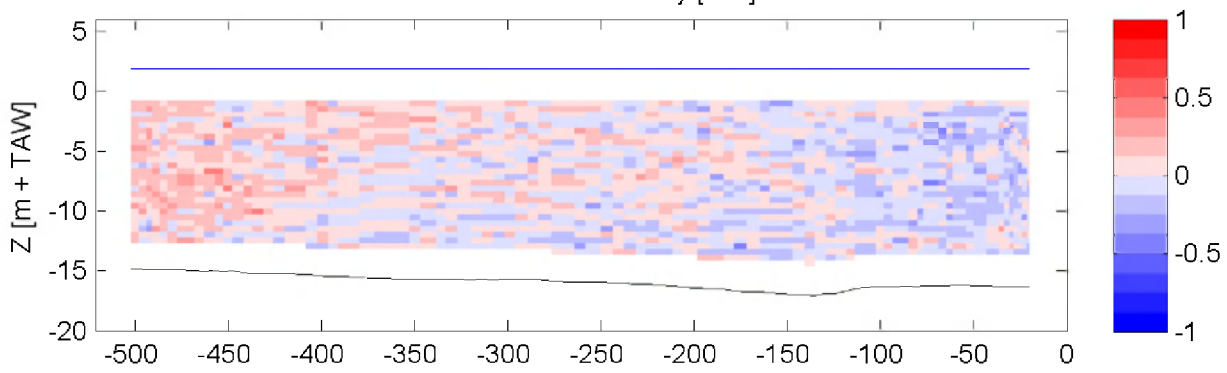
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I/RA/11283/06.110/BDC

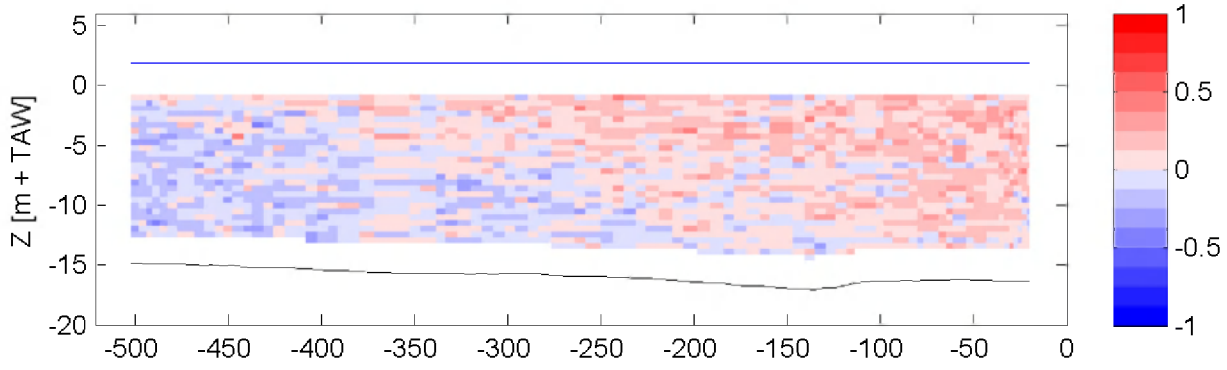
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2024DGDt000r.csv	Location: Transect DGD

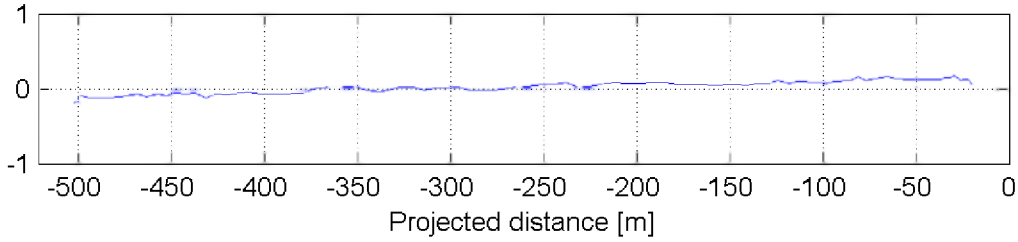
Parallel Current Velocity [m/s]



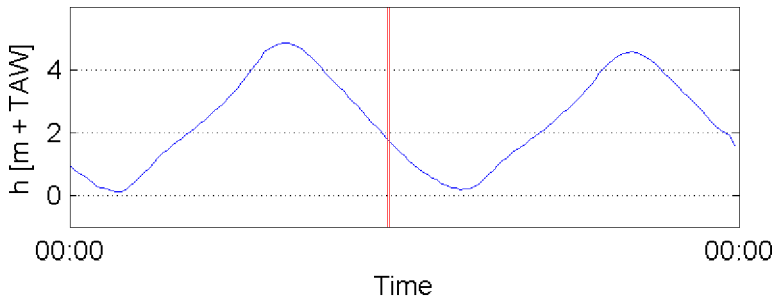
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

11:22:48 - 11:26:54

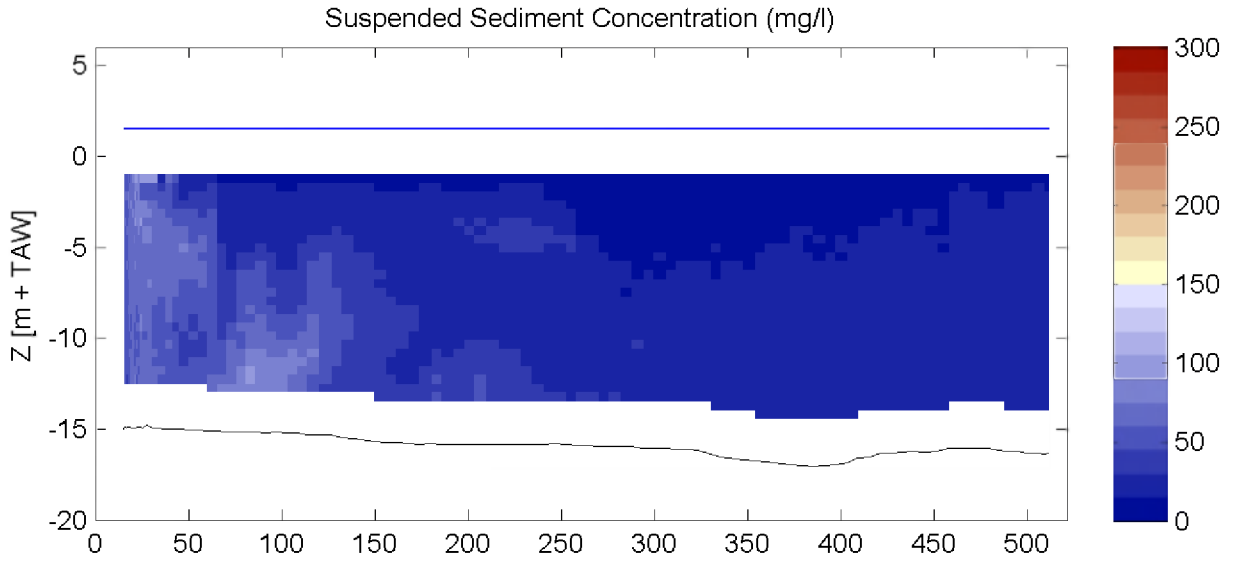
Data Processed by: IMDC

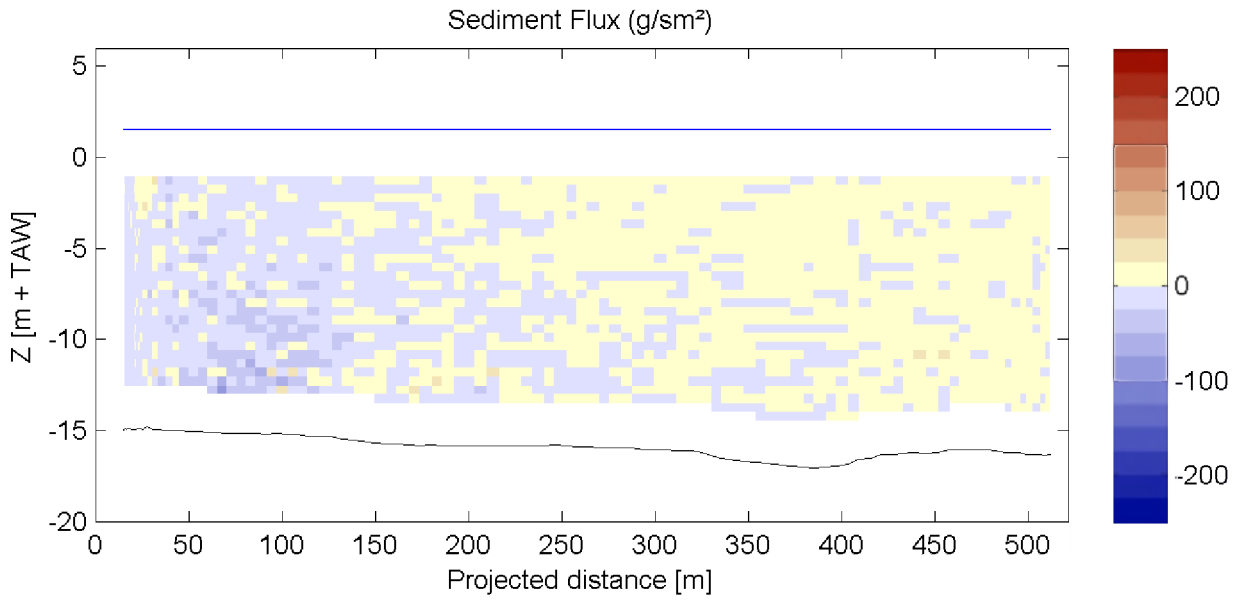
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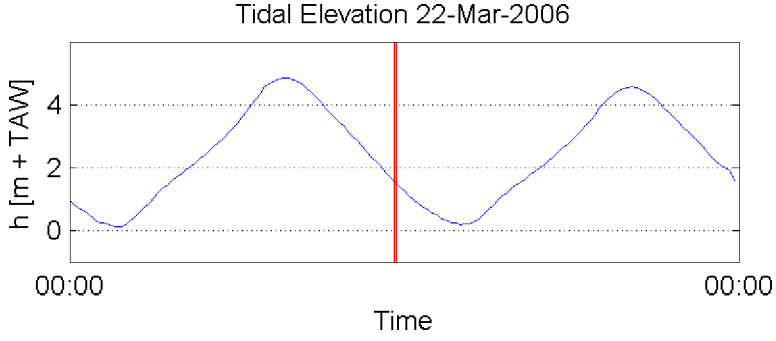
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2026DGDt000r.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

11:37:26 - 11:42:07

Data Processed by: IMDC

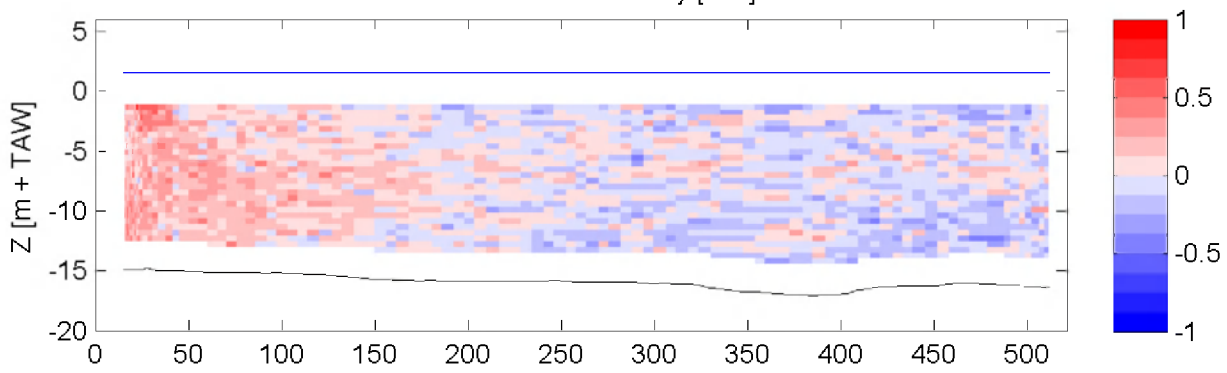
In association with :

I/RA/11283/06.110/BDC

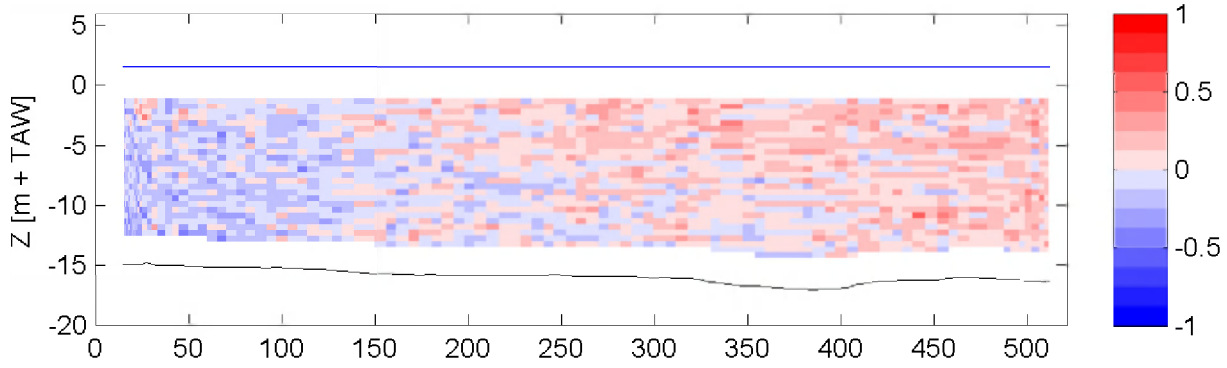
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2026DGDt000r.csv	Location: Transect DGD

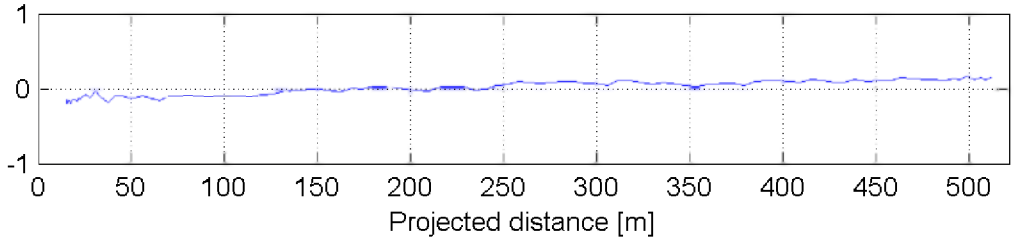
Parallel Current Velocity [m/s]



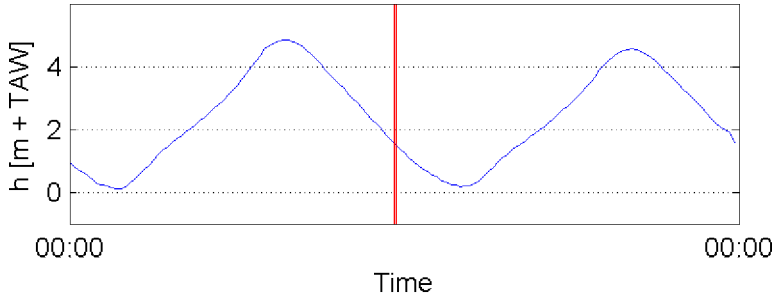
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

11:37:26 - 11:42:07

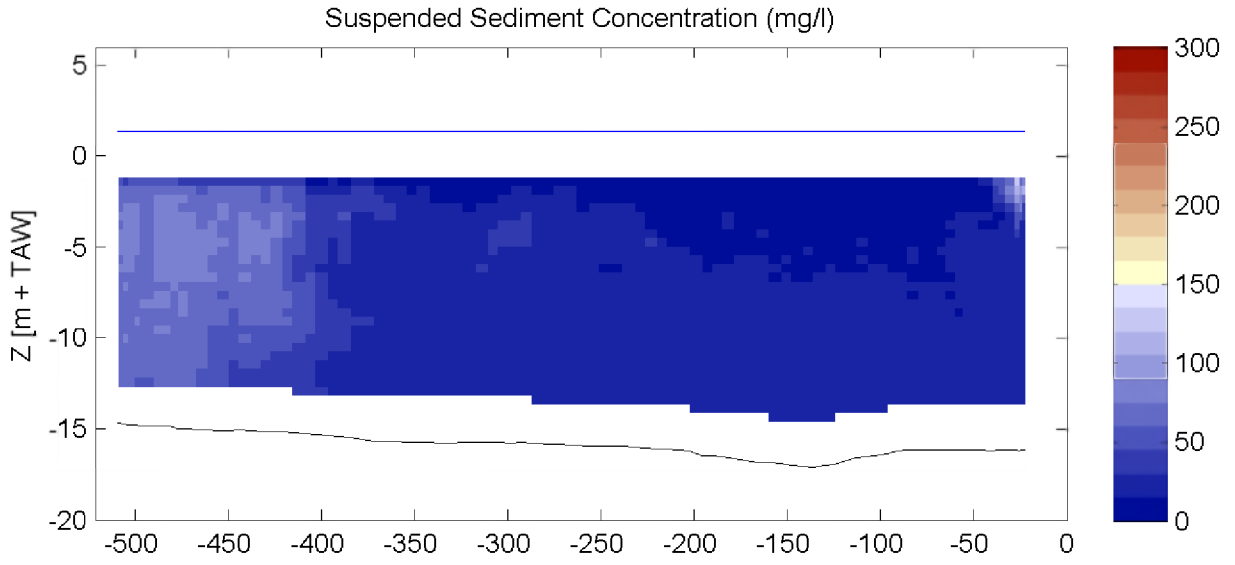
Data Processed by: IMDC

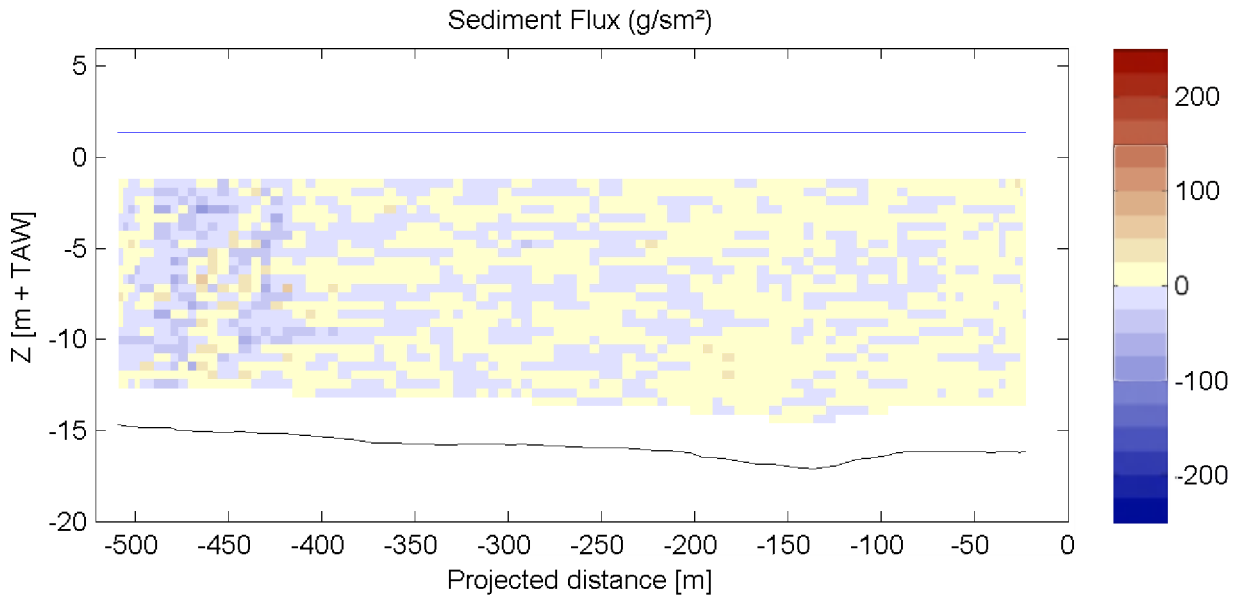
In association with :

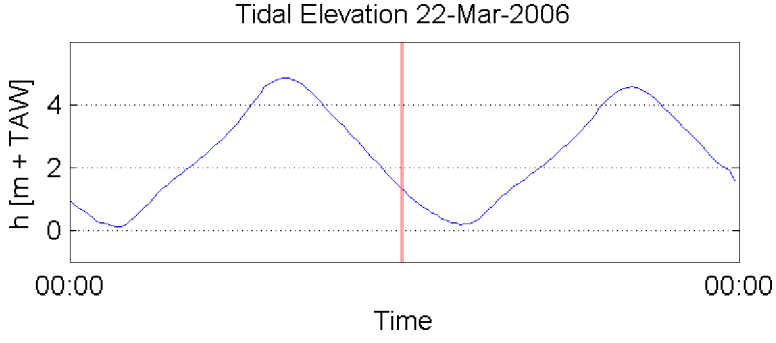
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2028DGDt000r.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

11:52:35 - 11:56:39

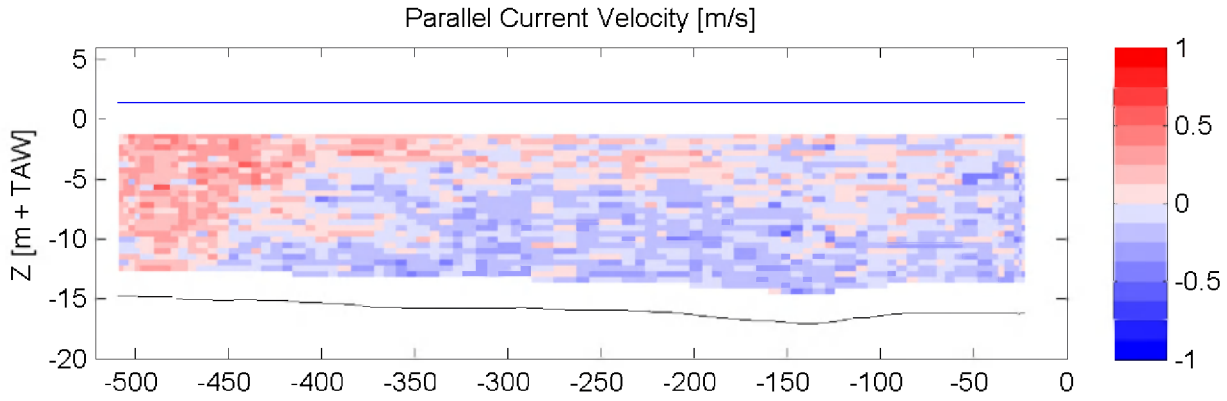
Data Processed by: IMDC

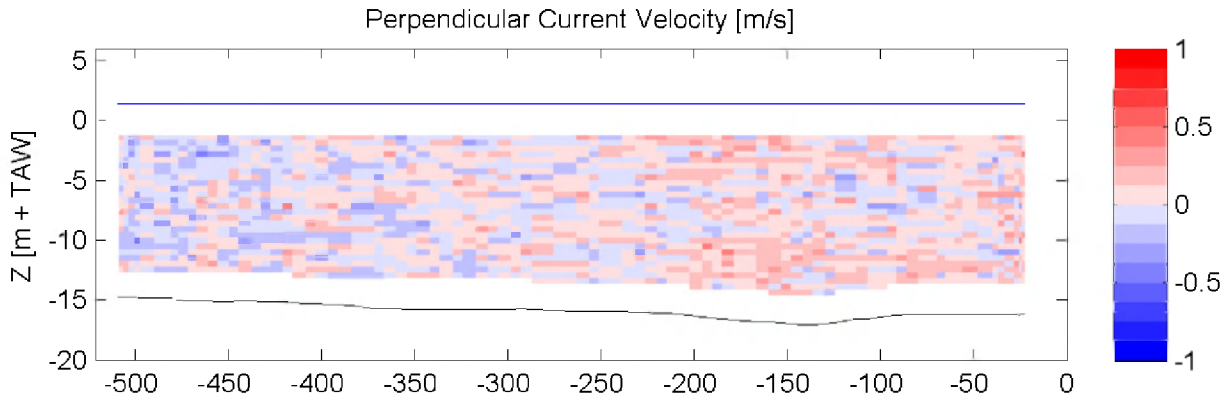
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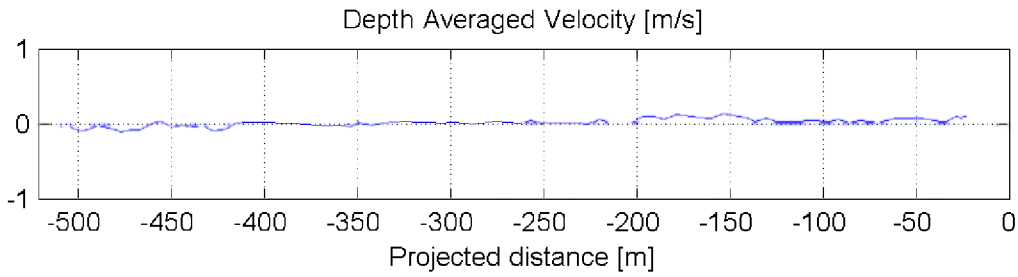
I/RA/11283/06.110/BDC

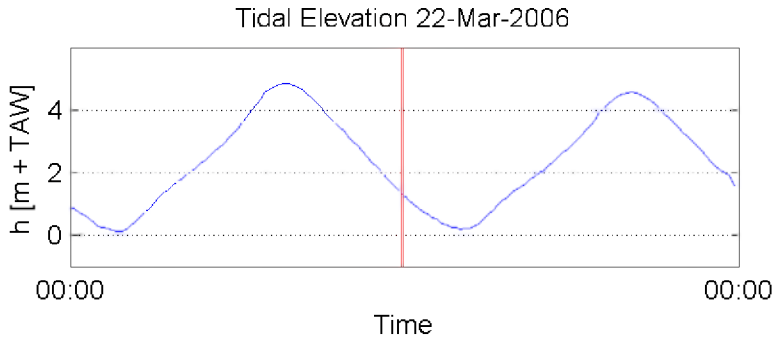
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2028DGDt000r.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

11:52:35 - 11:56:39

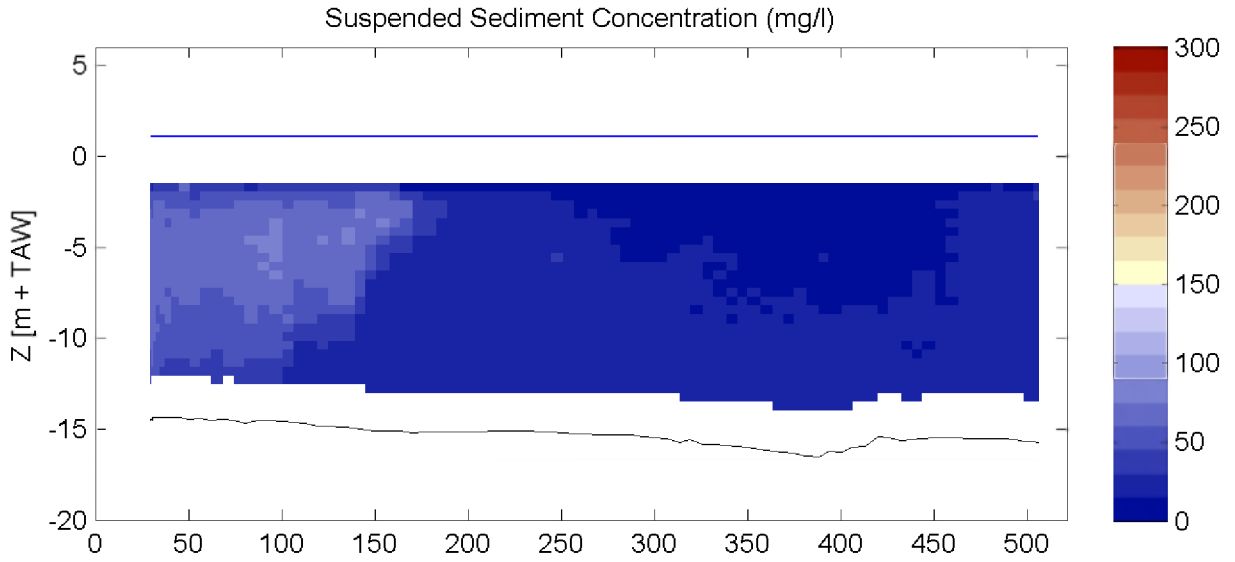
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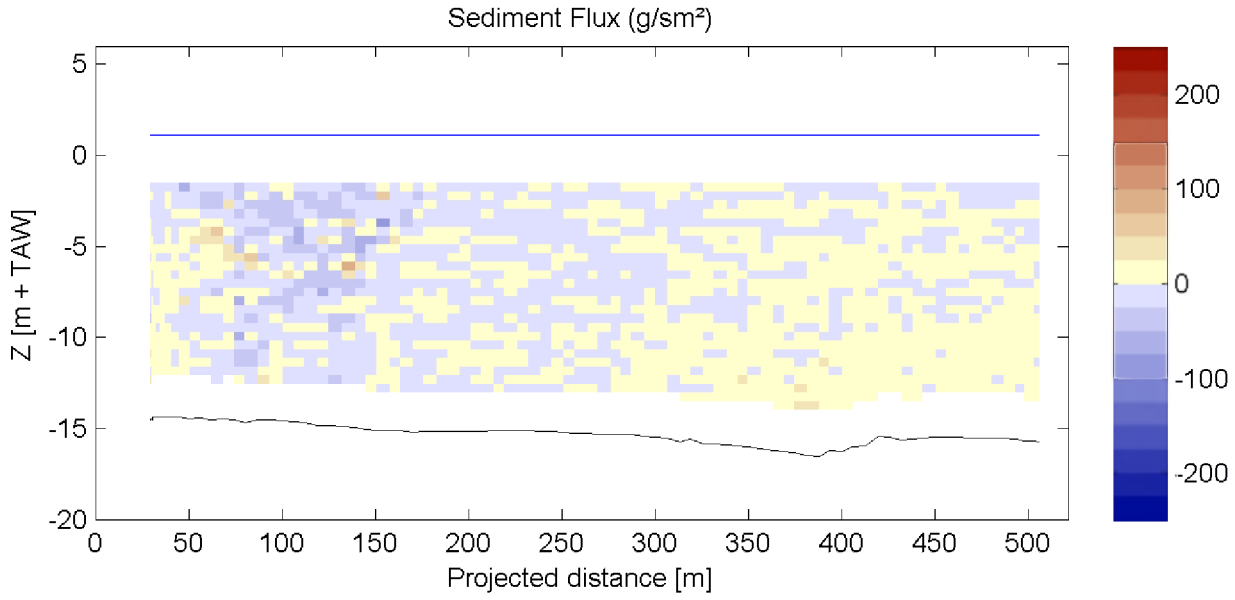
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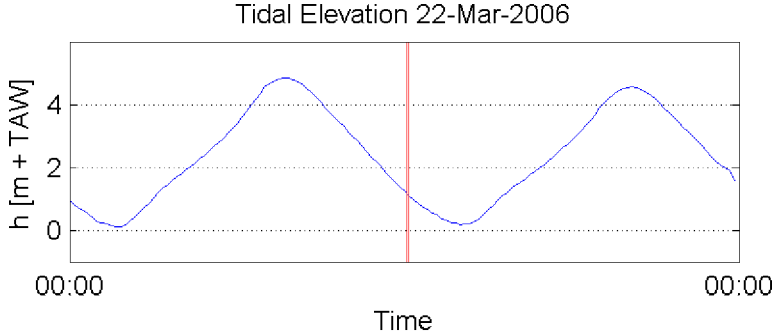
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2030DGDt000rbis.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

12:05:42 - 12:09:27

Data Processed by: IMDC

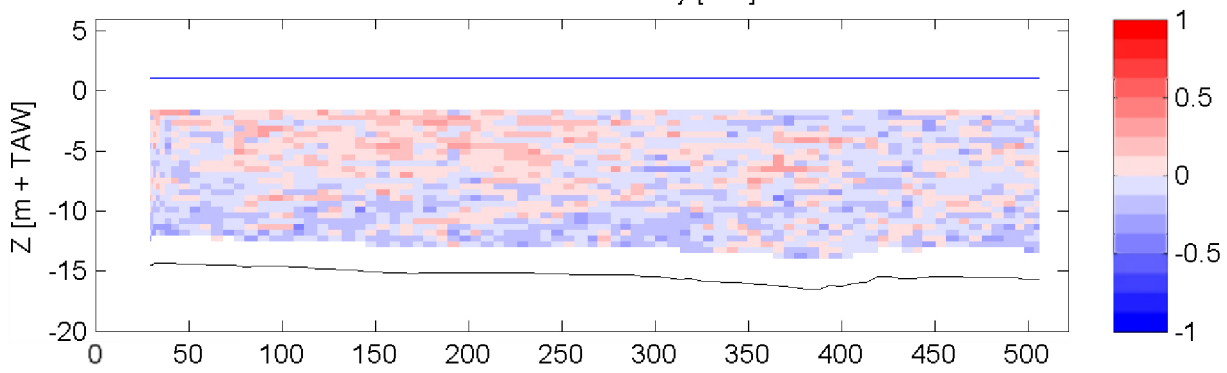
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I/RA/11283/06.110/BDC

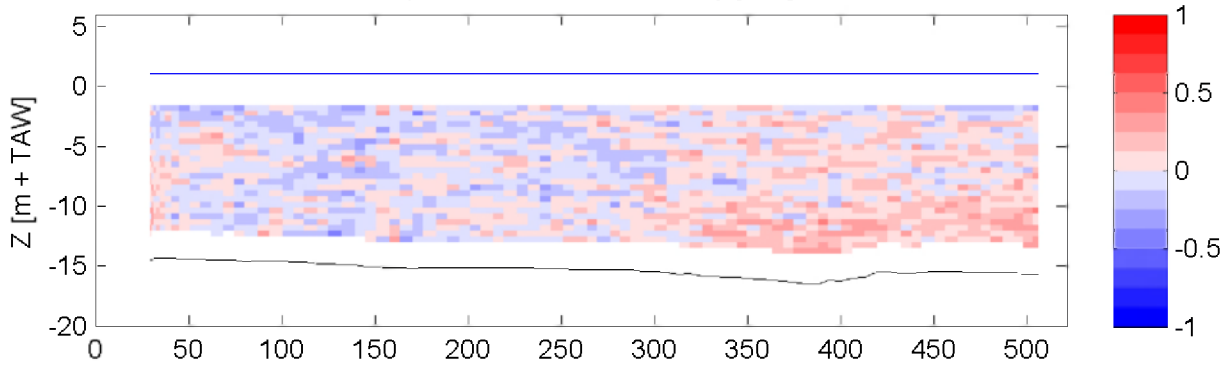
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2030DGDt000rbis.csv	Location: Transect DGD

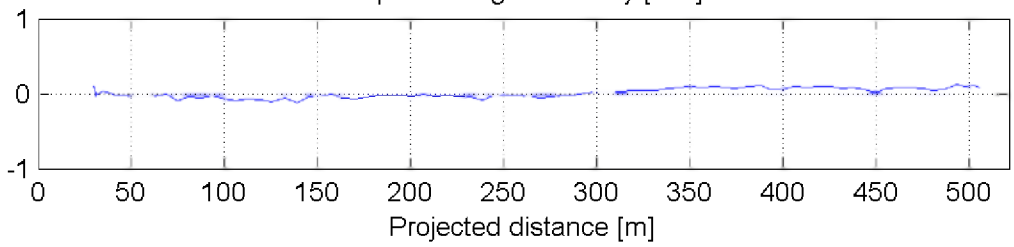
Parallel Current Velocity [m/s]



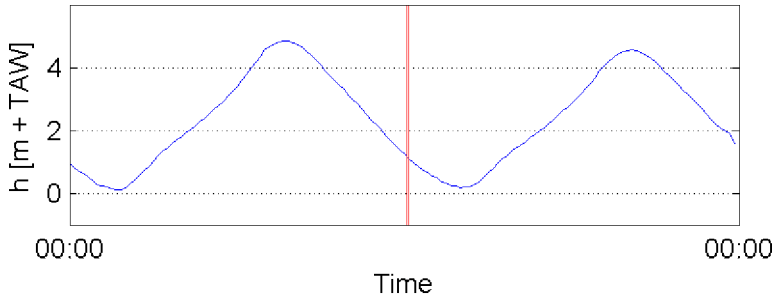
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

12:05:42 - 12:09:27

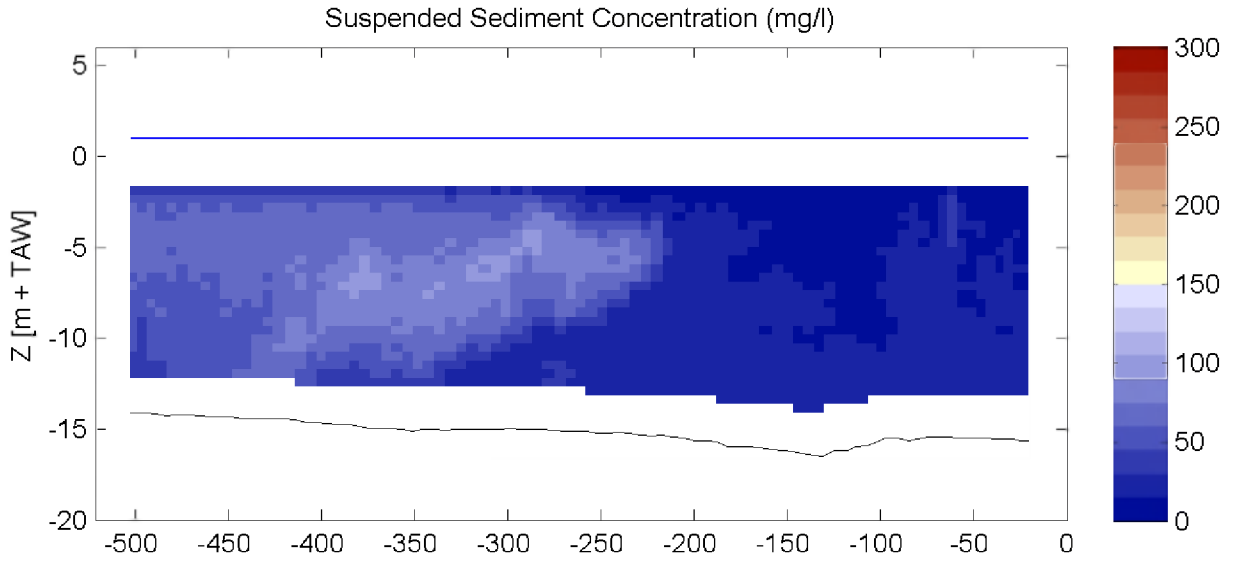
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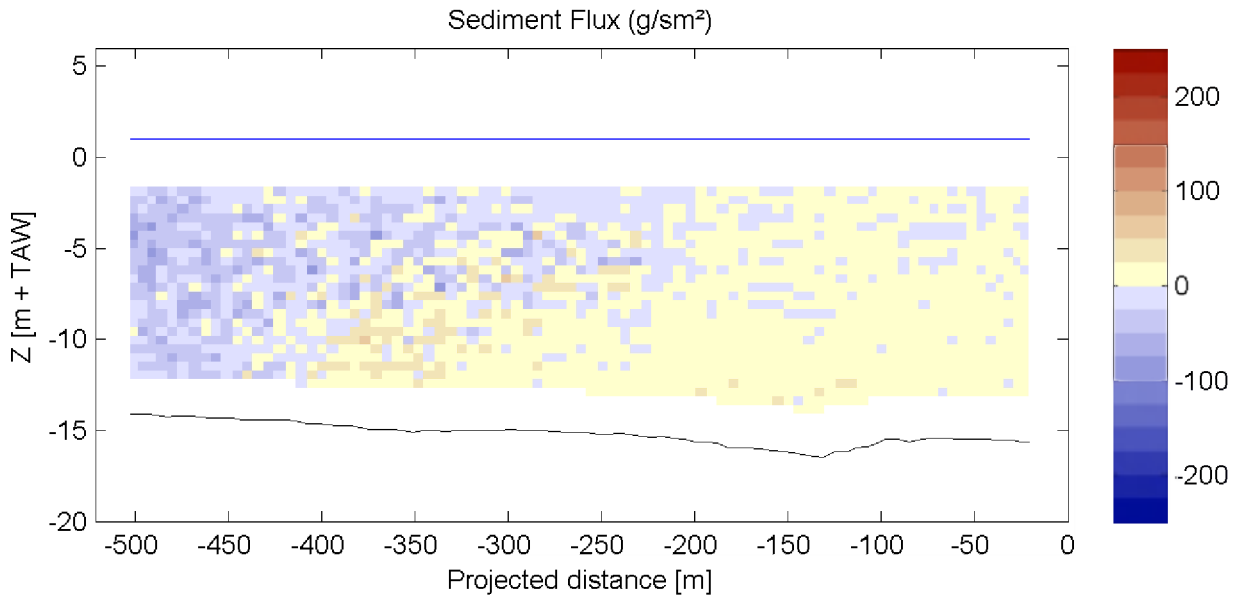
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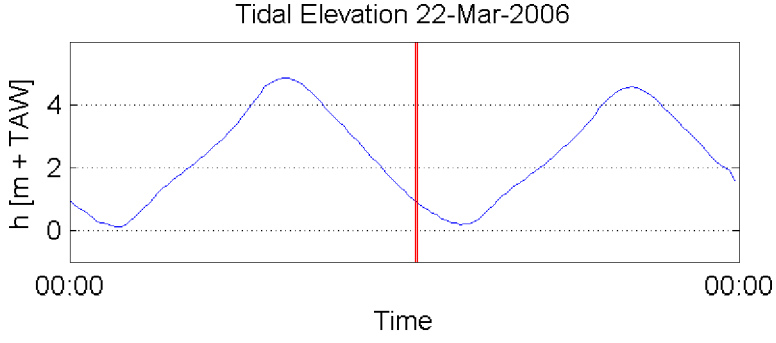
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2032DGDt000rbis.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

12:23:18 - 12:27:05

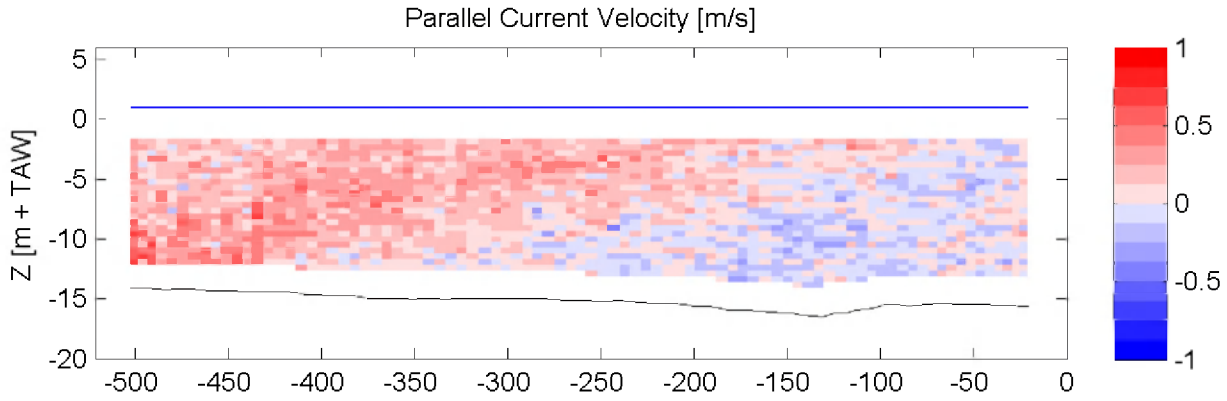
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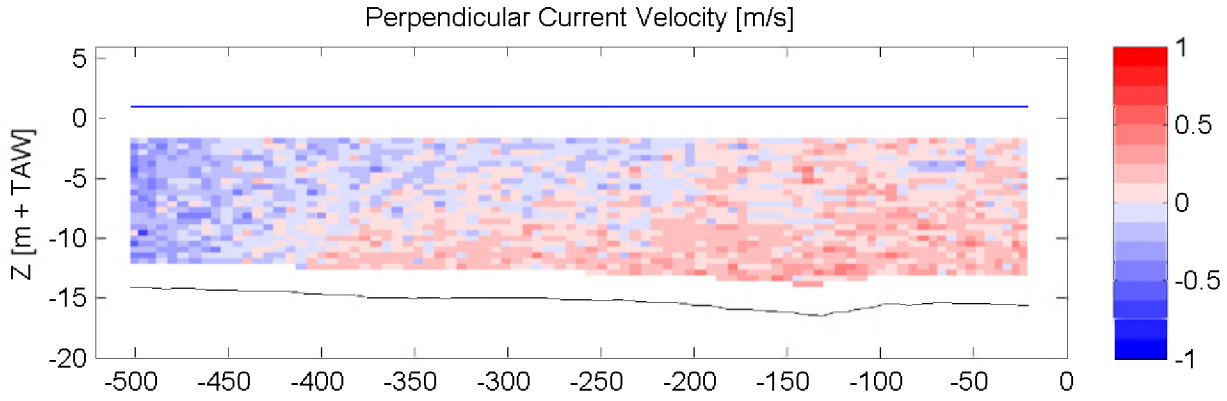
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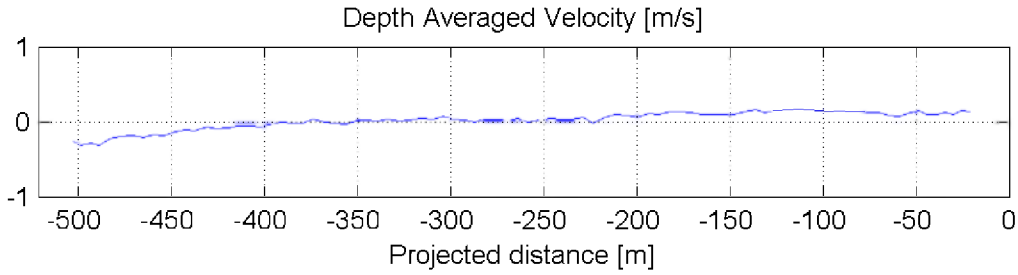
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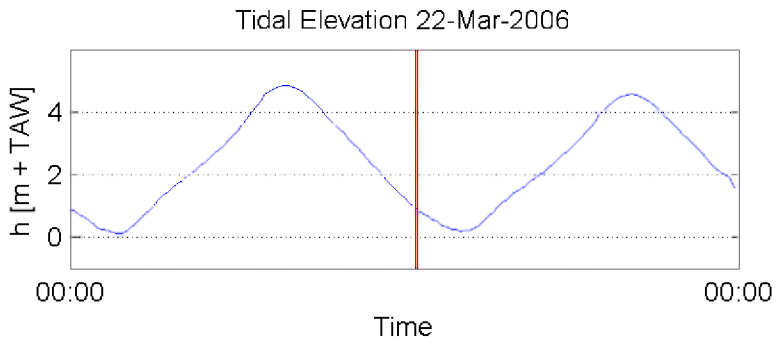
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2032DGDt000rbis.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

12:23:18 - 12:27:05

Data Processed by: IMDC

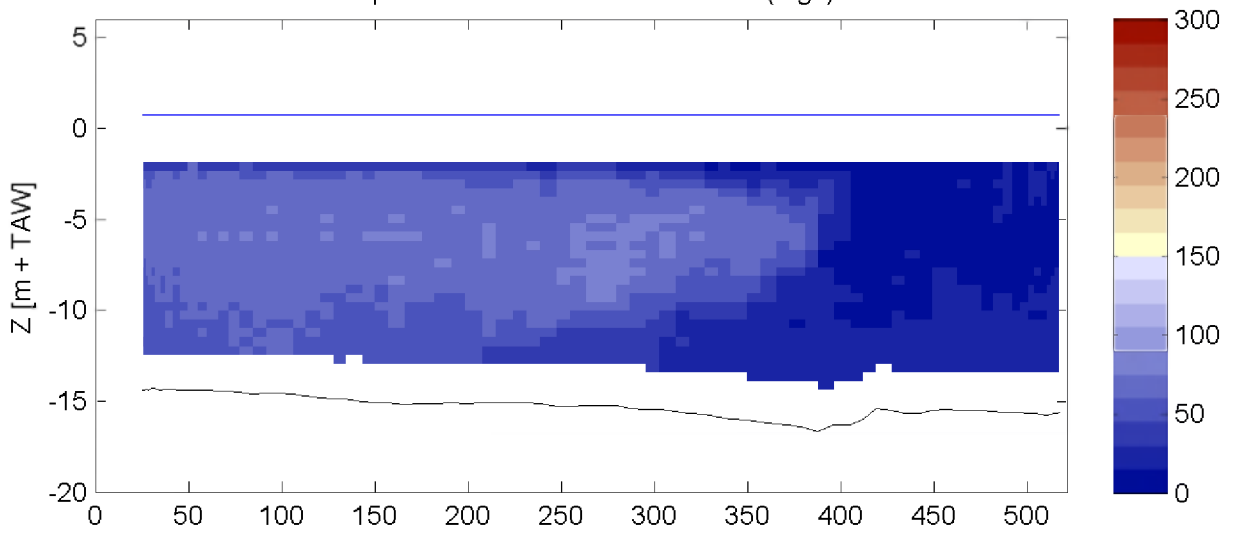
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I/RA/11283/06.110/BDC

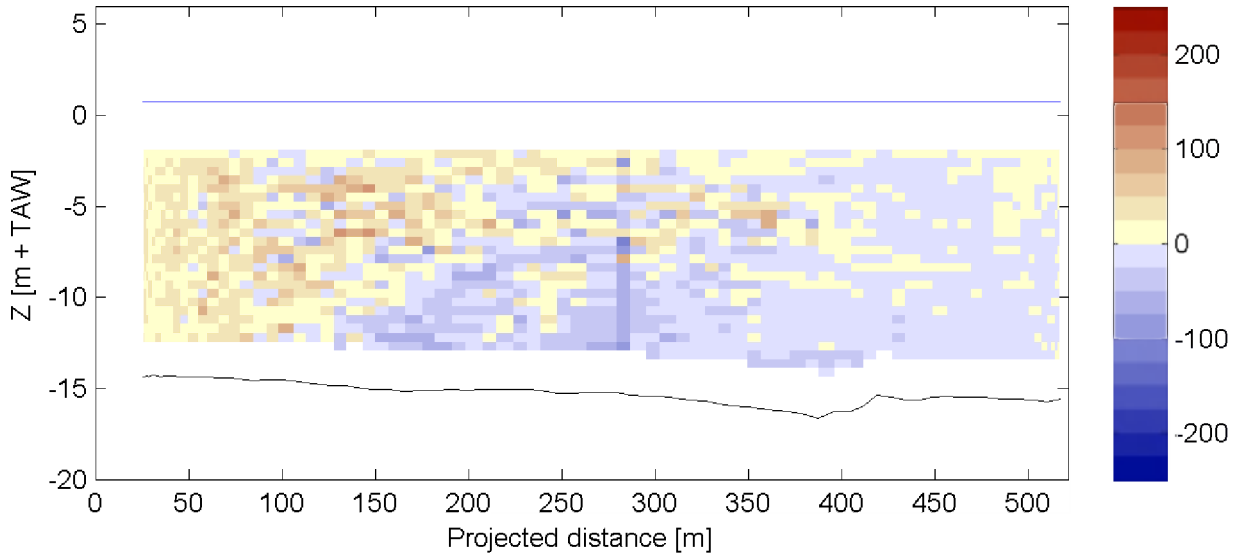
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2034DGDt000rbissub.csv	Location: Transect DGD

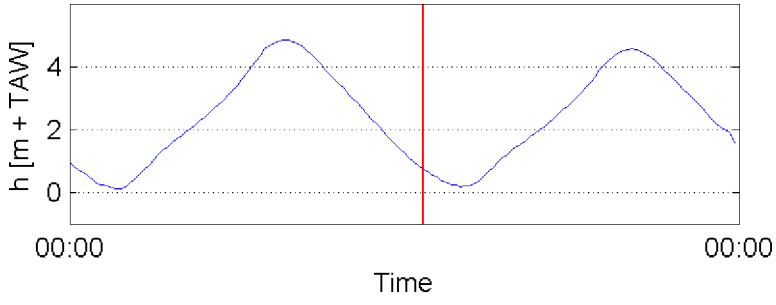
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

12:37:28 - 12:40:57

Data Processed by: IMDC

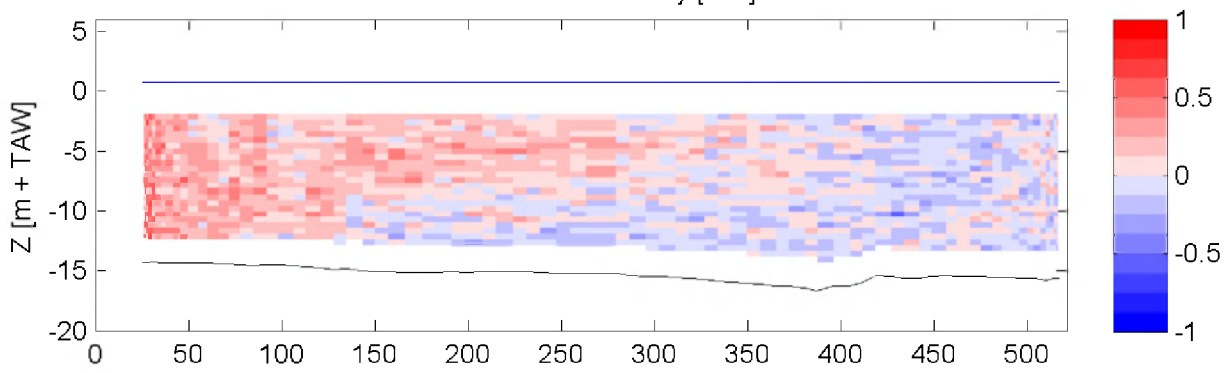
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I/RA/11283/06.110/BDC

