CHRISTIAN-ALBRECHTS-UNIVERSITÄT ZU KIEL

Berichte - Reports
Institut für Geowissenschaften

Nr. 23

Martin G. Wiesner, Karl Stattegger, Maren Voß, Klaus Schwarzer, Thomas Pohlmann, Thorben Amann, Deniz Bombar, Leopoldo de Silva, Joachim Dippner, Do Huy Cuong, Doan Nhu Hai, Kiem Duong Trung, Alina Freing, Julia Grosse, Ulrich Heidemann, Hartmut Hein, Kay Heyckendorf, Robert Jagodzinski, Anna Kagelmacher, Niko Lahajnar, Le Xuan Thuyen, Iris Liskow, Pia Moisander, Joseph Montoya, Nguyen Ba Minh, Nguyen Din Cho, Nguyen Huu Huan, Nguyen Kim Vinh, Nguyen Ngoc Lam, Nguyen Trung Thanh, Nguyen Van Tuan, Rolf Peinert, Alyssa Peleo-Alampay, Phung Van Phach, Alexander Schimanski, Eric Steen, Torben Stichel, Ajit Subramaniam, Witold Szuzucinski, Tran Van Chung, Daniel Unverricht, Vo Van Quang, Andreas Welsch, Andreas Wetzel

Cruise Report RV SONNE 187
VIETNAM

Land-Ocean-Atmosphere
Interactions in the Coastal Zone of Vietnam

Ber. – Rep., Inst. für Geowiss., Universität Kiel, Nr. 23,
99 S., Kiel, (Dezember) 2006.

ISSN 0175-9302

CRUISE REPORT RV SONNE 187

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Martin G. Wiesner, Karl Stattegger, Maren Voß, Klaus Schwarzer, Thomas Pohlmann,

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Herausgeber: Institut für Geowissenschaften
der Christian-Albrechts-Universität
24098 Kiel, Deutschland

Schriftleitung: Dr. Kyaw Winn

ISSN 0175 - 9302 • Für den Inhalt der Arbeit sind die Verfasser allein verantwortlich.

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1. Major Research Objectives of SO 187

The coasts and shallow seas of southern Vietnam are threatened by the consequences of climatic change as well as by intensive human use of coastal regions and coastal seas. Ongoing global warming leads to changes in the monsoon climate system and its seasonality, to changes in river discharge to the sea, to changes in nearshore current and circulation patterns in the coastal sea and to sea level rise. These manifold changes are often accelerated by natural and anthropogenic subsidence of coastal lowlands and by an increase in the frequency and intensity of storms. The fact that the major part of Vietnam's population lives close to the coast and is economically dependant on resources from the coastal seas amounts to a mutual risk situation for humans and for coastal ecosystems. Together with the strong population pressure on coastal areas and shelf seas, ongoing global change together with human use of resources and habitation cause a rapid degradation of natural coastal systems. Because of the multi-factorial character of the impacts, cumulative effects of these aspects are still largely unknown.

The overall goal of the cruise was to obtain information on the biological, geological and oceanographic forcings triggering major changes in the coastal zone of southern Vietnam. A synoptical view of land-ocean interactions on the short-term perspective of seasonality and extreme events and on the long-term perspective of coastal and shelf evolution is needed to improve the predictability of the future behavior and evolution of this unique coastal system. Furtehrmore, understanding the natural adjustments that occur between coastal landforms, coastal ecology, river discharge, shallow marine morphologies and the processes in the water column including coastal upwelling is essential for a better management of coastal resources.

The cruise was financed by the German Ministry of Education and Research (BMBF) and represents an integral part of the joint Vietnamese-German research programme on 'Land-Ocean-Atmosphere Interactions in the Coastal Zone of Vietnam' (VIETNAM) funded by the German Science Foundation (DFG). The programme includes the following German, Vietnamese and Philippine research institutions: Center for Tropical Marine Ecology (Bremen), Institute for Baltic Sea Research (Rostock), Institute of Geosciences (Kiel), Institute of Oceanography (Hamburg), Institute of Biogeochemistry and Marine Chemistry (Hamburg), Institute of Oceanography (Nha Trang), Institute of Marine Geology and Geophysics (Hanoi), Institute of Geography (Ho Chi Minh City) and the National Institute of Geological Sciences (Quezon City). The research area extends from the southern tip of Vietnam at Ca Mau to the upwelling zone off Nha Trang (Fig. 1) with investigations focussing on (i) sediment mobility, hydrology, nutrient cycles, phyto- and zooplankton

ecology and particle fluxes, and (ii) the Holocene history of the northern Sunda and southern central Vietnam shelf regimes bordering the upwelling region and including the Mekong delta.