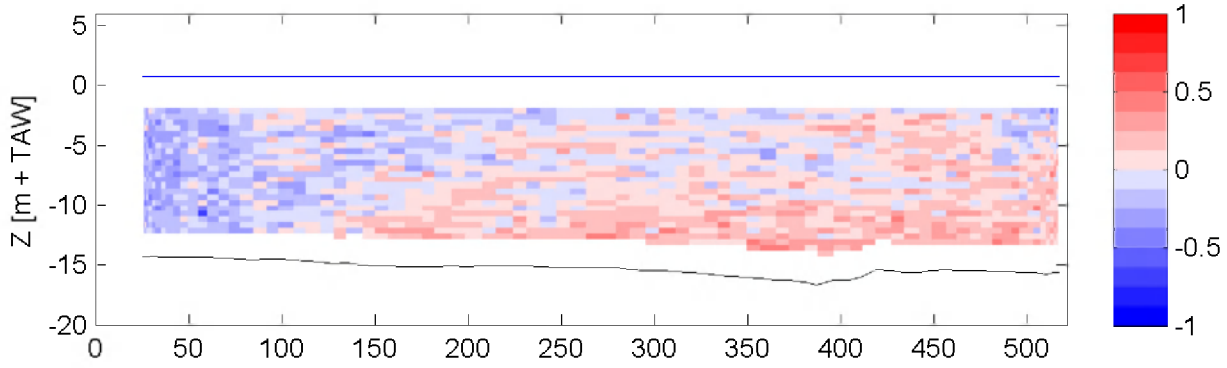
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2034DGDt000rbissub.csv	Location: Transect DGD

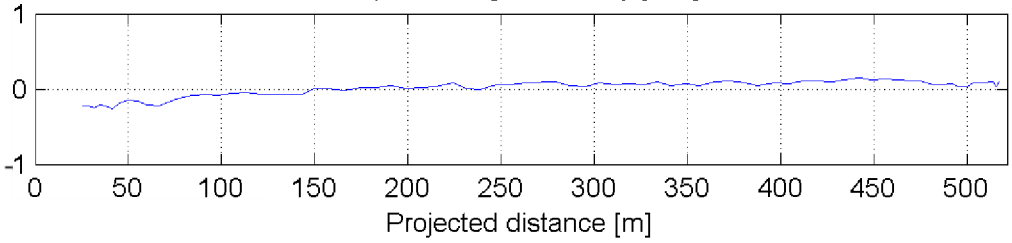
Parallel Current Velocity [m/s]



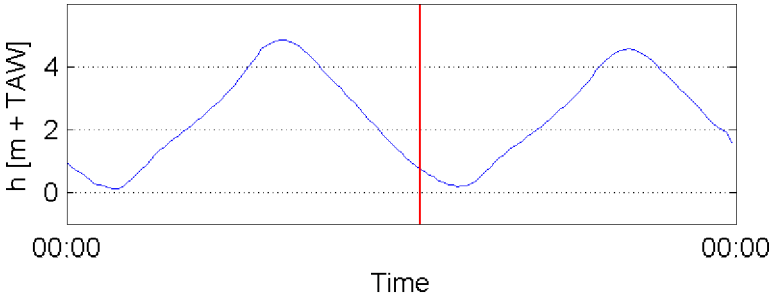
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

12:37:28 - 12:40:57

Data Processed by: IMDC

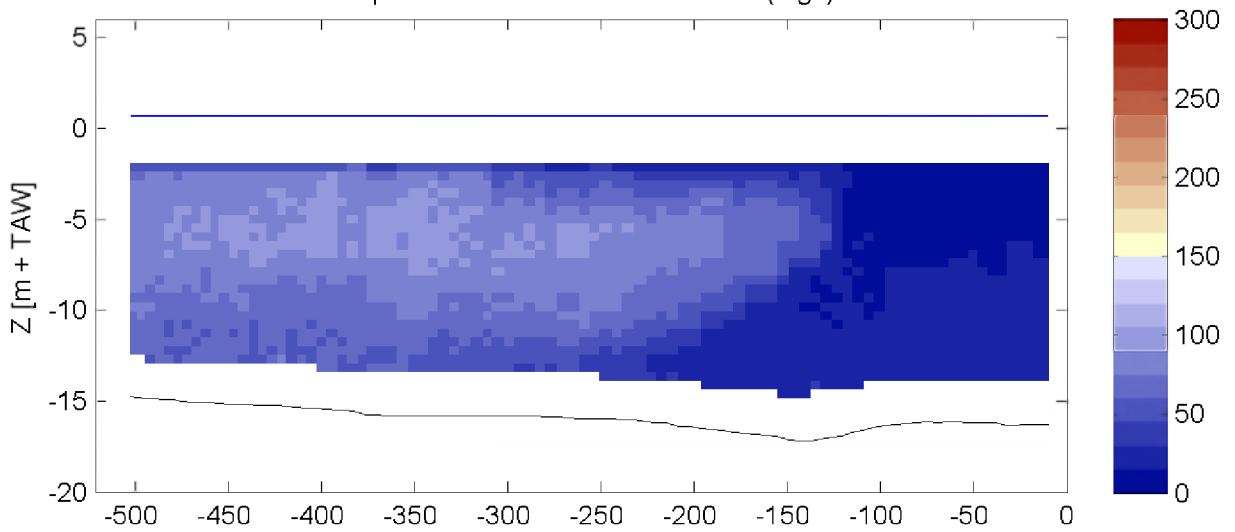
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I/RA/11283/06.110/BDC

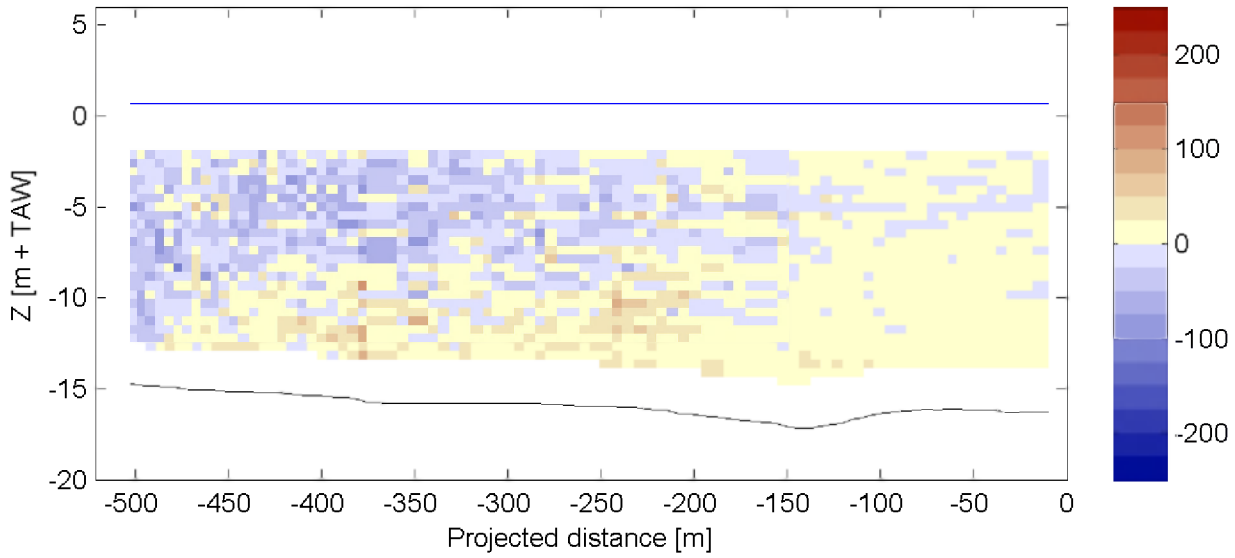
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2036DGDt000rsub.csv	Location: Transect DGD

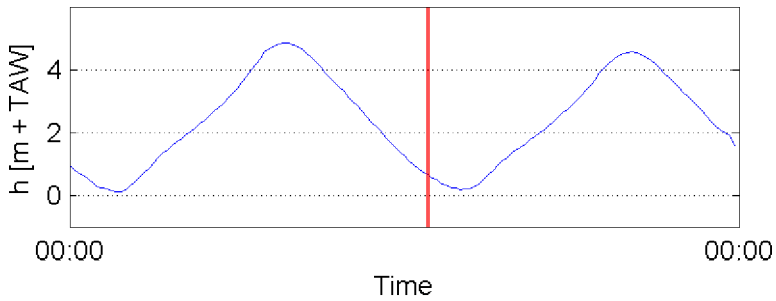
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

12:48:42 - 12:52:39

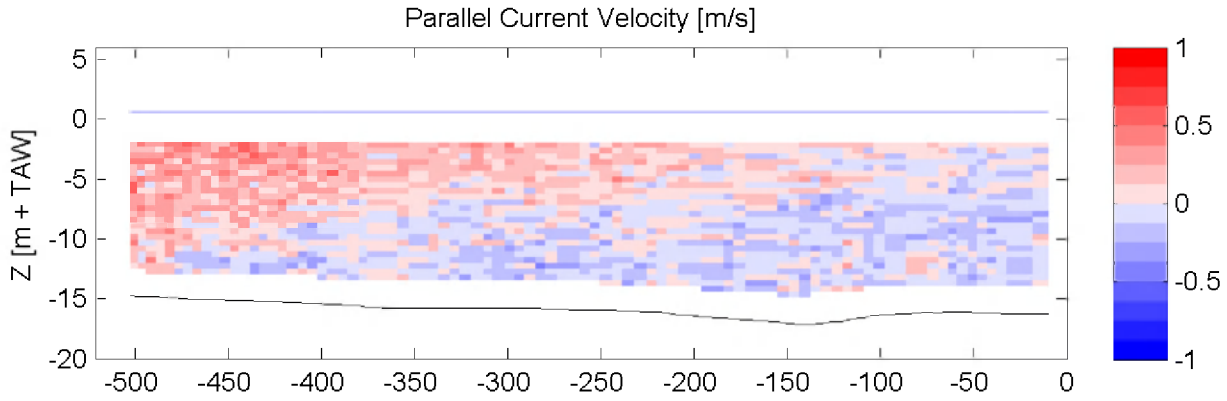
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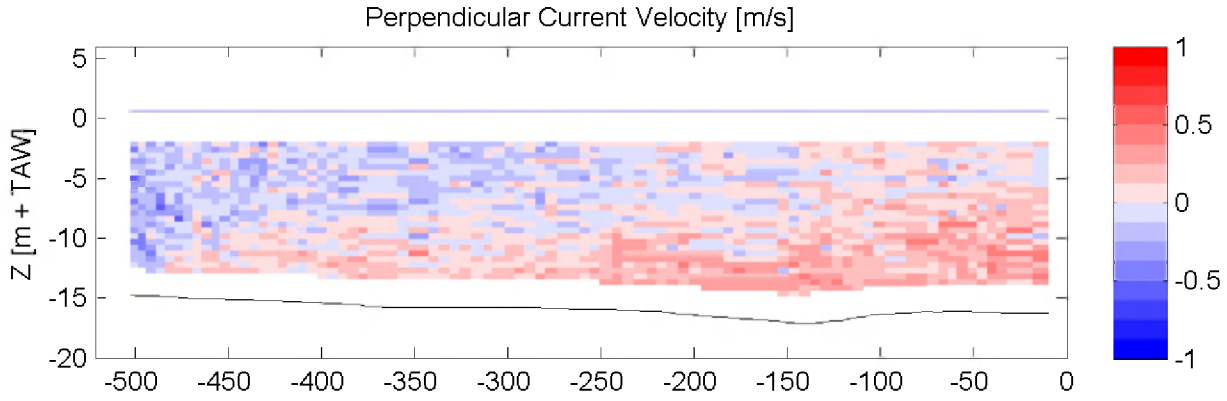
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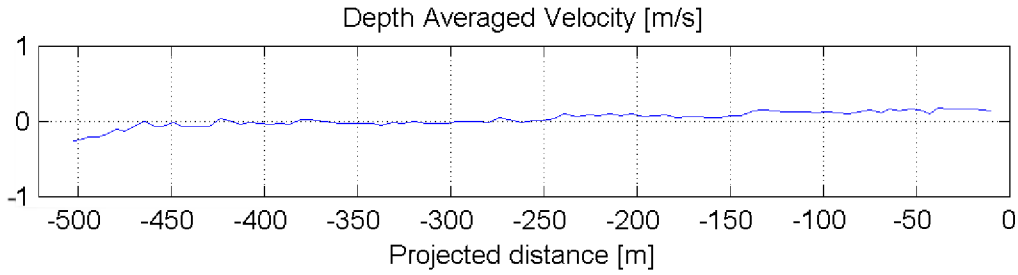
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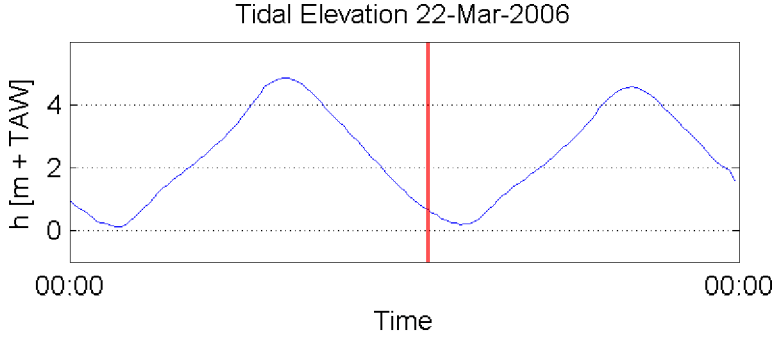
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2036DGDt000rsub.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

12:48:42 - 12:52:39

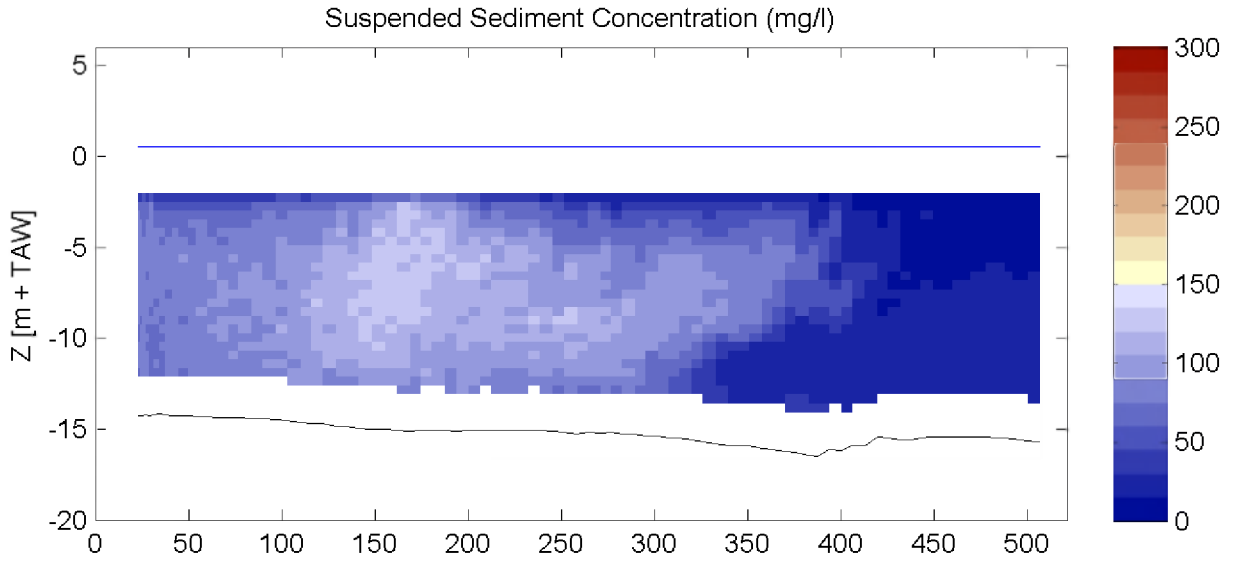
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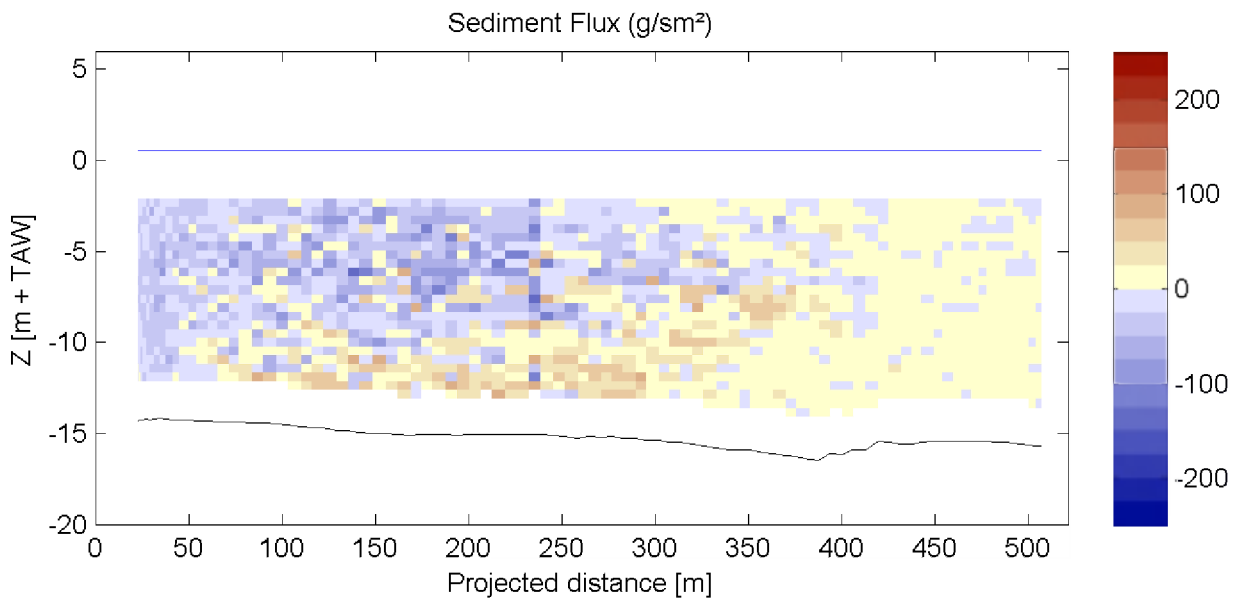
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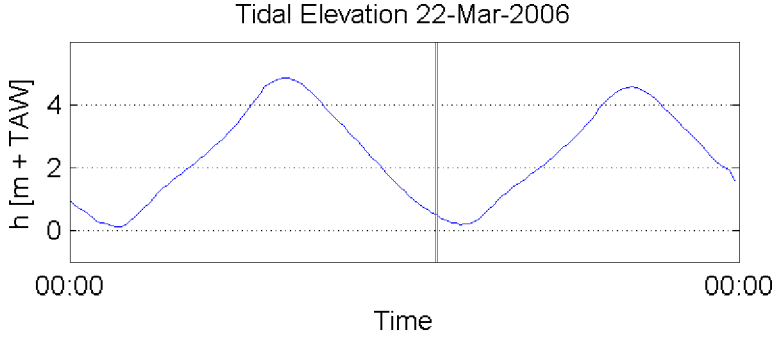
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2038DGDt000rbissub.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

13:07:31 - 13:11:23

Data Processed by: IMDC

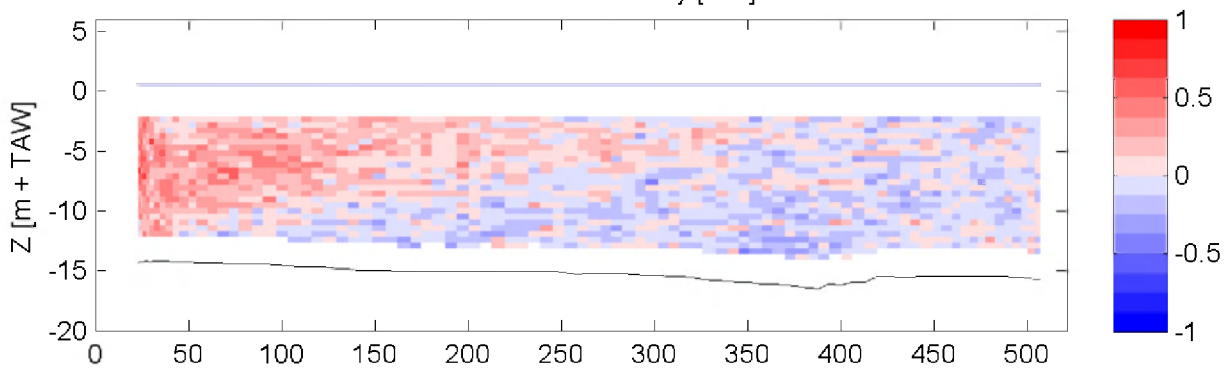
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I/RA/11283/06.110/BDC

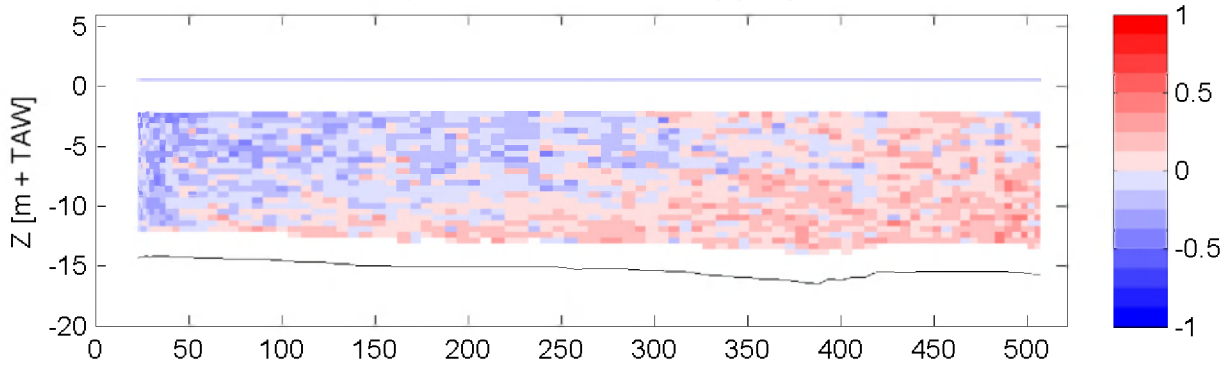
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2038DGDt000rbissub.csv	Location: Transect DGD

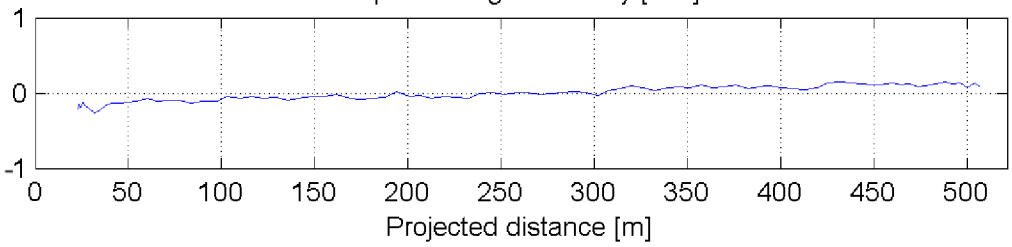
Parallel Current Velocity [m/s]



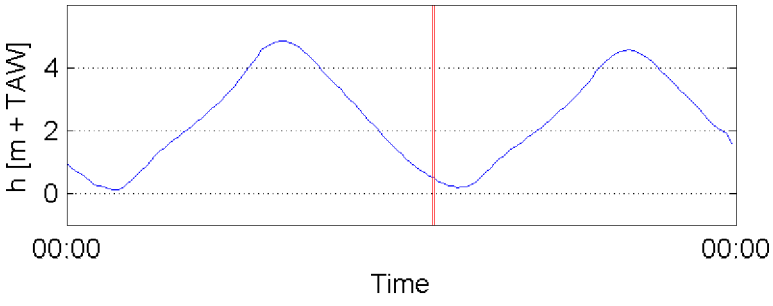
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

13:07:31 - 13:11:23

Data Processed by: IMDC

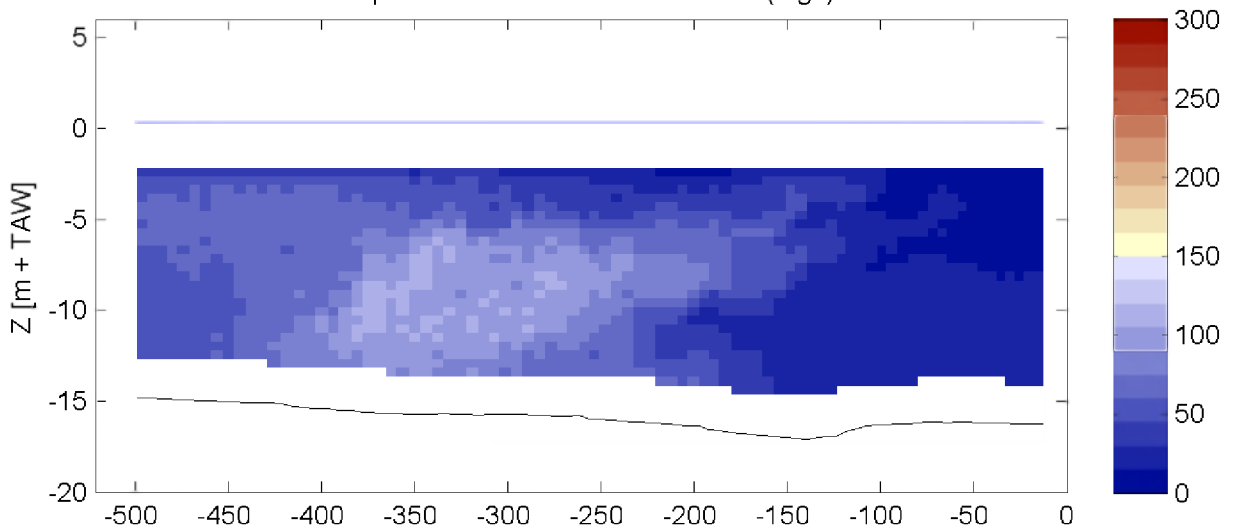
In association with :

I/RA/11283/06.110/BDC

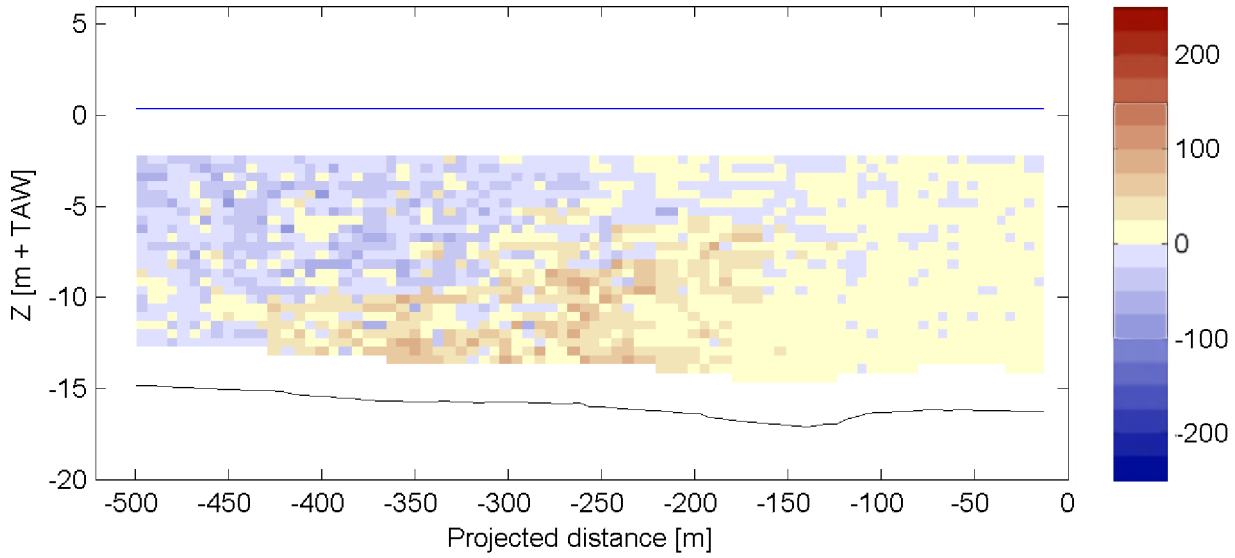
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2040DGDt000r.csv	Location: Transect DGD

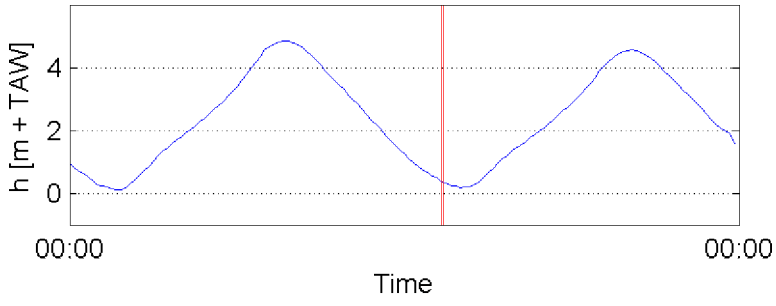
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

13:20:30 - 13:24:11

Data Processed by: IMDC

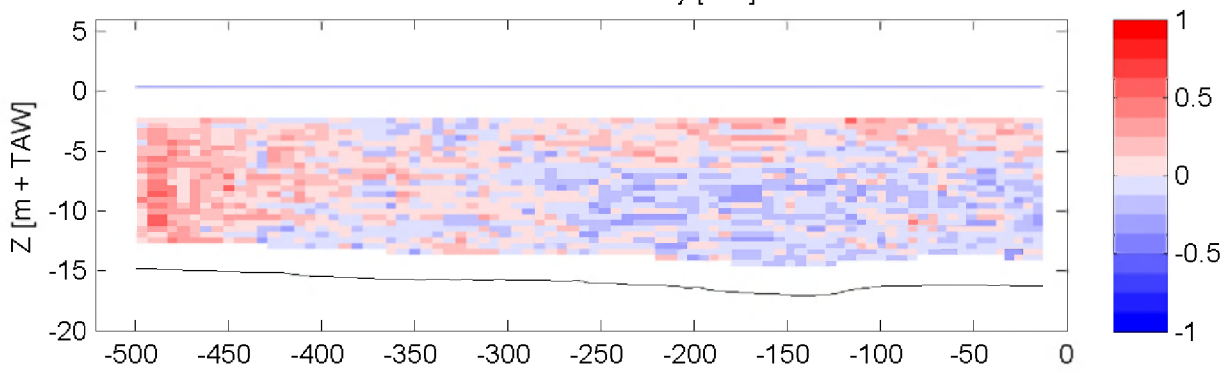
In association with :

I/RA/11283/06.110/BDC

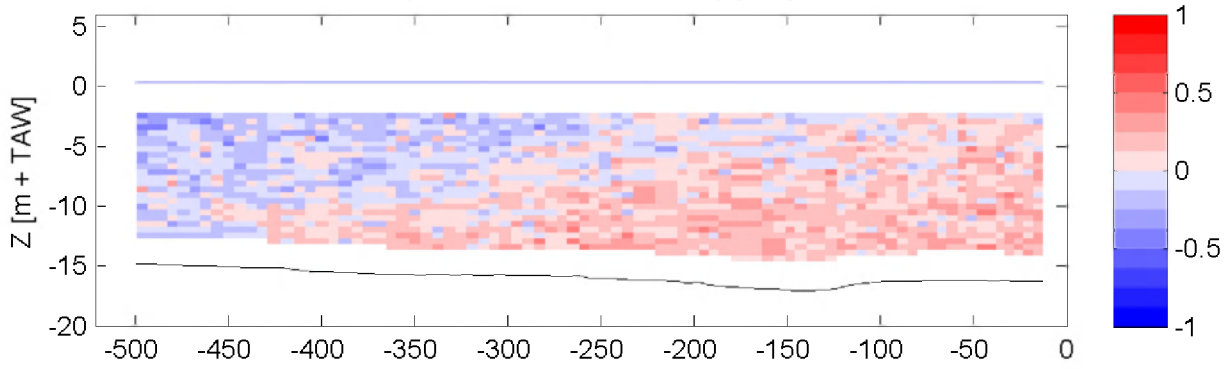
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2040DGDt000r.csv	Location: Transect DGD

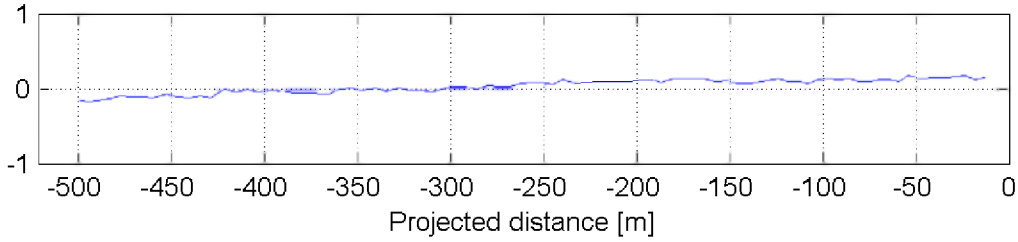
Parallel Current Velocity [m/s]



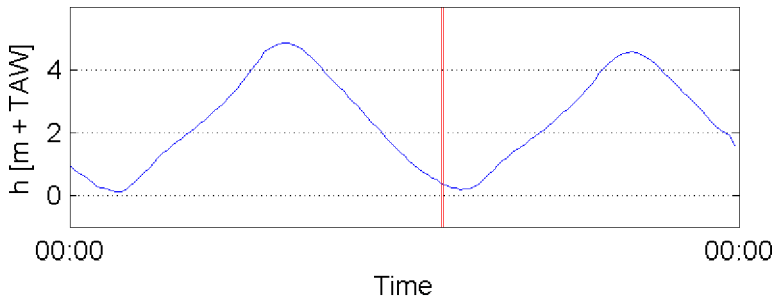
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

13:20:30 - 13:24:11

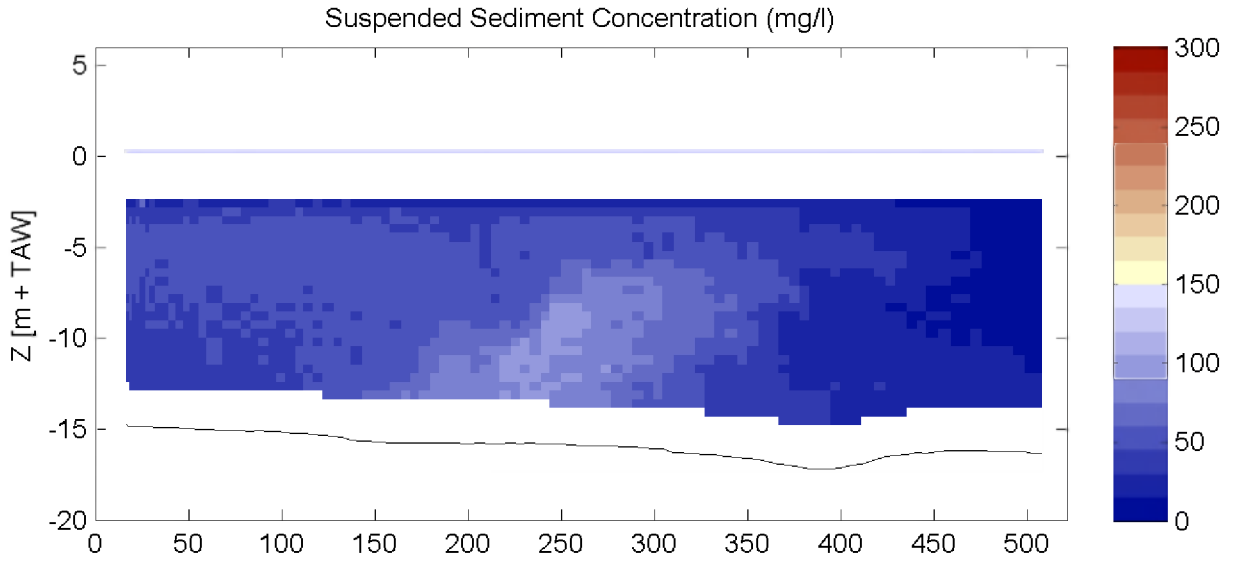
Data Processed by: IMDC

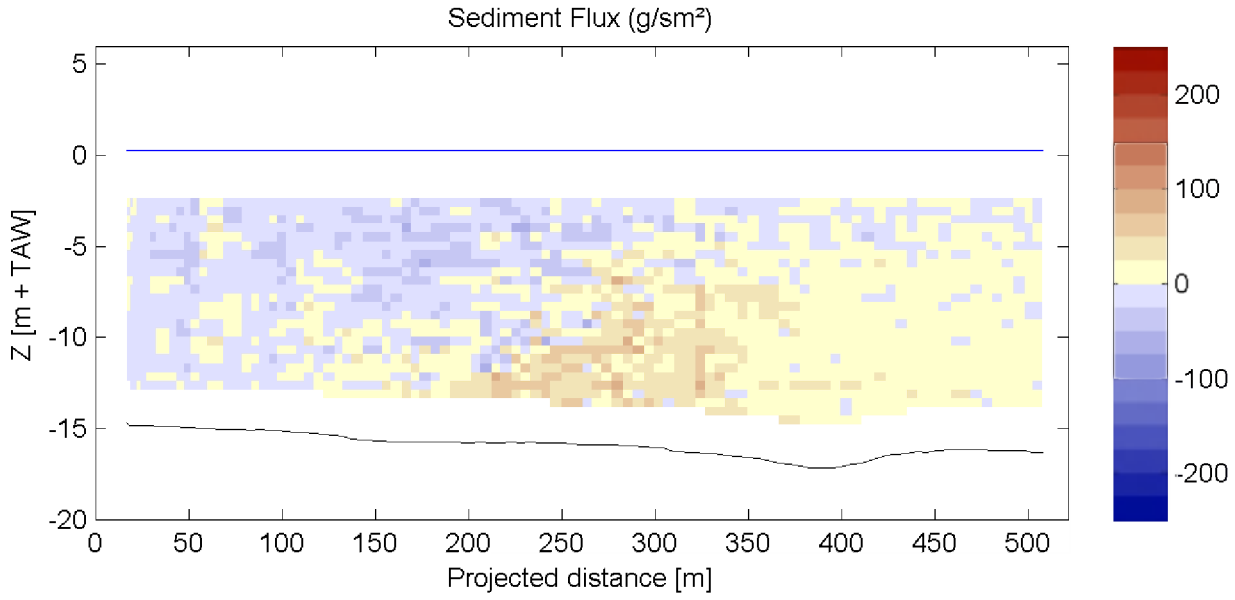
In association with :

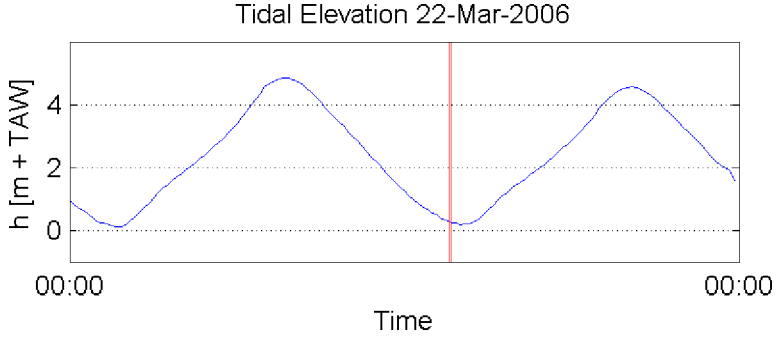
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2042DGDt000rsub.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

13:36:28 - 13:40:43

Data Processed by: IMDC

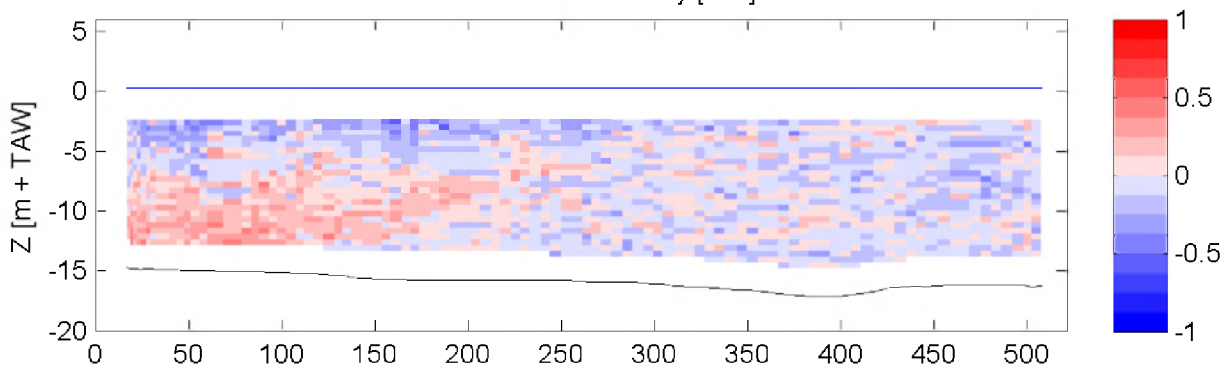
In association with :

I/RA/11283/06.110/BDC

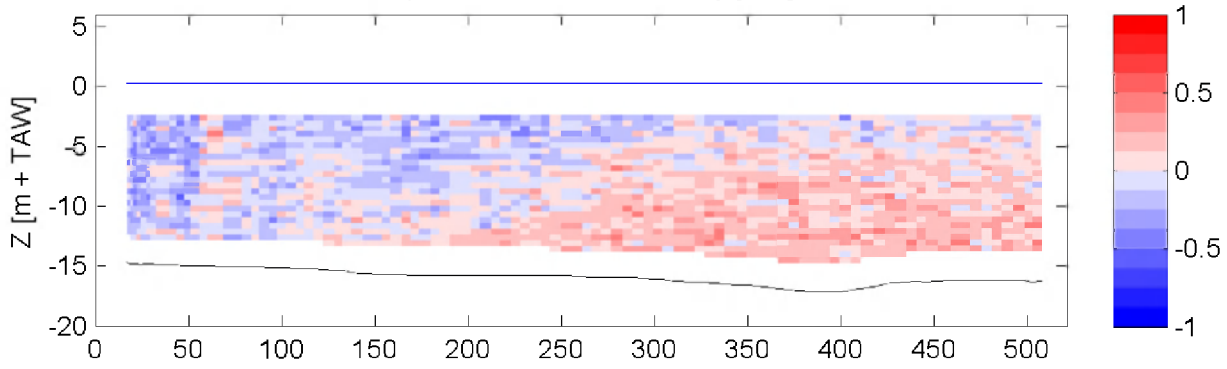
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2042DGDt000rsub.csv	Location: Transect DGD

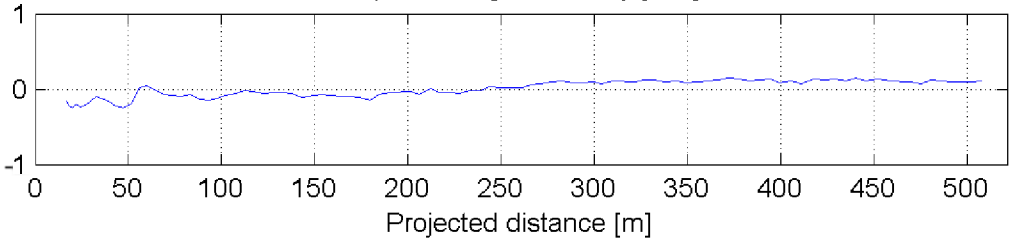
Parallel Current Velocity [m/s]



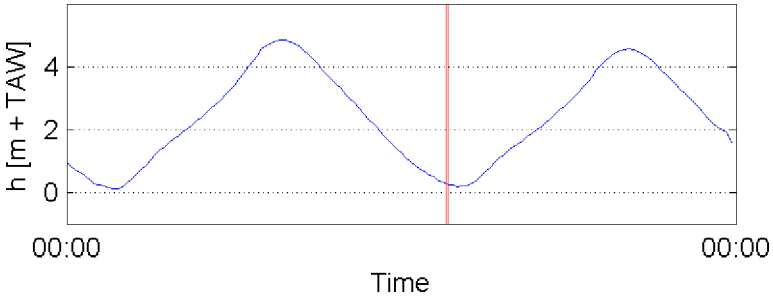
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

13:36:28 - 13:40:43

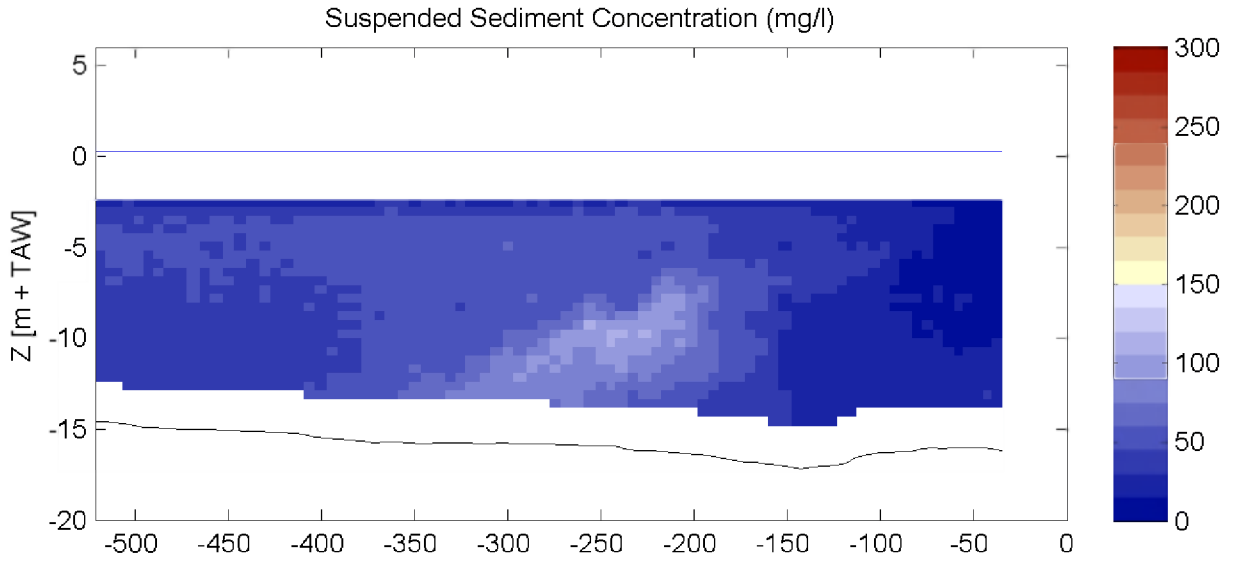
Data Processed by: IMDC

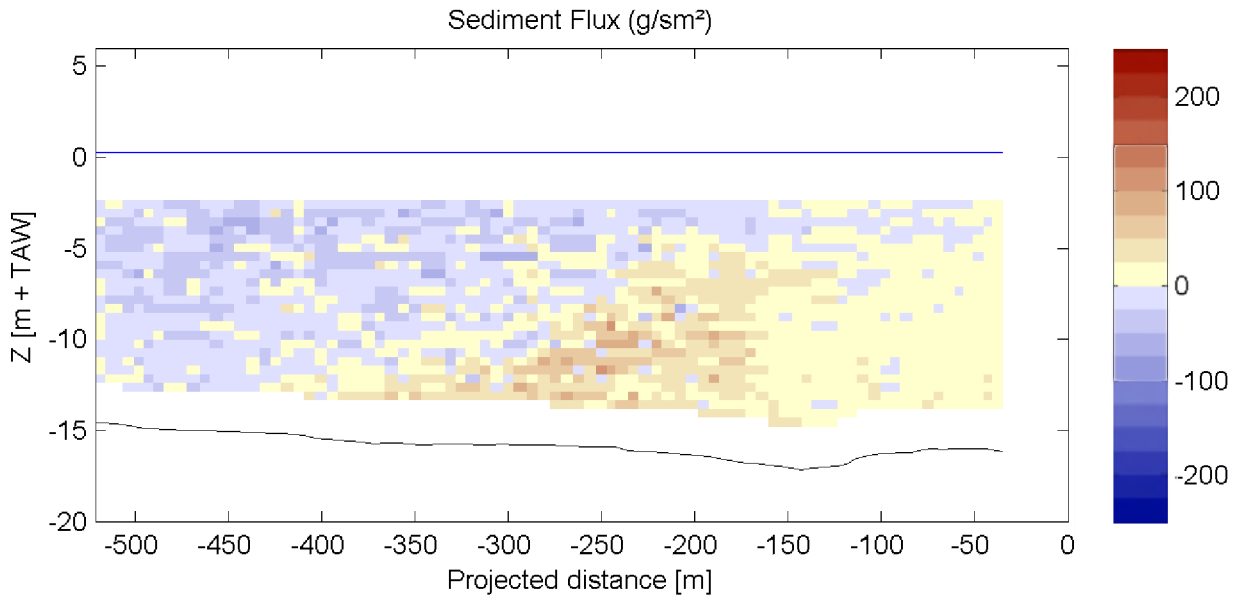
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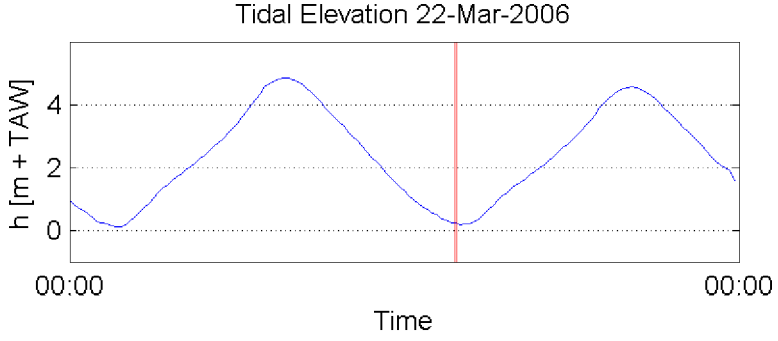
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2044DGDt000rsub.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

13:49:29 - 13:53:02

Data Processed by: IMDC

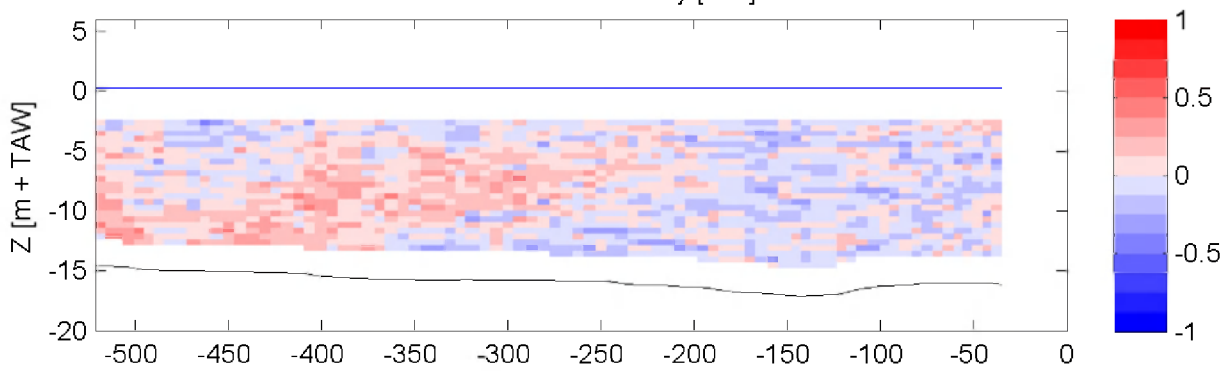
In association with :

I/RA/11283/06.110/BDC

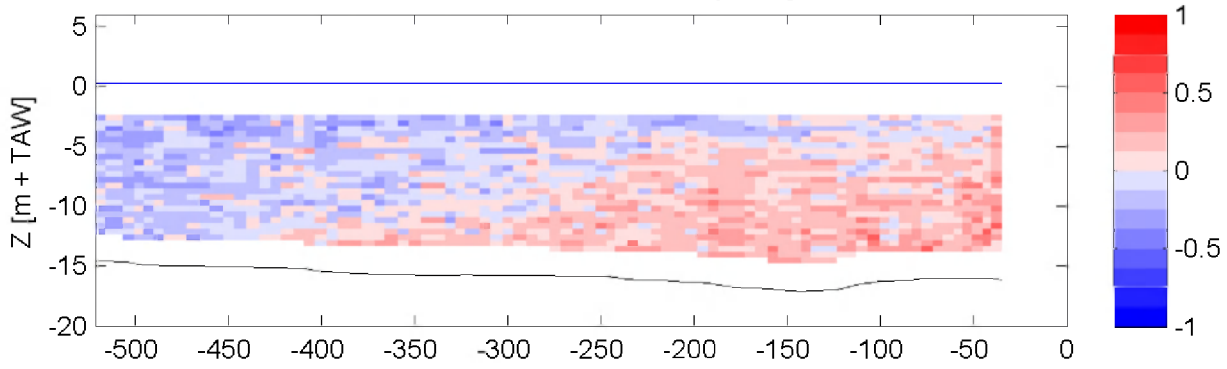
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2044DGDt000rsub.csv	Location: Transect DGD

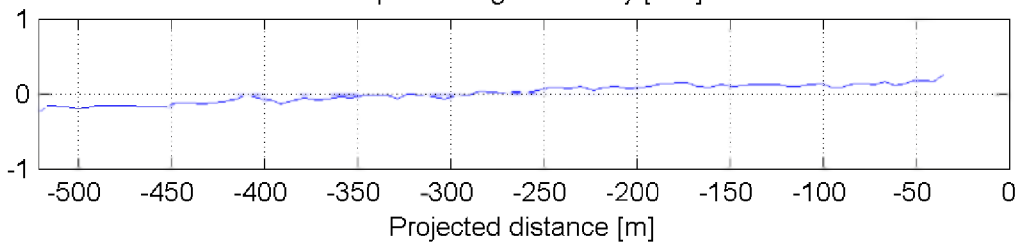
Parallel Current Velocity [m/s]



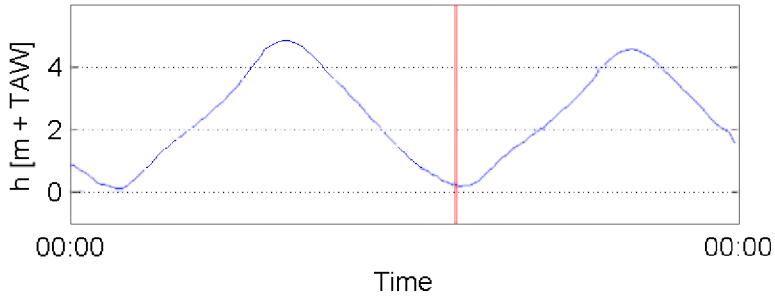
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

13:49:29 - 13:53:02

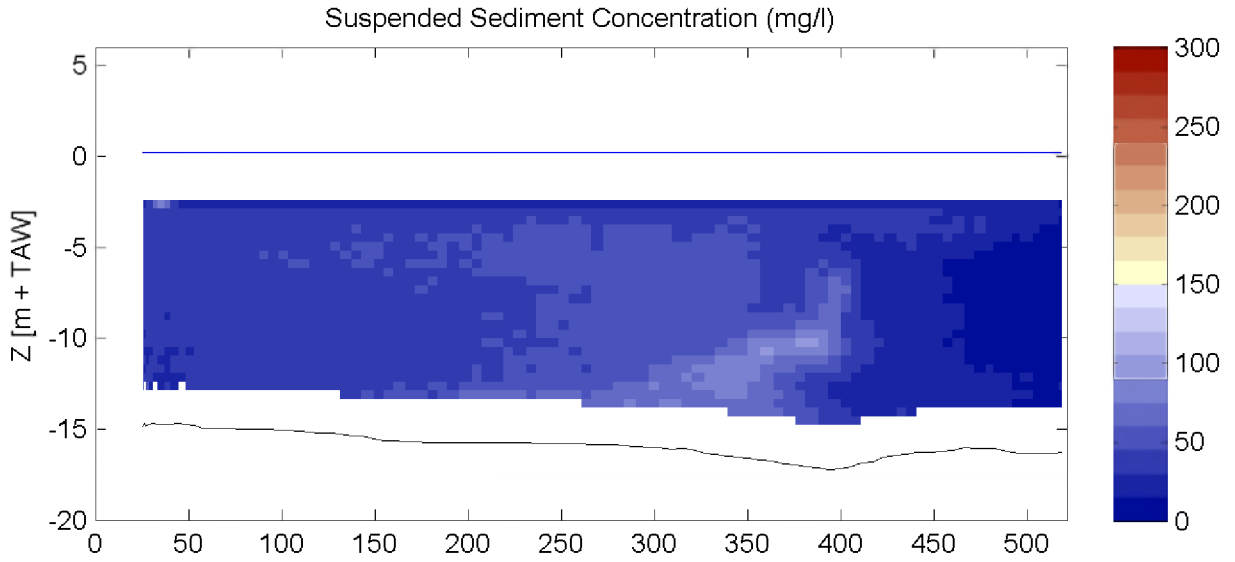
Data Processed by: IMDC

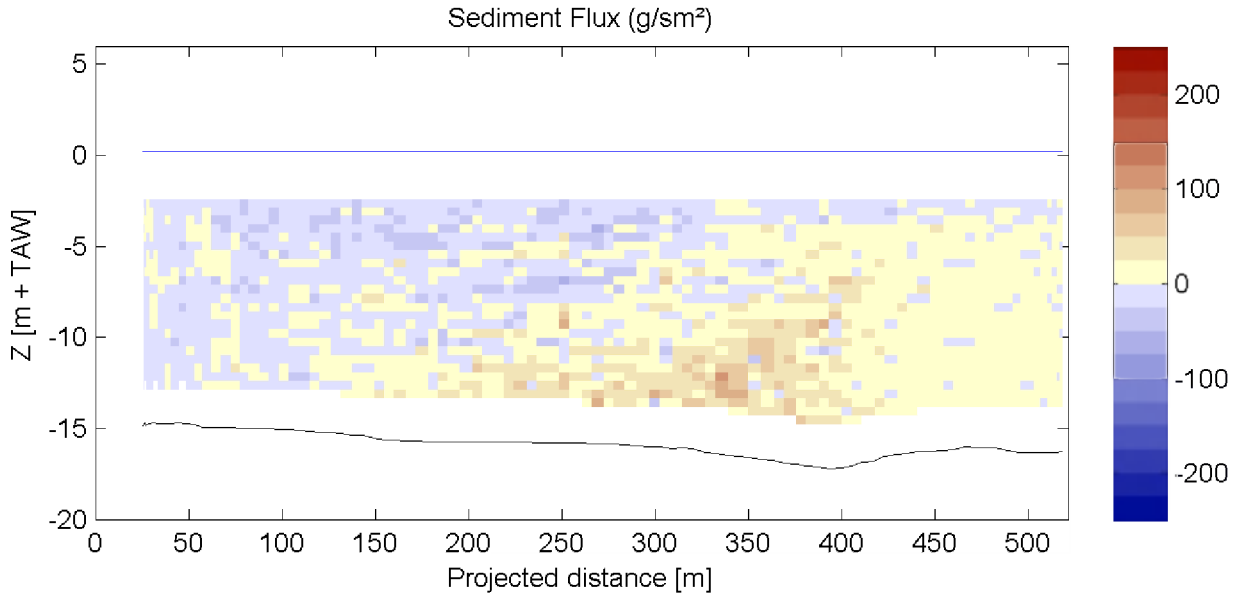
In association with :

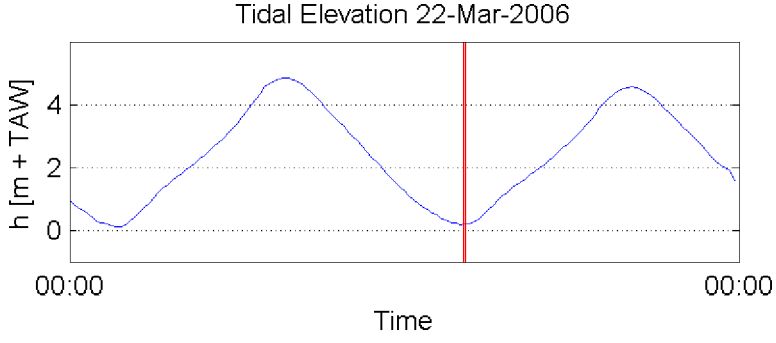
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2046DGDt000rsub.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

14:07:18 - 14:11:28

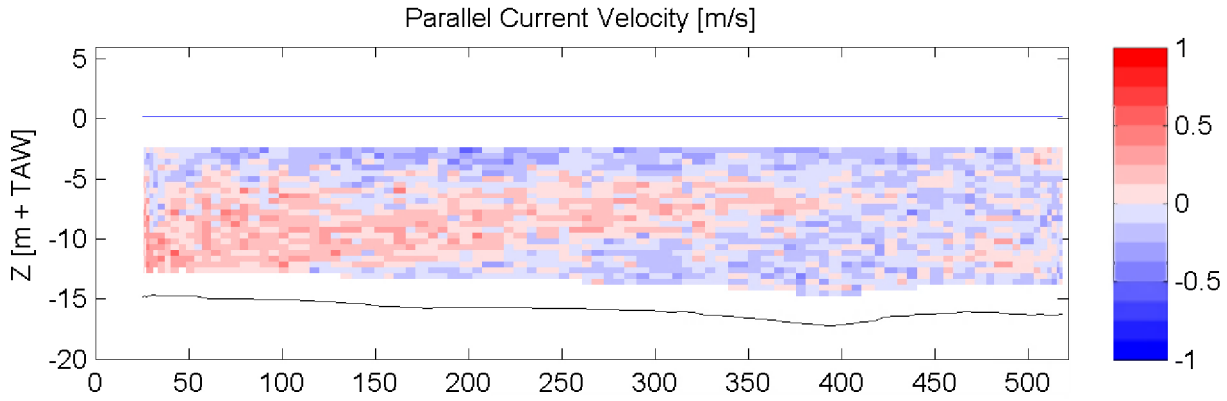
Data Processed by: IMDC

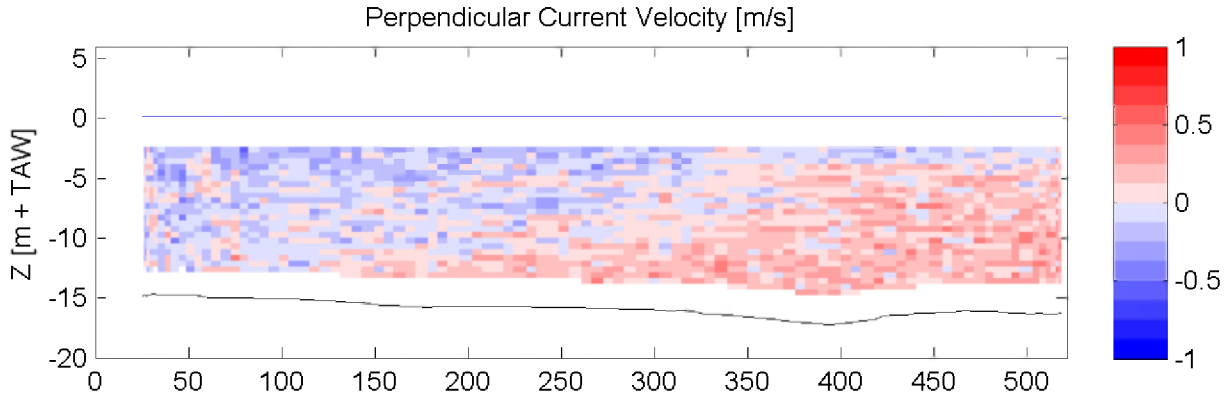
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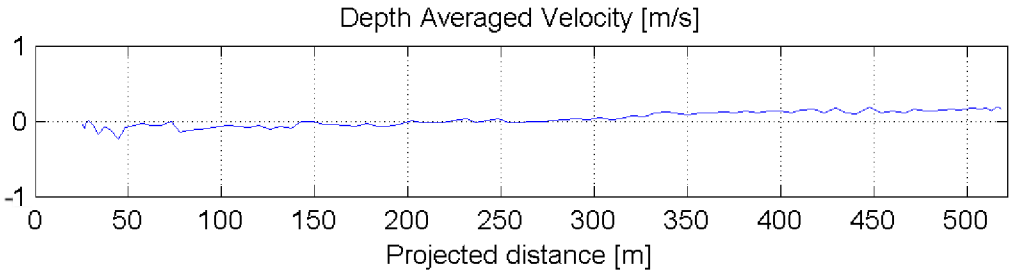
I/RA/11283/06.110/BDC

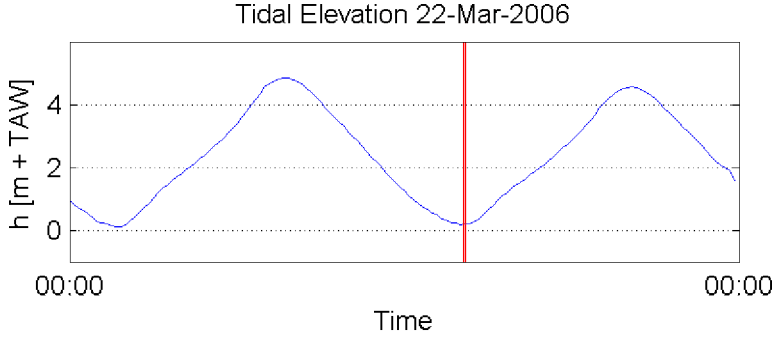
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2046DGDt000rsub.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

14:07:18 - 14:11:28

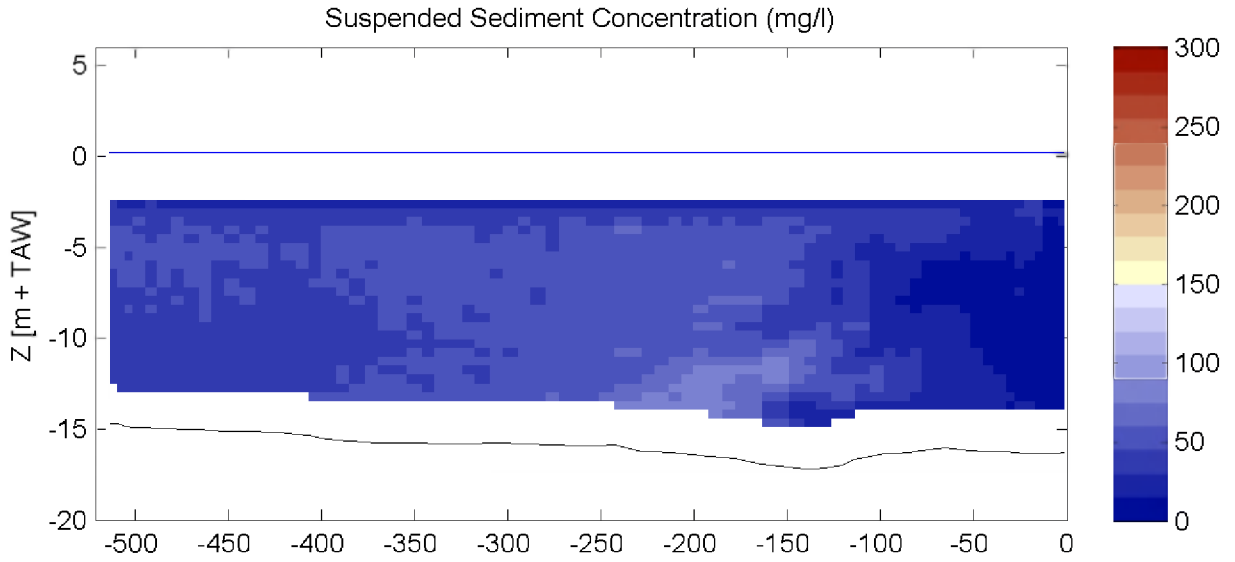
Data Processed by: IMDC

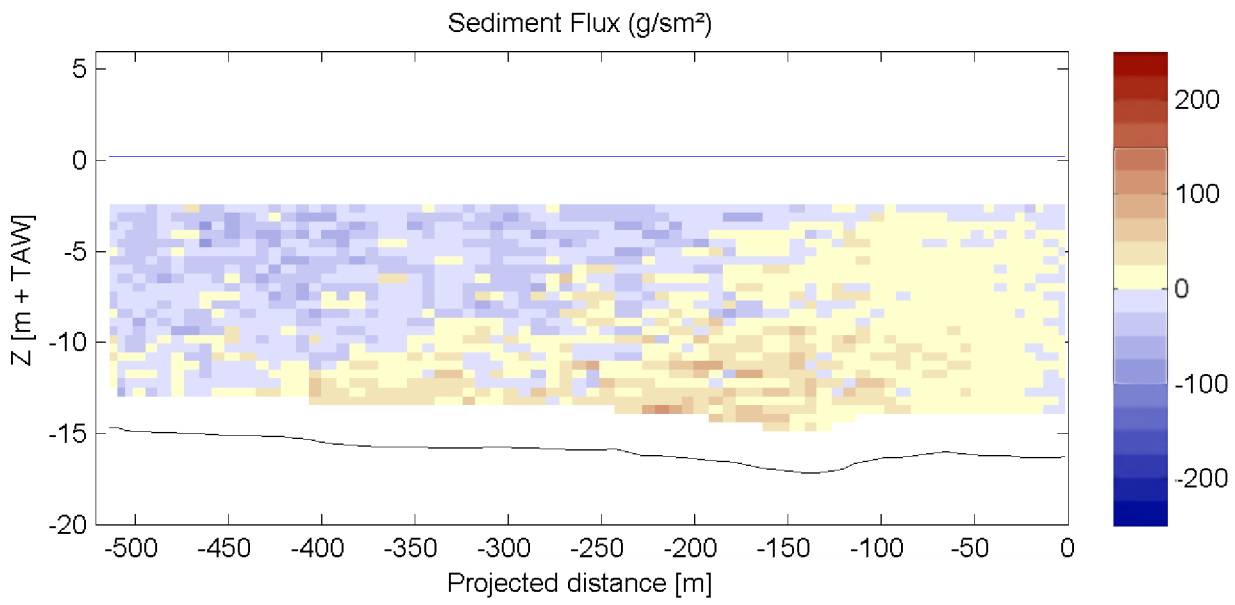
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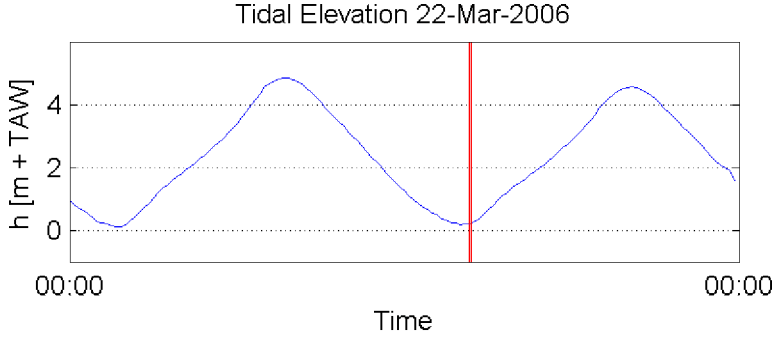
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2048DGDt000r2.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

14:20:14 - 14:23:32

Data Processed by: IMDC

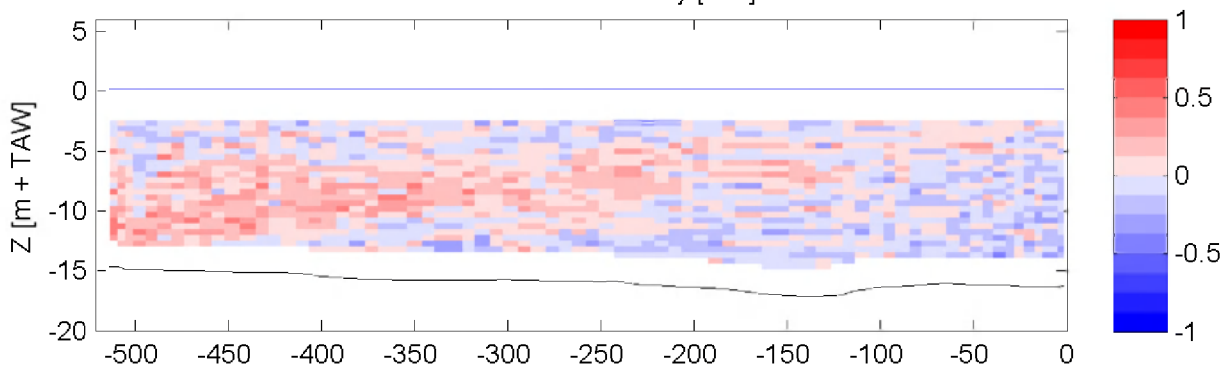
In association with :

I/RA/11283/06.110/BDC

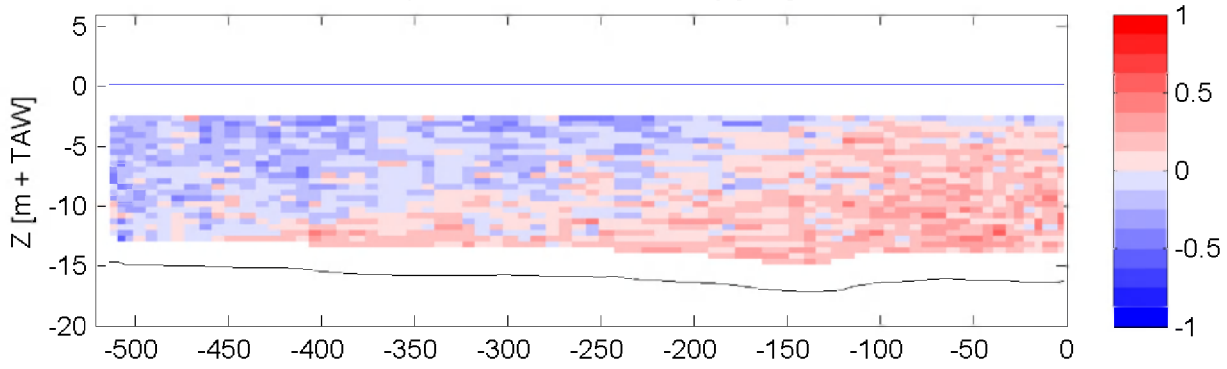
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2048DGDt000r2.csv	Location: Transect DGD

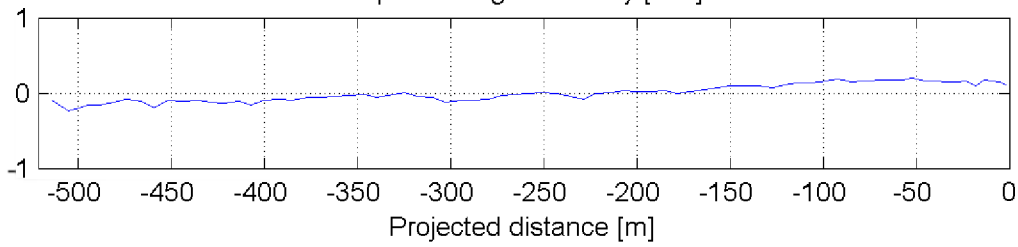
Parallel Current Velocity [m/s]



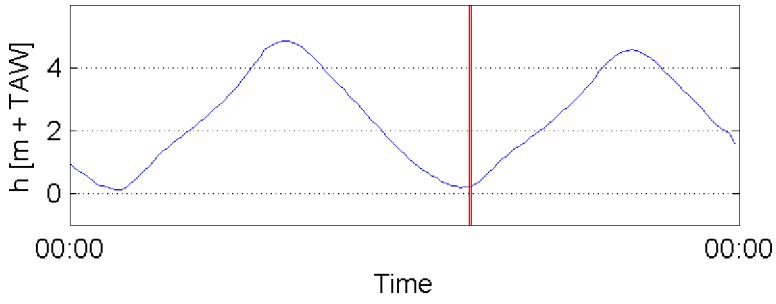
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

14:20:14 - 14:23:32

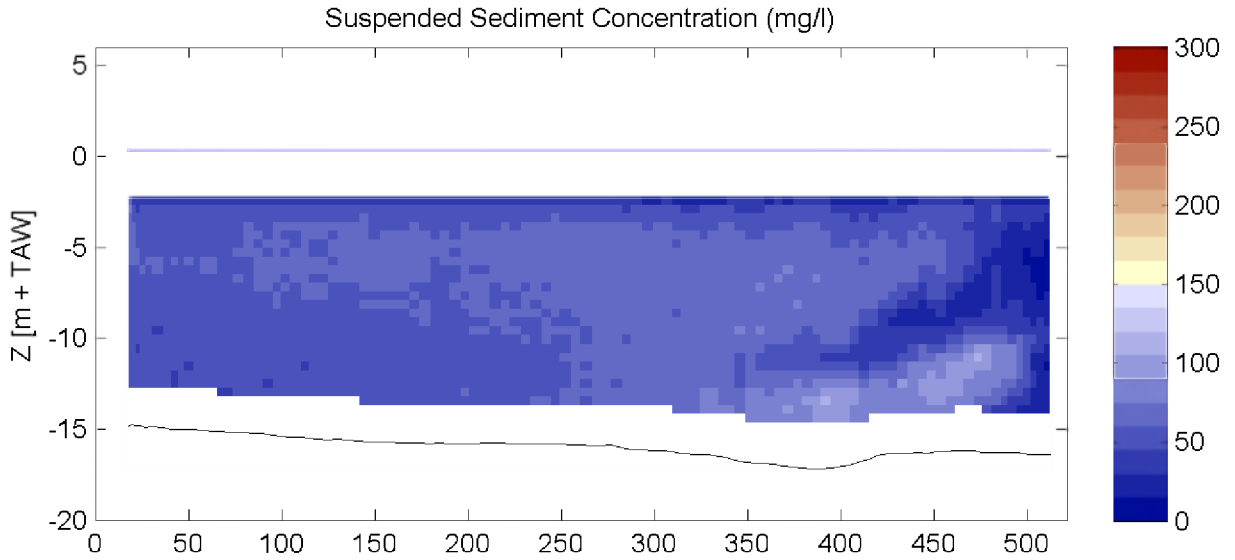
Data Processed by: IMDC

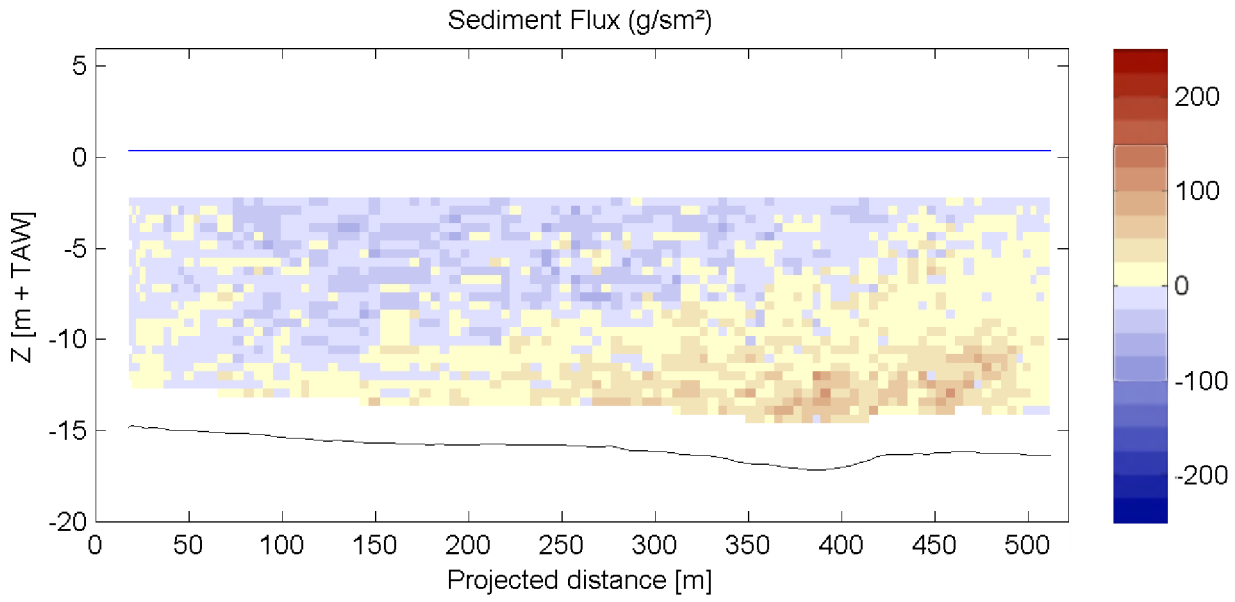
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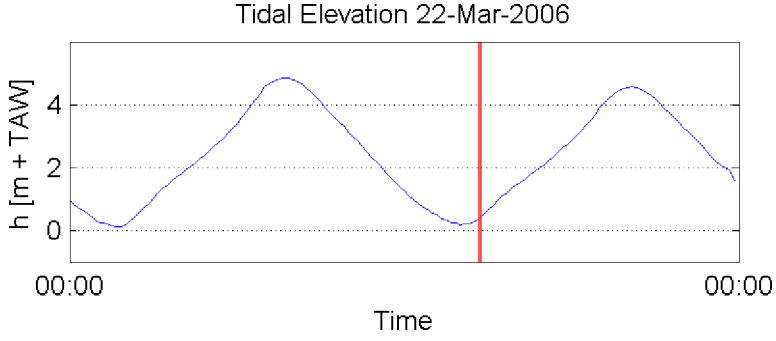
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2050DGDt000rsub.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

14:39:35 - 14:44:03

Data Processed by: IMDC

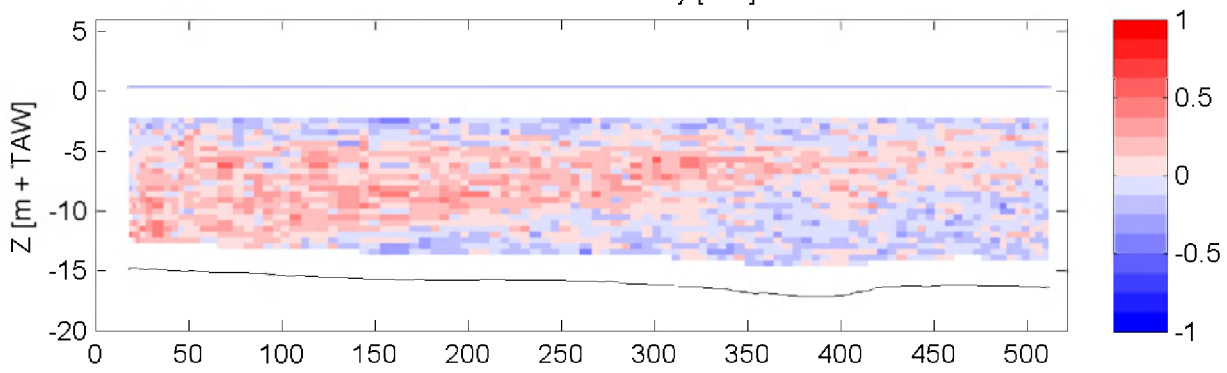
In association with :

I/RA/11283/06.110/BDC

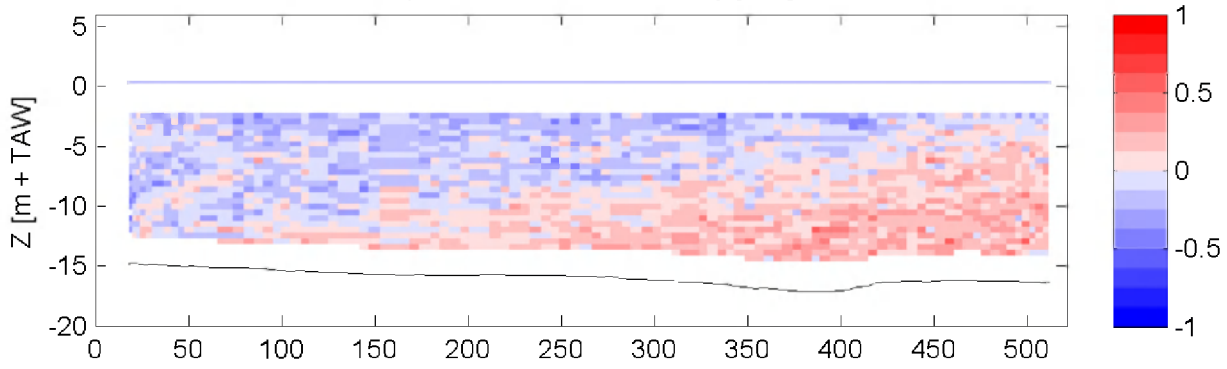
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2050DGDt000rsub.csv	Location: Transect DGD

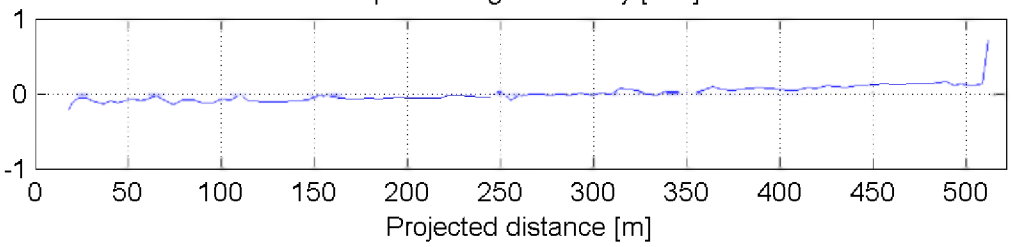
Parallel Current Velocity [m/s]



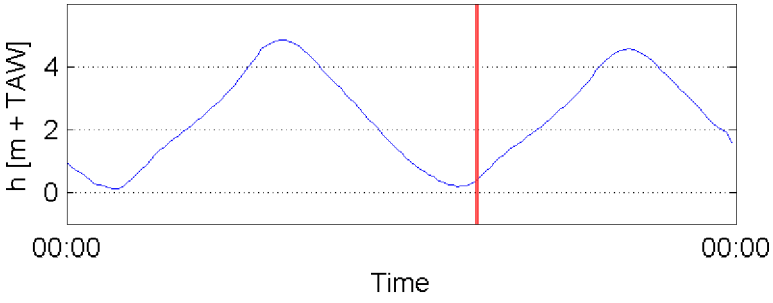
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

14:39:35 - 14:44:03

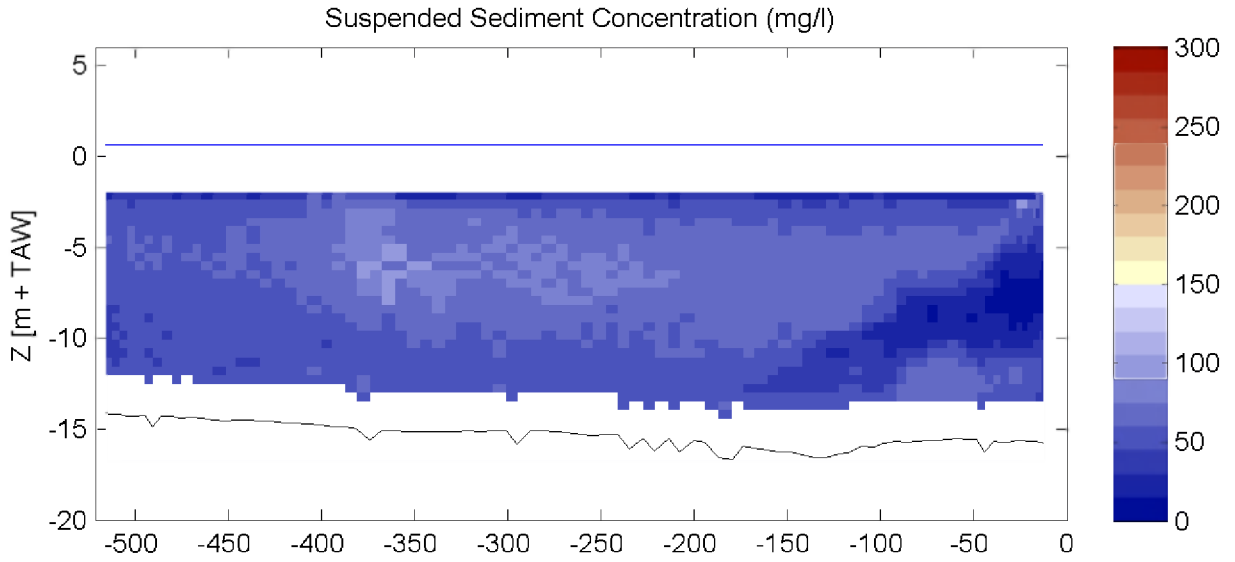
Data Processed by: IMDC

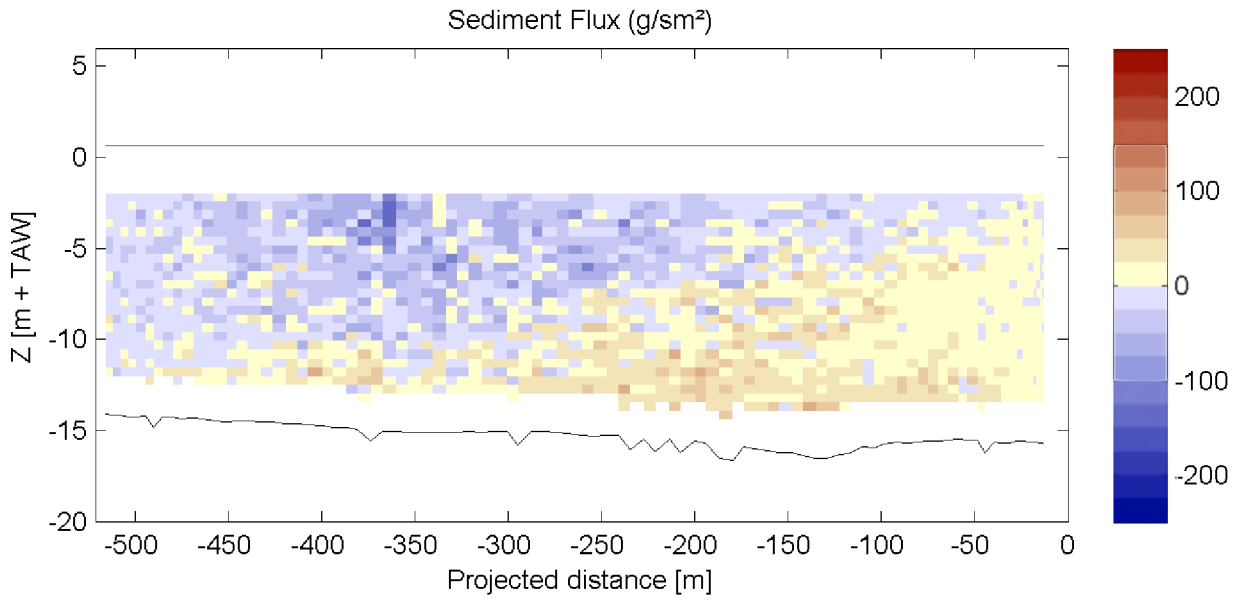
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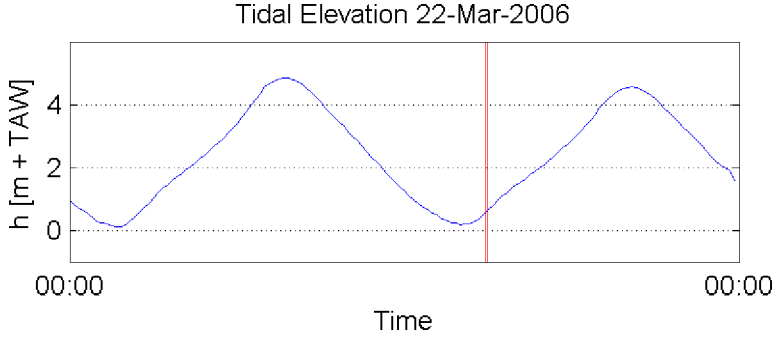
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2052DGDt000rbis.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

14:55:09 - 14:59:02

Data Processed by: IMDC

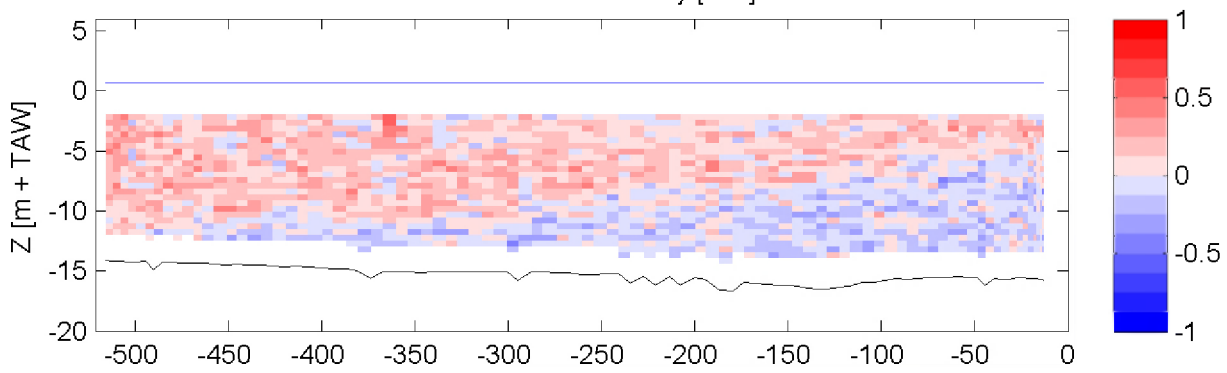
In association with :

I/RA/11283/06.110/BDC

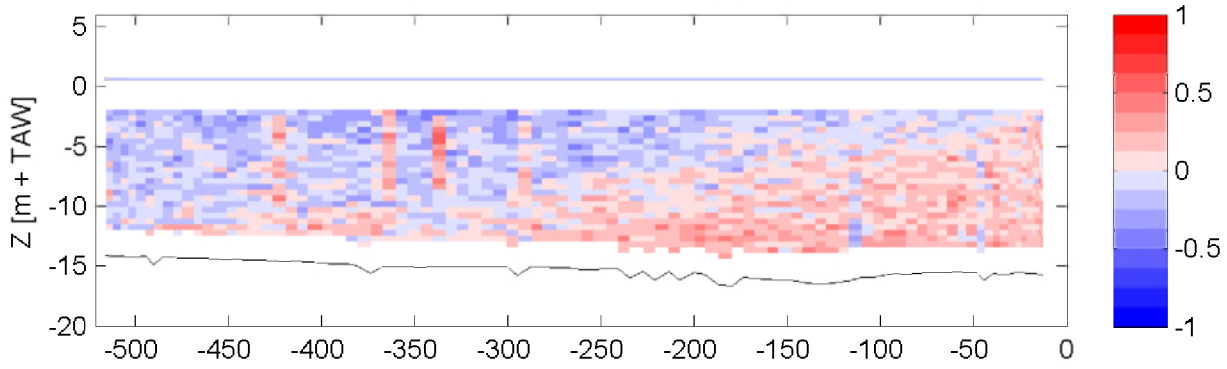
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2052DGDt000rbis.csv	Location: Transect DGD

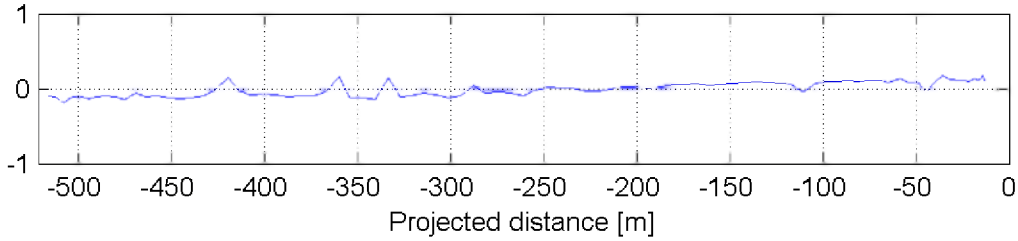
Parallel Current Velocity [m/s]



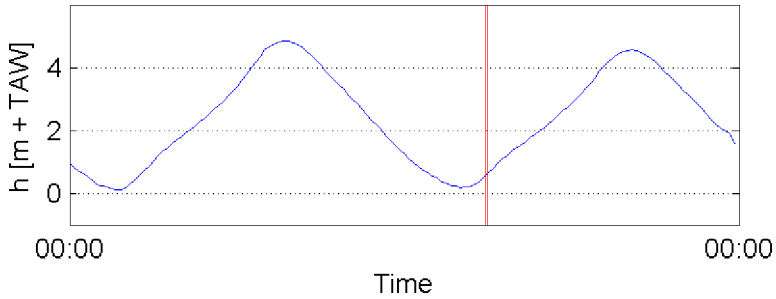
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

14:55:09 - 14:59:02

Data Processed by: IMDC

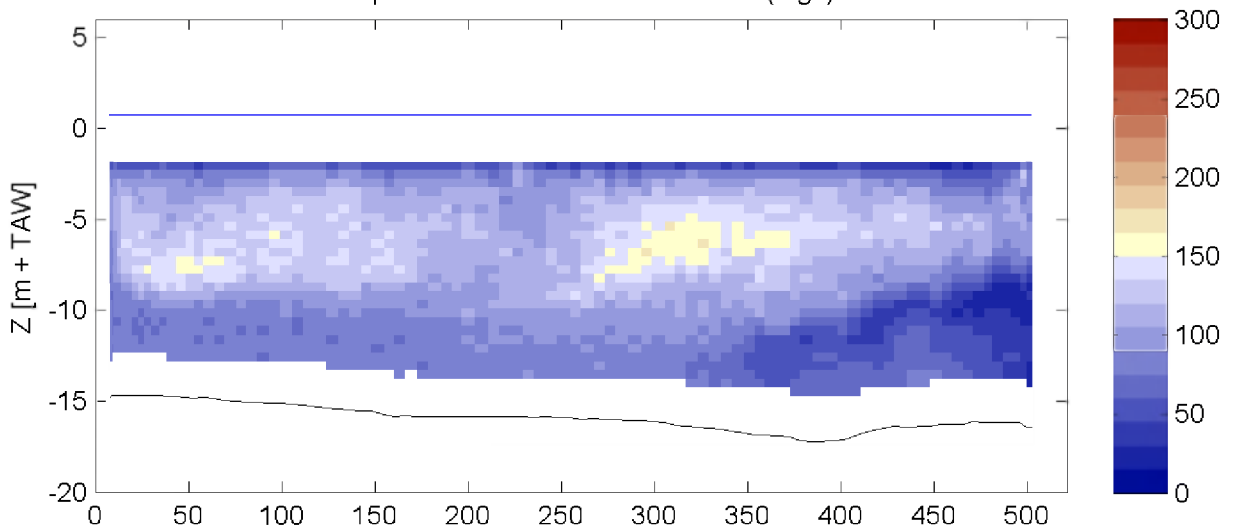
In association with :

I/RA/11283/06.110/BDC

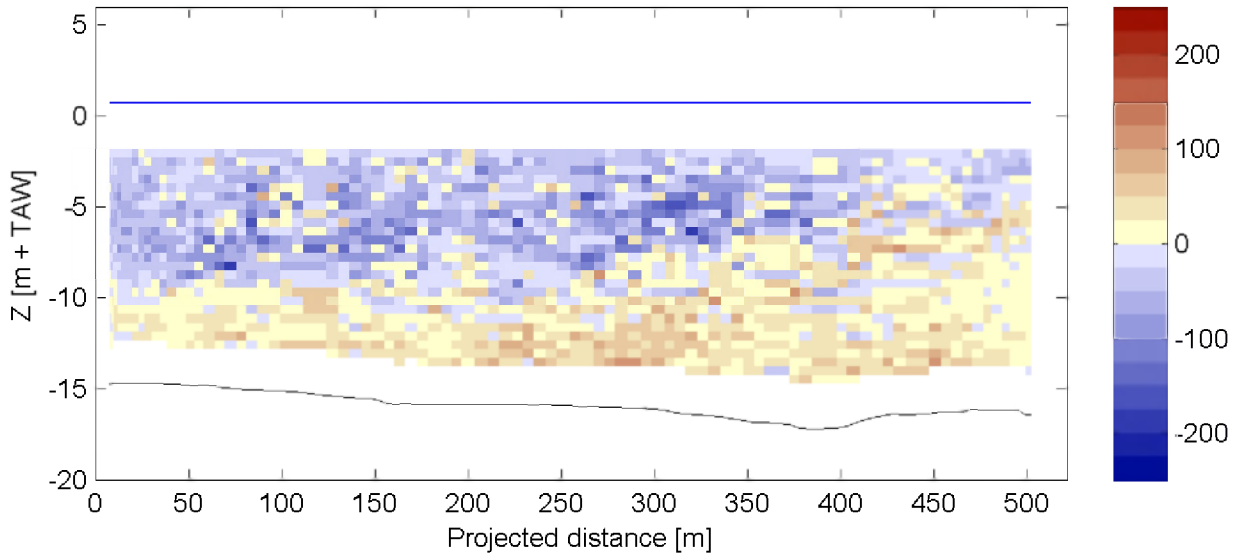
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2054DGDt000r.csv	Location: Transect DGD

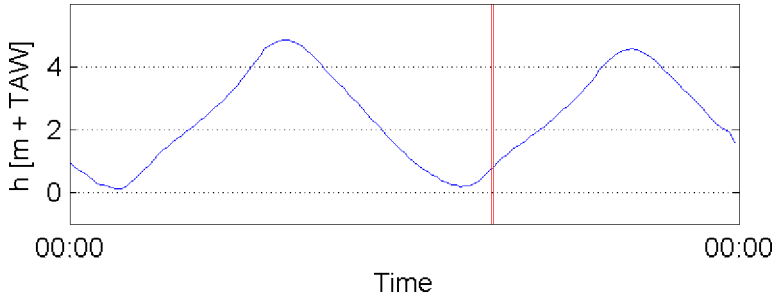
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

15:07:55 - 15:11:56

Data Processed by: IMDC

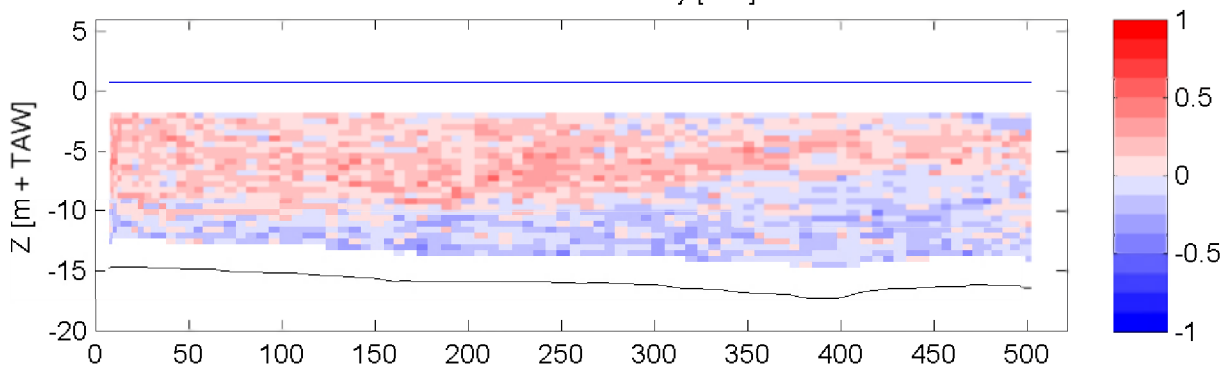
In association with :

I/RA/11283/06.110/BDC

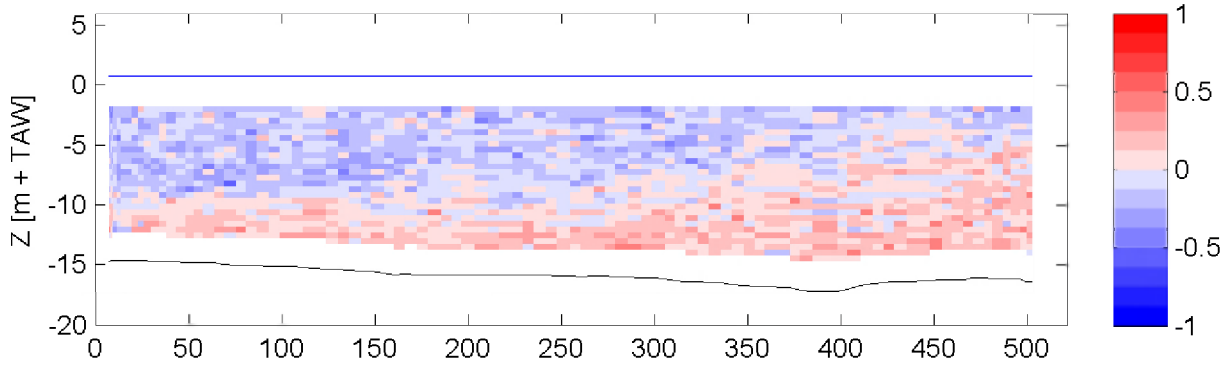
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2054DGDt000r.csv	Location: Transect DGD

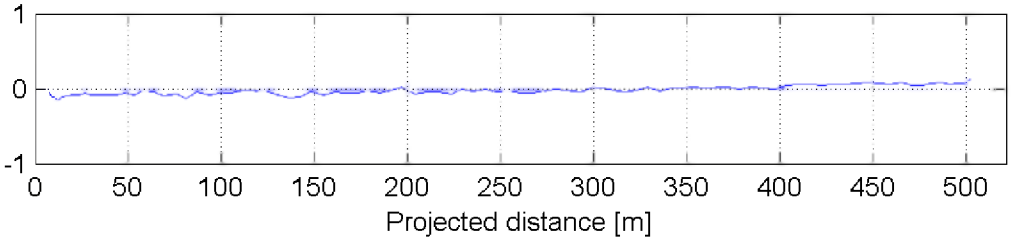
Parallel Current Velocity [m/s]



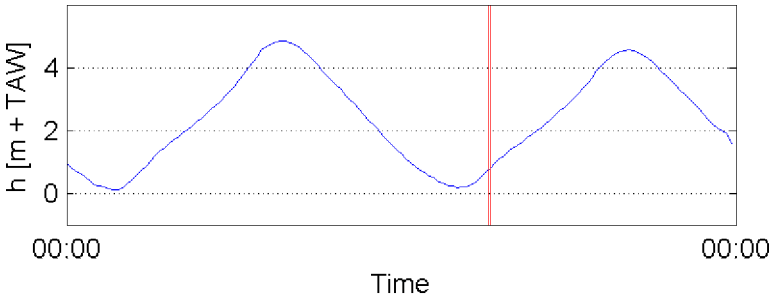
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