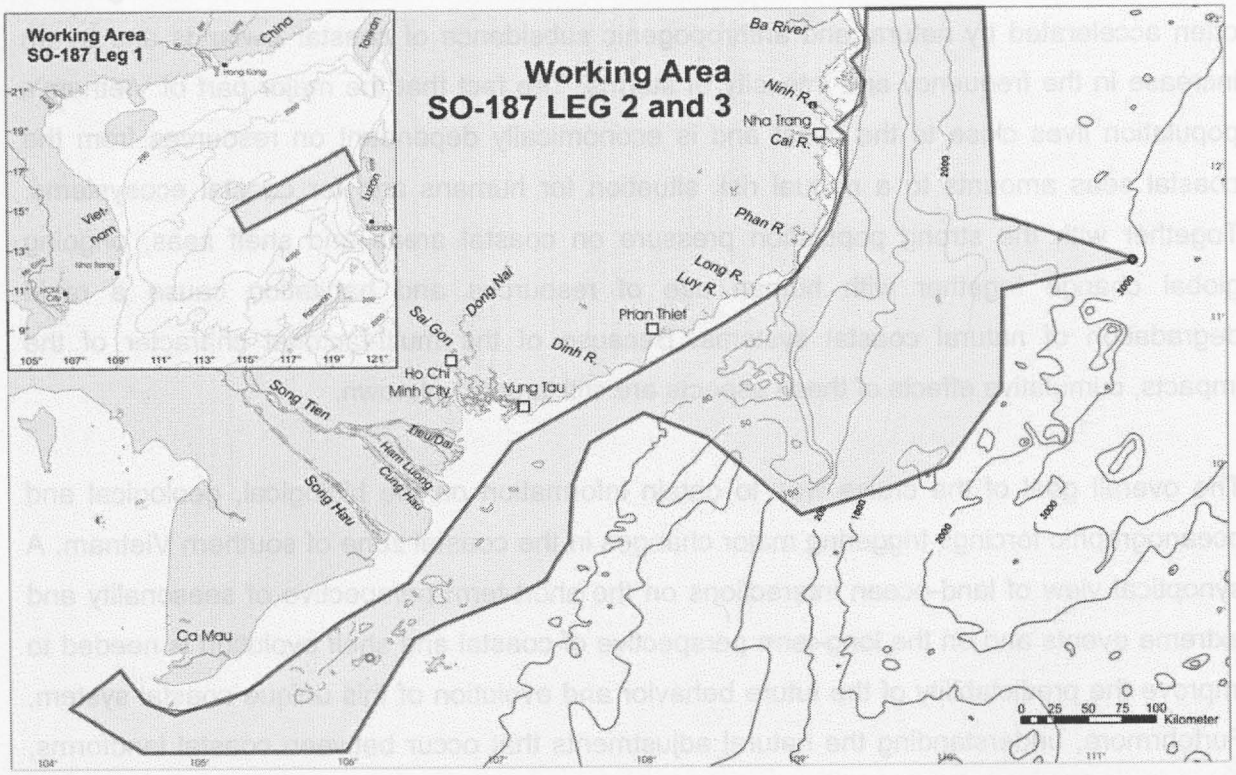

Fig. 1. Working areas of RV *Sonne* cruise SO-187.