15:07:55 - 15:11:56

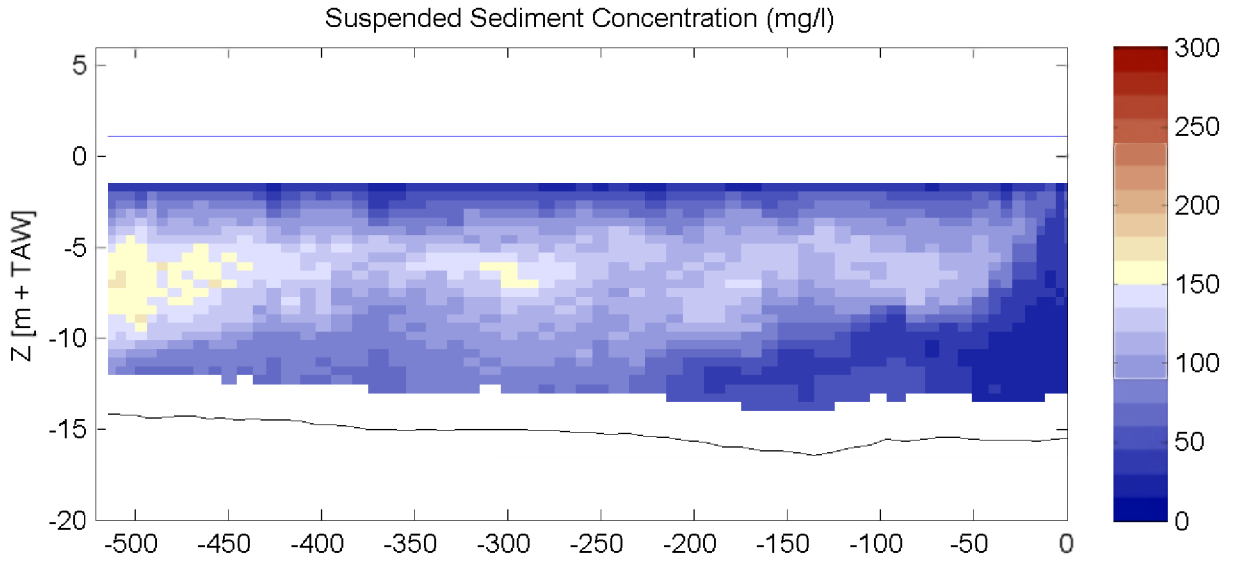
Data Processed by: IMDC

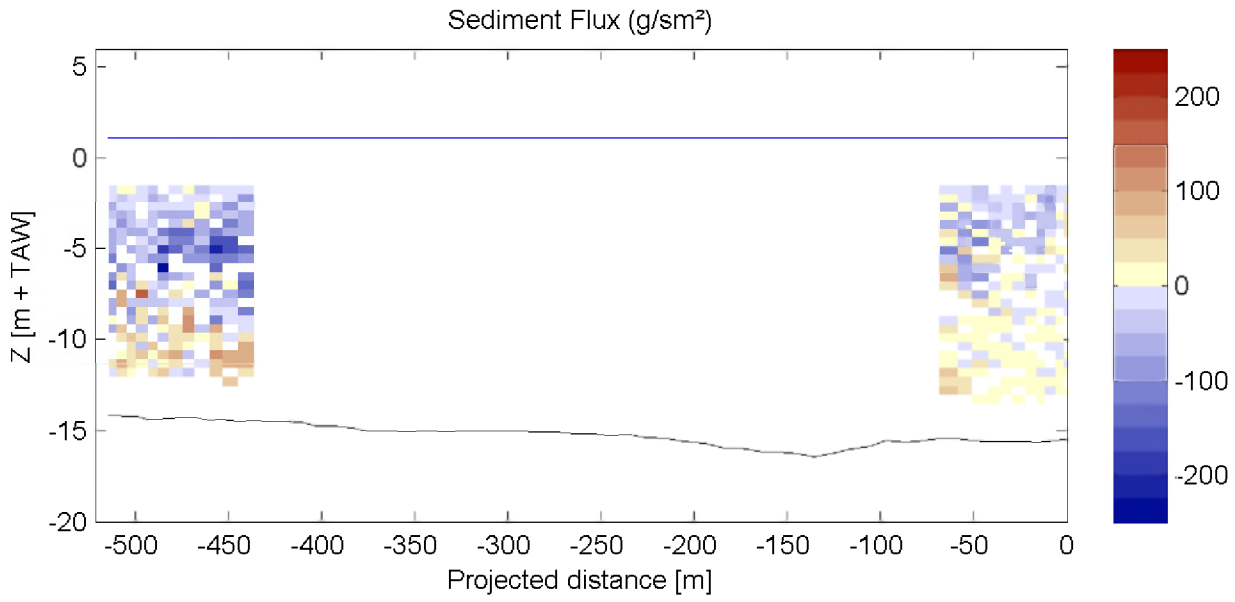
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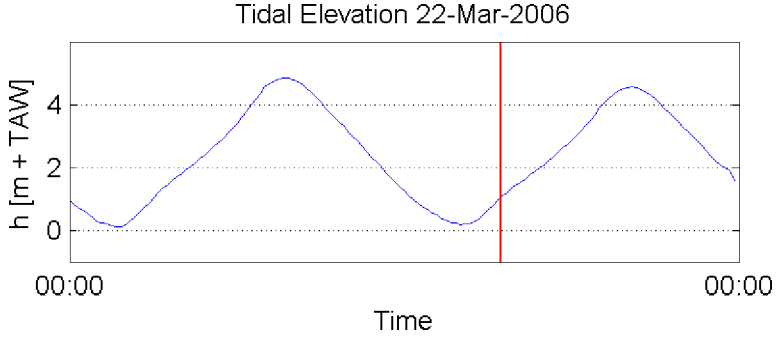
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2056DGDt000rbis.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

15:25:36 - 15:28:26

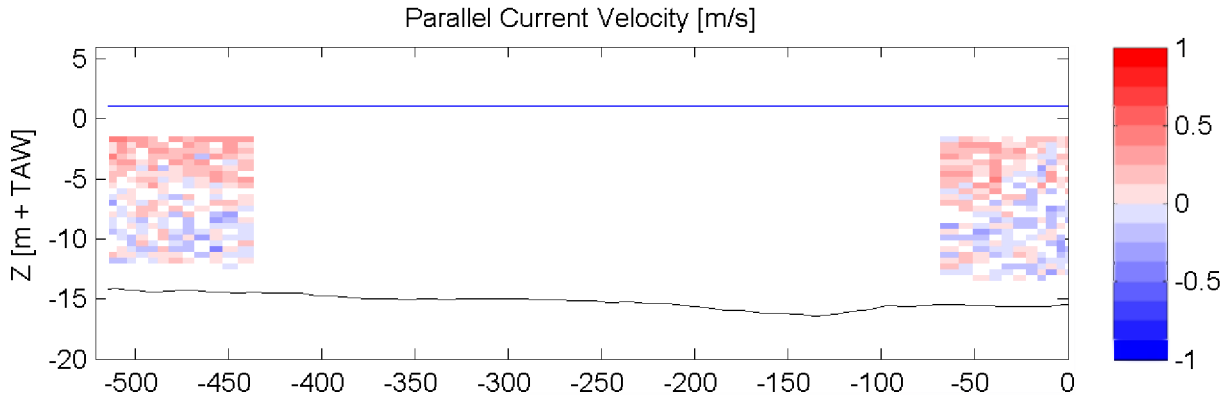
Data Processed by: IMDC

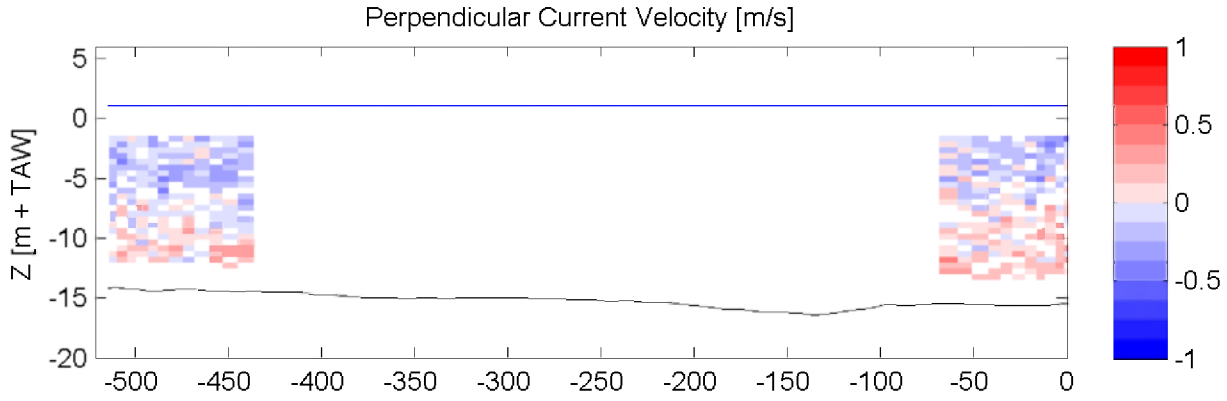
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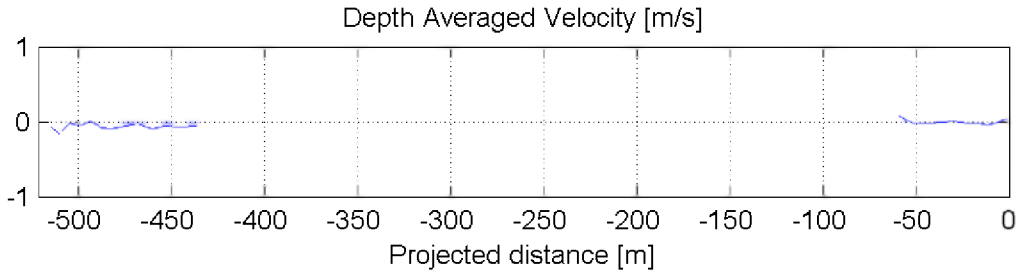
I/RA/11283/06.110/BDC

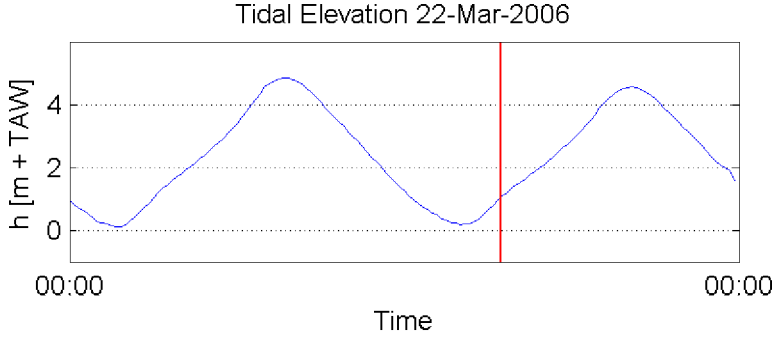
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2056DGDt000rbis.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

15:25:36 - 15:28:26

Data Processed by: IMDC

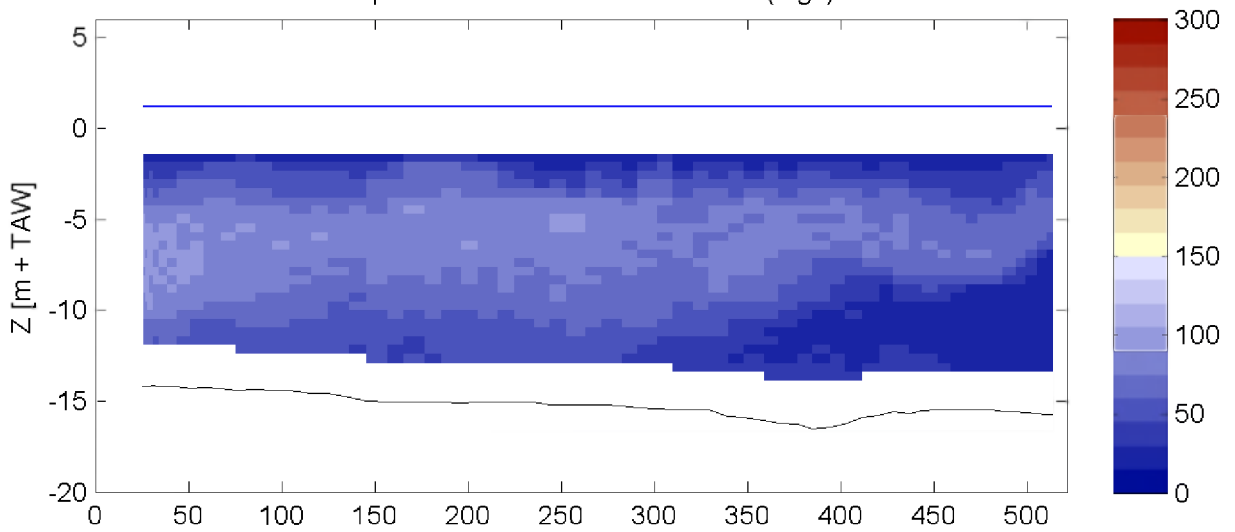
In association with :

I/RA/11283/06.110/BDC

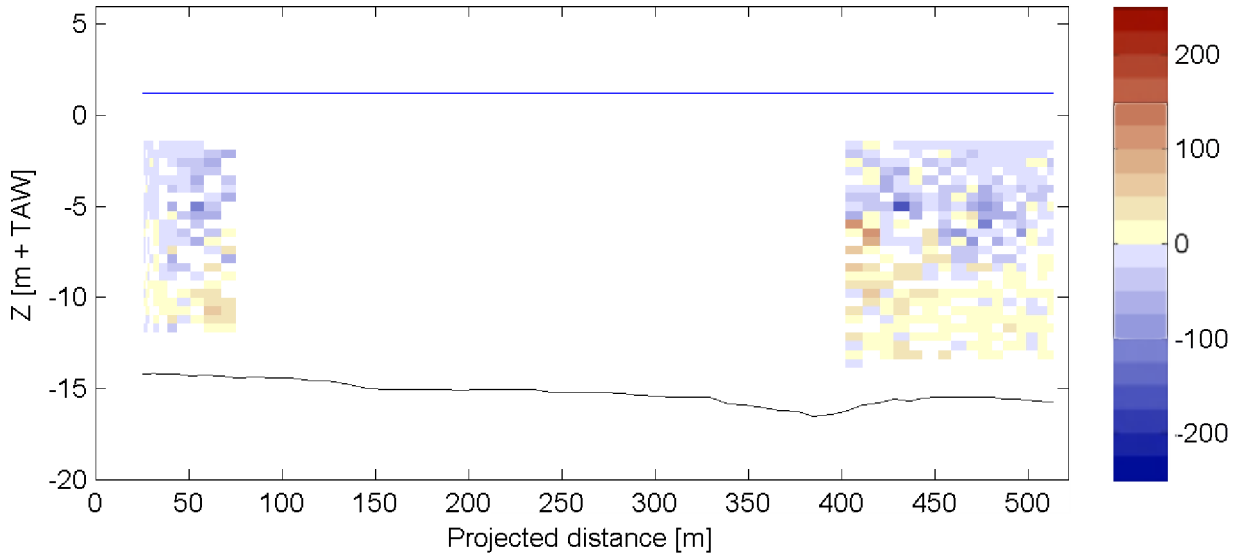
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2058DGDt000rbissub.csv	Location: Transect DGD

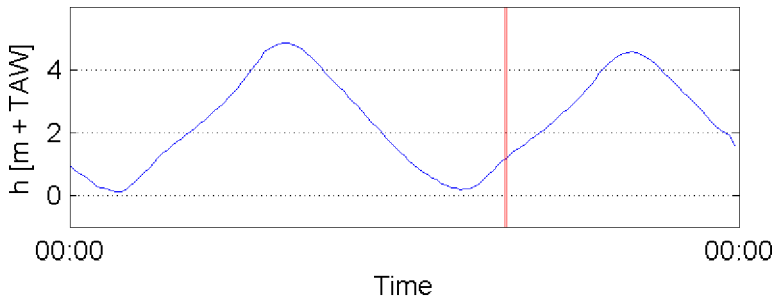
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

15:37:11 - 15:39:53

Data Processed by: IMDC

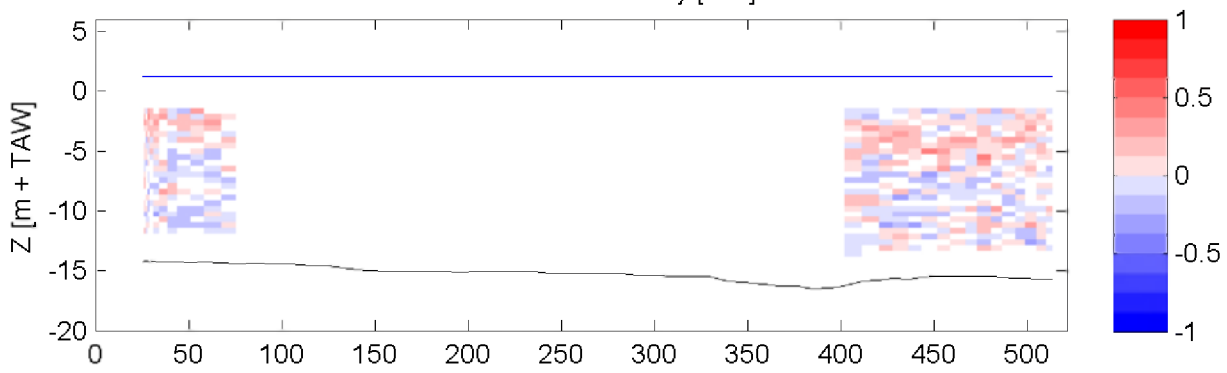
In association with :

I/RA/11283/06.110/BDC

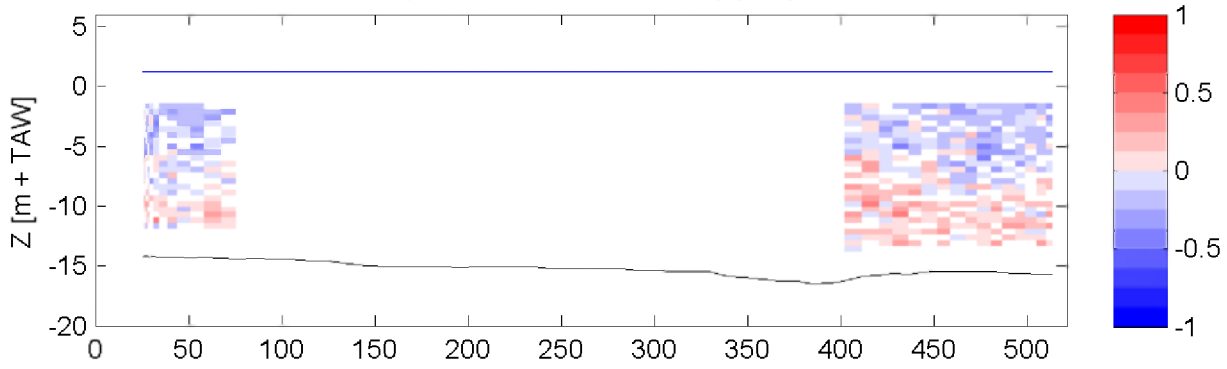
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2058DGDt000rbissub.csv	Location: Transect DGD

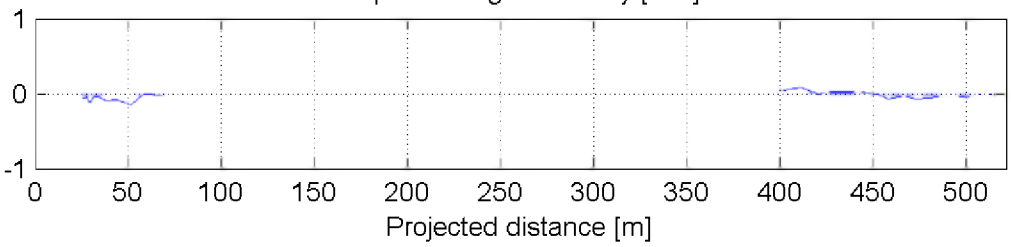
Parallel Current Velocity [m/s]



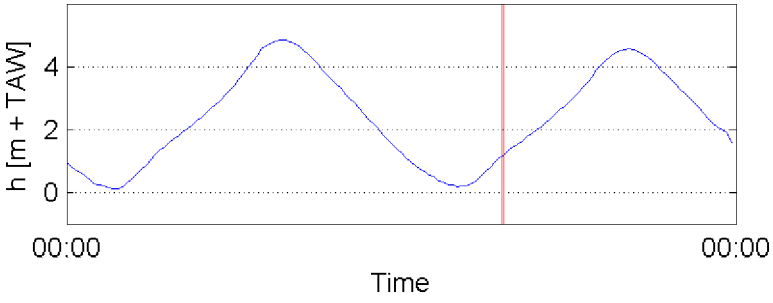
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

15:37:11 - 15:39:53

Data Processed by: IMDC

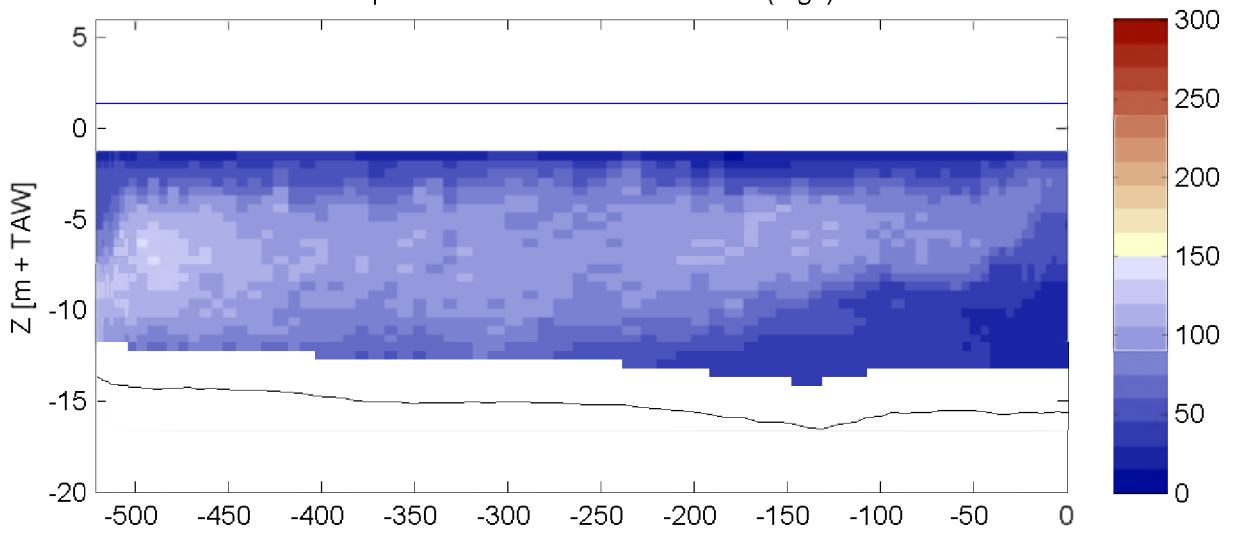
In association with :

I/RA/11283/06.110/BDC

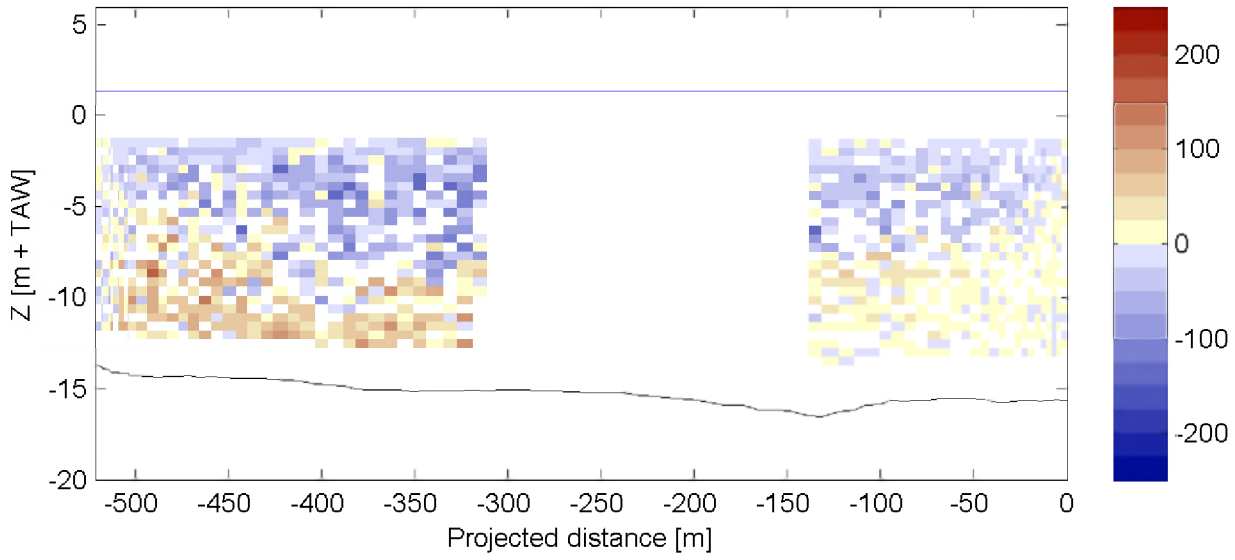
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2060DGDt000rbis.csv	Location: Transect DGD

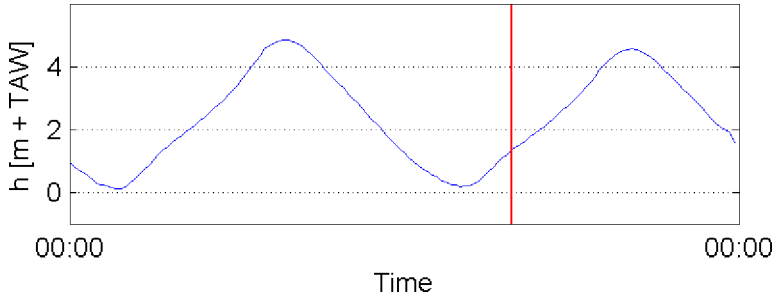
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

15:47:39 - 15:51:31

Data Processed by: IMDC

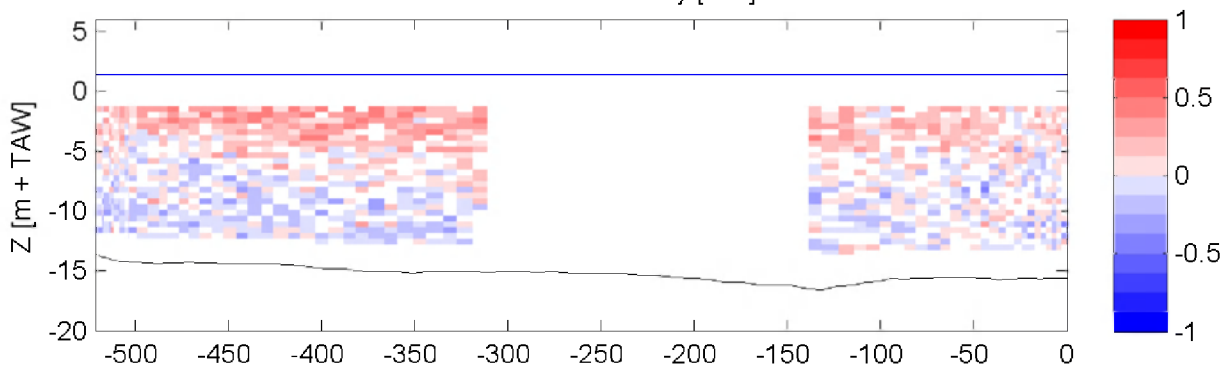
In association with :

I/RA/11283/06.110/BDC

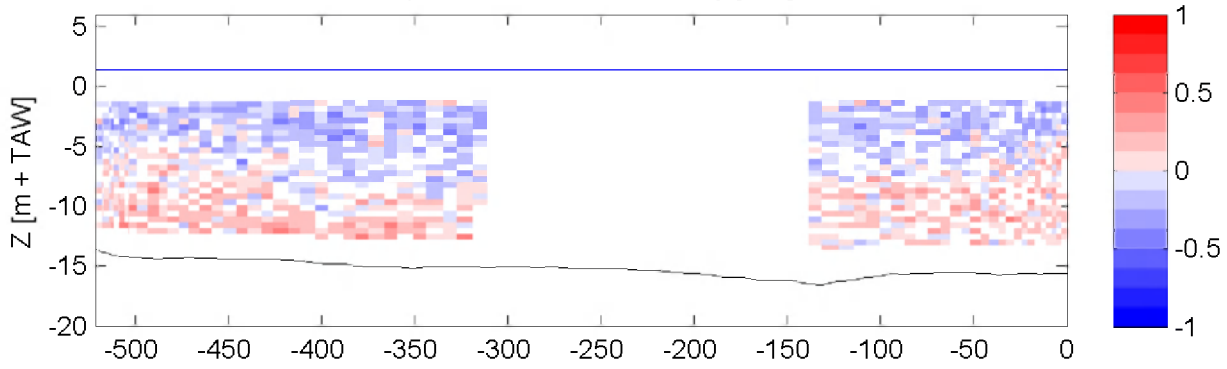
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2060DGDt000rbis.csv	Location: Transect DGD

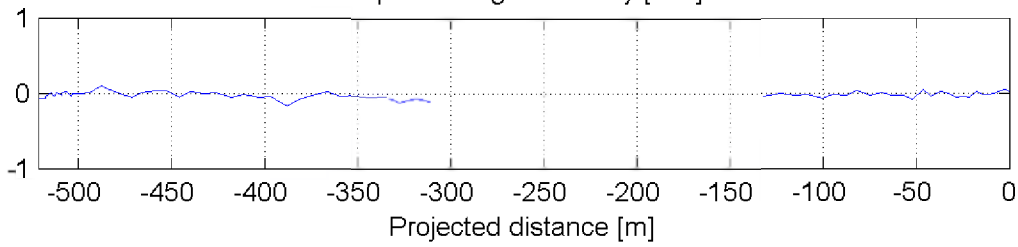
Parallel Current Velocity [m/s]



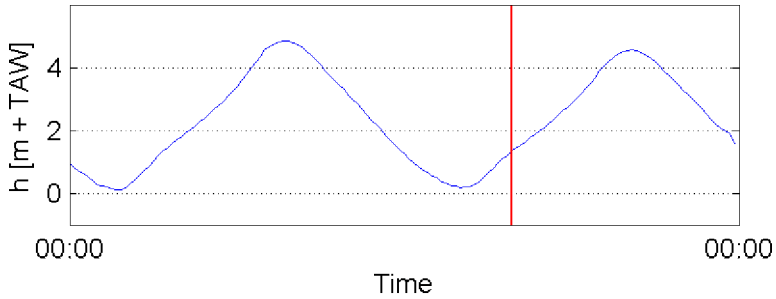
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

15:47:39 - 15:51:31

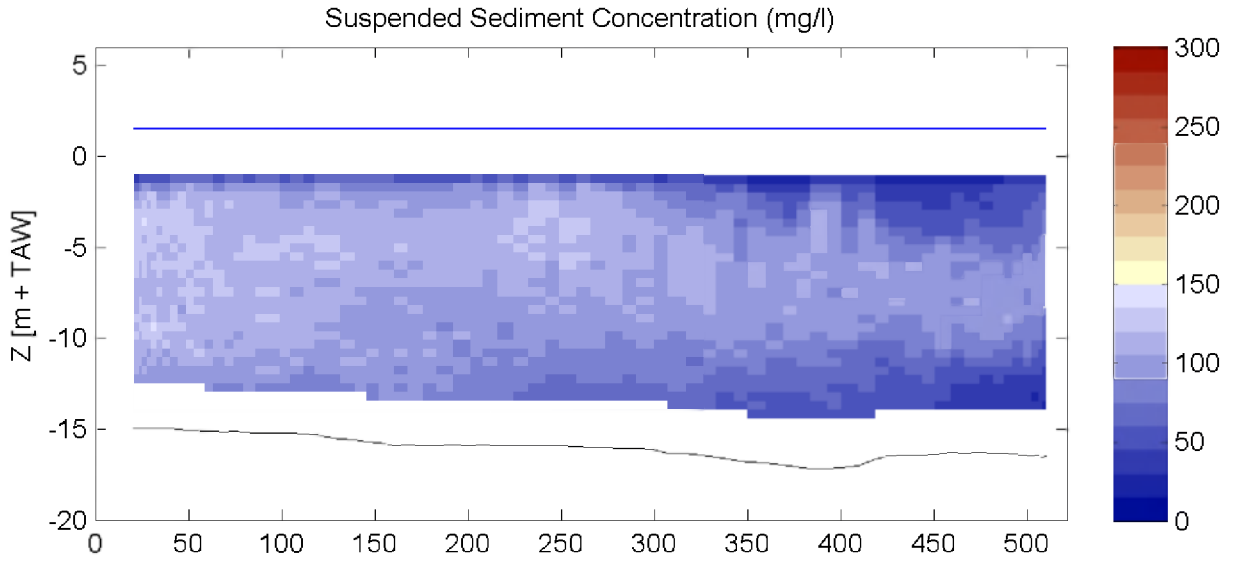
Data Processed by: IMDC

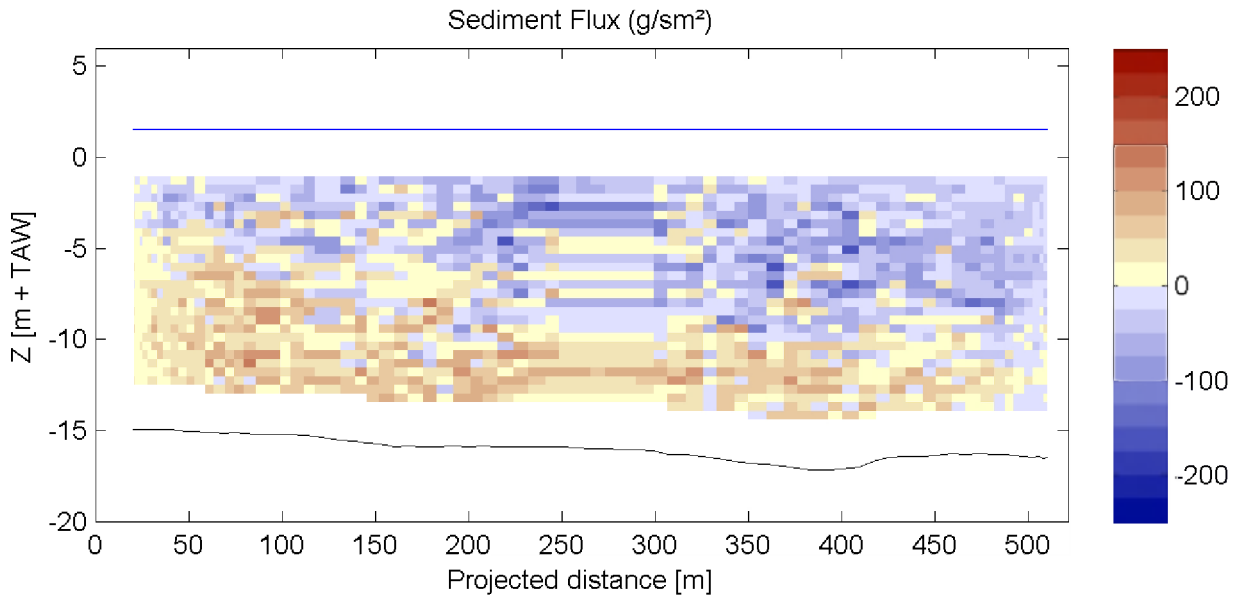
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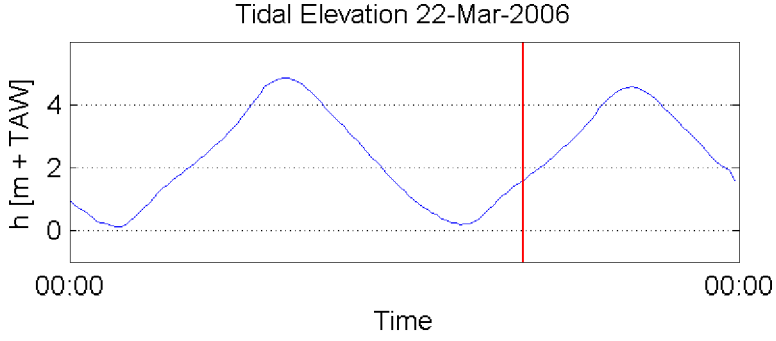
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2062DGDt000rsub.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

16:12:28 - 16:15:53

Data Processed by: IMDC

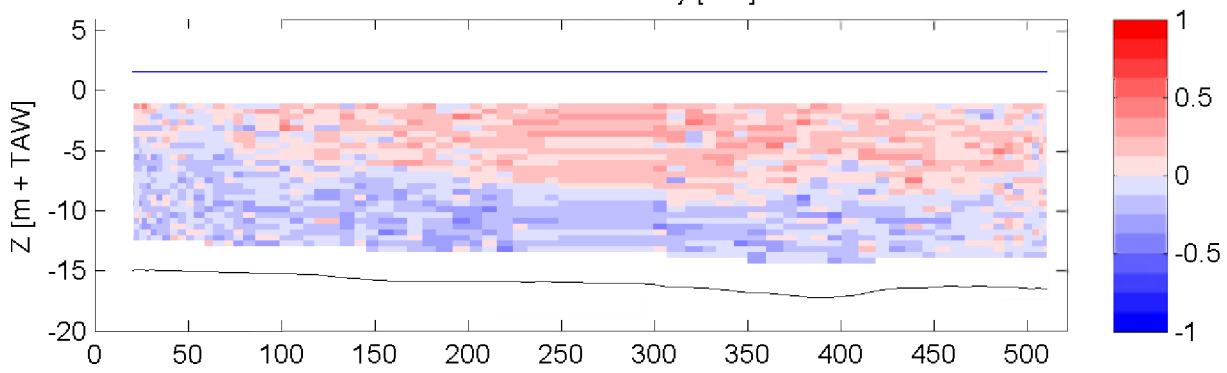
In association with :

I/RA/11283/06.110/BDC

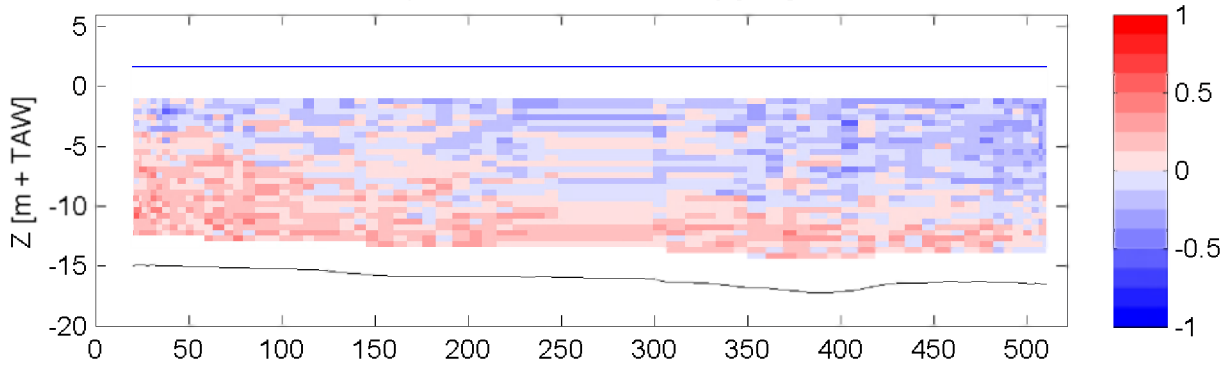
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2062DGDt000rsub.csv	Location: Transect DGD

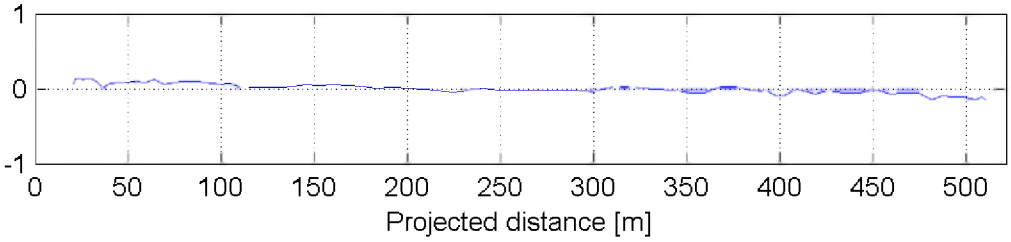
Parallel Current Velocity [m/s]



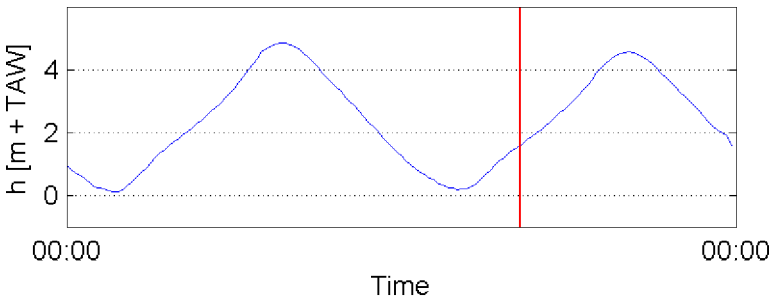
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

16:12:28 - 16:15:53

Data Processed by: IMDC

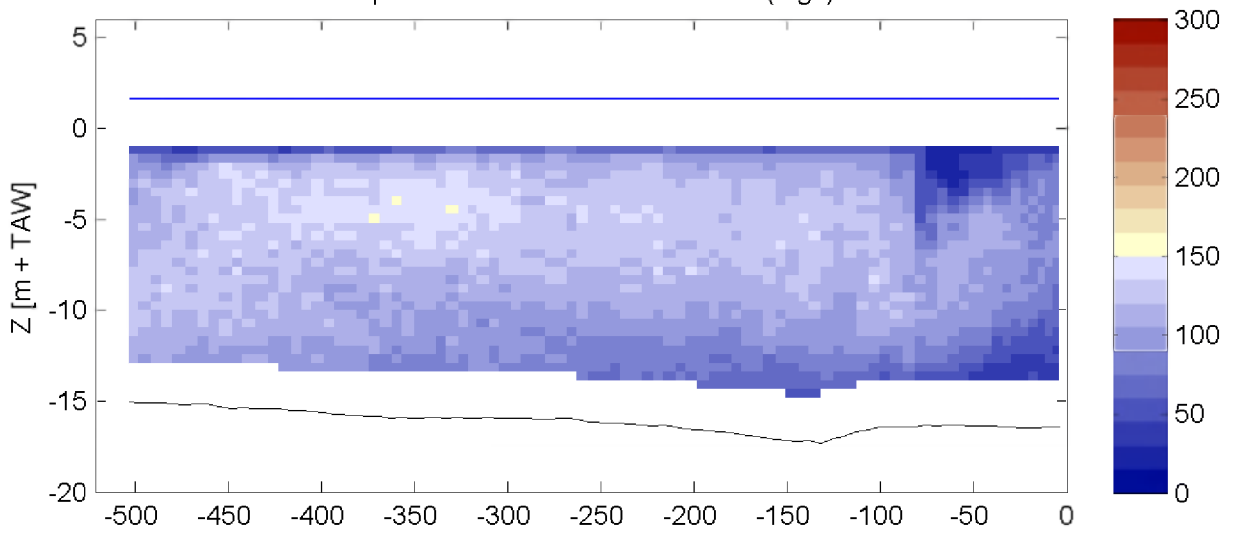
In association with :

I/RA/11283/06.110/BDC

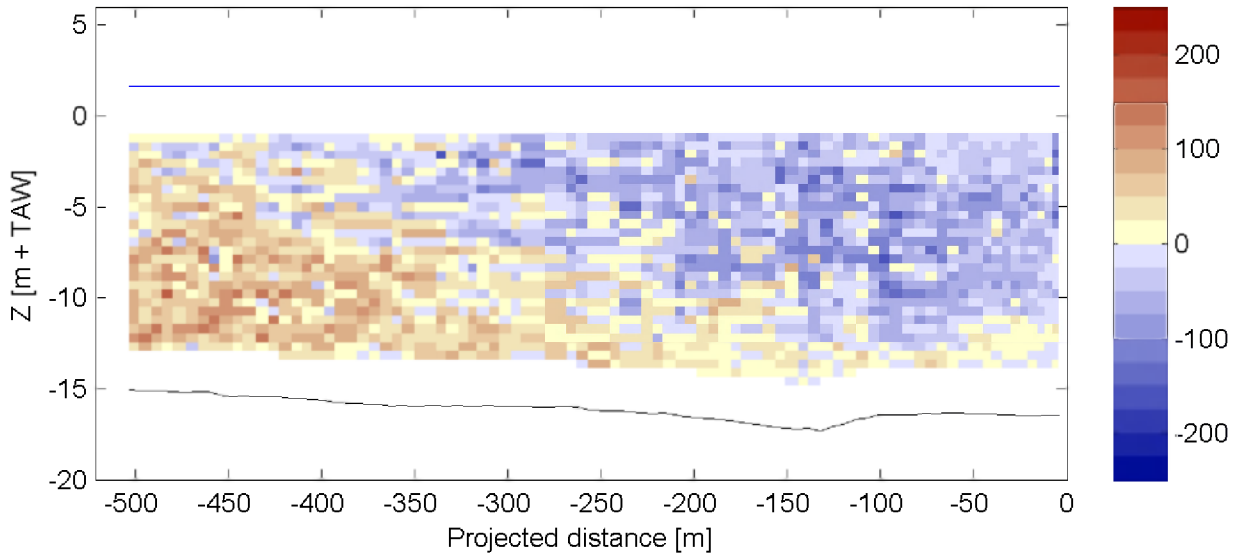
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2064DGDt000rsub.csv	Location: Transect DGD

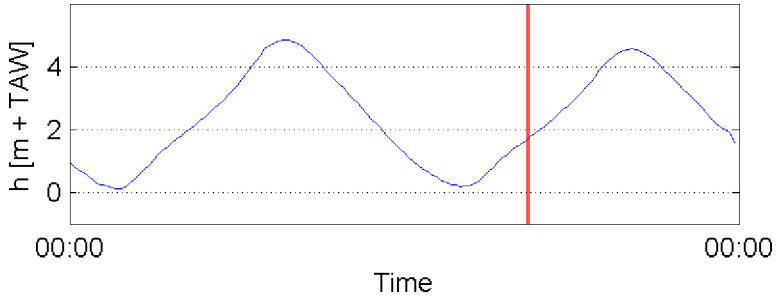
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

16:24:16 - 16:28:03

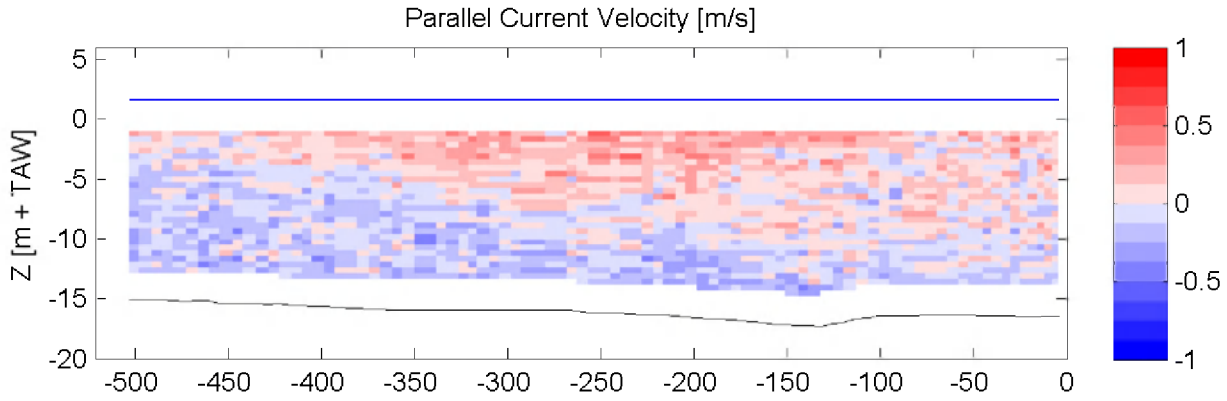
Data Processed by: IMDC

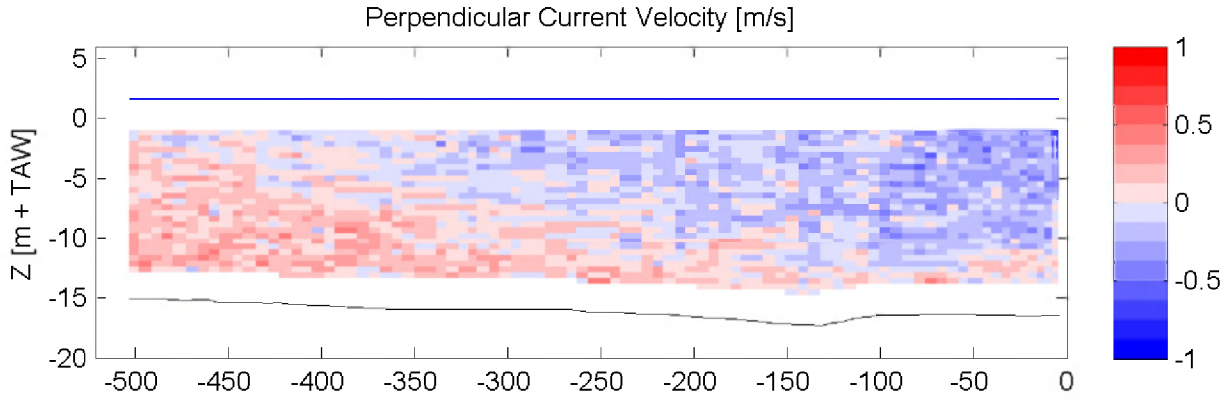
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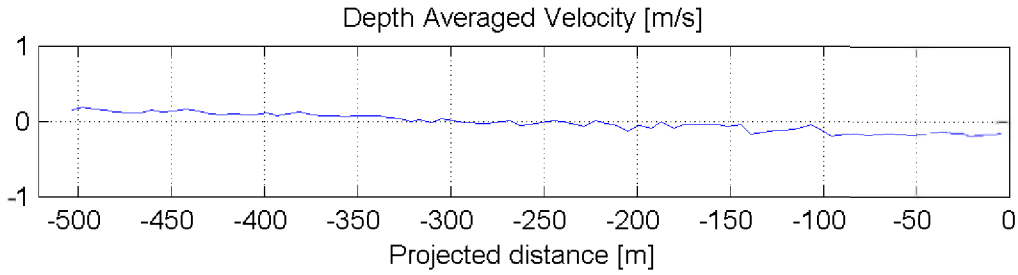
I/RA/11283/06.110/BDC

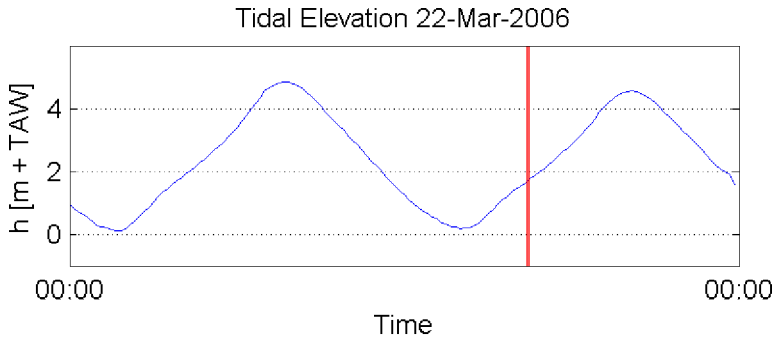
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2064DGDt000rsub.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

16:24:16 - 16:28:03

Data Processed by: IMDC

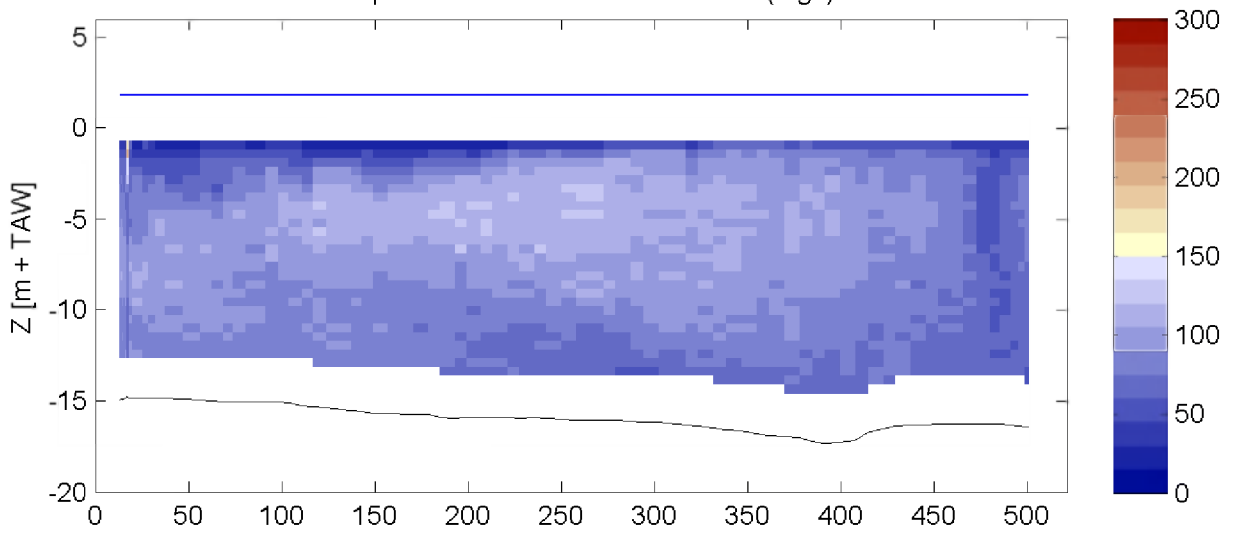
In association with :

I/RA/11283/06.110/BDC

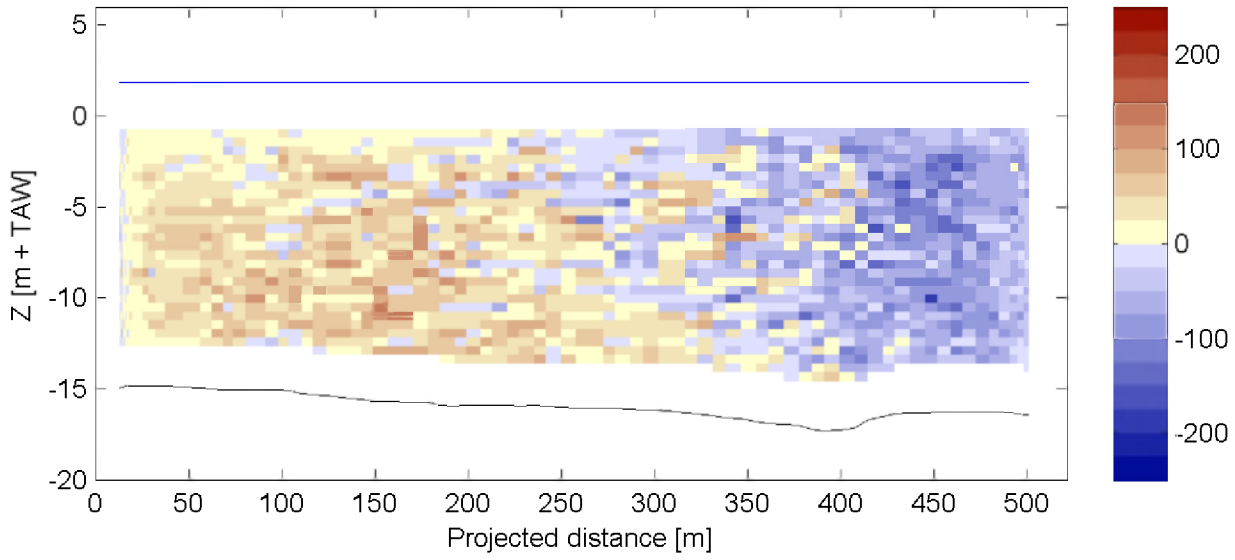
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2066DGDt000r.csv	Location: Transect DGD

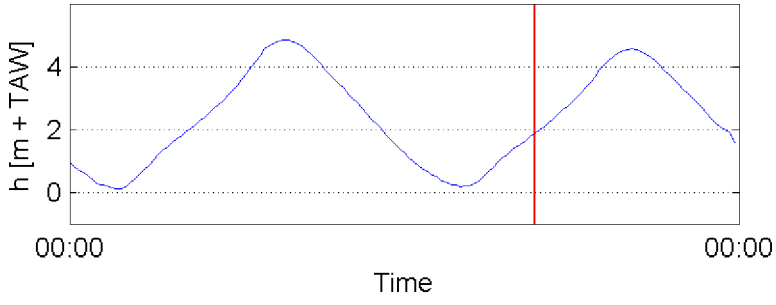
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

16:37:16 - 16:41:00

Data Processed by: IMDC

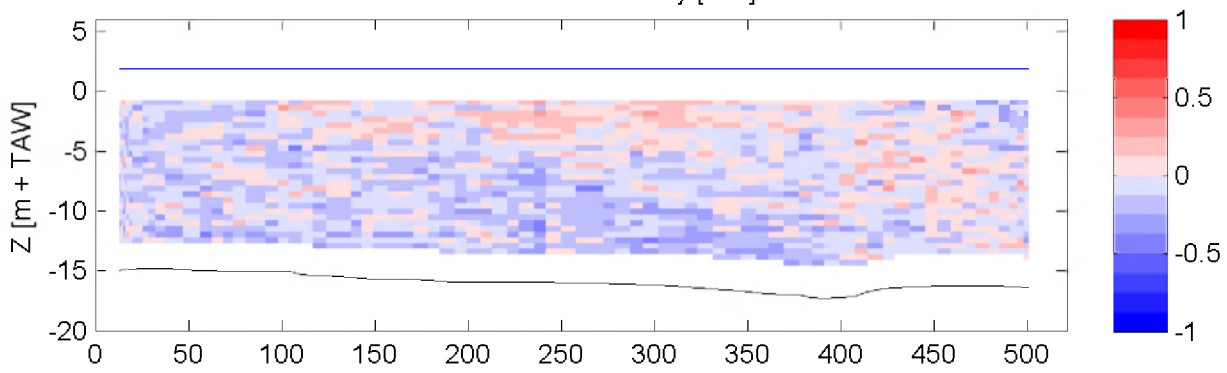
In association with :

I/RA/11283/06.110/BDC

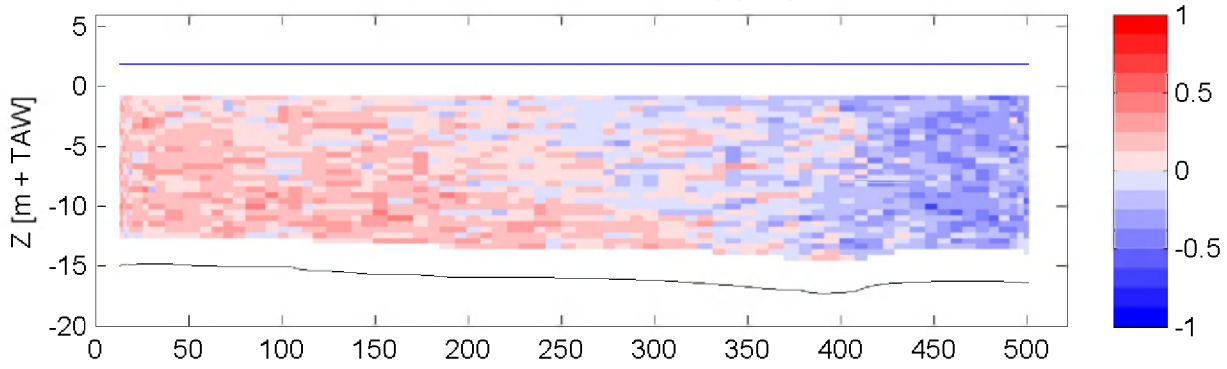
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2066DGDt000r.csv	Location: Transect DGD

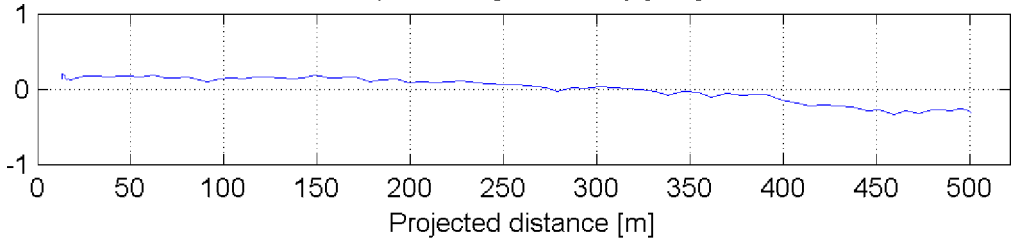
Parallel Current Velocity [m/s]



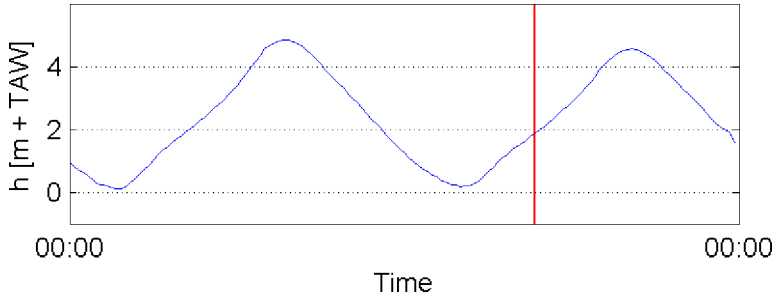
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

16:37:16 - 16:41:00

Data Processed by: IMDC

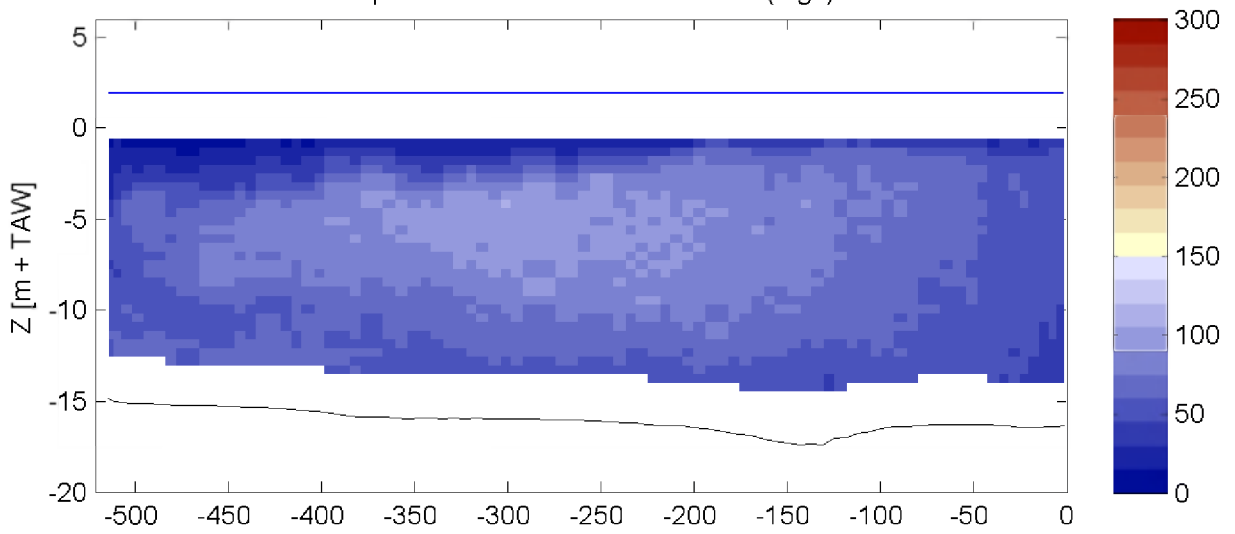
In association with :

I/RA/11283/06.110/BDC

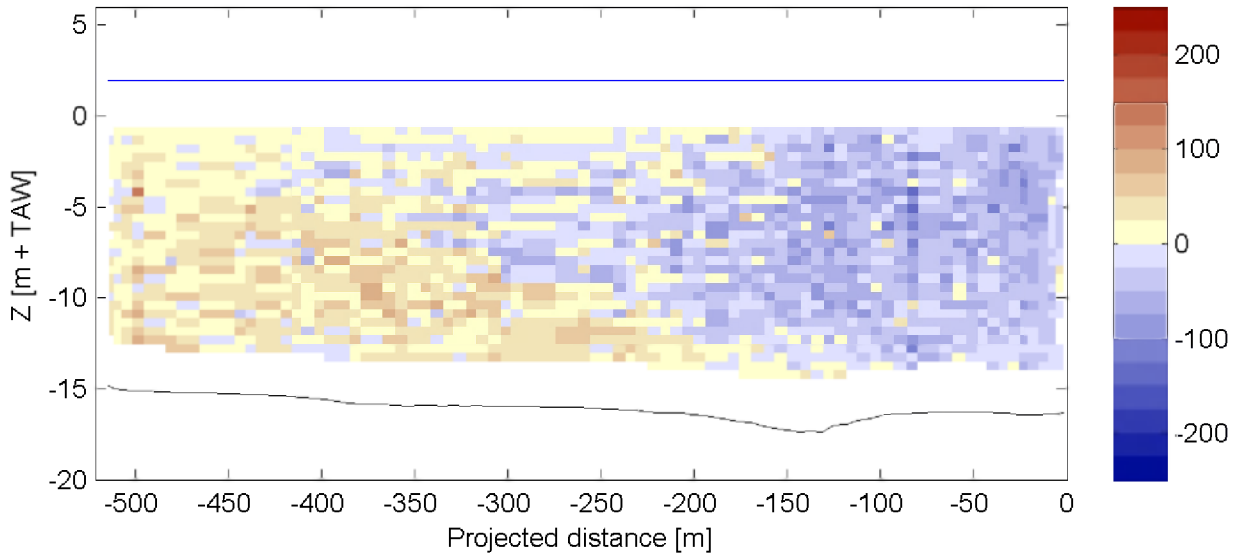
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2068DGDt000rsub.csv	Location: Transect DGD

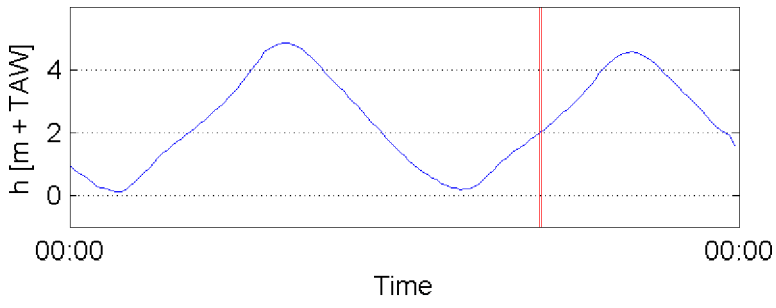
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

16:50:38 - 16:54:27

Data Processed by: IMDC

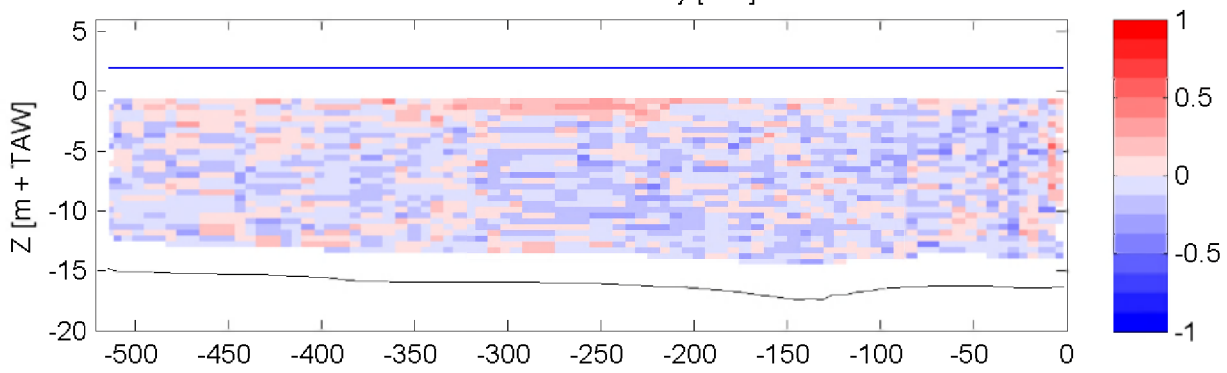
In association with :

I/RA/11283/06.110/BDC

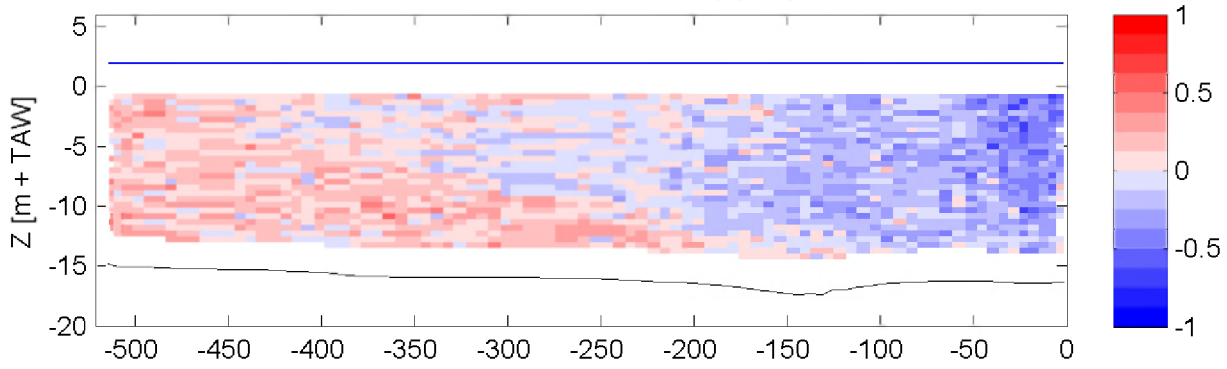
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2068DGDt000rsub.csv	Location: Transect DGD

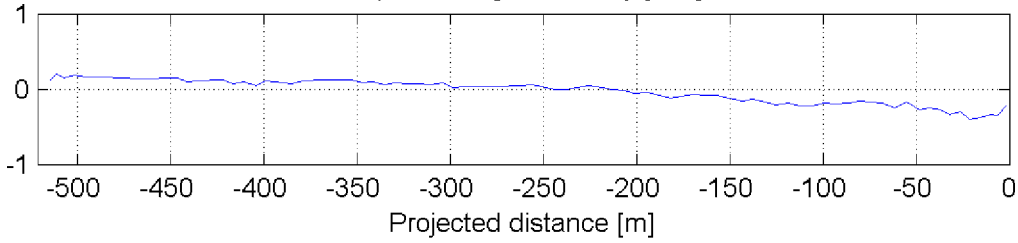
Parallel Current Velocity [m/s]



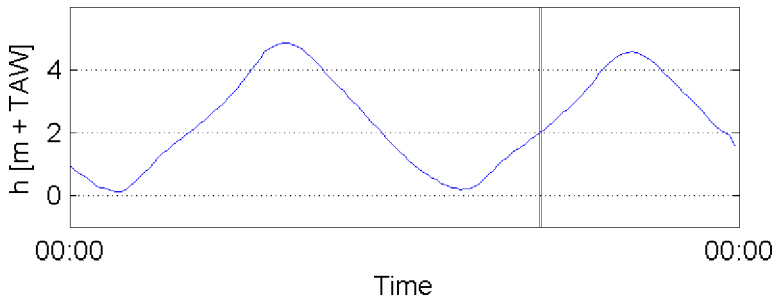
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

16:50:38 - 16:54:27

Data Processed by: IMDC

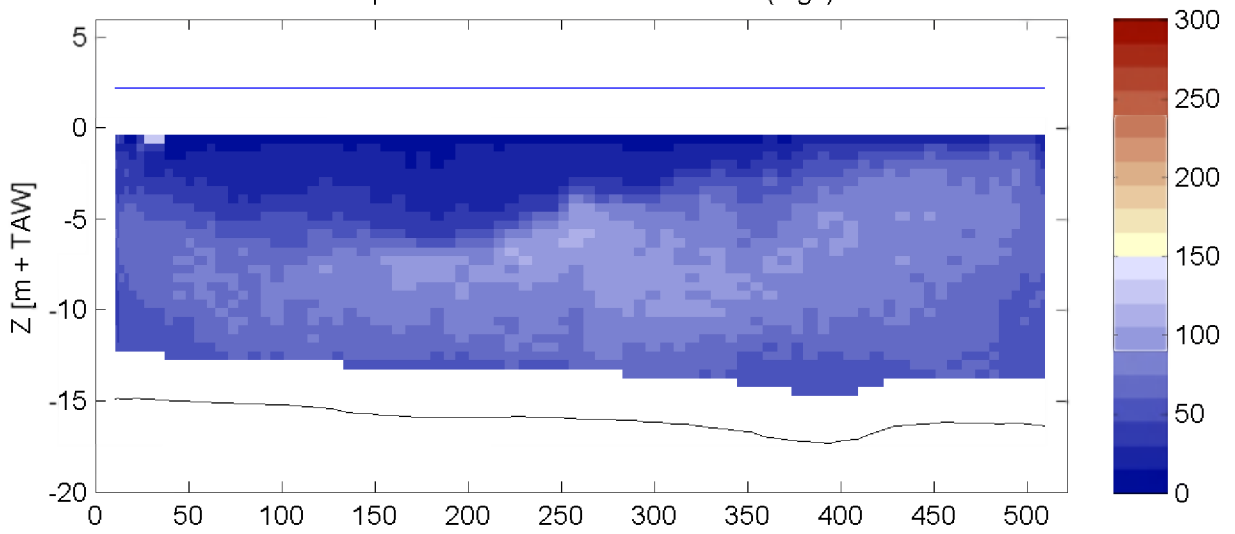
In association with :

I/RA/11283/06.110/BDC

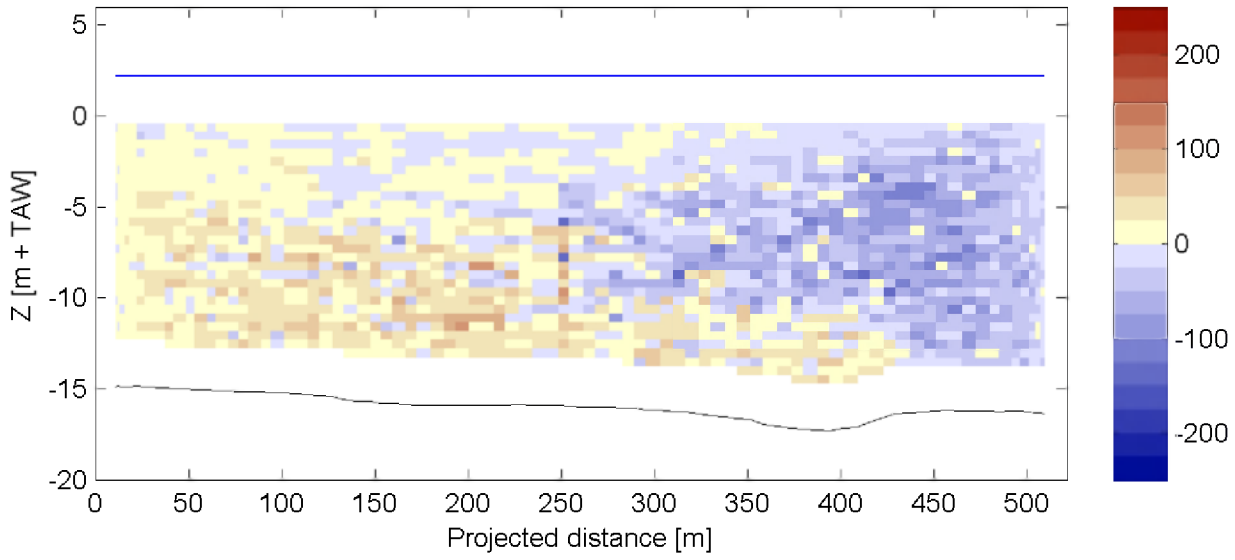
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2070DGDt000rsub.csv	Location: Transect DGD

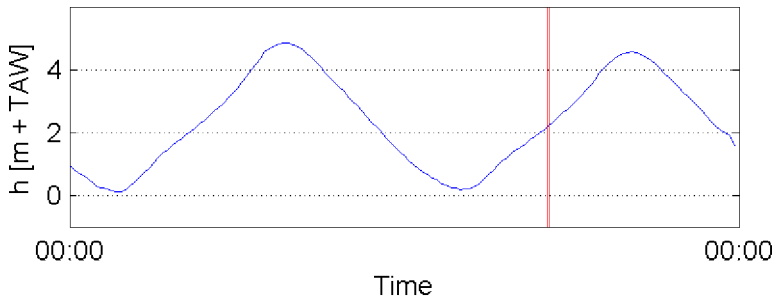
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

17:07:25 - 17:11:05

Data Processed by: IMDC

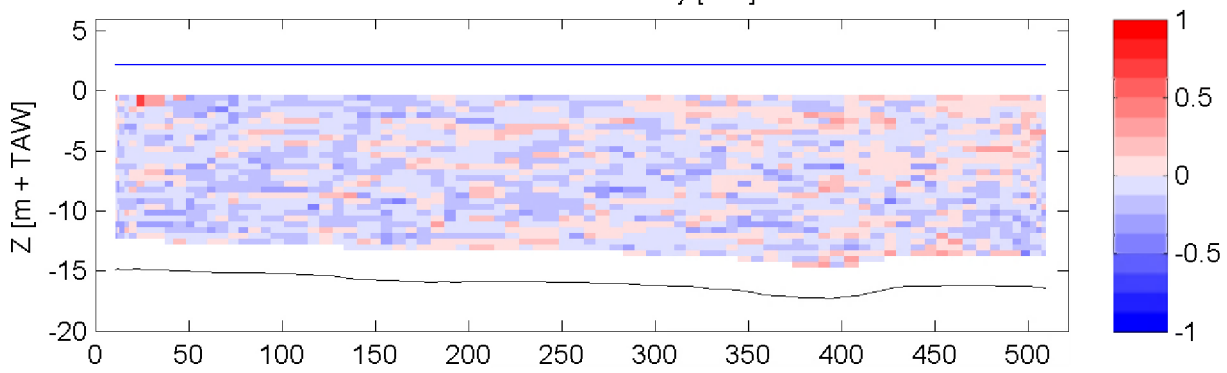
In association with :

I/RA/11283/06.110/BDC

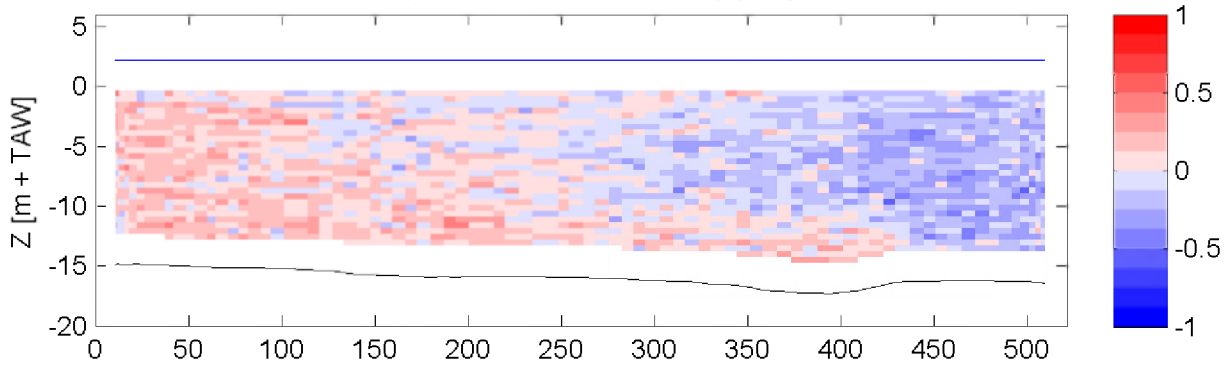
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2070DGDt000rsub.csv	Location: Transect DGD

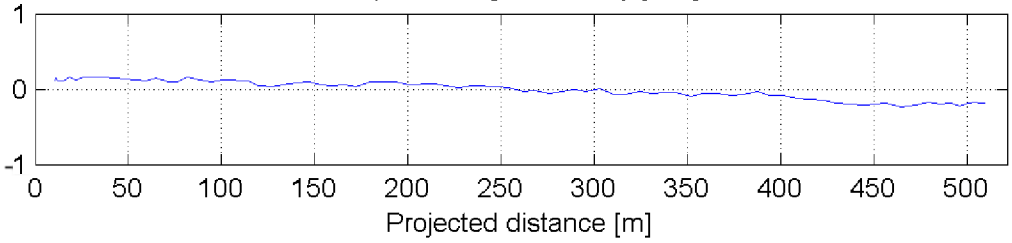
Parallel Current Velocity [m/s]



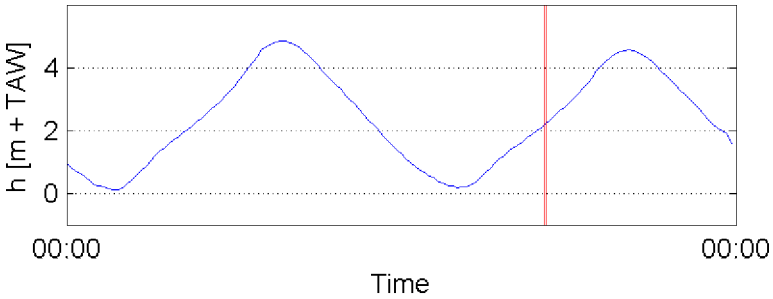
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

17:07:25 - 17:11:05

Data Processed by: IMDC

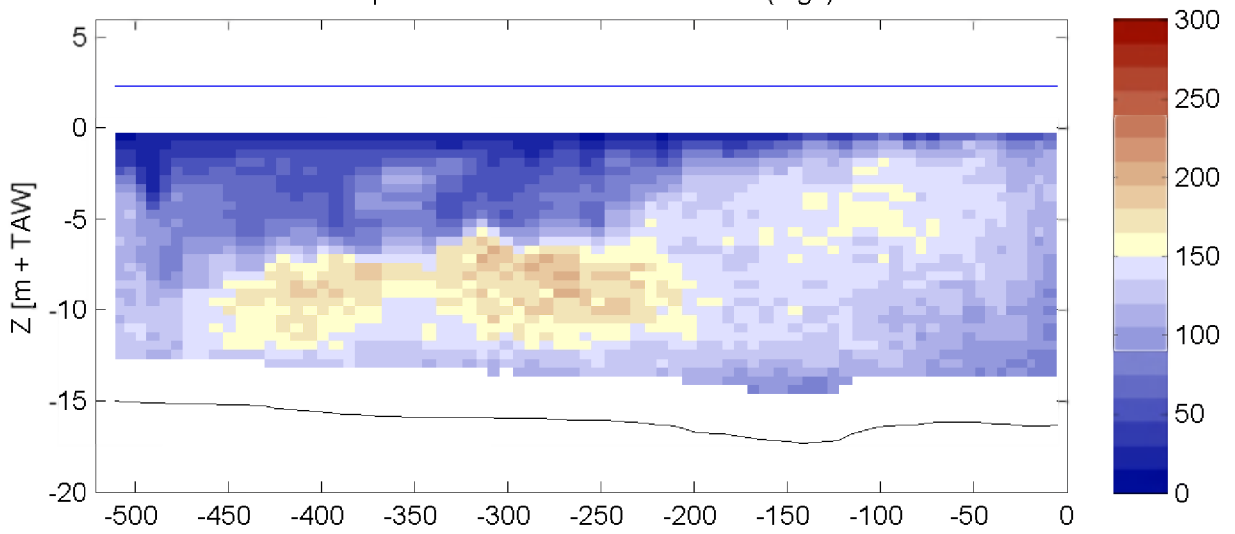
In association with :

I/RA/11283/06.110/BDC

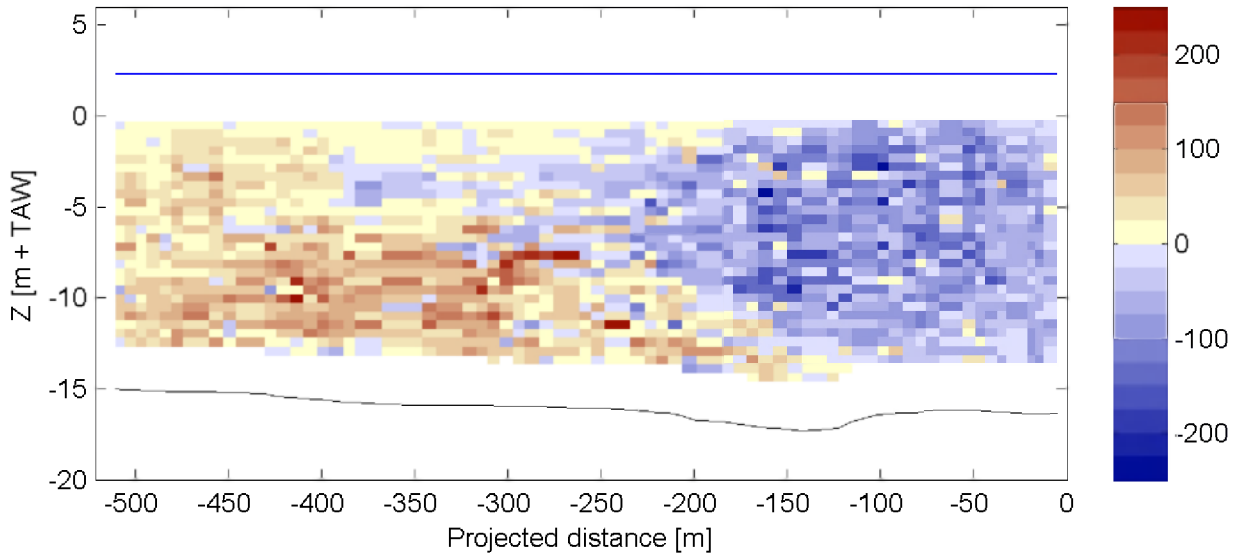
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2072DGDt000rsub.csv	Location: Transect DGD

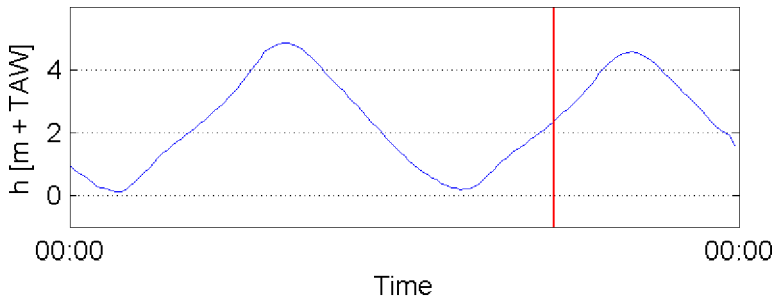
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

17:19:00 - 17:22:24

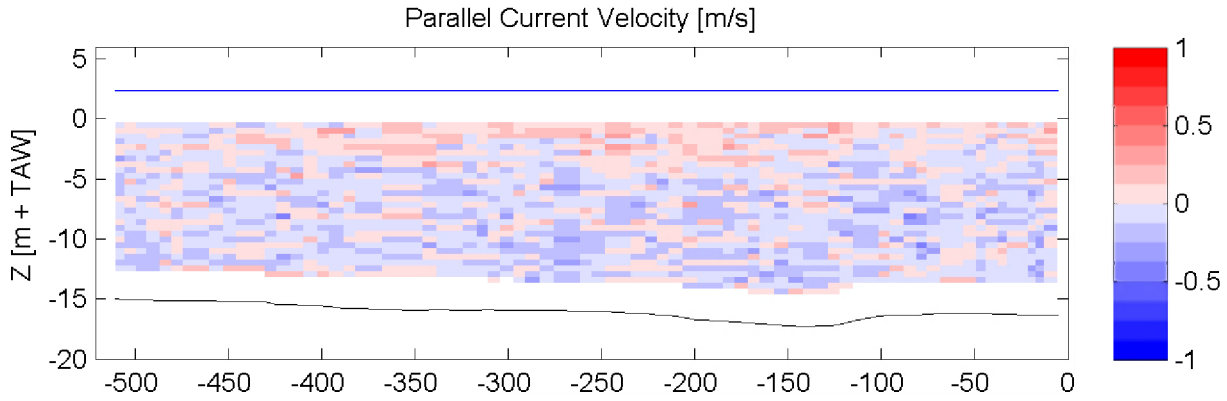
Data Processed by: IMDC

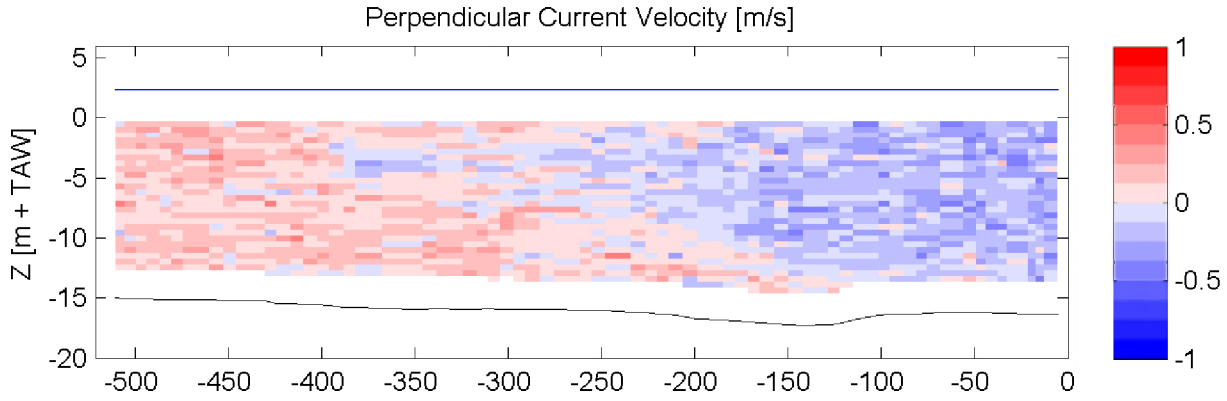
In association with :

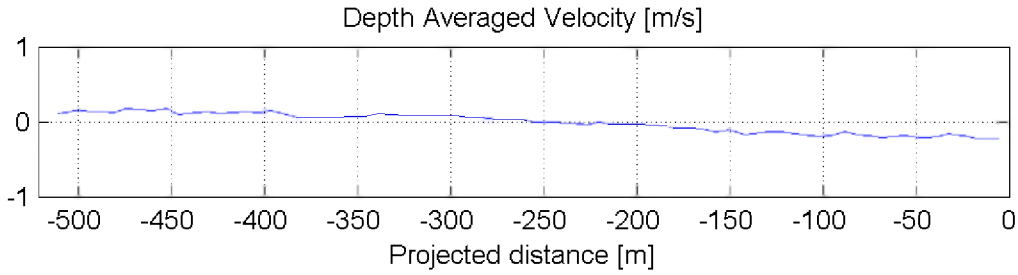
I/RA/11283/06.110/BDC

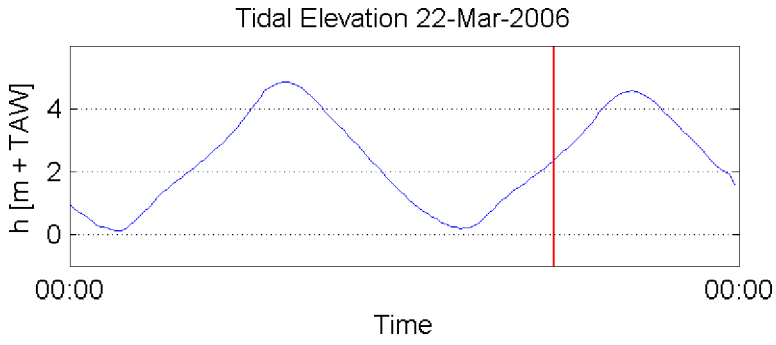
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2072DGDt000rsub.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

17:19:00 - 17:22:24

Data Processed by: IMDC

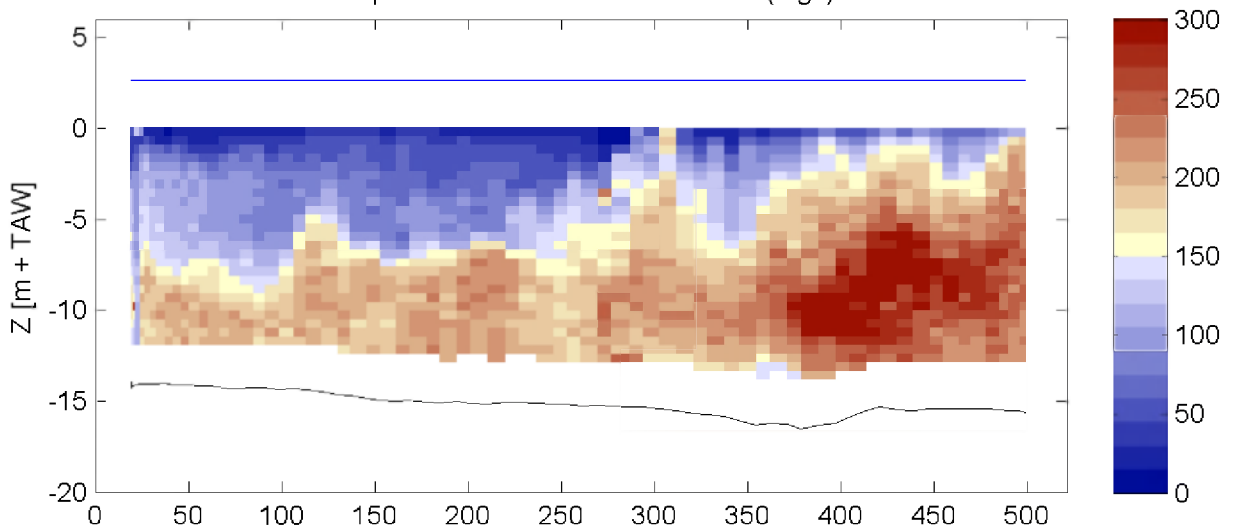
In association with :

I/RA/11283/06.110/BDC

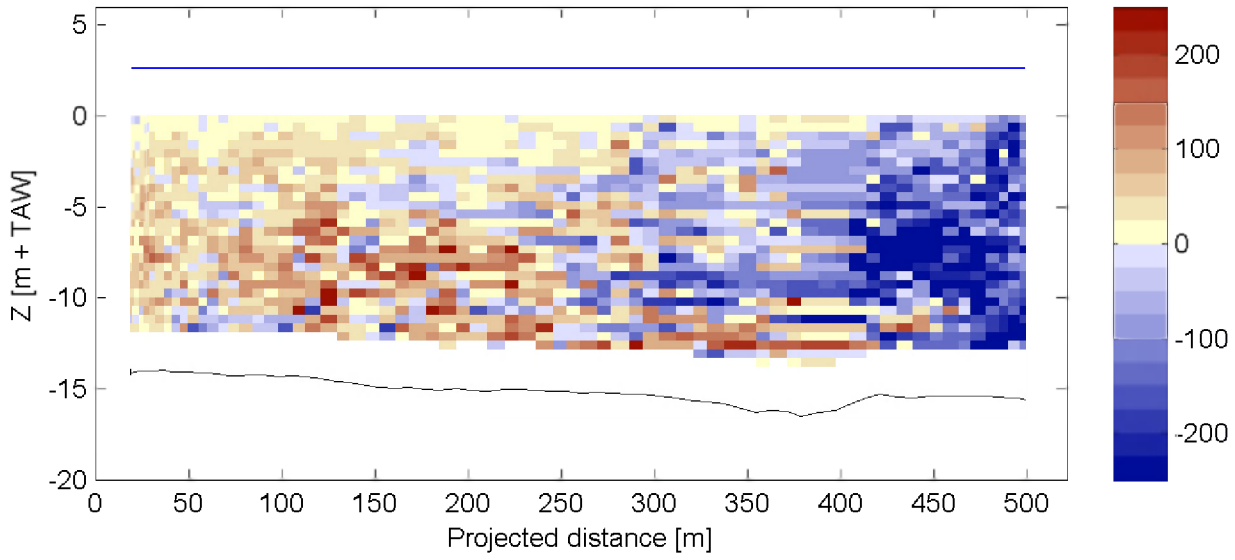
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2074DGDt000rbis.csv	Location: Transect DGD

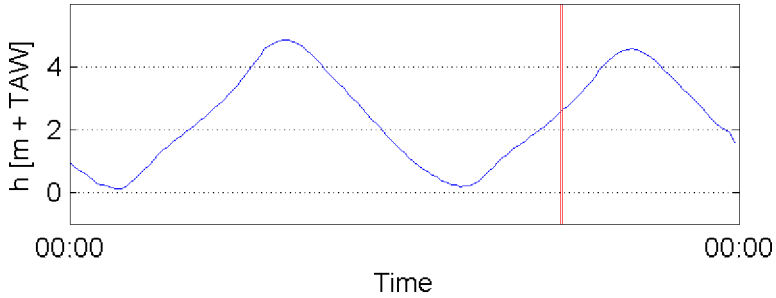
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

17:36:23 - 17:39:31

Data Processed by: IMDC

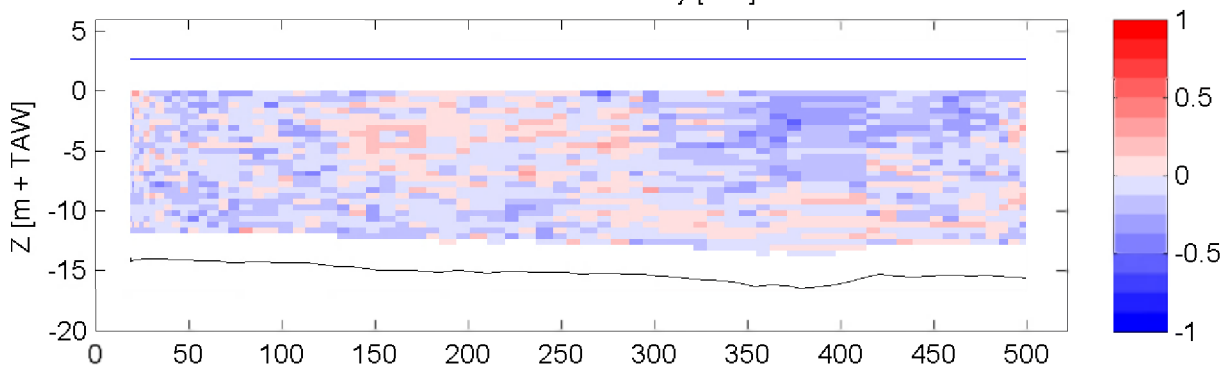
In association with :

I/RA/11283/06.110/BDC

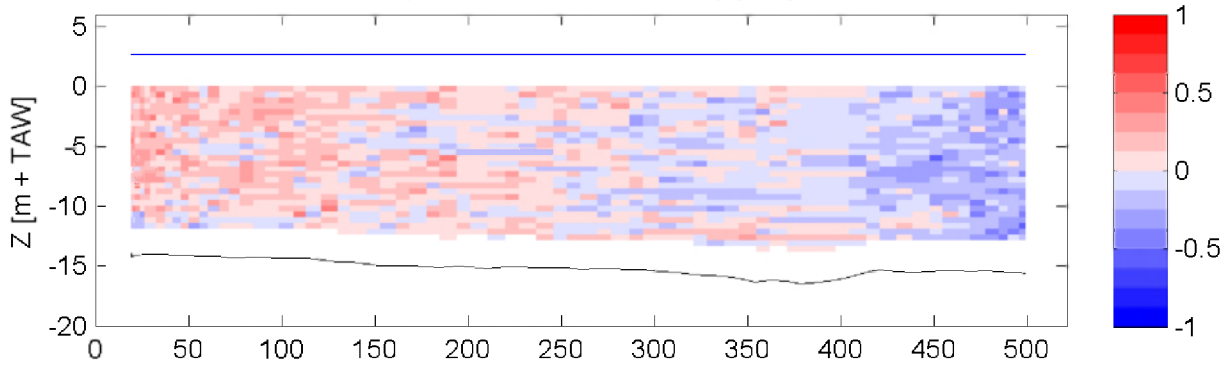
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2074DGDt000rbis.csv	Location: Transect DGD

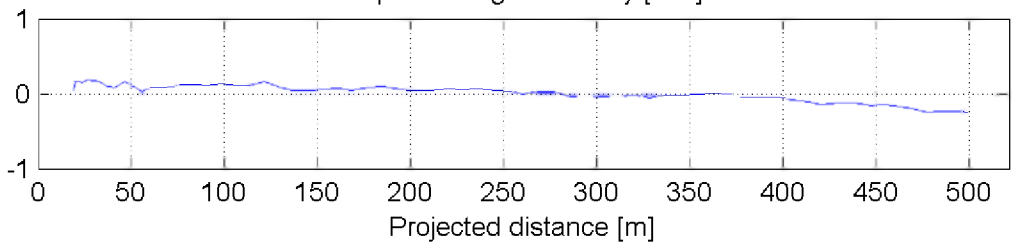
Parallel Current Velocity [m/s]



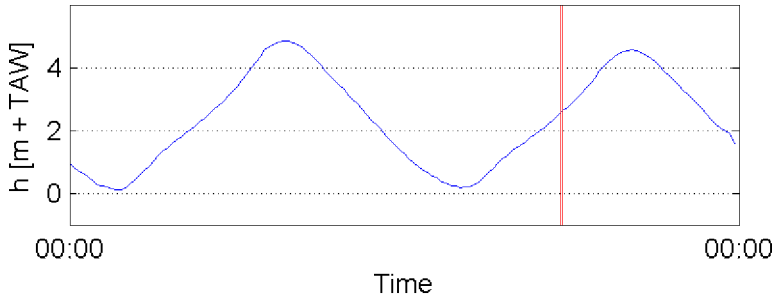
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

17:36:23 - 17:39:31

Data Processed by: IMDC

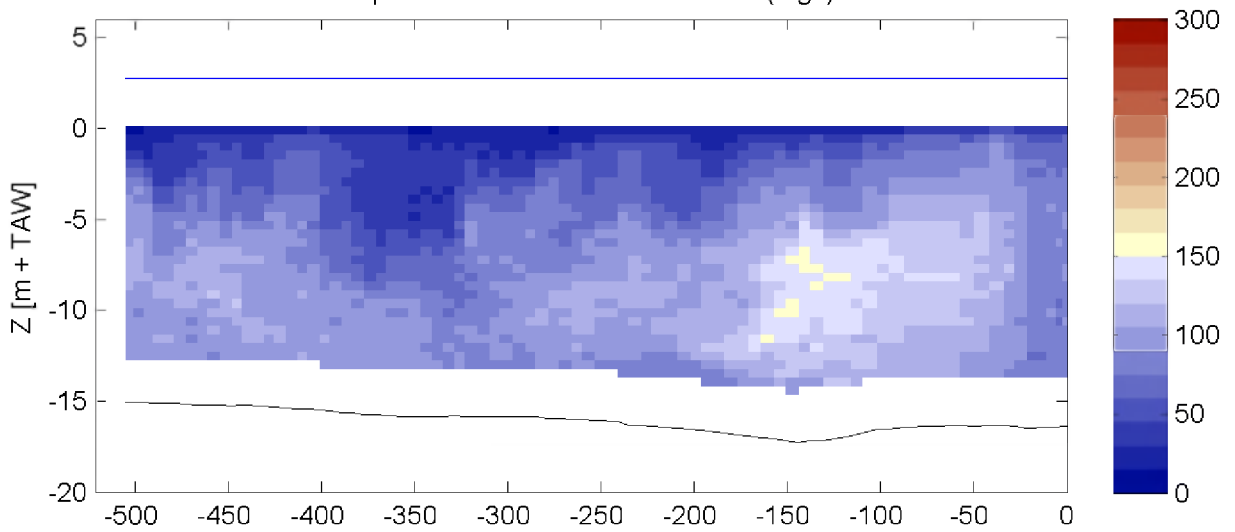
In association with :

I/RA/11283/06.110/BDC

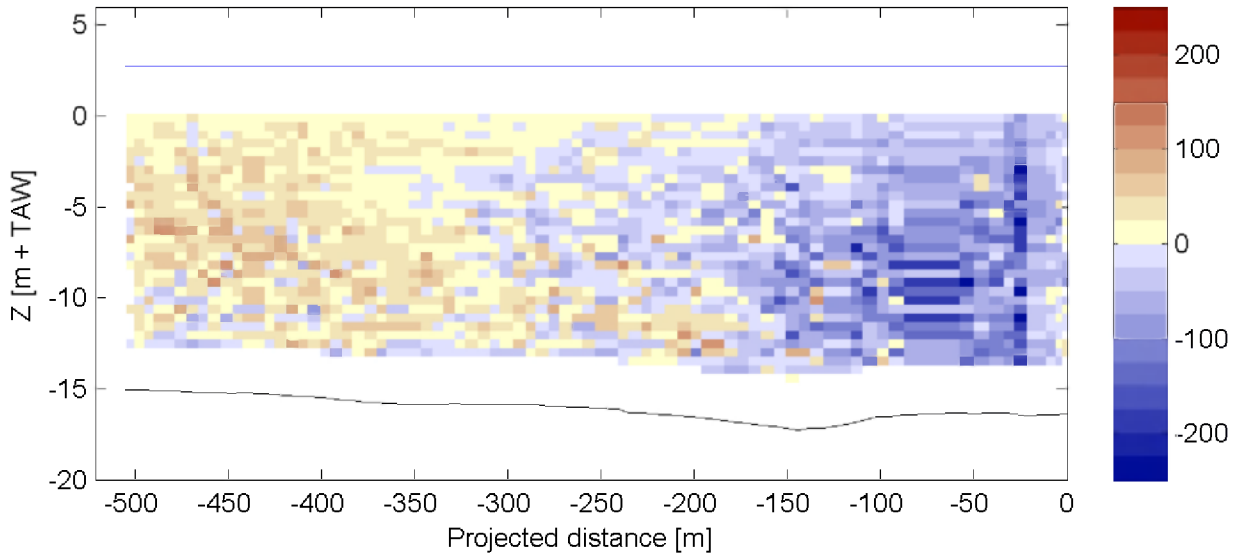
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2076DGDt000rsub.csv	Location: Transect DGD

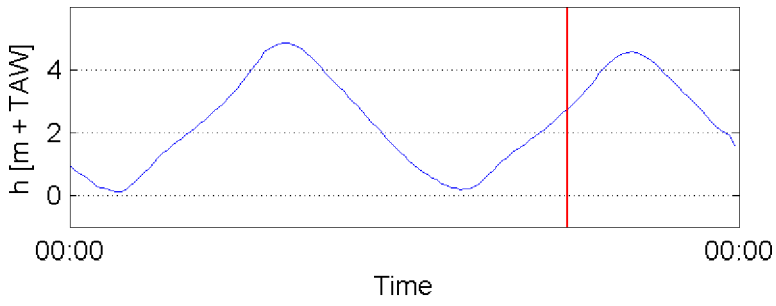
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

17:47:57 - 17:51:42

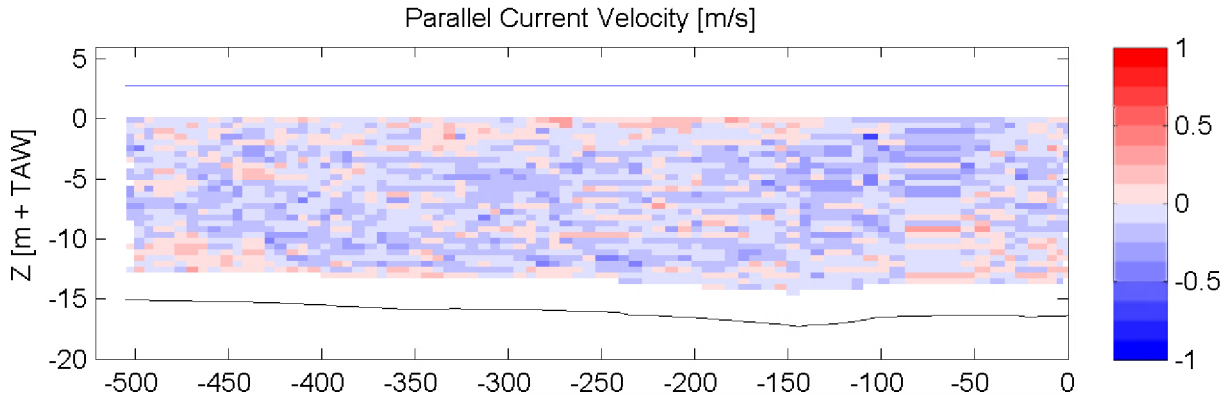
Data Processed by: IMDC

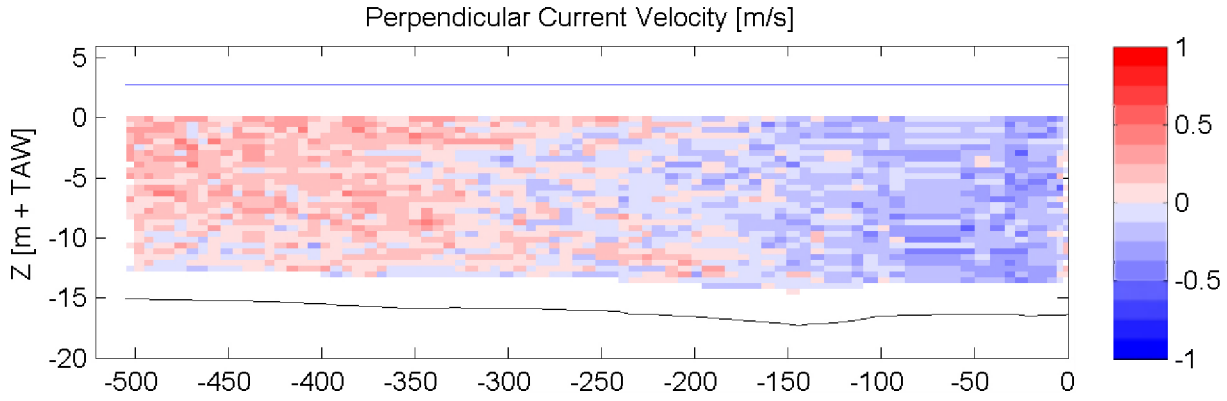
In association with :

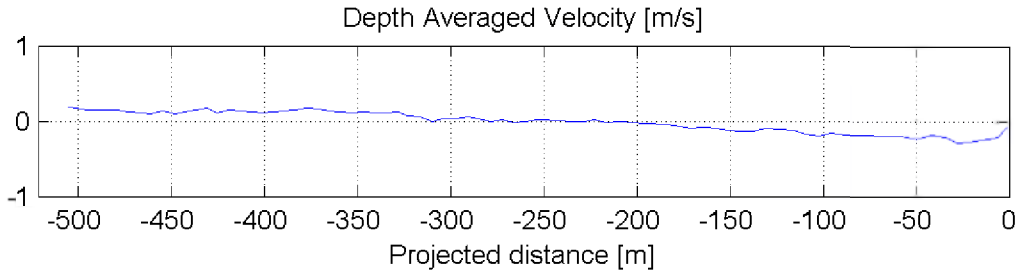
I/RA/11283/06.110/BDC

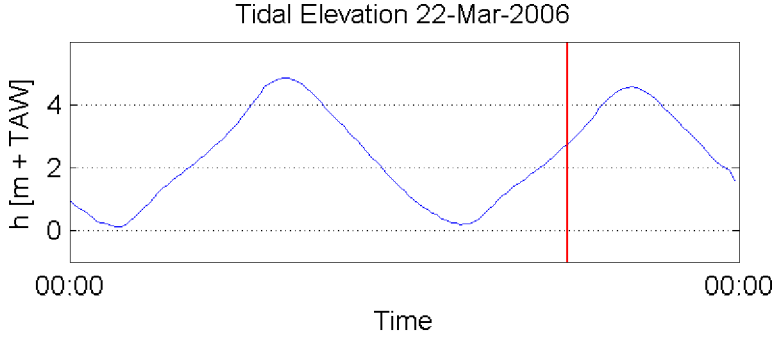
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2076DGDt000rsub.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

17:47:57 - 17:51:42

Data Processed by: IMDC

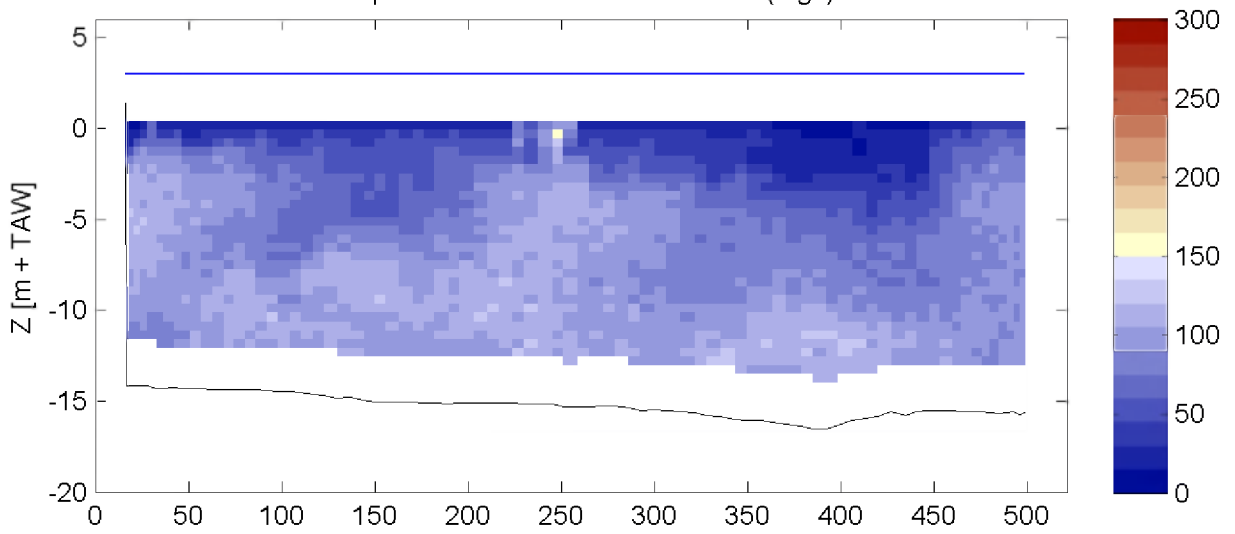
In association with :

I/RA/11283/06.110/BDC

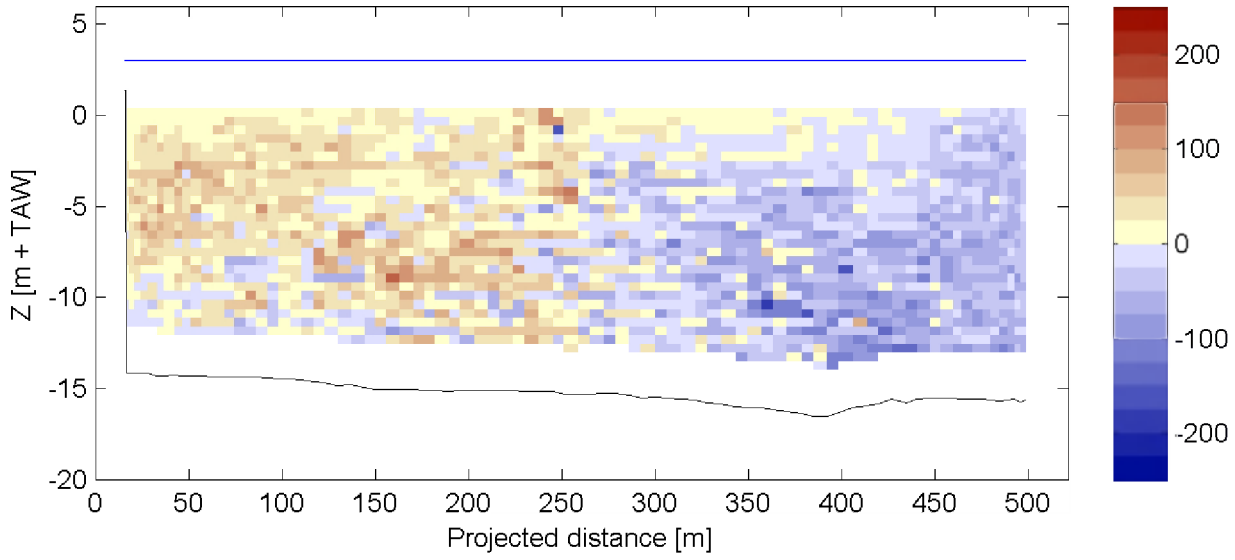
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2078DGDt000rbissub.csv	Location: Transect DGD

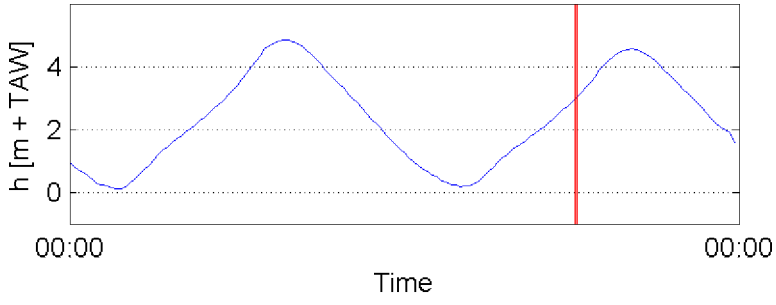
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

18:07:23 - 18:11:02

Data Processed by: IMDC

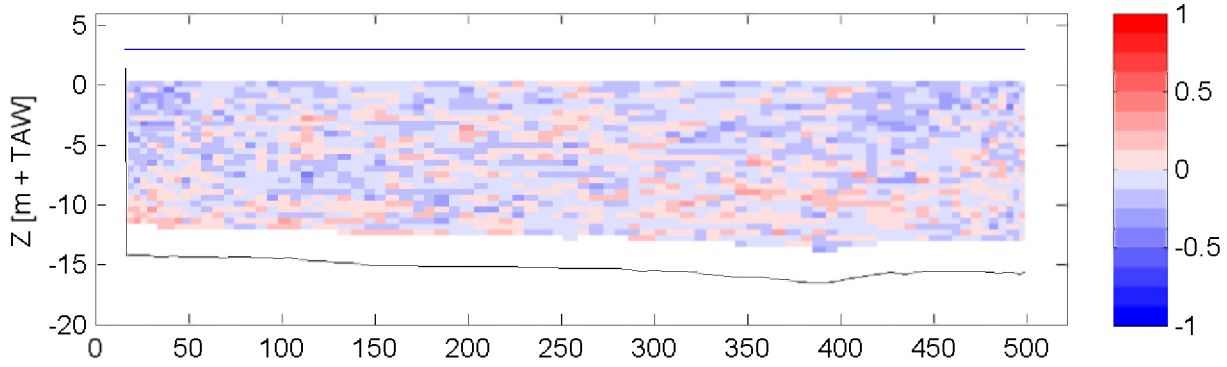
In association with :

I/RA/11283/06.110/BDC

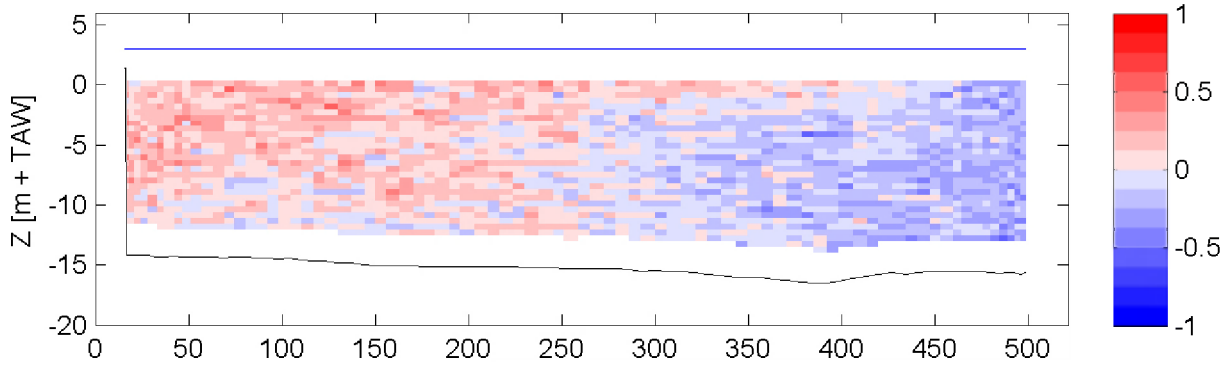
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2078DGDt000rbissub.csv	Location: Transect DGD

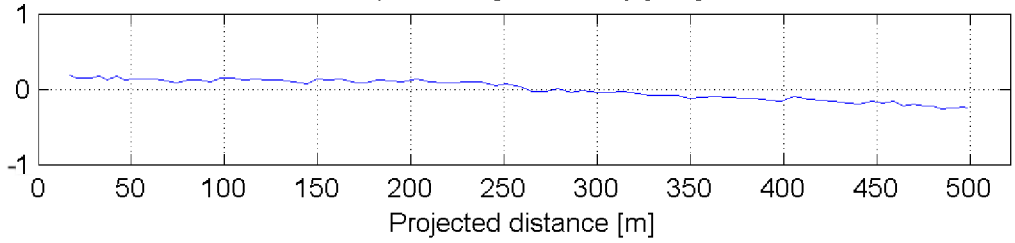
Parallel Current Velocity [m/s]



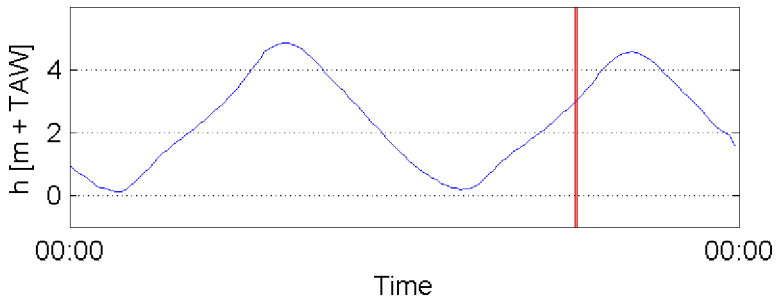
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

18:07:23 - 18:11:02

Data Processed by: IMDC

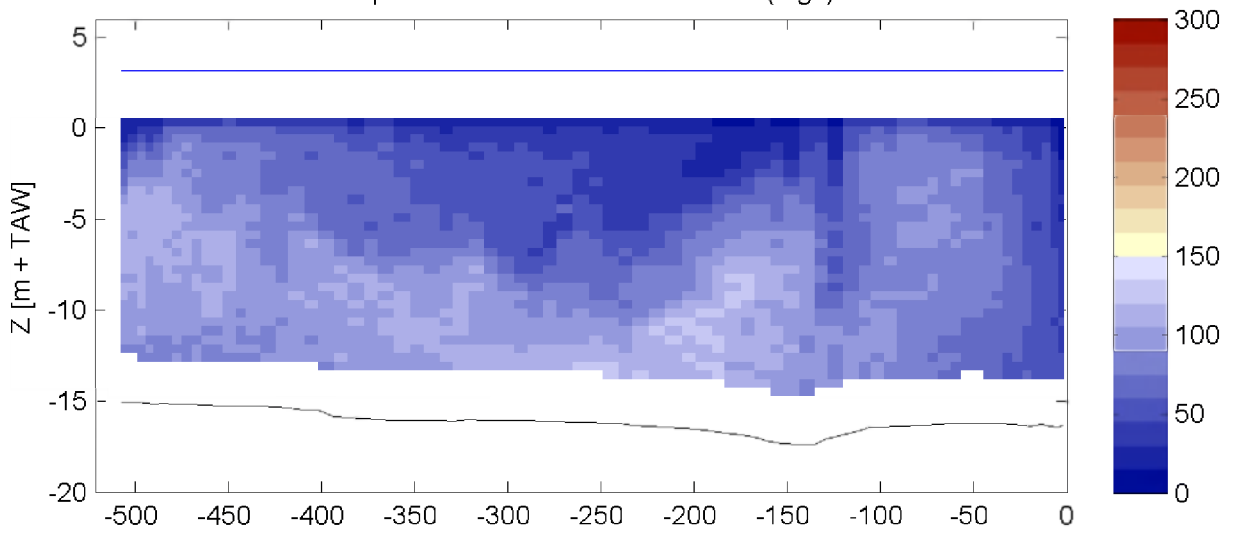
In association with :

I/RA/11283/06.110/BDC

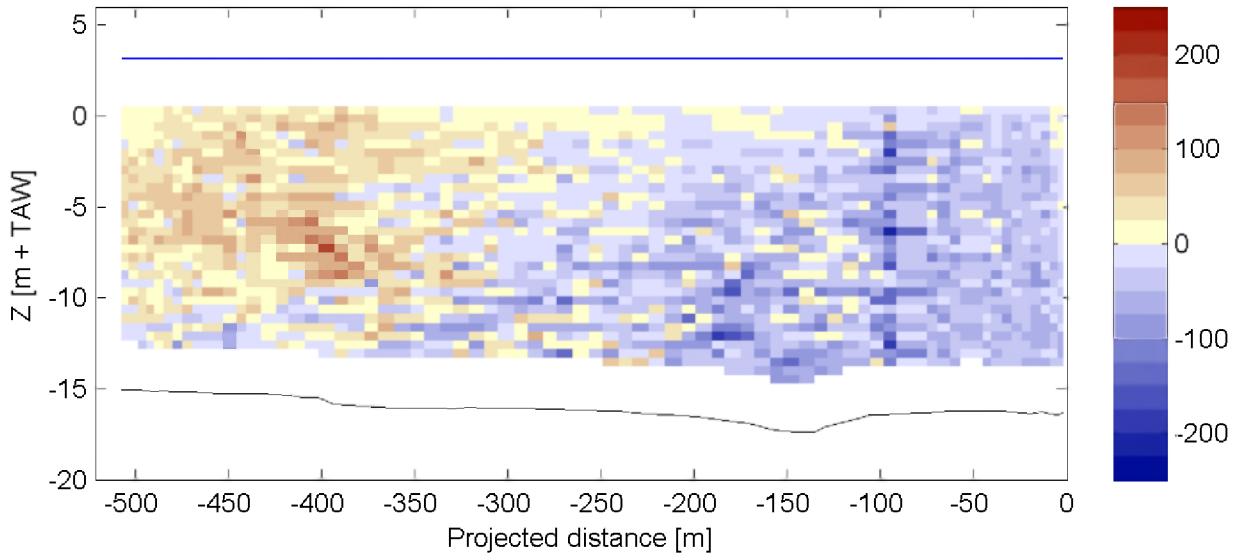
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2080DGDt000rsub.csv	Location: Transect DGD

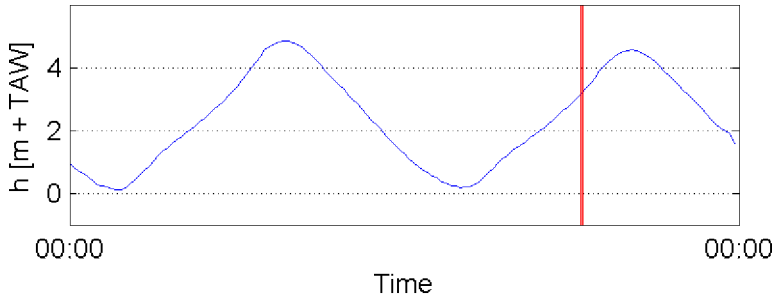
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

18:20:33 - 18:23:51

Data Processed by: IMDC

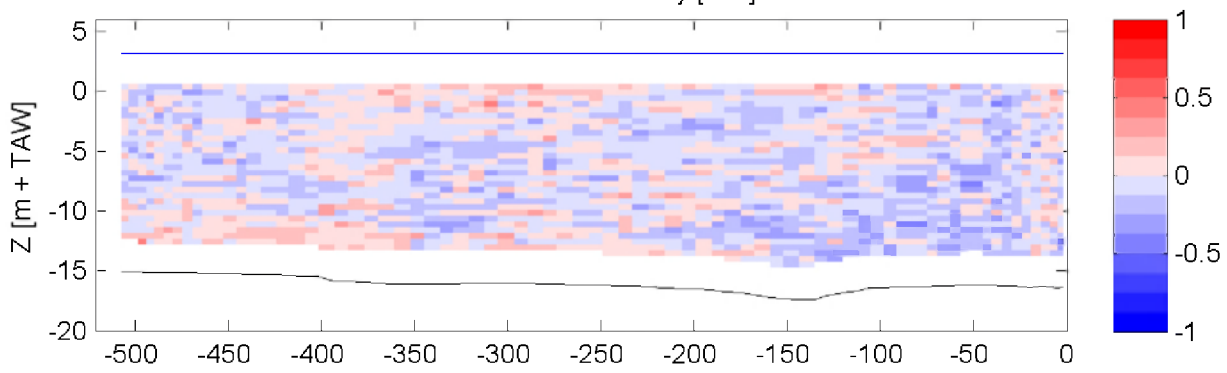
In association with :

I/RA/11283/06.110/BDC

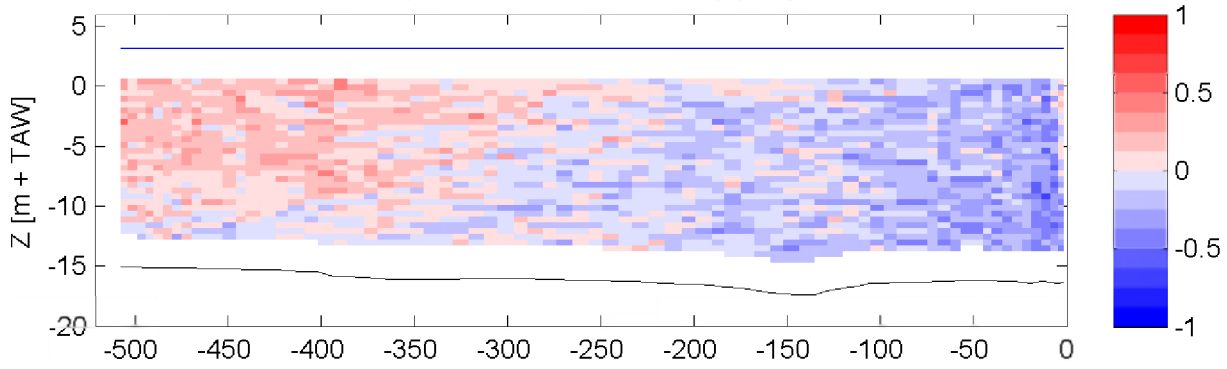
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2080DGDt000rsub.csv	Location: Transect DGD

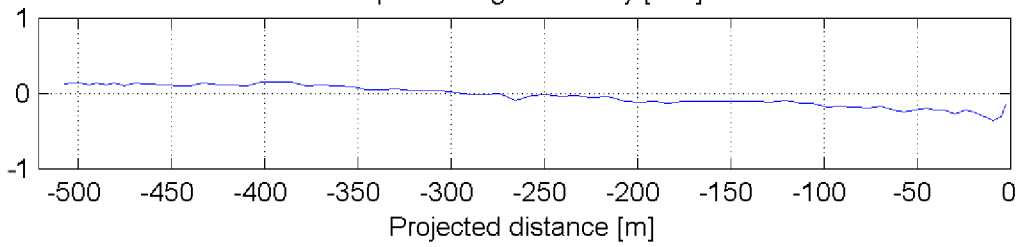
Parallel Current Velocity [m/s]



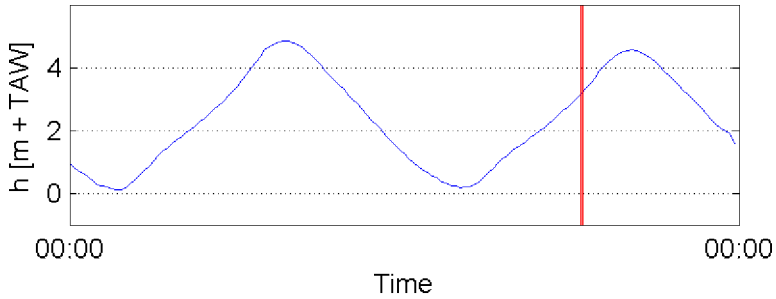
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

18:20:33 - 18:23:51

Data Processed by: IMDC

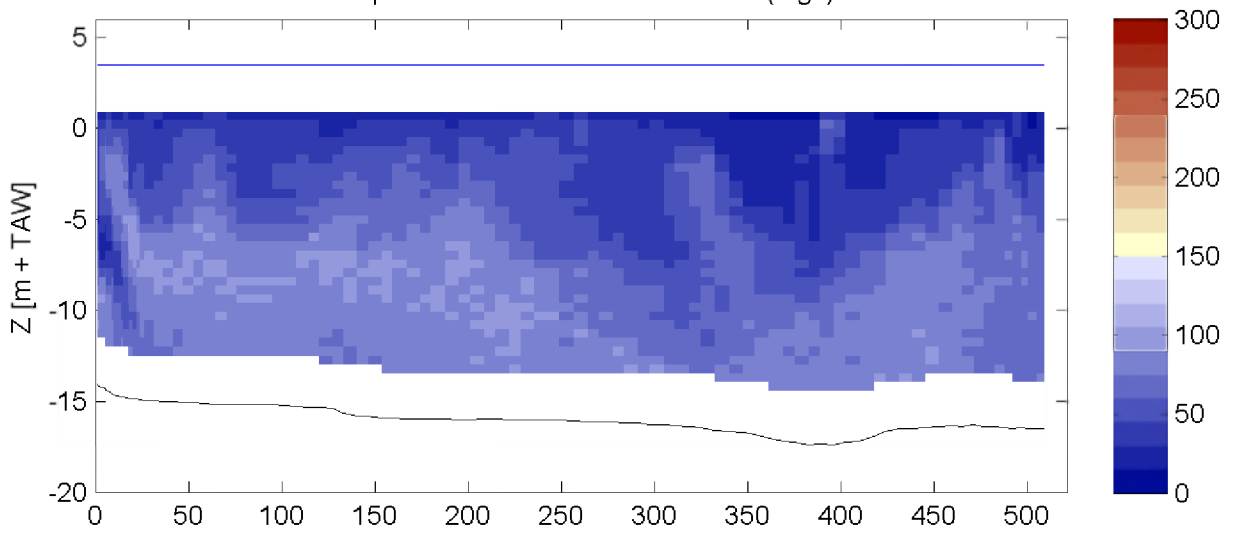
In association with :

I/RA/11283/06.110/BDC

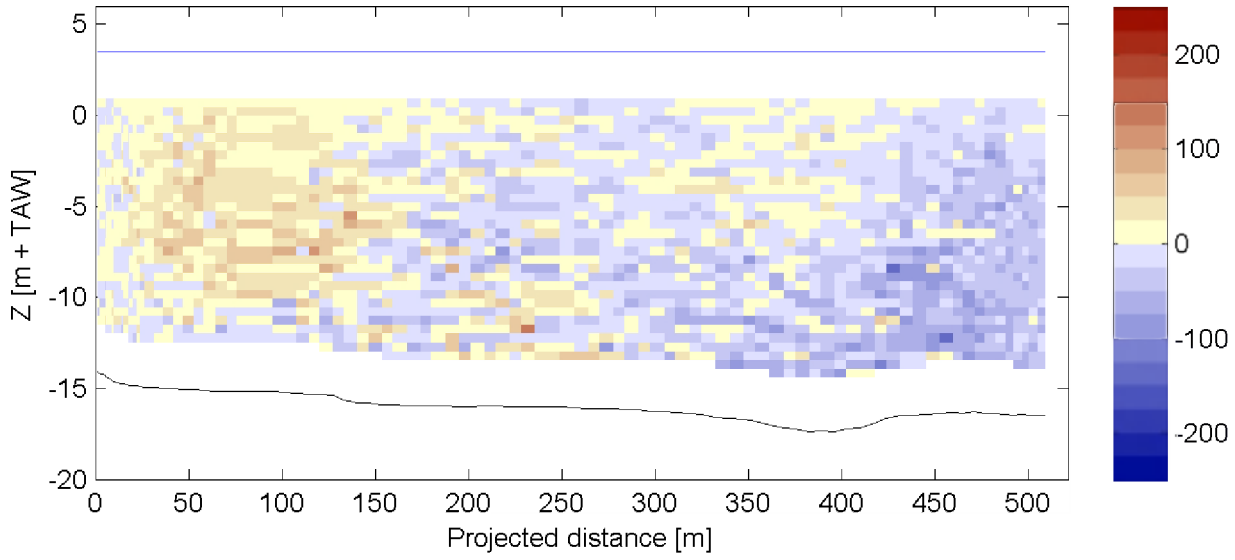
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2082DGDt000r.csv	Location: Transect DGD

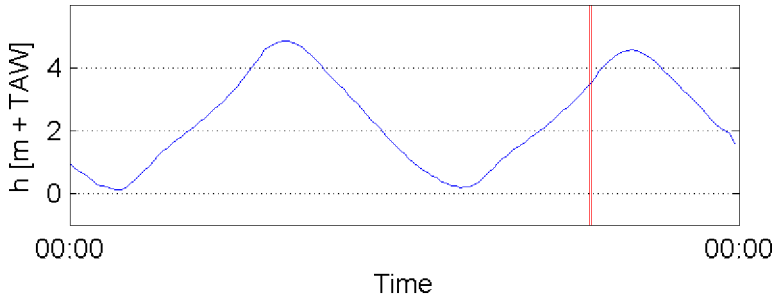
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

18:38:06 - 18:42:10

Data Processed by: IMDC

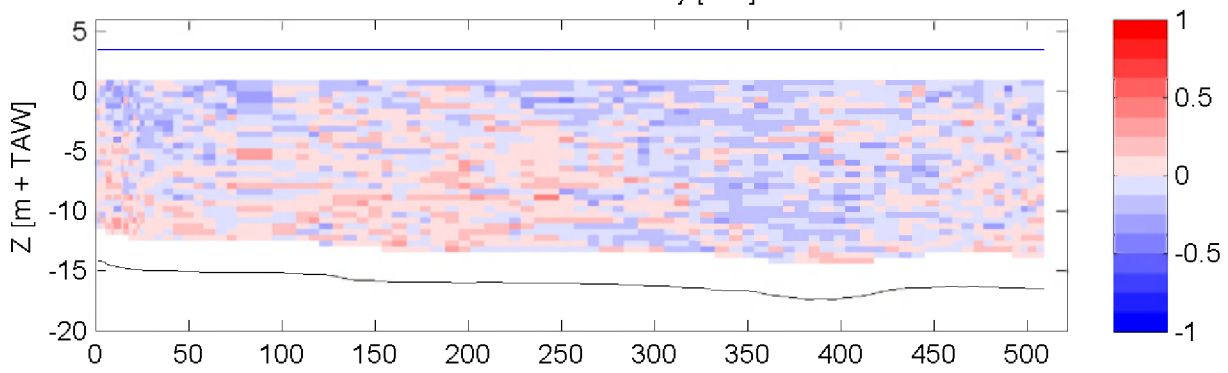
In association with :

I/RA/11283/06.110/BDC

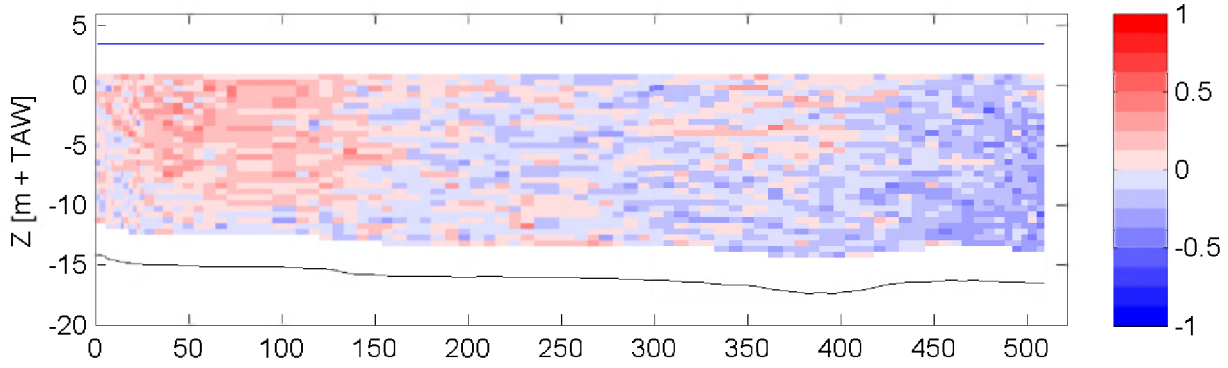
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2082DGDt000r.csv	Location: Transect DGD

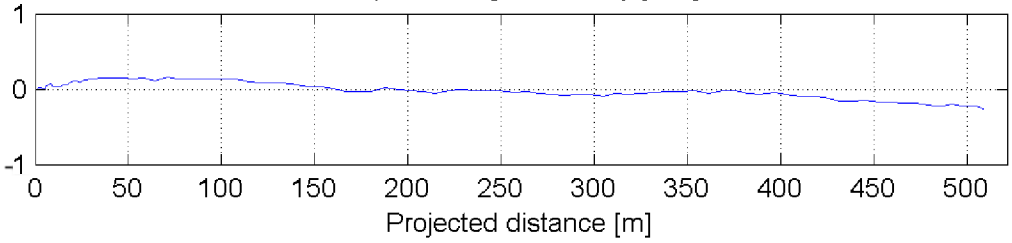
Parallel Current Velocity [m/s]



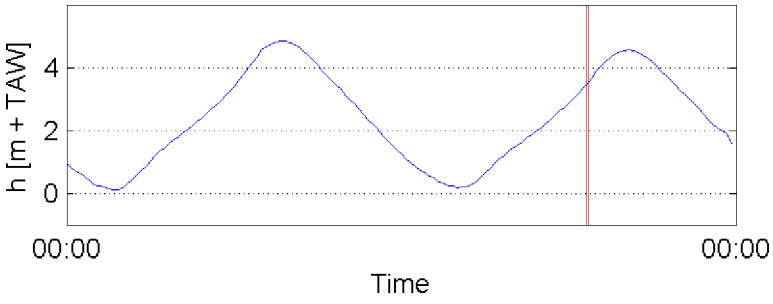
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

18:38:06 - 18:42:10

Data Processed by: IMDC

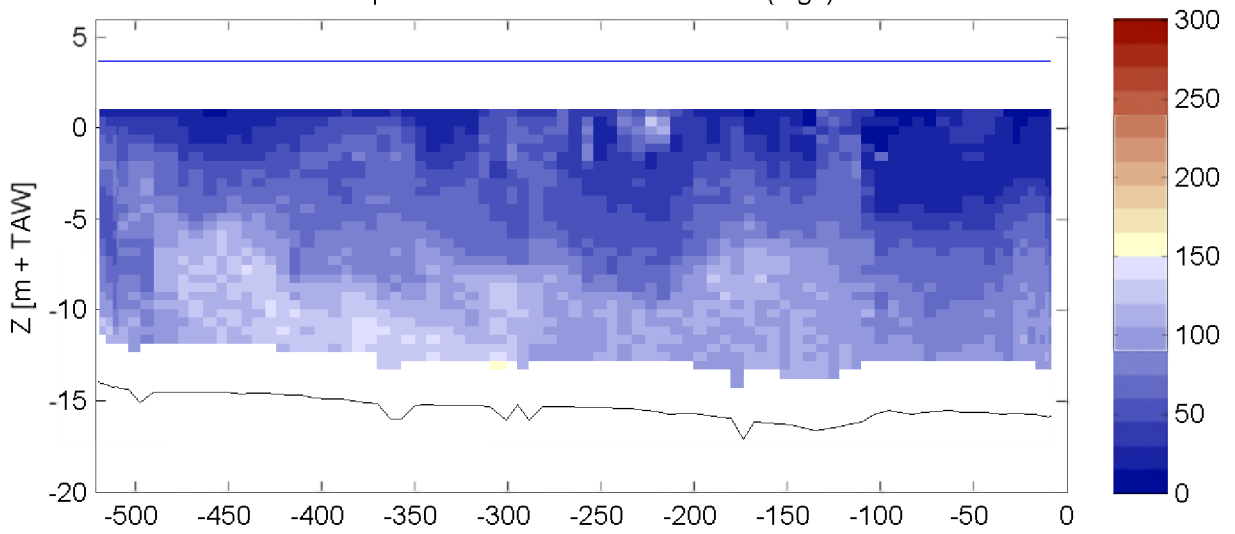
In association with :

I/RA/11283/06.110/BDC

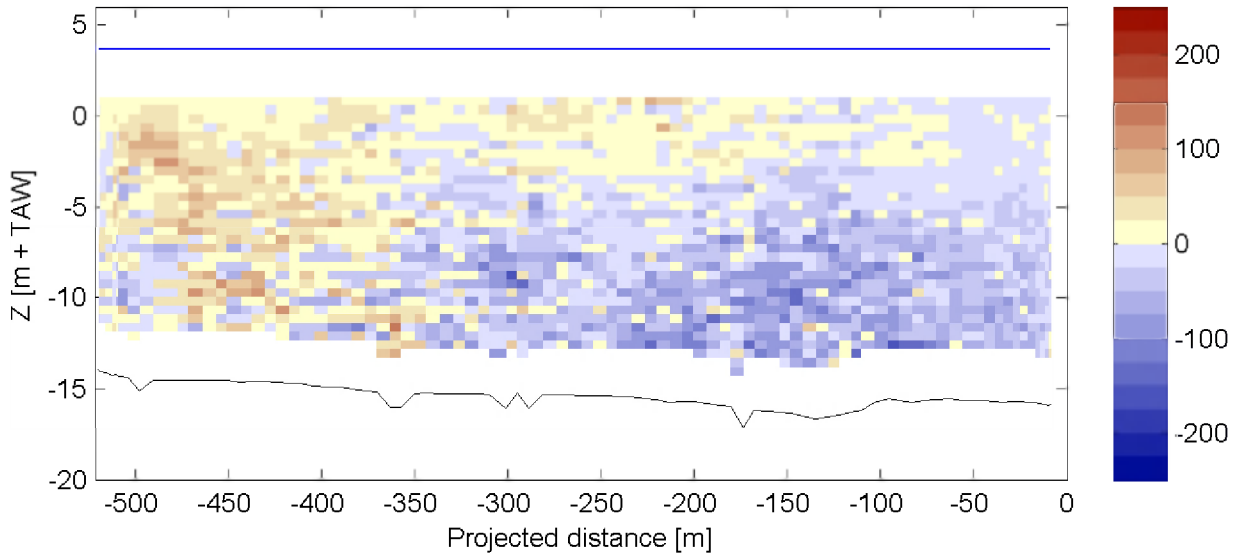
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2084DGDt000r.csv	Location: Transect DGD

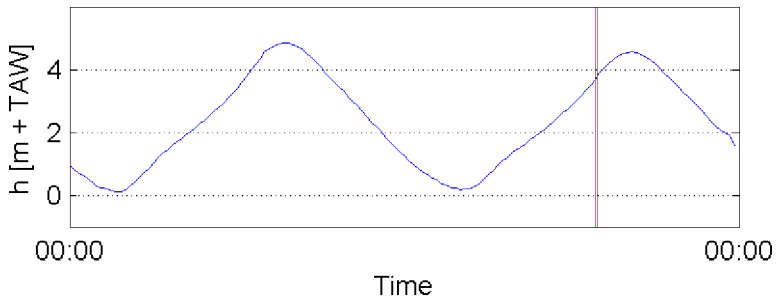
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

18:51:37 - 18:55:32

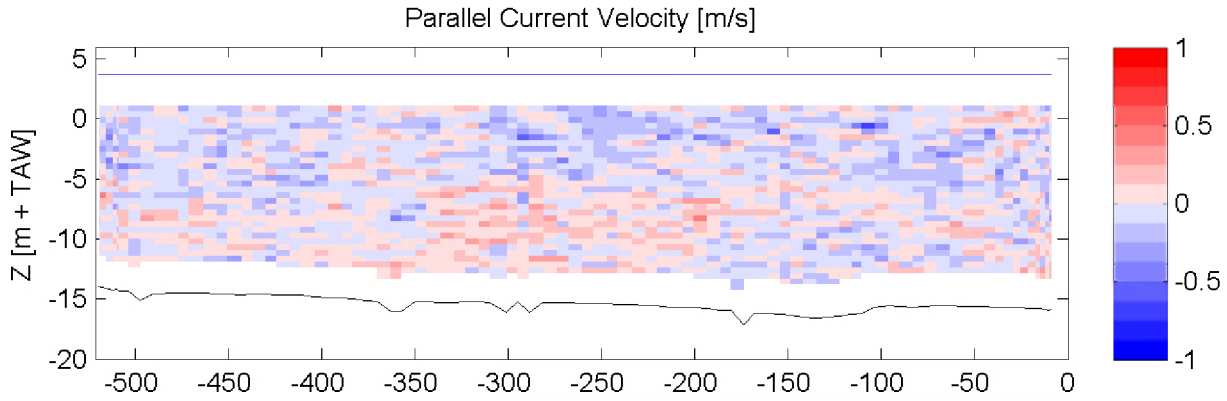
Data Processed by: IMDC

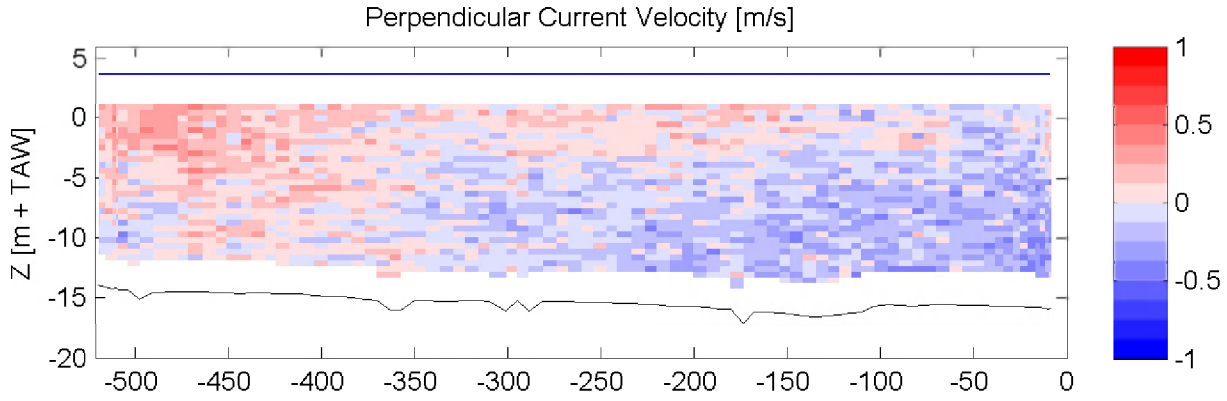
In association with :

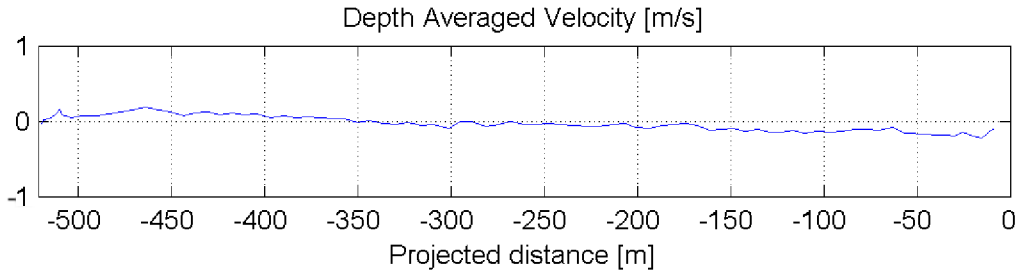
I/RA/11283/06.110/BDC

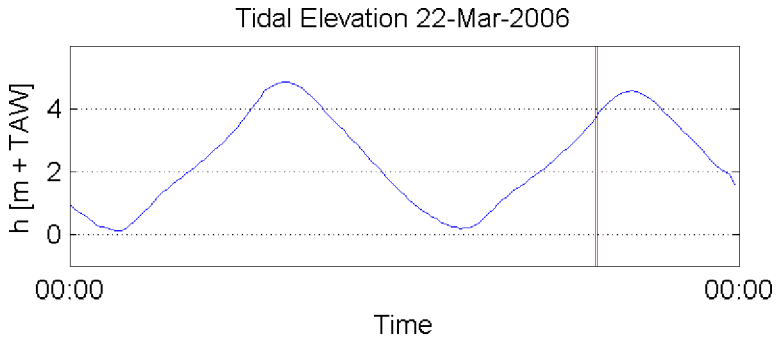
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2084DGDt000r.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

18:51:37 - 18:55:32

Data Processed by: IMDC

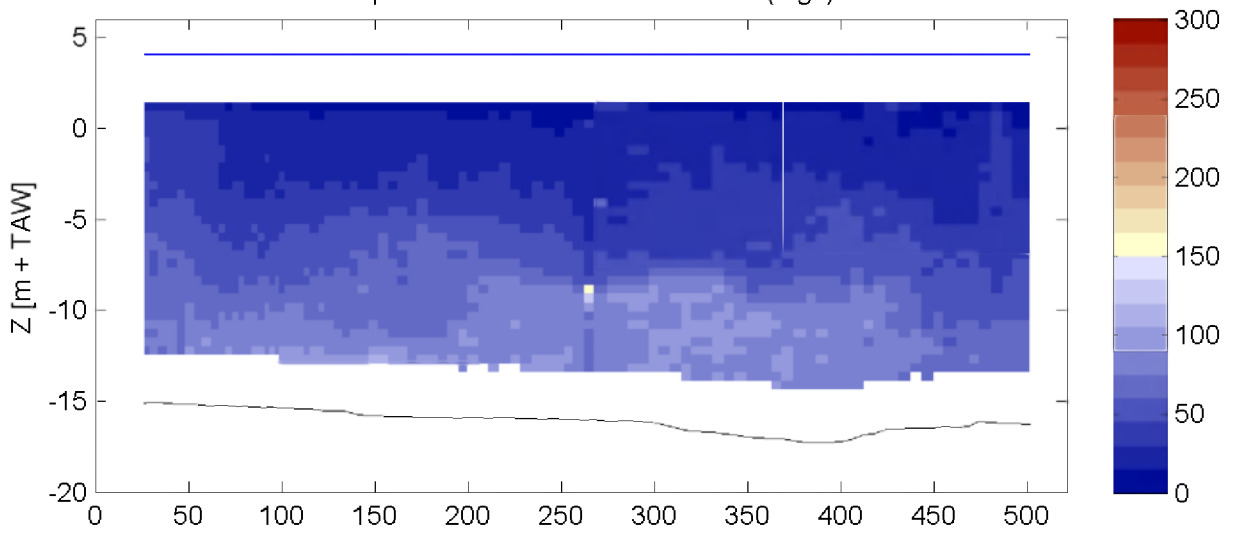
In association with :

I/RA/11283/06.110/BDC

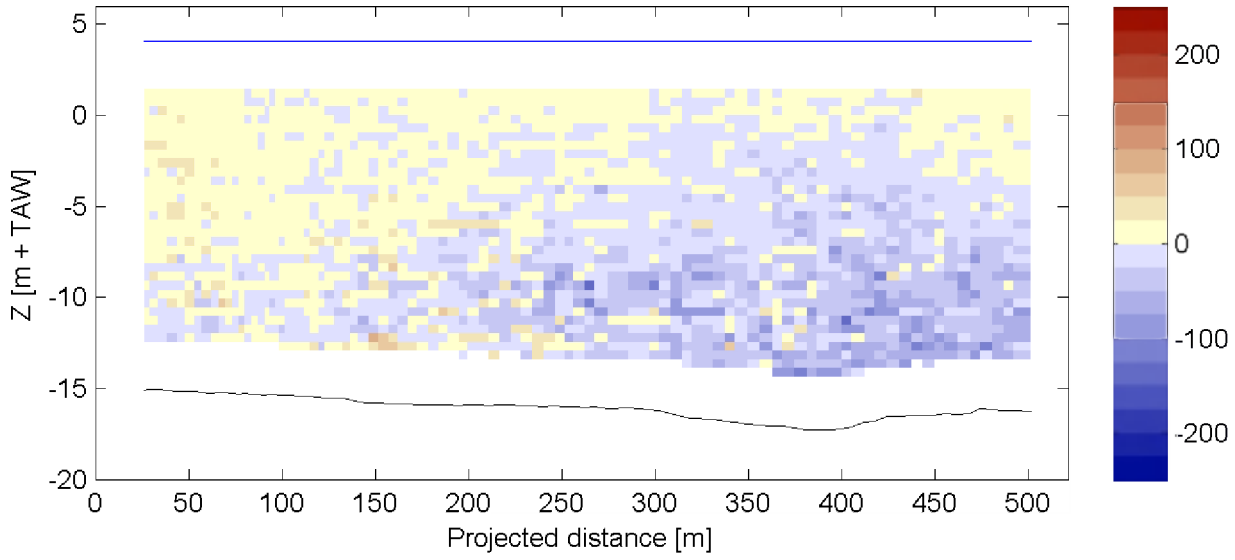
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2086DGDt000rsub2.csv	Location: Transect DGD

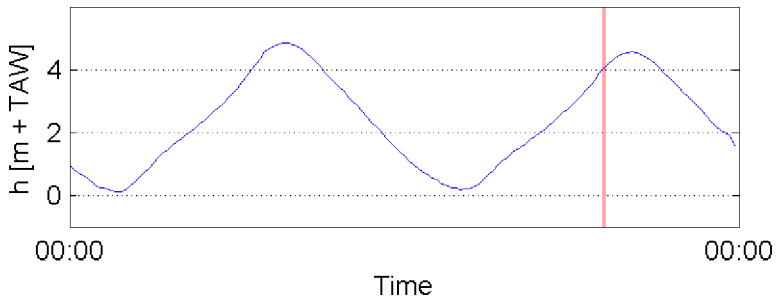
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

19:07:22 - 19:11:32

Data Processed by: IMDC

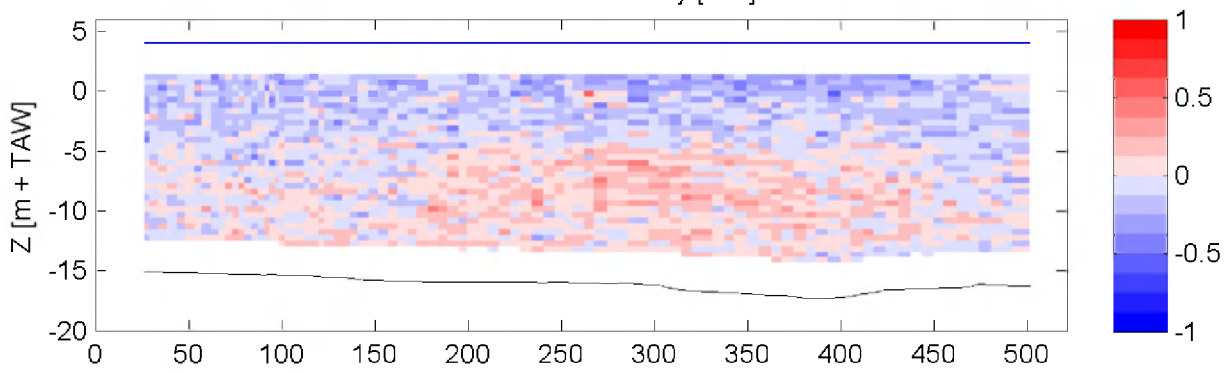
In association with :

I/RA/11283/06.110/BDC

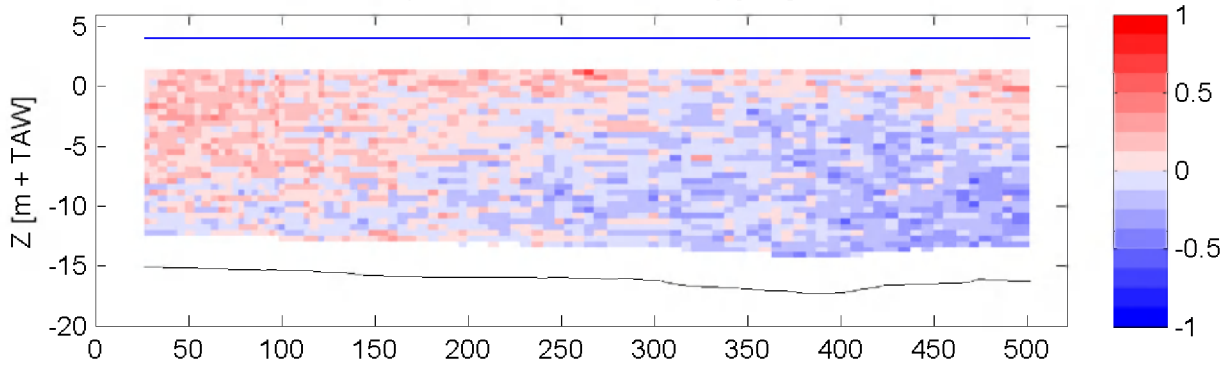
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2086DGDt000rsub2.csv	Location: Transect DGD

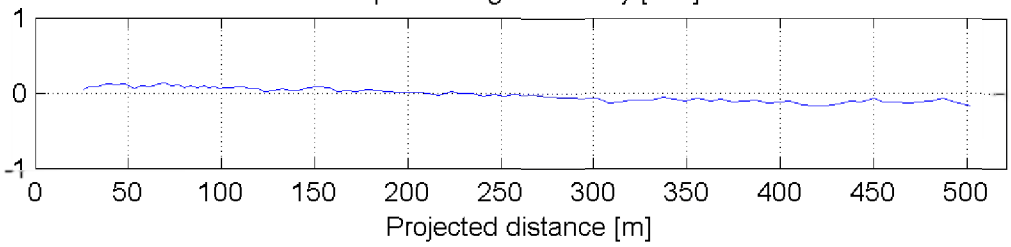
Parallel Current Velocity [m/s]



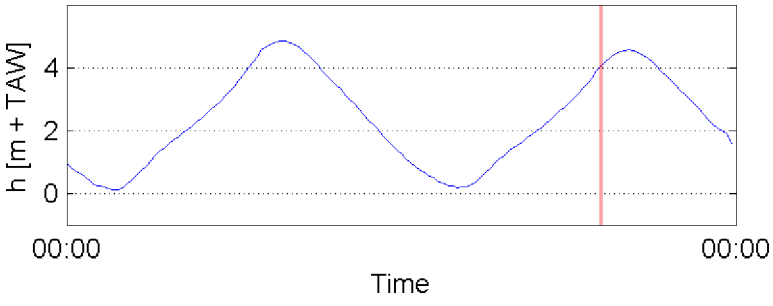
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

19:07:22 - 19:11:32

Data Processed by: IMDC

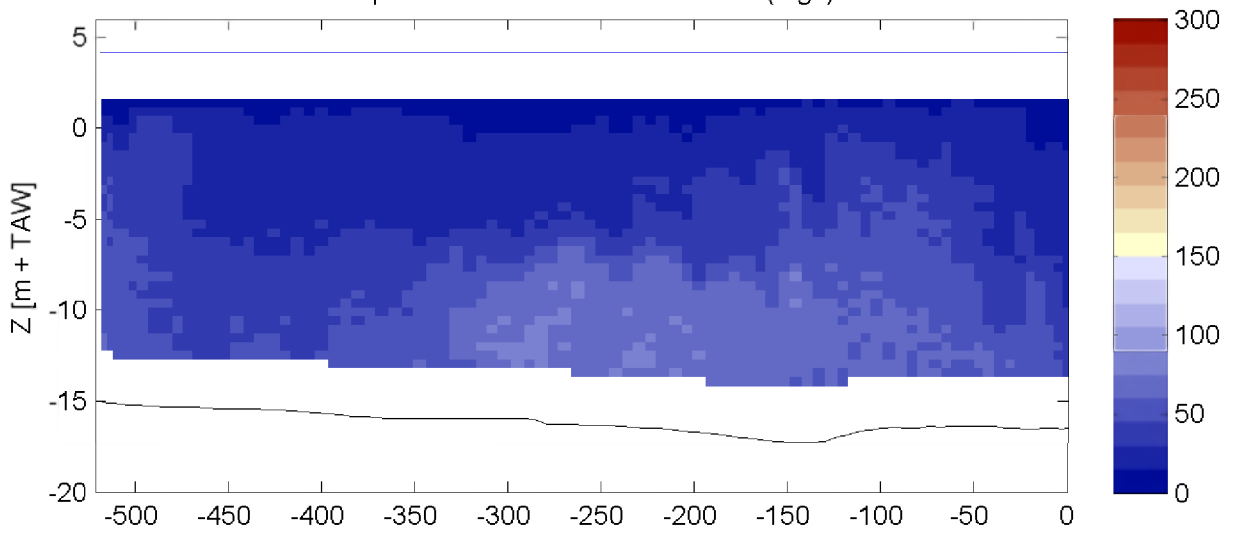
In association with :

I/RA/11283/06.110/BDC

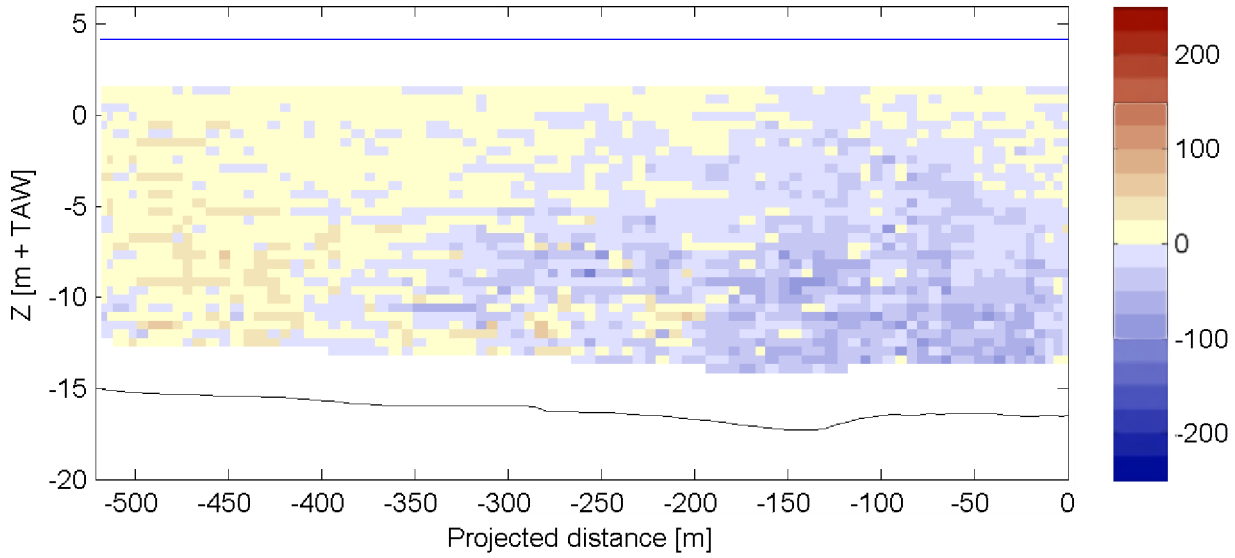
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2088DGDt000r.csv	Location: Transect DGD

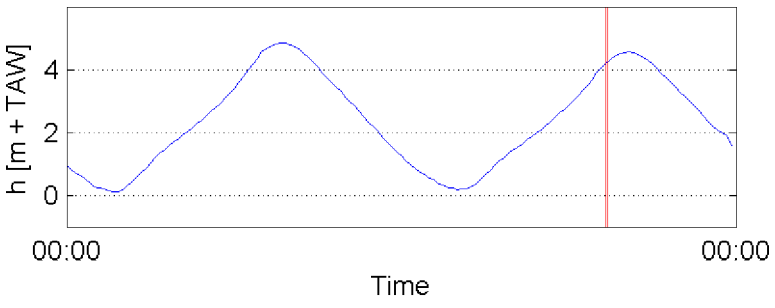
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

19:20:18 - 19:24:12

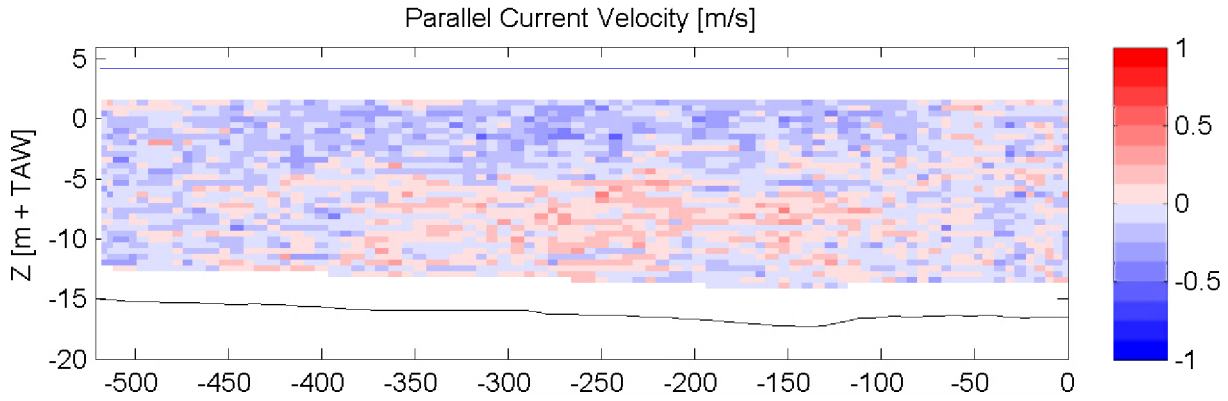
Data Processed by: IMDC

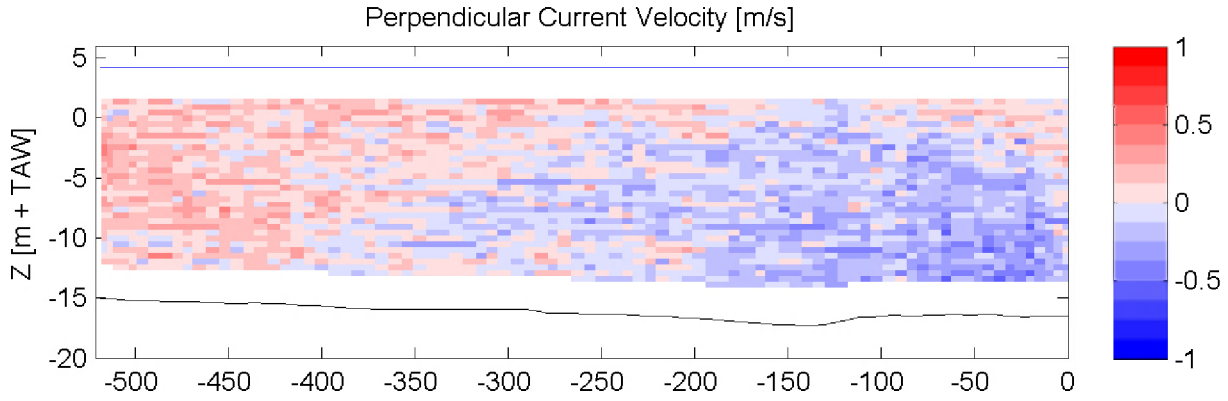
In association with :

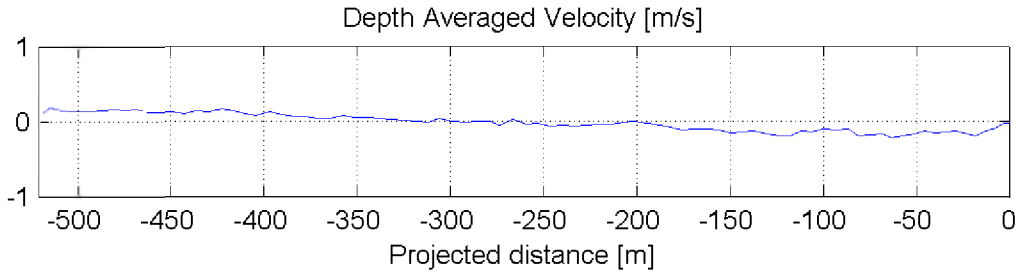
I/RA/11283/06.110/BDC

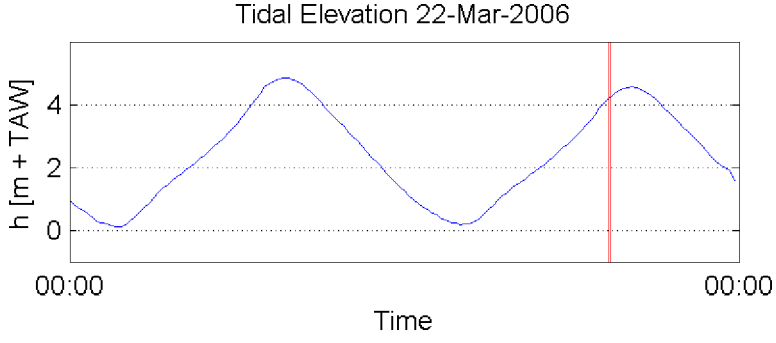
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2088DGDt000r.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

19:20:18 - 19:24:12

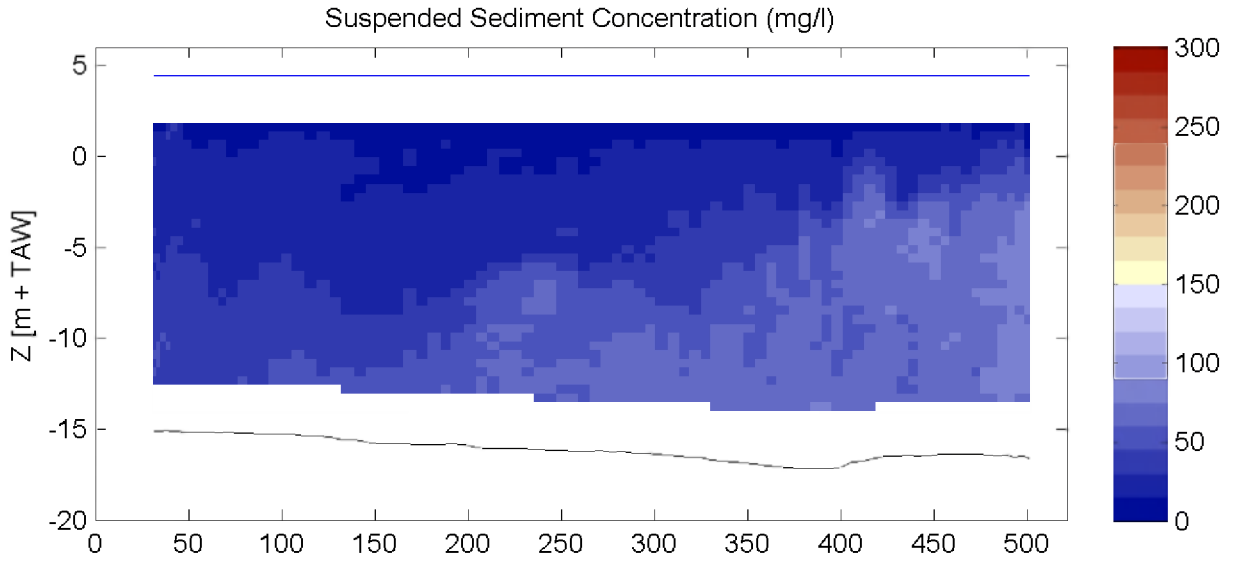
Data Processed by: IMDC

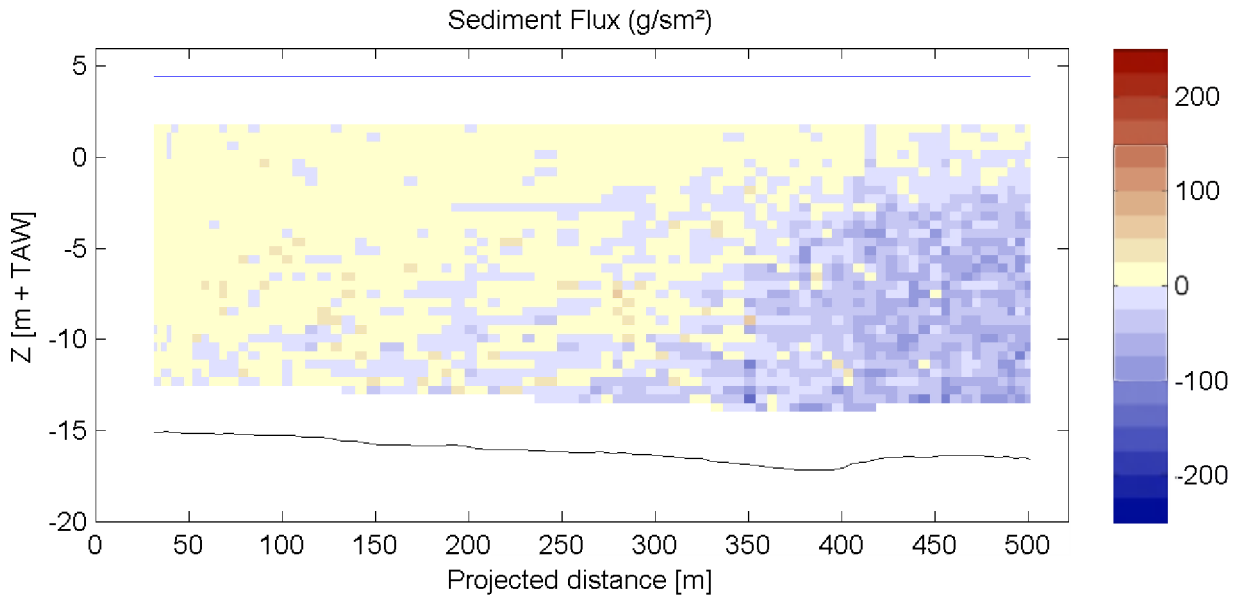
In association with :

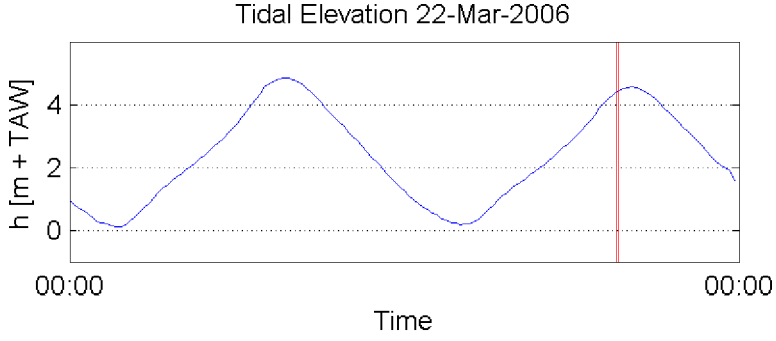
I/RA/11283/06.110/BDC

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2090DGDt000rsub2.csv	Location: Transect DGD







Date / Time [MET] :

22-Mar-2006

19:36:44 - 19:40:33

Data Processed by: IMDC

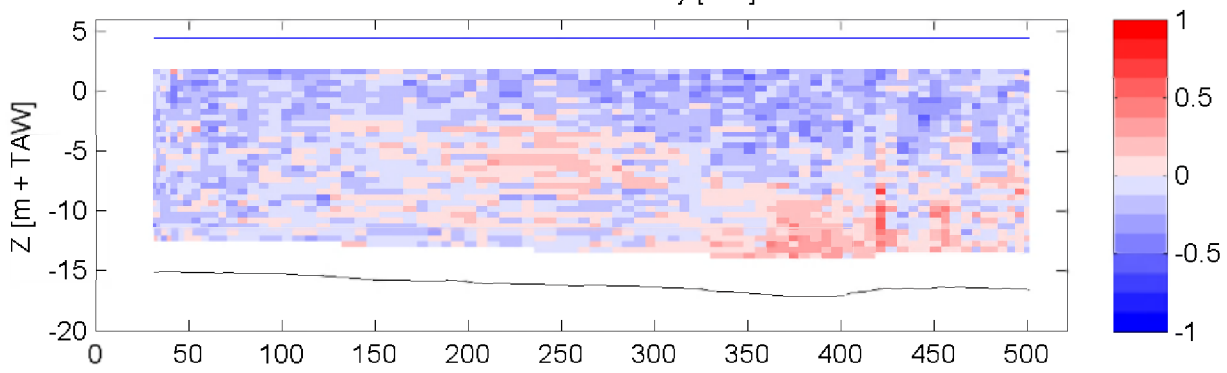
In association with : GEMS

I/RA/11283/06.110/BDC

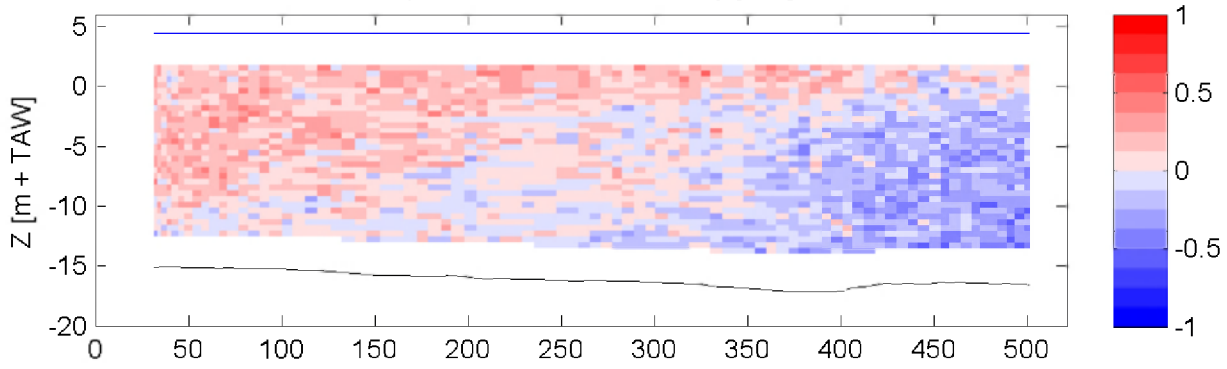
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2090DGDt000rsub2.csv	Location: Transect DGD

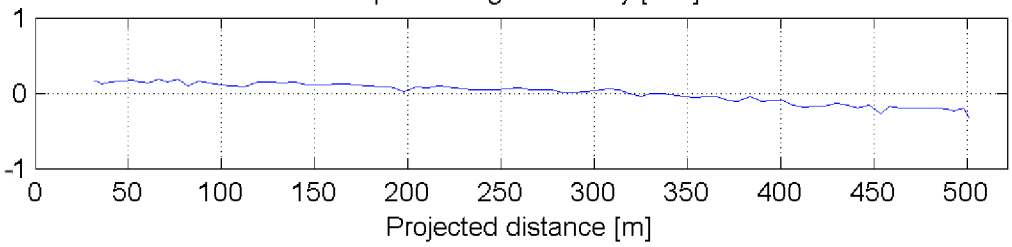
Parallel Current Velocity [m/s]



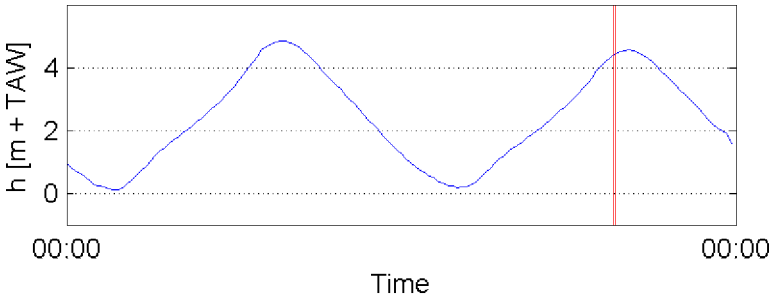
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

19:36:44 - 19:40:33

Data Processed by: IMDC

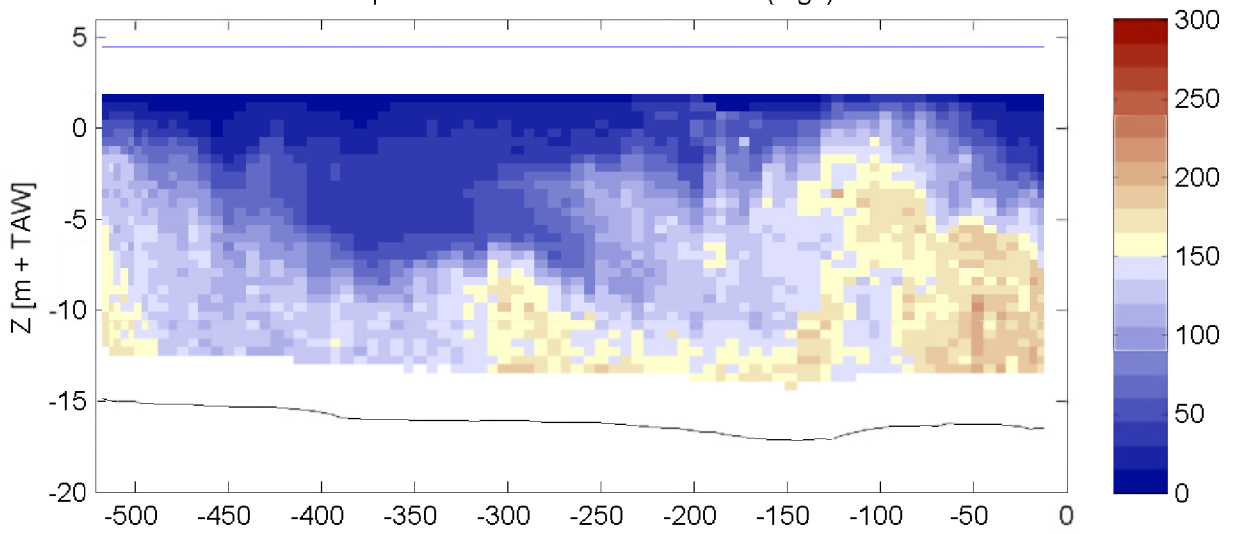
In association with :

I/RA/11283/06.110/BDC

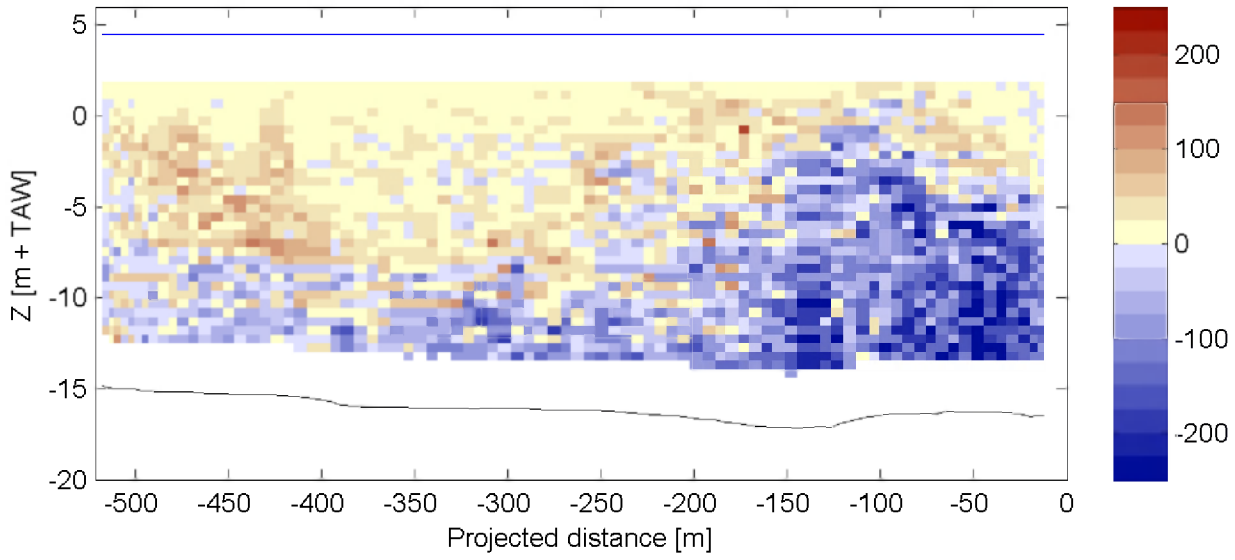
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2092DGDt000r2.csv	Location: Transect DGD

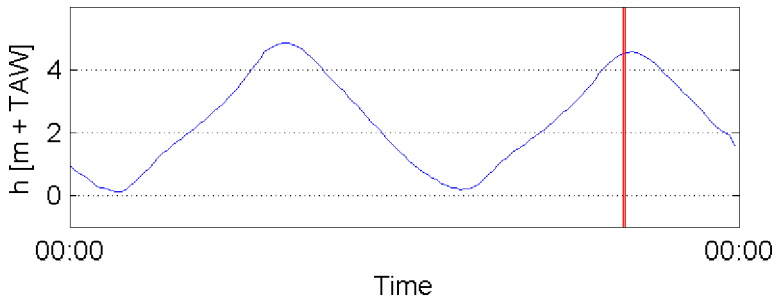
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

19:50:23 - 19:54:11

Data Processed by: IMDC

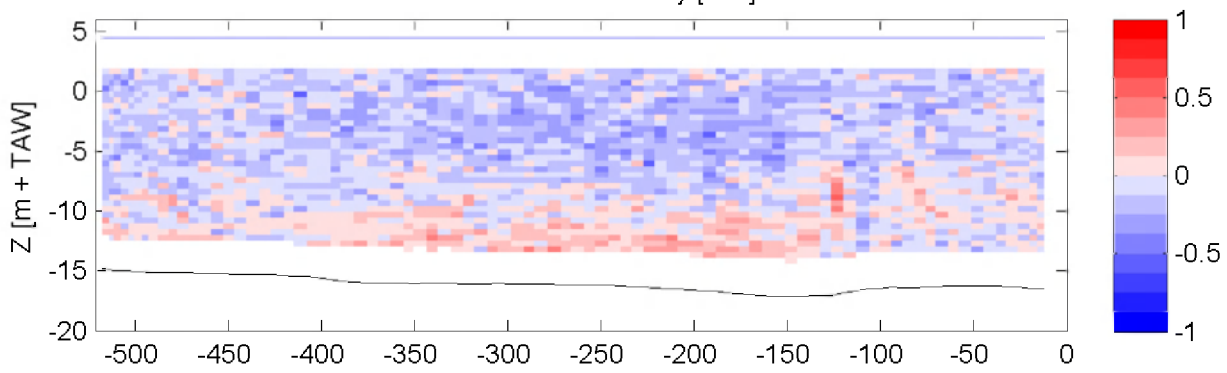
In association with :

I/RA/11283/06.110/BDC

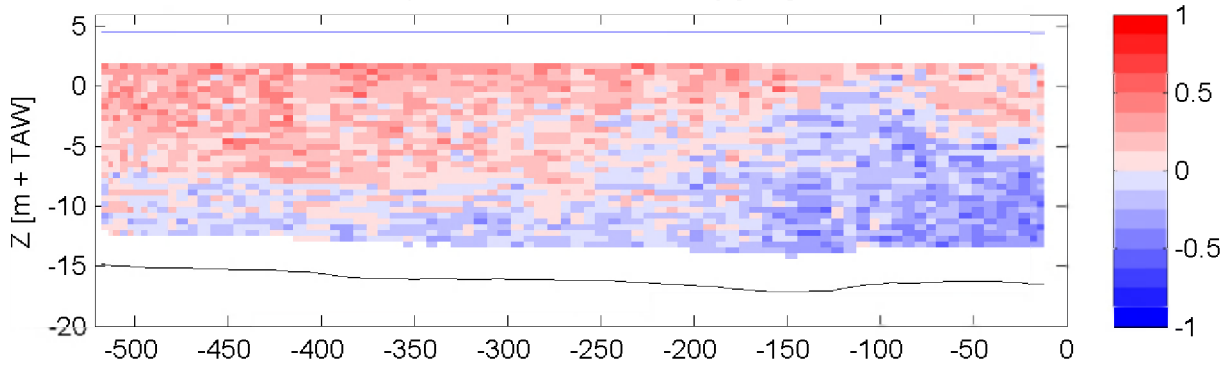
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2092DGDt000r2.csv	Location: Transect DGD

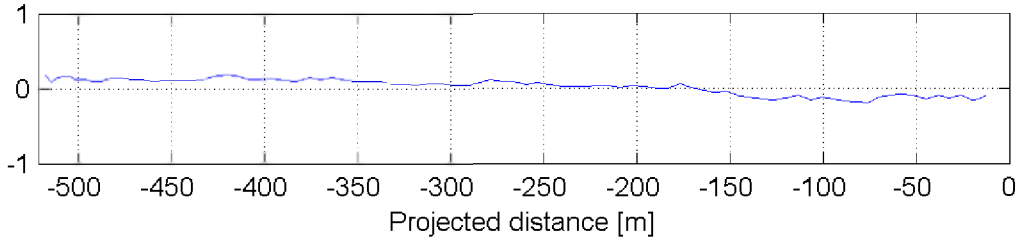
Parallel Current Velocity [m/s]



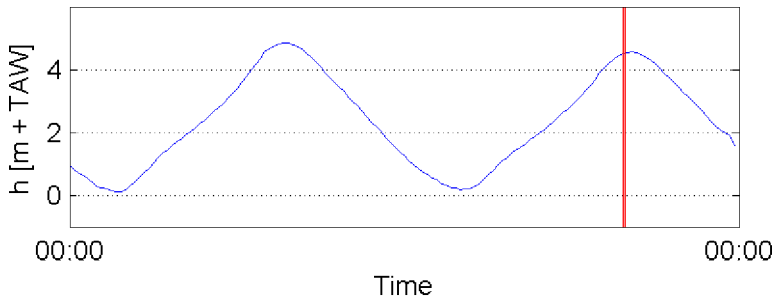
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

19:50:23 - 19:54:11

Data Processed by: IMDC

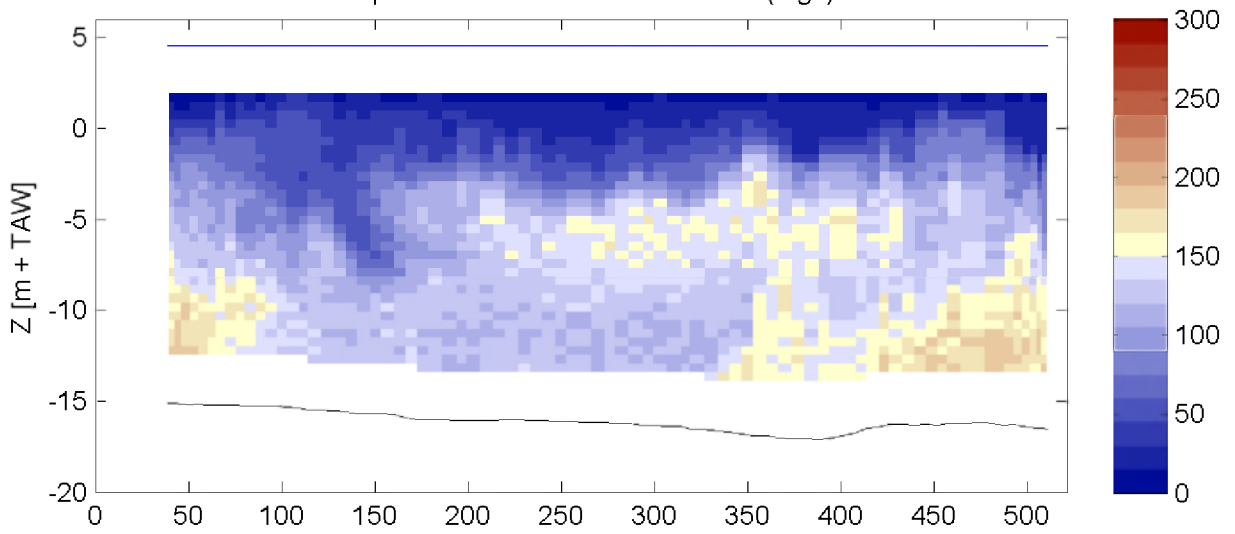
In association with :

I/RA/11283/06.110/BDC

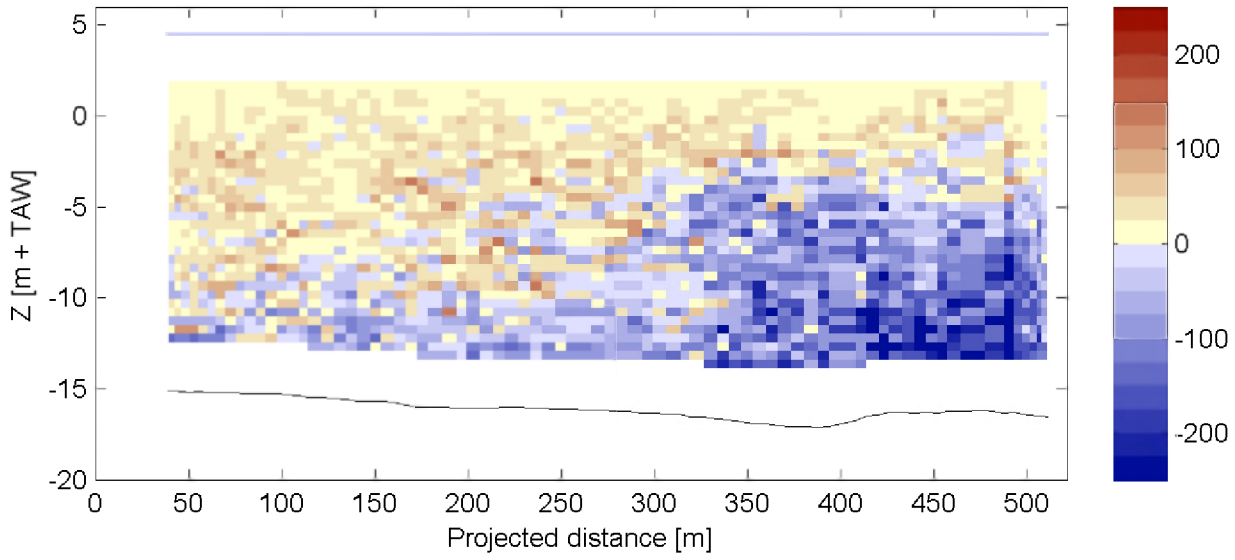
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2094DGDt000r2.csv	Location: Transect DGD

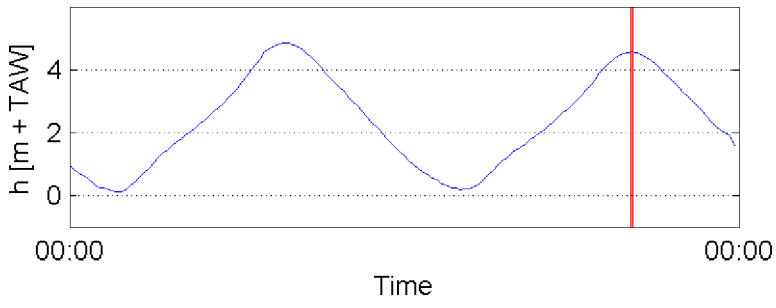
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

20:06:57 - 20:10:30

Data Processed by: IMDC

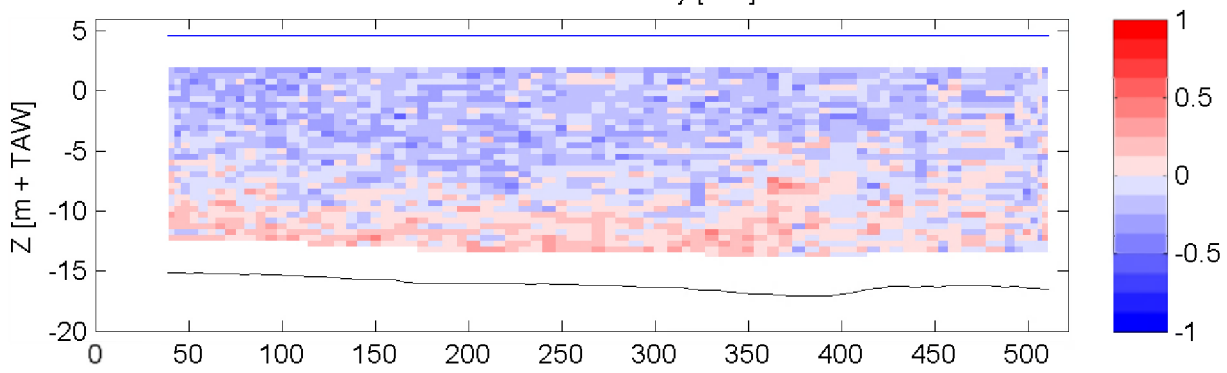
In association with :

I/RA/11283/06.110/BDC

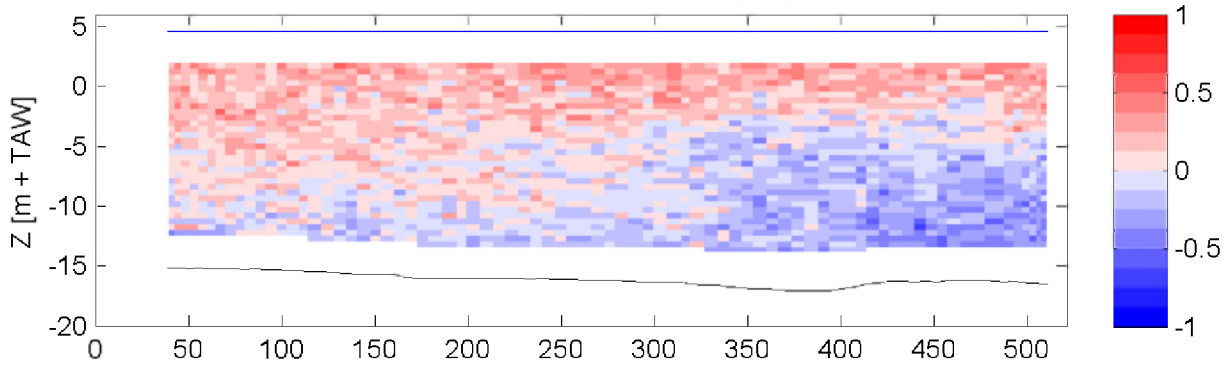
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2094DGDt000r2.csv	Location: Transect DGD

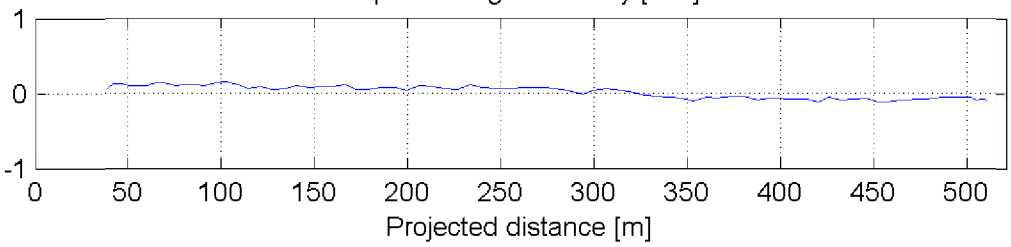
Parallel Current Velocity [m/s]



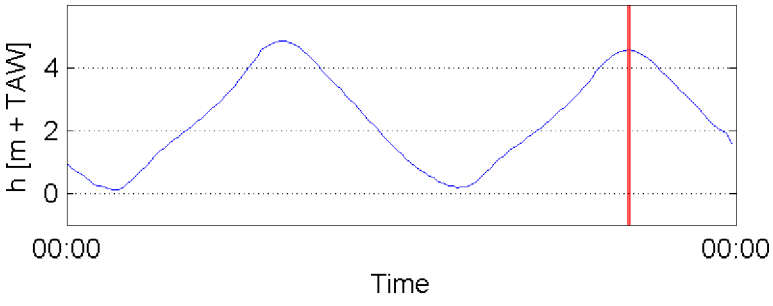
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

20:06:57 - 20:10:30

Data Processed by: IMDC

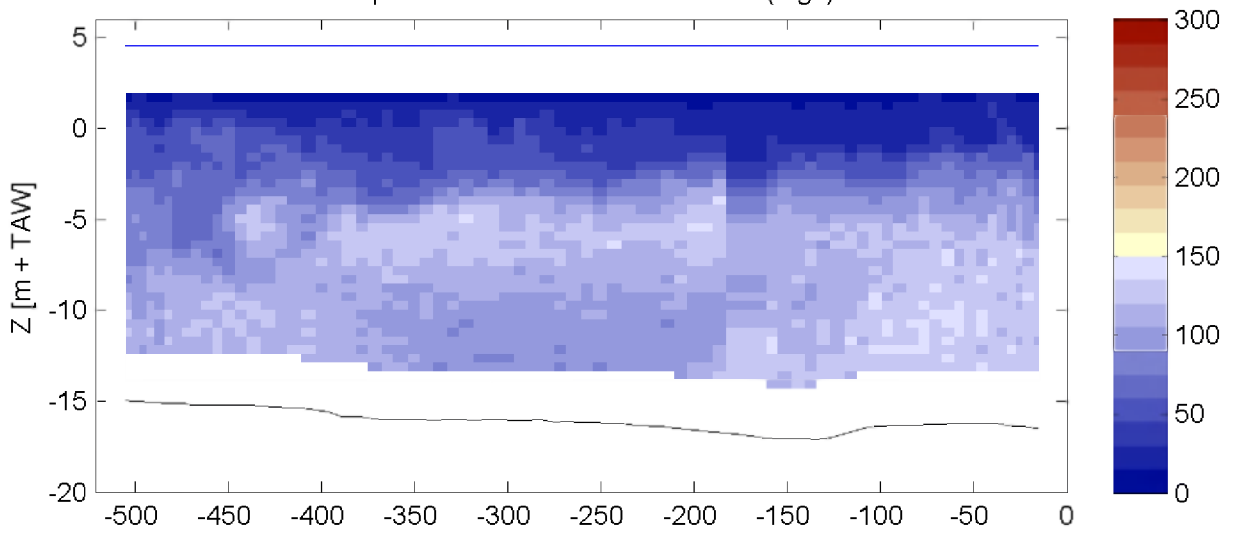
In association with :

I/RA/11283/06.110/BDC

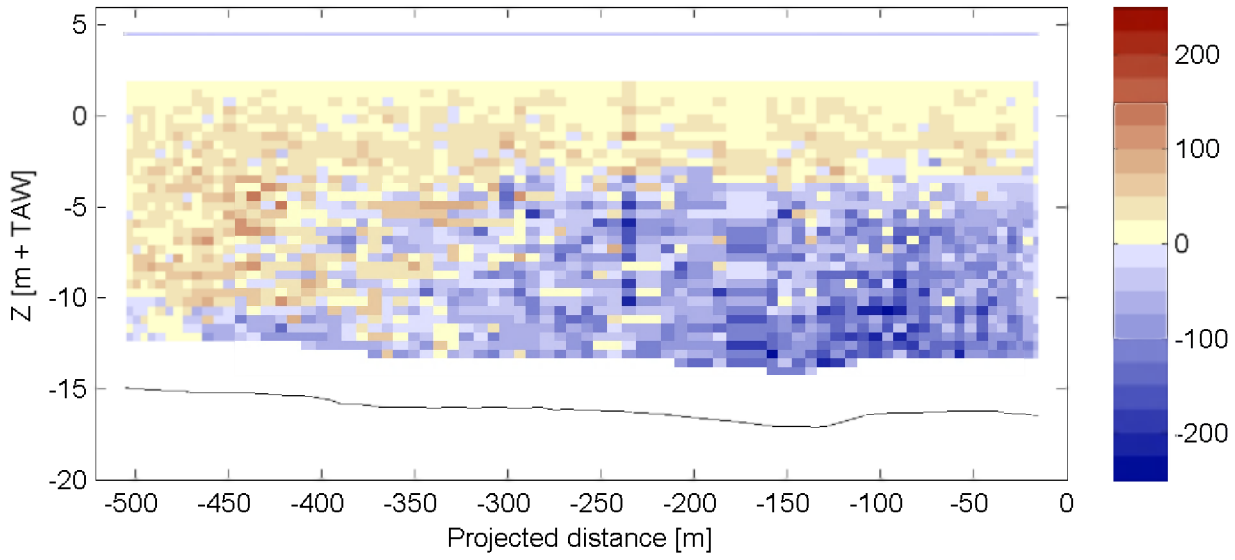
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2096DGDt000rsub.csv	Location: Transect DGD

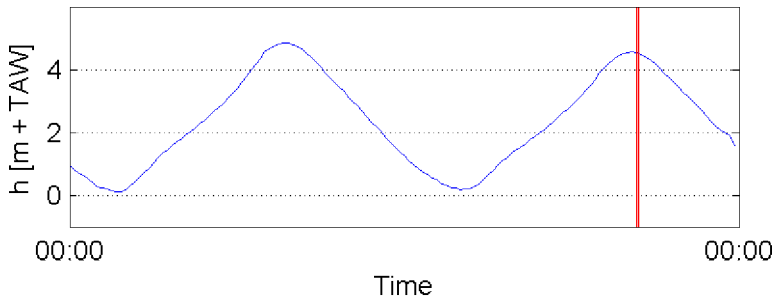
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

20:19:40 - 20:23:11

Data Processed by: IMDC

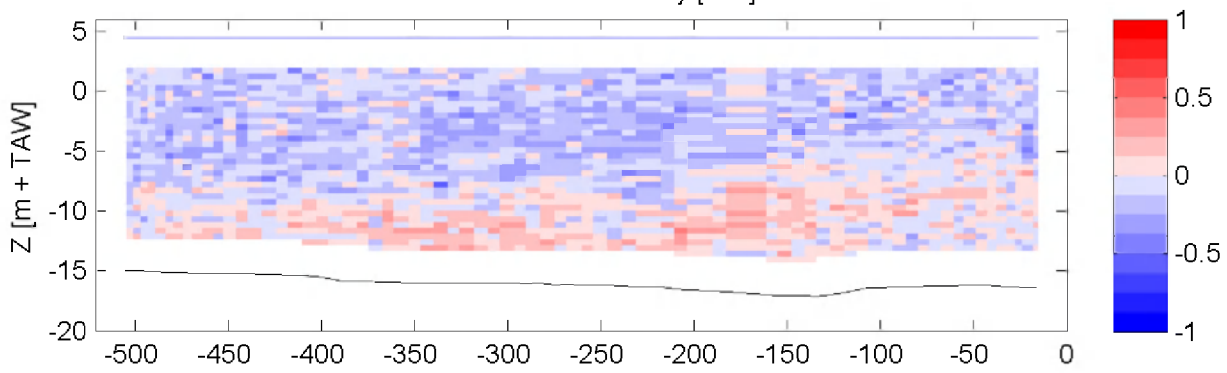
In association with :

I/RA/11283/06.110/BDC

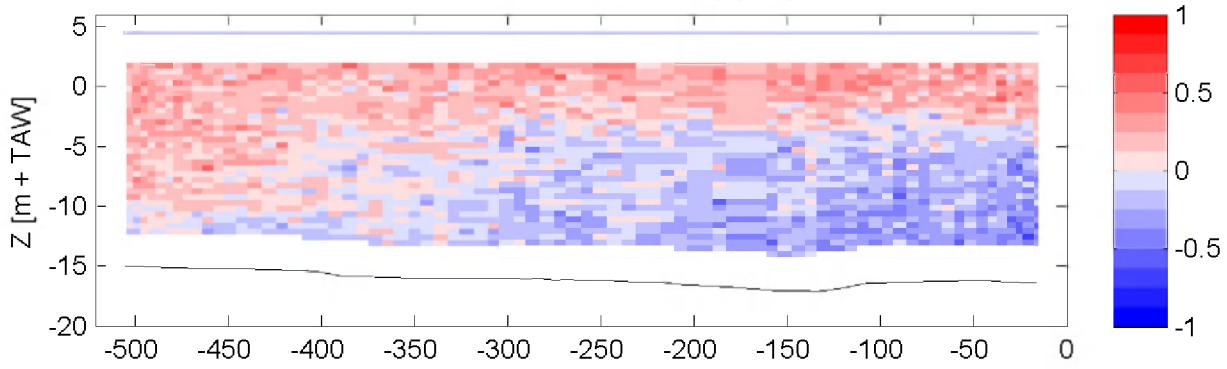
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2096DGDt000rsub.csv	Location: Transect DGD

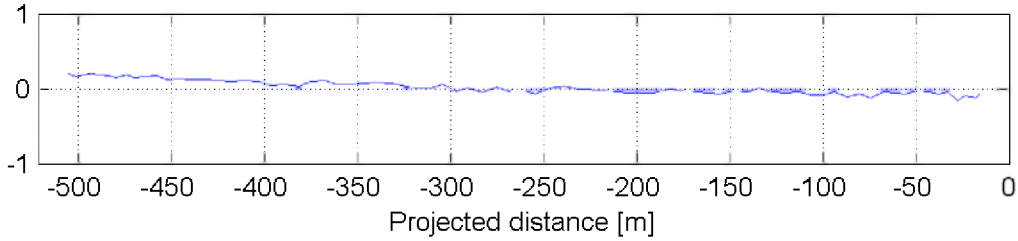
Parallel Current Velocity [m/s]



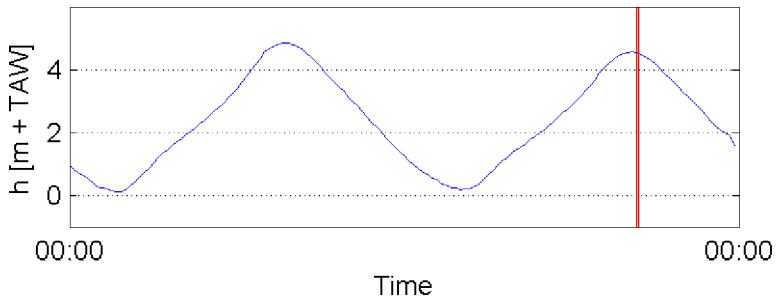
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

20:19:40 - 20:23:11

Data Processed by: IMDC

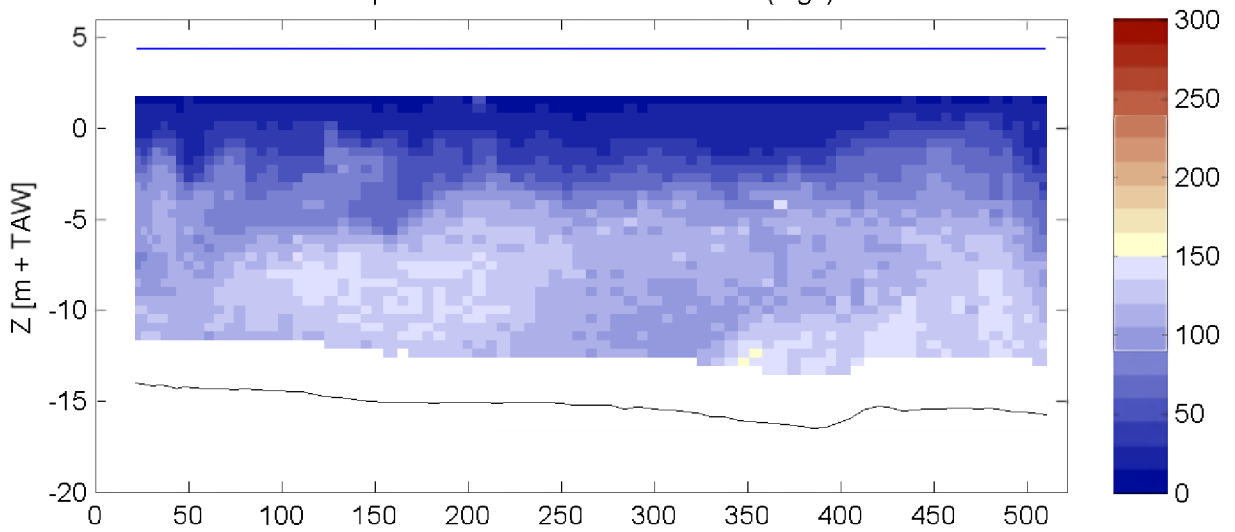
In association with :

I/RA/11283/06.110/BDC

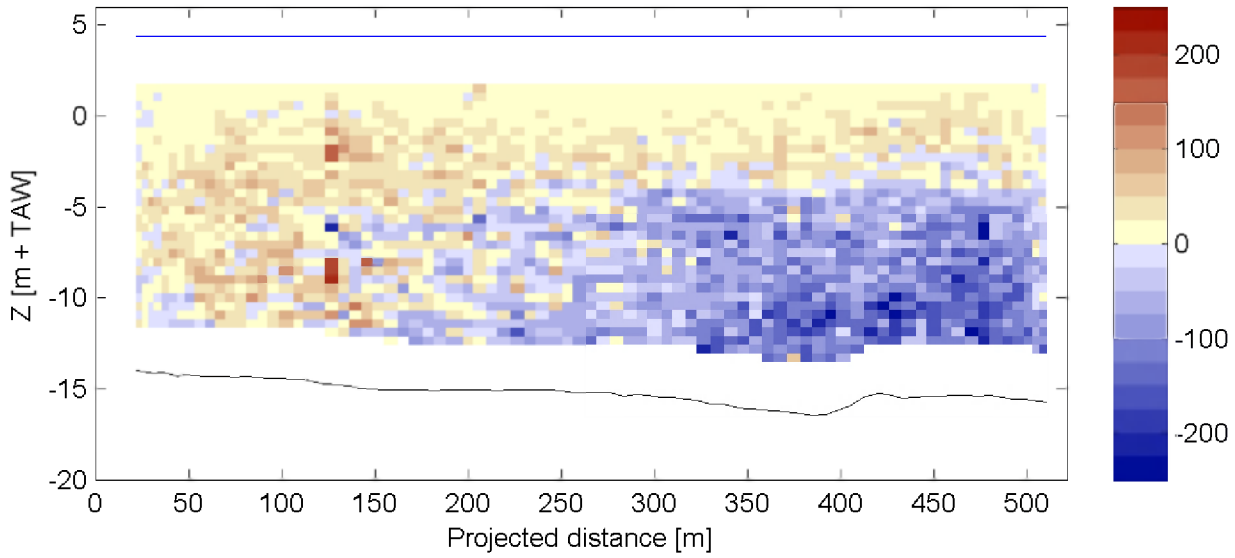
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2098DGDt000rbis.csv	Location: Transect DGD

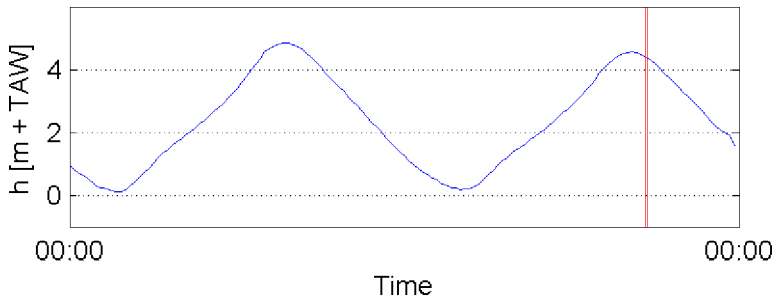
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

20:38:22 - 20:41:58

Data Processed by: IMDC

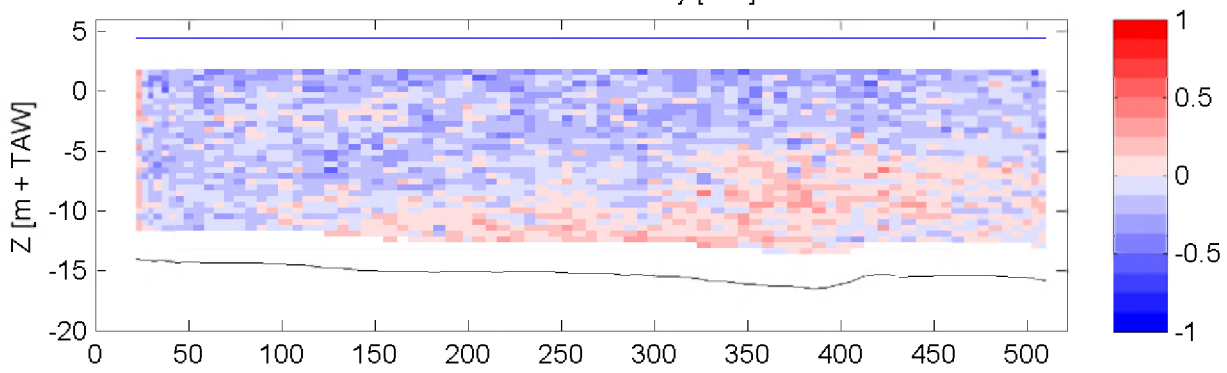
In association with :

I/RA/11283/06.110/BDC

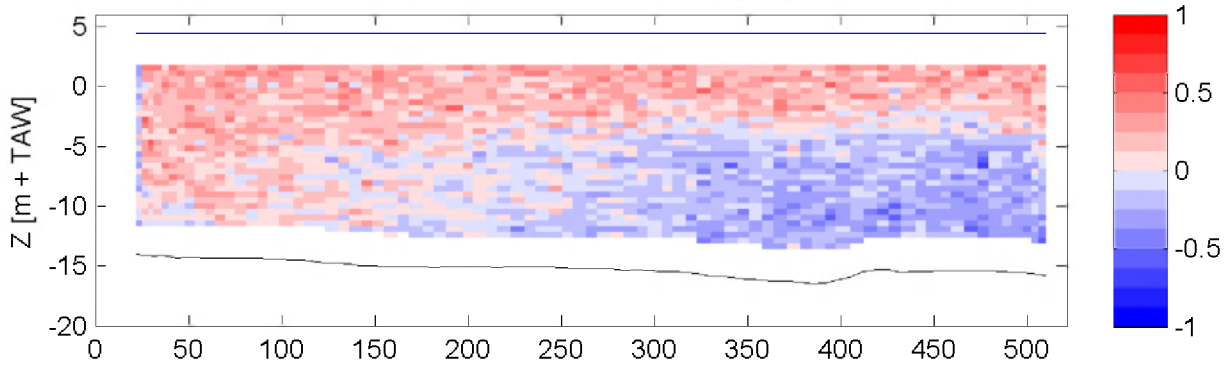
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2098DGDt000rbis.csv	Location: Transect DGD

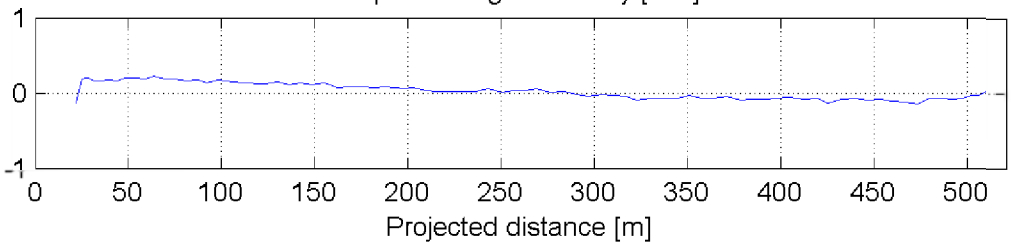
Parallel Current Velocity [m/s]



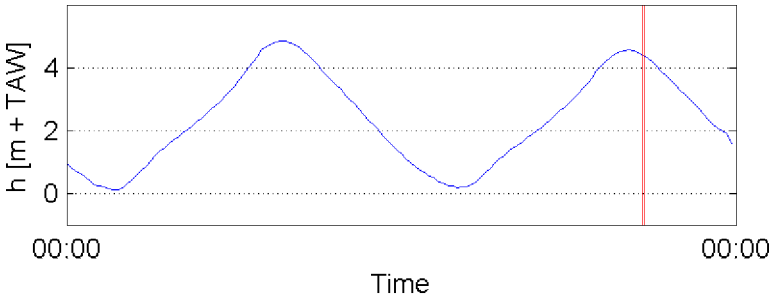
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

20:38:22 - 20:41:58

Data Processed by: IMDC

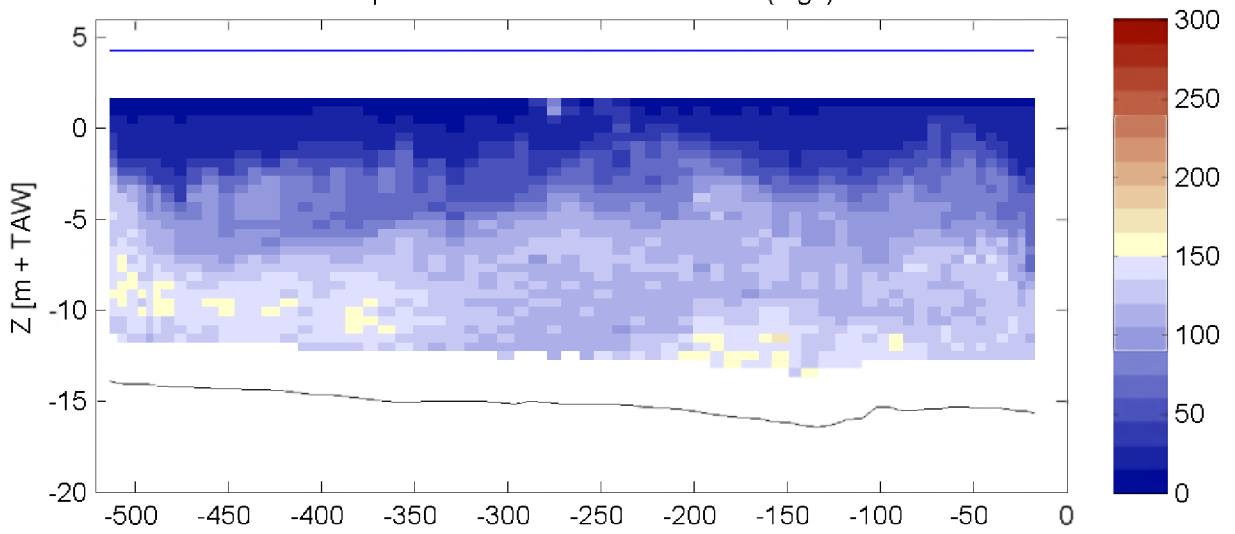
In association with :

I/RA/11283/06.110/BDC

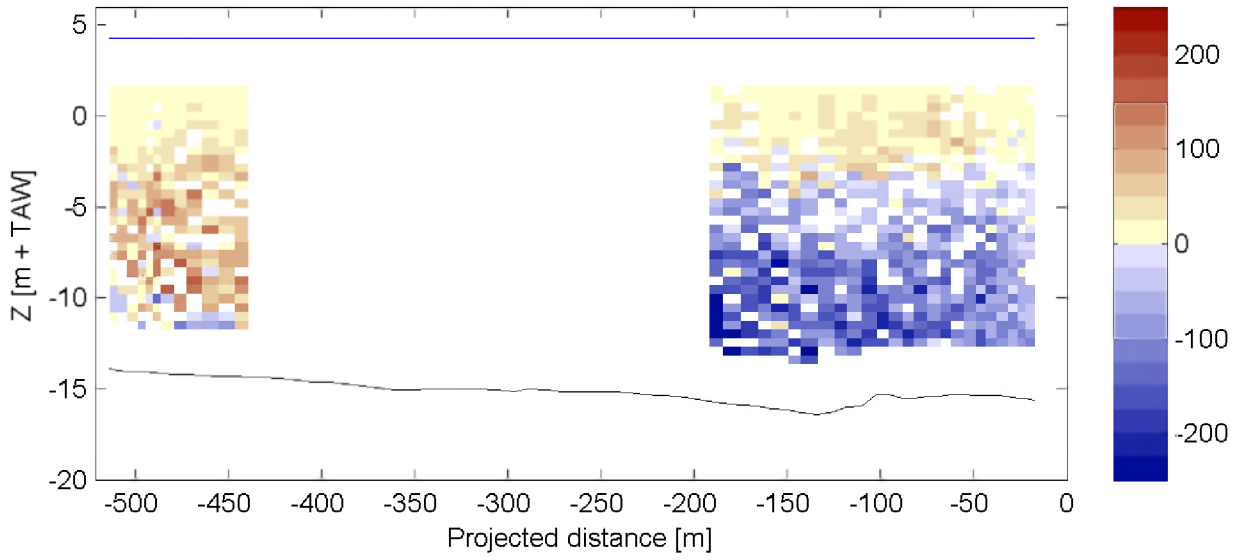
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2100DGDt000rbis.csv	Location: Transect DGD

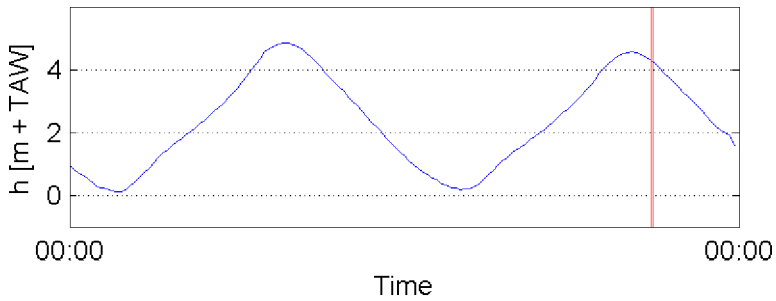
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

20:51:10 - 20:54:07

Data Processed by: IMDC

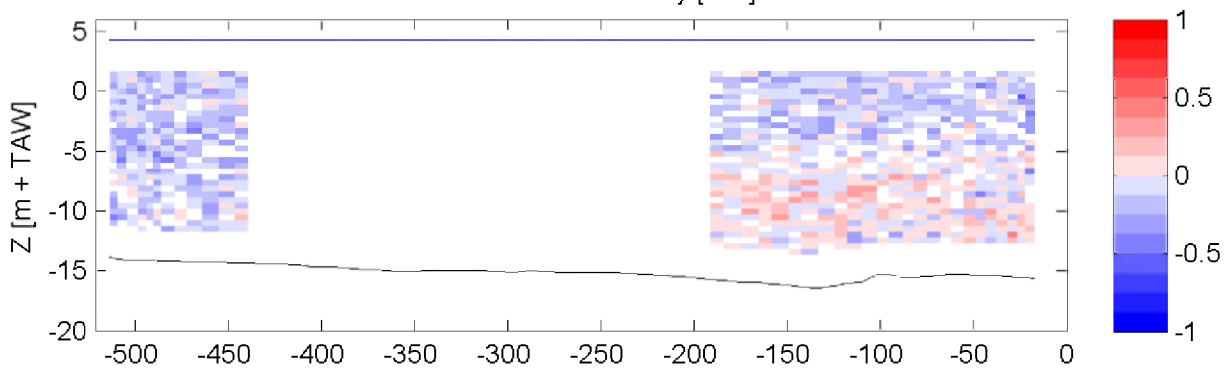
In association with :

I/RA/11283/06.110/BDC

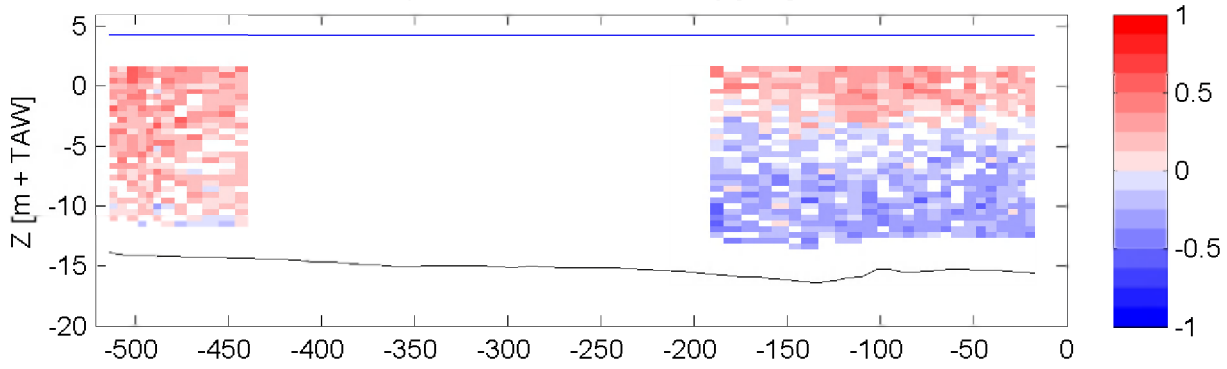
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2100DGDt000rbis.csv	Location: Transect DGD

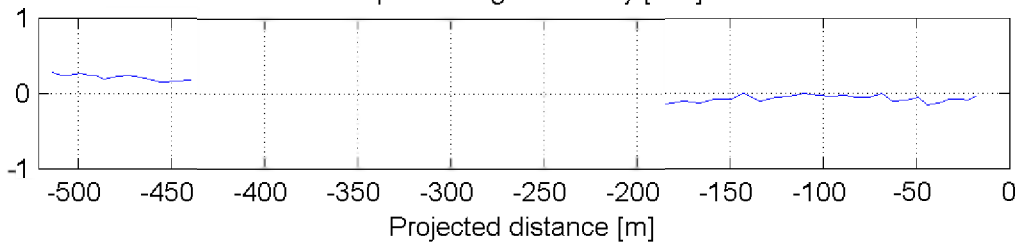
Parallel Current Velocity [m/s]



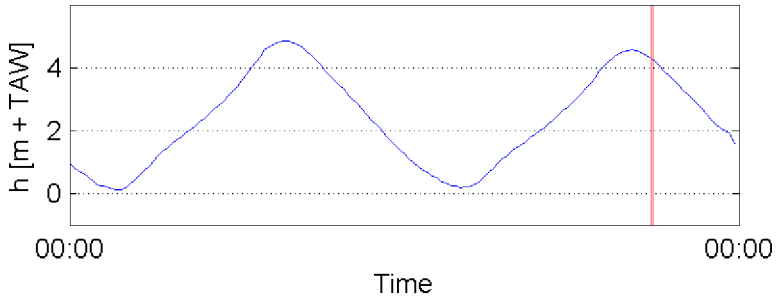
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

20:51:10 - 20:54:07

Data Processed by: IMDC

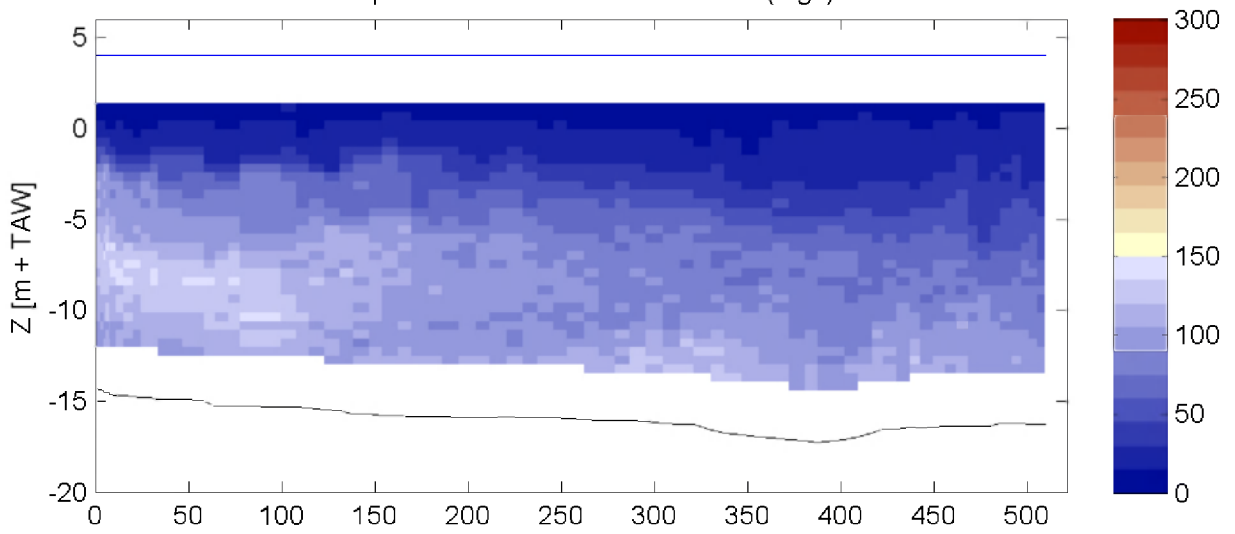
In association with :

I/RA/11283/06.110/BDC

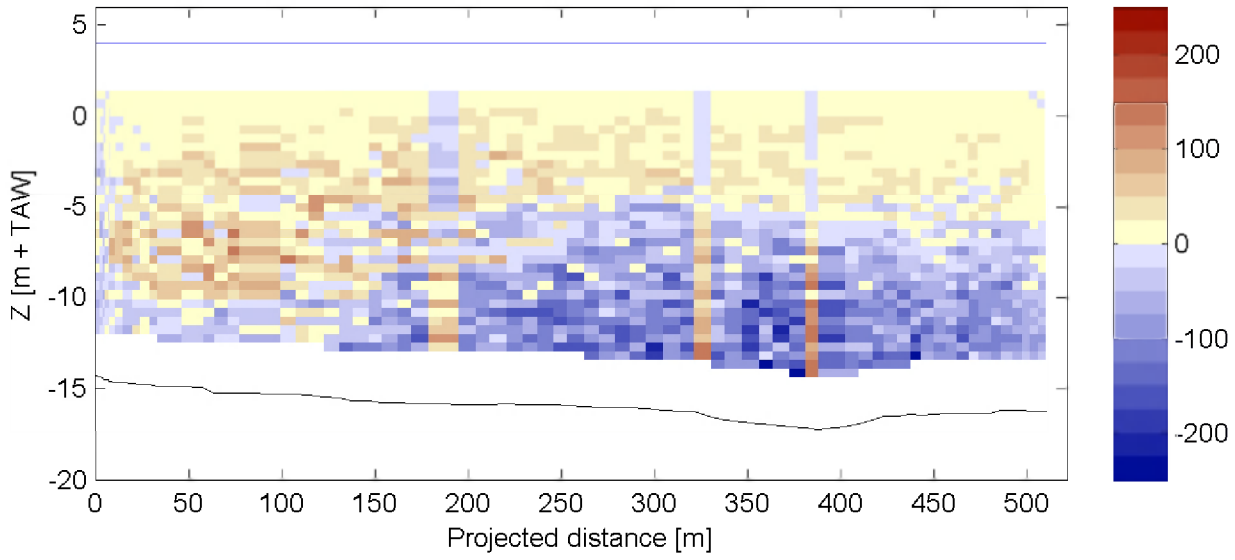
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2102DGDt000rsub2.csv	Location: Transect DGD

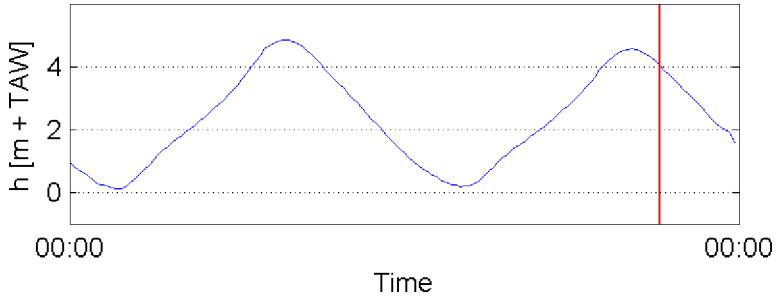
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

21:06:19 - 21:09:45

Data Processed by: IMDC

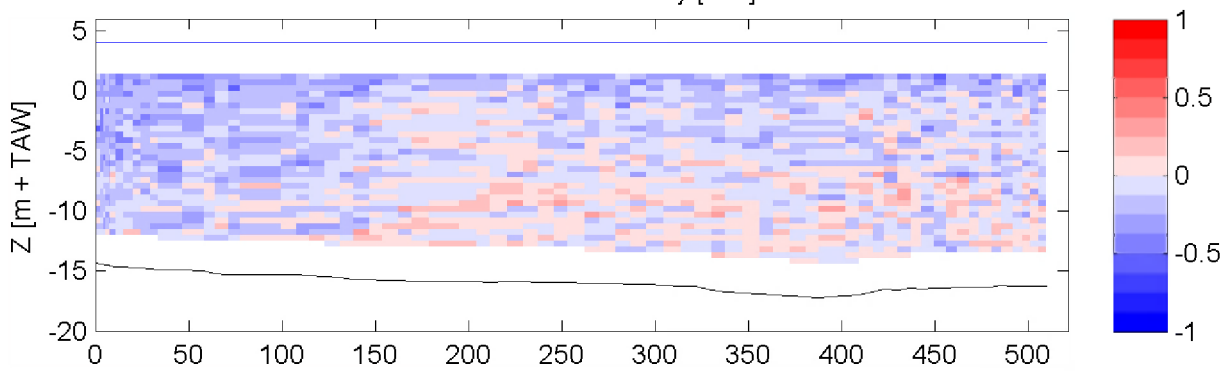
In association with :

I/RA/11283/06.110/BDC

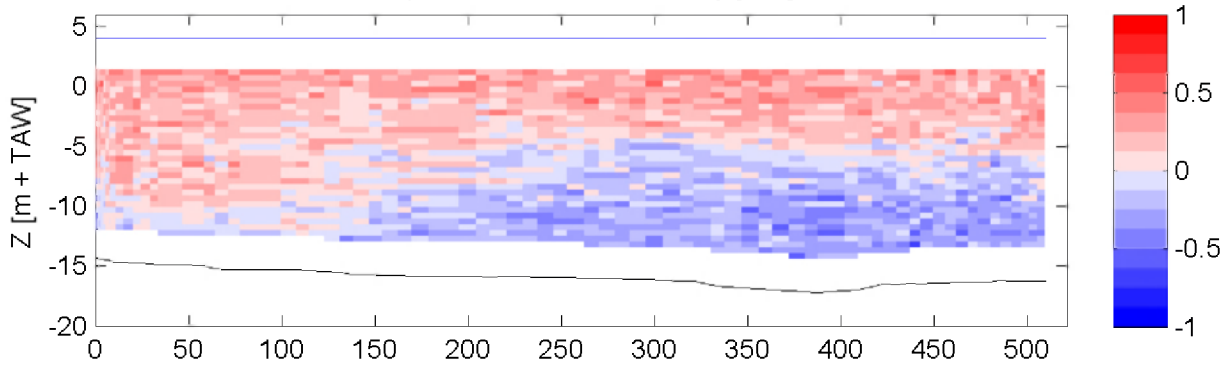
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2102DGDt000rsub2.csv	Location: Transect DGD

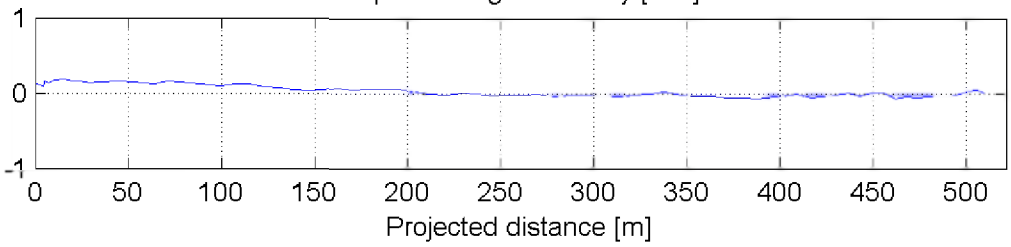
Parallel Current Velocity [m/s]



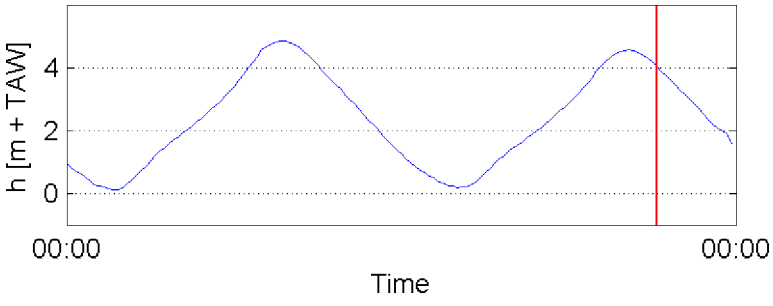
Perpendicular Current Velocity [m/s]



Depth Averaged Velocity [m/s]



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

21:06:19 - 21:09:45

Data Processed by: IMDC

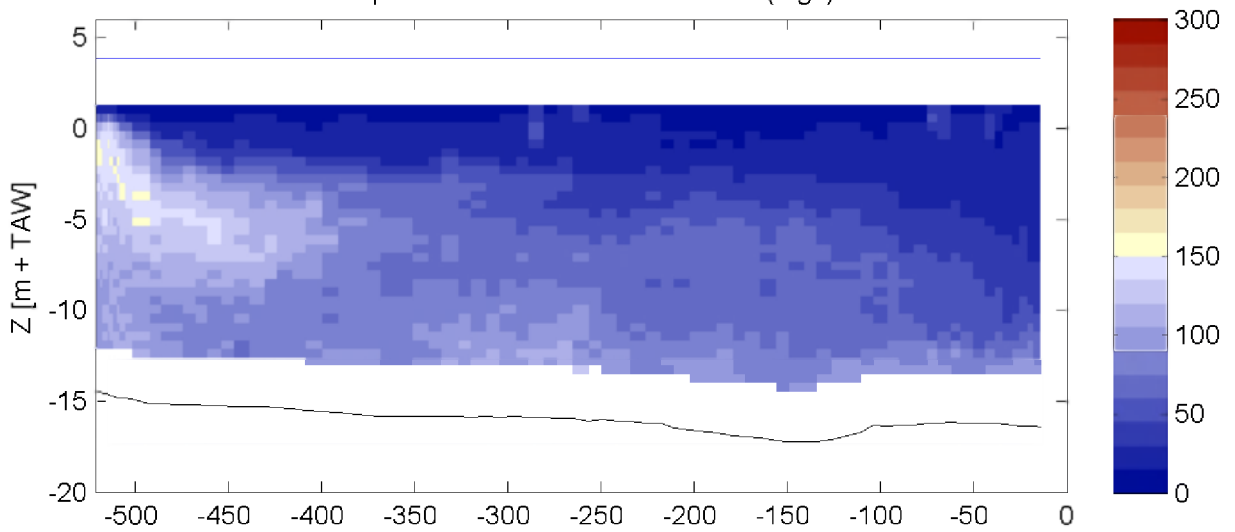
In association with :

I/RA/11283/06.110/BDC

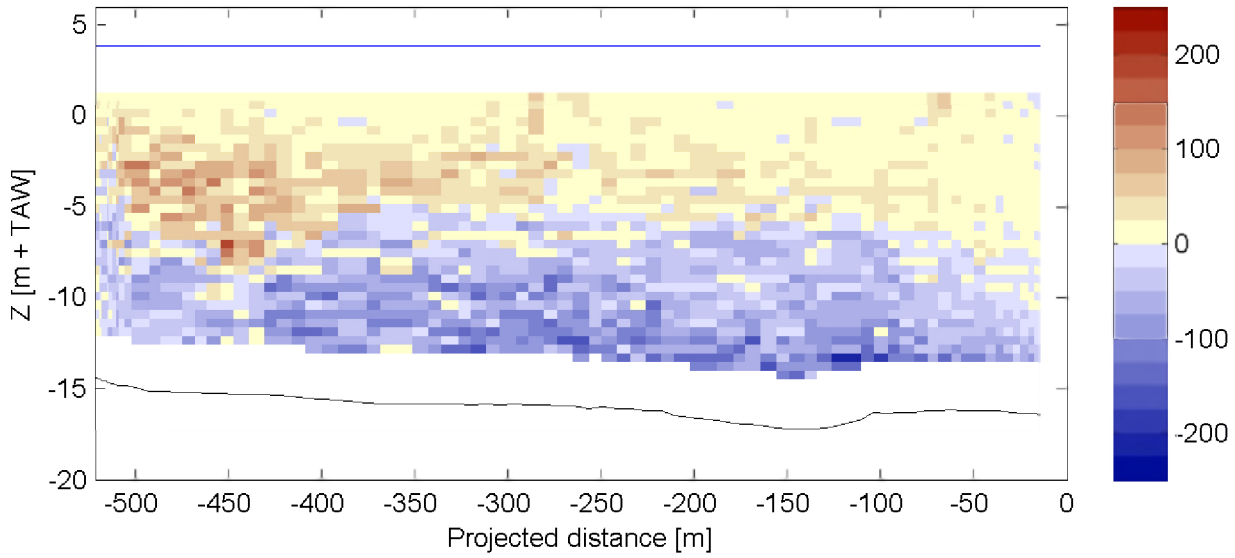
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2104DGDt000rsub.csv	Location: Transect DGD

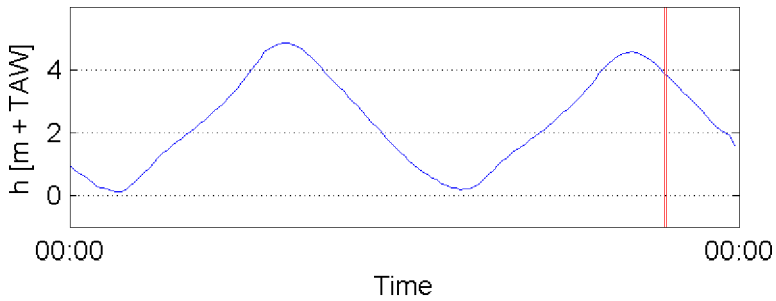
Suspended Sediment Concentration (mg/l)



Sediment Flux (g/sm²)



Tidal Elevation 22-Mar-2006



Date / Time [MET] :

22-Mar-2006

21:19:20 - 21:22:52

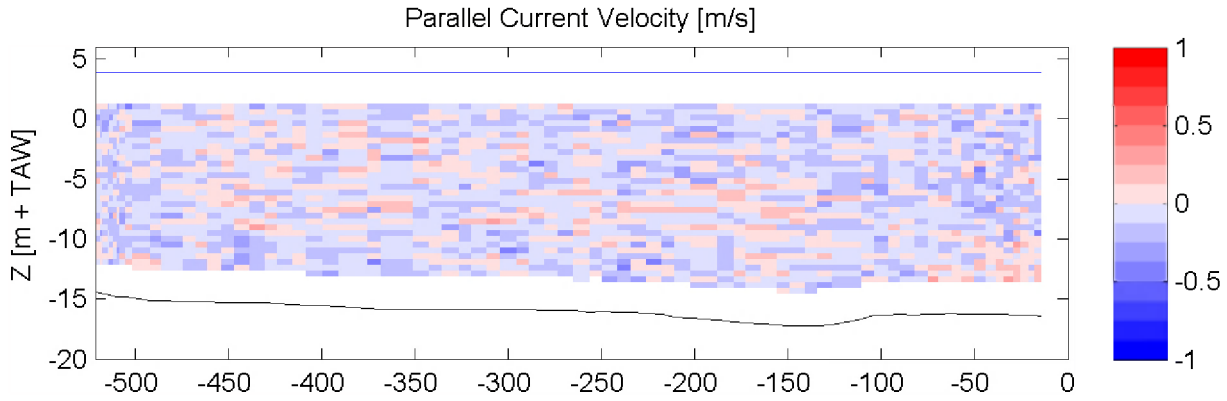
Data Processed by: IMDC

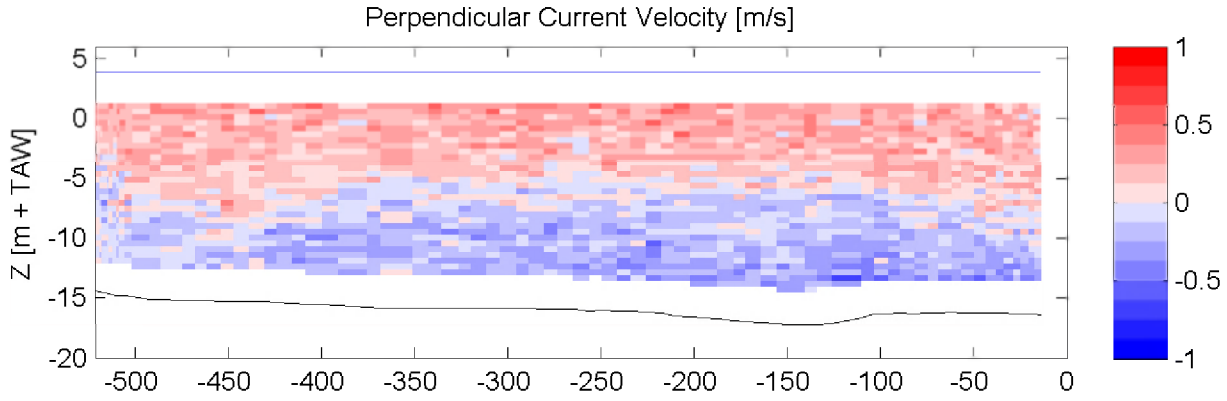
In association with :

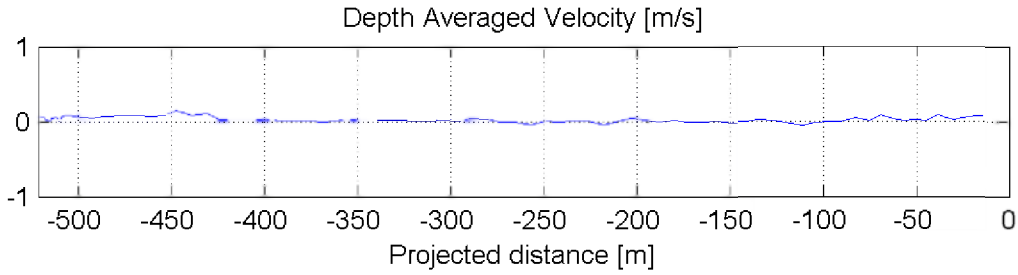
I/RA/11283/06.110/BDC

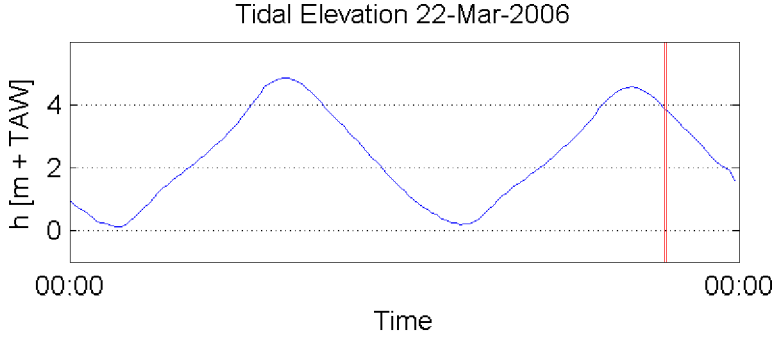
Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
Sourcefile: 2104DGDt000rsub.csv	Location: Transect DGD









Date / Time [MET] :

22-Mar-2006

21:19:20 - 21:22:52

Data Processed by: IMDC

In association with :

I/RA/11283/06.110/BDC

APPENDIX G. DISCHARGE AND SEDIMENT FLUX FOR THE TOTAL CROSS-SECTION

Filename	Qmid [m³/s]	Qtop [m³/s]	Qbottom [m³/s]	Qleft [m³/s]	Qright [m³/s]	Qtotal [m³/s]
2002DGDt000r.csv	106	320	17	183	-22	604
2005DGDt000r.csv	120	393	17	47	-42	536
2008DGDt000rbis.csv	69	314	12	33	25	453
2011DGDt000r2.csv	-21	229	-3	45	150	399
2014DGDt000rsub2.csv	203	162	29	-127	30	298
2016DGDt000r.csv	152	183	24	-128	39	269
2018DGDt000rsub.csv	243	144	35	-81	29	369
2020DGDt000r.csv	165	143	24	0	0	332
2022DGDt000r.csv	97	135	16	-140	42	150
2024DGDt000r.csv	103	111	16	-39	-35	156
2026DGDt000r.csv	133	57	20	66	21	297
2028DGDt000r.csv	101	52	14	-32	-91	43
2030DGDt000rbis.csv	68	-71	11	25	28	62
2032DGDt000rbis.csv	146	-51	24	-140	25	4
2034DGDt000rbissub.csv	79	-130	13	-139	10	-167
2036DGDt000rsub.csv	152	-10	22	-154	326	336
2038DGDt000rbissub.csv	17	-89	2	-109	22	-156
2040DGDt000r.csv	201	-96	29	-246	39	-74
2042DGDt000rsub.csv	129	-142	17	-123	27	-92
2044DGDt000rsub.csv	88	-138	11	-230	44	-226
2046DGDt000rsub.csv	171	-187	26	0	0	11
2048DGDt000r2.csv	-14	-198	-3	-41	74	-183
2050DGDt000rsub.csv	65	-211	8	-37	169	-6
2052DGDt000rbis.csv	-76	-245	-13	-36	26	-343
2054DGDt000r.csv	-112	-203	-18	-92	23	-402
2056DGDt000r.csv	Not Fully Recorded					
2058DGDt000r.csv	Not Fully Recorded					
2060DGDt000r.csv	Not Fully Recorded					
2062DGDt000rsub.csv	-40	-207	-6	92	-32	-194
2064DGDt000rsub.csv	-152	-133	-23	117	-51	-241
2066DGDt000r.csv	-94	-77	-17	202	45	58
2068DGDt000rsub.csv	-274	-26	-40	101	-98	-337
2070DGDt000rsub.csv	-151	-45	-21	130	-33	-120
2072DGDt000rsub.csv	-91	12	-13	78	-78	-92
2074DGDt000rbis.csv	-9	52	-2	44	-80	4
2076DGDt000rbis2.csv	-100	78	-16	47	-9	0
2078DGDt000rbissub.csv	-60	127	-8	19	-88	-10
2080DGDt000rsub.csv	-265	31	-35	90	-83	-264
2082DGDt000r.csv	-218	25	-31	170	-79	-133
2084DGDt000r.csv	-247	136	-36	10	-40	-177
2086DGDt000rsub2.csv	-228	141	-31	105	-125	-137
2088DGDt000r.csv	-253	104	-34	419	-16	220

Filename	Qmid [m³/s]	Qtop [m³/s]	Qbottom [m³/s]	Qleft [m³/s]	Qright [m³/s]	Qtotal [m³/s]
2090DGDt000rsub2.csv	7	169	-1	111	-81	206
2092DGDt000r2.csv	123	337	18	57	-29	506
2094DGDt000r2.csv	91	321	12	86	-26	484
2096DGDt000rsub.csv	79	333	13	168	-68	525
2098DGDt000rbis.csv	87	331	14	88	-16	505
2100DGDt000r.csv	Not Fully Recorded					
2102DGDt000rsub2.csv	80	310	13	-87	-16	299
2104DGDt000rsub.csv	135	357	21	-59	21	475

Filename	Fmid [kg/s]	Ftop [kg/s]	Fbottom [kg/s]	Fleft [kg/s]	Fright [kg/s]	Ftotal [kg/s]
2002DGDt000r.csv	-37	3	2	15	-2	-18
2005DGDt000r.csv	-29	4	2	3	-4	-25
2008DGDt000rbis.csv	-11	4	1	3	1	-2
2011DGDt000r2.csv	-9	2	0	3	5	1
2014DGDt000rsub2.csv	-1	1	3	-5	1	-2
2016DGDt000r.csv	-4	1	1	-8	1	-8
2018DGDt000rsub.csv	-1	1	1	-5	1	-2
2020DGDt000r.csv	-5	1	1	0	0	-3
2022DGDt000r.csv	-8	1	0	-10	1	-16
2024DGDt000r.csv	-6	1	0	-4	-2	-10
2026DGDt000r.csv	-3	0	0	5	0	1
2028DGDt000r.csv	0	1	0	-2	-3	-5
2030DGDt000rbis.csv	-1	-2	0	2	1	-1
2032DGDt000rbis.csv	-5	-2	0	-8	0	-15
2034DGDt000rbissub.csv	-6	-4	-1	-8	0	-18
2036DGDt000rsub.csv	-4	-2	0	-15	6	-15
2038DGDt000rbissub.csv	-11	-4	-2	-9	0	-25
2040DGDt000r.csv	7	-3	1	-16	1	-11
2042DGDt000rsub.csv	4	-4	0	-7	0	-7
2044DGDt000rsub.csv	3	-4	0	-13	1	-12
2046DGDt000rsub.csv	6	-5	1	0	0	2
2048DGDt000r2.csv	-3	-5	-1	-2	1	-10
2050DGDt000rsub.csv	5	-7	1	-2	3	0
2052DGDt000rbis.csv	-8	-8	-1	-2	2	-17
2054DGDt000r.csv	-23	-10	-2	-6	1	-40
2056DGDt000r.csv	Not Fully Recorded					
2058DGDt000r.csv	Not Fully Recorded					
2060DGDt000r.csv	Not Fully Recorded					
2062DGDt000rsub.csv	-2	-9	1	11	-2	-2
2064DGDt000rsub.csv	-13	-7	0	12	-3	-11
2066DGDt000r.csv	-4	-4	-1	15	4	10
2068DGDt000rsub.csv	-19	-2	-2	6	-7	-23
2070DGDt000rsub.csv	-14	-1	-1	10	-2	-8
2072DGDt000rsub.csv	-15	-2	0	6	-6	-17
2074DGDt000rbis.csv	-30	-1	-2	5	-18	-45
2076DGDt000rbis2.csv	-23	1	-3	4	-1	-22
2078DGDt000rbissub.csv	-6	3	-1	1	-8	-11
2080DGDt000rsub.csv	-19	1	-3	9	-4	-16
2082DGDt000r.csv	-14	0	-3	12	-6	-11
2084DGDt000r.csv	-26	4	-4	1	-3	-28
2086DGDt000rsub2.csv	-21	2	-3	6	-5	-21
2088DGDt000r.csv	-19	1	-3	23	-1	1

Filename	Fmid [kg/s]	Ftop [kg/s]	Fbottom [kg/s]	Fleft [kg/s]	Fright [kg/s]	Ftotal [kg/s]
2090DGDt000rsub2.csv	-19	1	-1	4	-5	-21
2092DGDt000r2.csv	-48	5	2	7	-3	-38
2094DGDt000r2.csv	-42	4	1	10	-3	-30
2096DGDt000rsub.csv	-34	4	1	12	-6	-23
2098DGDt000rbis.csv	-33	4	1	7	-1	-22
2100DGDt000rbis.csv	Not Fully Recorded					
2102DGDt000rsub2.csv	-27	3	2	-8	-1	-31
2104DGDt000rsub.csv	-18	4	2	-8	1	-18

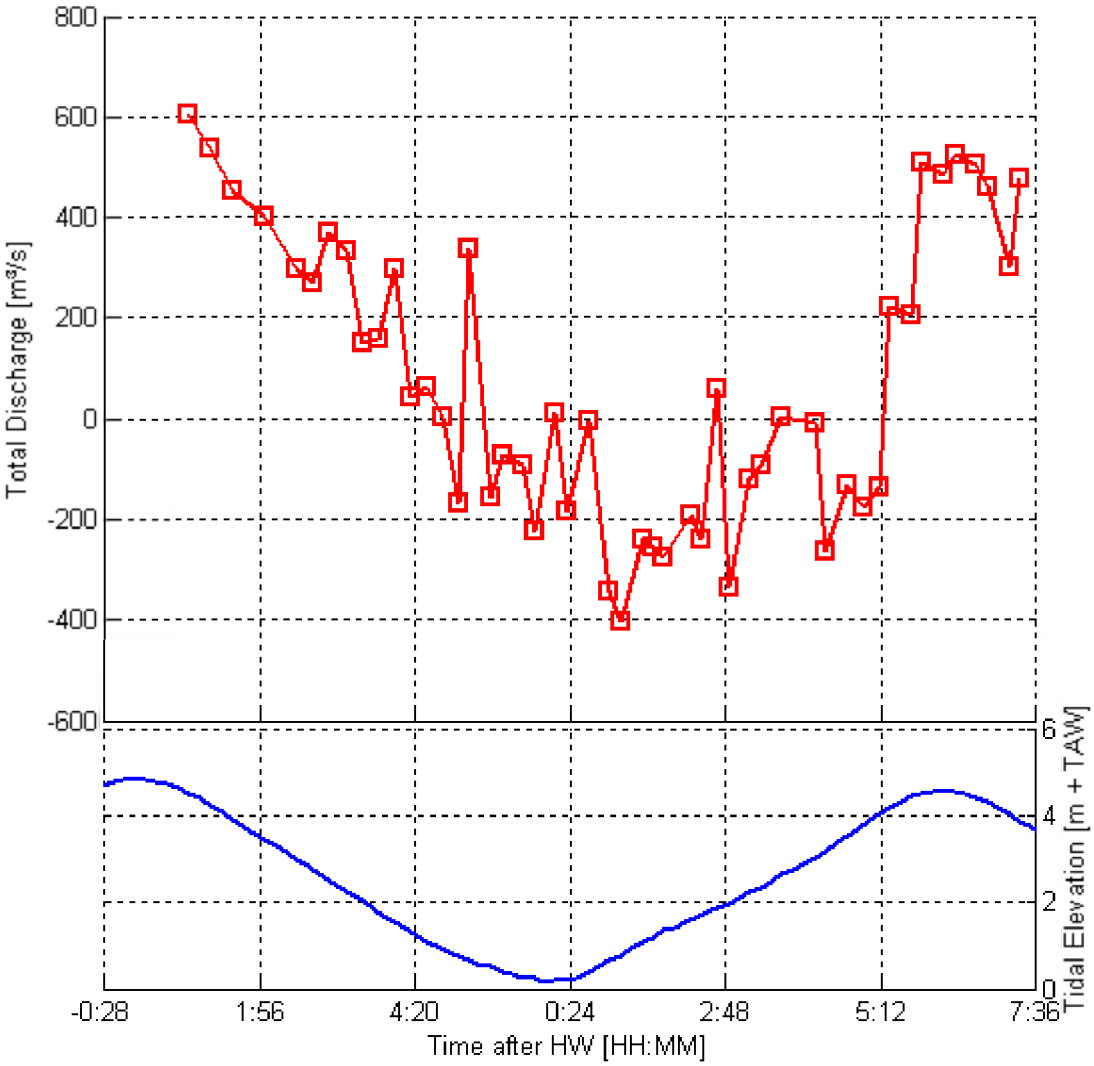
Net flux over measurement campaign: -708 Ton dry matter

APPENDIX H.

TEMPORAL VARIATION OF TOTAL FLUX AND TOTAL DISCHARGE

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
	Location: Transect DGD

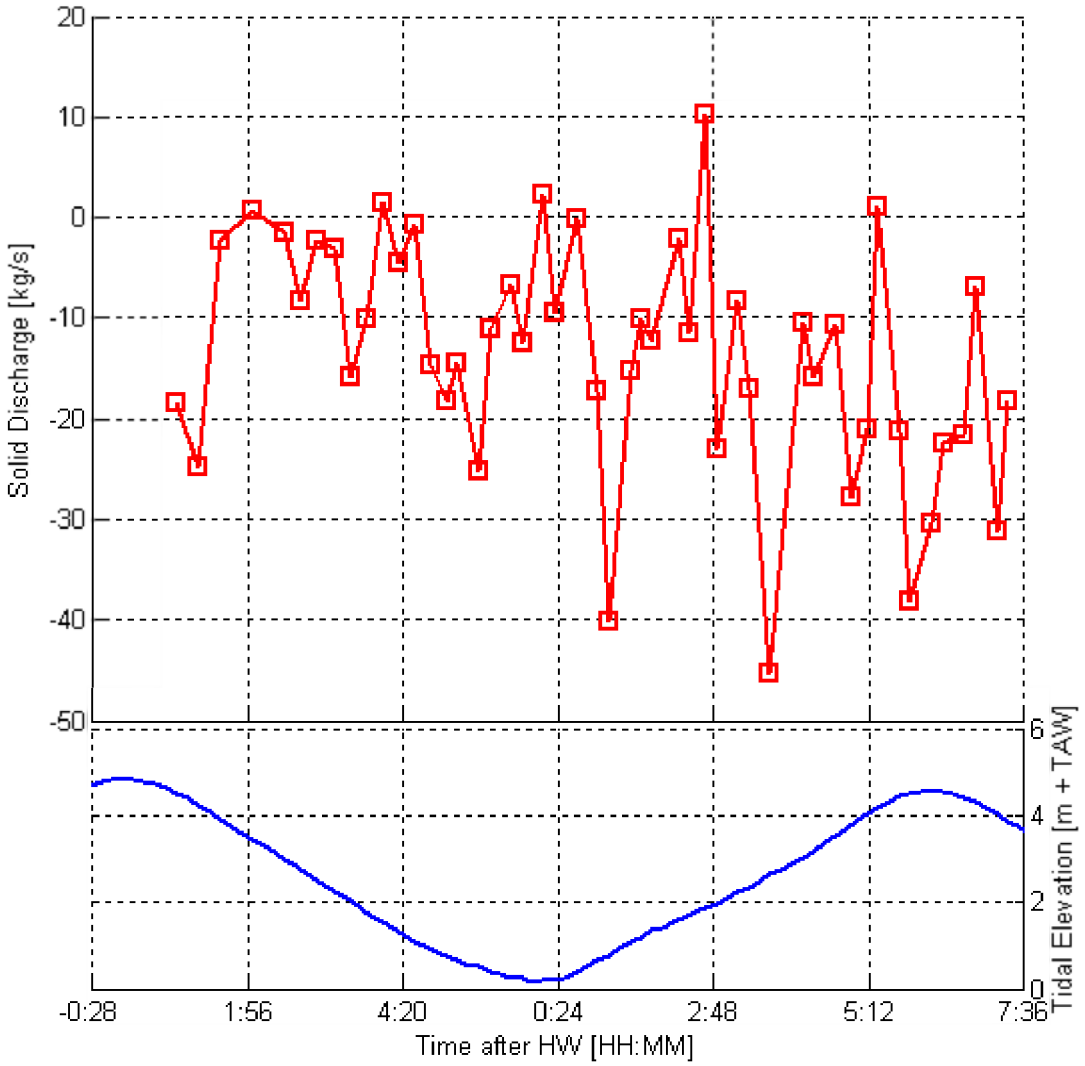


Data Processed by:

Total discharge through the measured cross section, positive downstream (outbound the dock)

Aanslibbing Deurganckdok

11283	Equipment(s): ADCP
	Location: Transect DGD



Data Processed by:

Total flux through the measured cross section, positive downstream (outbound the dock)

APPENDIX I. HCBS2 REPORTS WINTER CAMPAIGN

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 during 2006 (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)
8.2	Near bed continuous monitoring summer 2006 (I/RA/11291/06.101/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	
11.1	Measurement day 27/9 Vessel 1 (I/RA/11291/06.104/MSA)
11.2	Measurement Day 27/9 vessel 2 (I/RA/11291/06.105/MSA)
11.3	Measurement Day 28/9 vessel 1 (I/RA/11291/06.106/MSA)
11.4	Measurement Day 28/9 vessel 2 (I/RA/11291/06.107/MSA)
11.5	Measurement Day 28/9 vessel 3 (I/RA/11291/06.108/MSA)
Analysis	
12	Report concerning the presence of HCBS layers in the Scheldt river (I/RA/11291/06.109/MSA)