2. Leg 1: Nagasaki - Nha Trang, 31.03. – 10.04.2006

2.1 Research Programme and Objectives

Monsoon-driven upwelling along the southeastern coast of Vietnam in summer and along the northern edge of the Sunda Shelf as well as off northwestern Luzon in winter generates the biologically most productive off-shelf regions in SE-Asian waters. Runoff from nearby rivers such as the Mekong and the Abra or Amburayan has been assumed to contribute to the fertility of these regions. The upwelling is significantly suppressed or fails during El Niño events which are predicted to increase in both frequency and amplitude on top of a global warming trend. The extent to which these events (and their cold counterparts) affect the ecological and biogeochemical conditions in these areas, however, is not known and future perturbations of the upwelling systems are difficult to describe.

Time-series records of the fluxes of sinking particulate matter have been obtained by sediment traps during the 1998 El Niño event in the upwelling regions off Vietnam (SCS-SW) and Luzon (SCS-NE) and in the oligotrophic central South China Sea (SCS-C) (Wiesner et al., 1999). The traps were redeployed by RV *Sonne* on cruise SO-140 to monitor the impact of ENSO-neutral or La Niña conditions, but recovery of the systems failed in 2000. The main objective of Leg 1 therefore was to dredge the moorings SCS-NE and SCS-C (dredging of SCS-SW and of another mooring deployed off Vietnam by the Institute of Baltic Sea Research was originally planned to be executed on Leg 3). Another objective was to test and tune a Laser In-Situ Scattering and Transmissometry (LISST) instrument to be fully employed along the Vietnam coast during Leg 2 and 3.

The trap samples should be integrated into the DFG-project VIETFLUX, an ongoing particle flux study off Vietnam (and an integral part of the VIETNAM programme) carried out jointly by the Institute of Biogeochemistry and Marine Chemistry of the University of Hamburg, Germany, the Institute of Oceanography in Nha Trang, Vietnam, and the National Institute of Geological Sciences in Diliman, Quezon City, Philippines. The project started in 2003 in order to (1) determine the pathways and extent of advective transport from the rivers across the shelf to the upwelling areas; (2) record particle fluxes in the upwelling zones, quantify the role of primary productivity versus lateral advection events, and assess their forcings; (3) describe the link between monsoon intensity, eddy formation, river runoff, ecosystem structure and biogeochemical fluxes; (4) calculate ENSO-induced biogeochemical anomalies; and (5) regionally test and improve proxies for these key processes for subsequent use in and refining of paleooceanographic studies.

2.2. Previous Studies

Sediment traps deployed in the upwelling centers within the framework of the ongoing VIETNAM project have shown that in contrast to what has been assumed earlier, only small proportions of the annual fluxes are produced during the upwelling seasons. Moreover, there is little indication of riverine suspended solids directly reaching the trap sites. During both El Niño and ENSO-neutral conditions, the major part of the fluxes is related to the formation of cold-core eddies, which occur during the early and late stages of the NE-monsoon, affecting the water column down to depth of greater than 500 m. These eddies enhance productivity by upward nutrient pumping, but synchronously resuspend large amounts of solids from the shelf and slope and advect the plumes to the trap sites. This influx appears to carry a mixed signal of northern, central and southern Vietnam rivers including the Mekong, indicating strong resuspension and resedimentation processes along the coast. The advected material masks primary production signals in the upwelling areas and produces large discrepancies between proxy and actual data. First results from sediment traps outside the upwelling regions integrated into this study show that advection plumes also affect the particle fluxes in the northern South China Sea while particle fluxes in the central and northeastern South China Sea are largely primary-productivity controlled.

2.3 Participants

Names, affiliations and tasks of the scientific participants and nautical crew members are given in Tables 1 and 2.

Table 1: List of Leg 1 Scientific Crew Members

Member	Affiliation	Tasks
De Silva, Leopoldo	NIGS*	Sediment Traps
Lahajnar, Niko	IfBM#	Sediment Traps
Wiesner, Martin	IfBM	Chief Scientist Sediment Traps

*NIGS - National Institute of Geological Sciences, University of the Philippines, Diliman, Quezon City, Philippines
#IfBM - Institute of Biogeochemistry and Marine Chemistry, University of Hamburg, Hamburg, Germany

Table 2: List of SO-187 Nautical Crew Members

Member	Affiliation	Tasks
Meyer, Oliver	RF*	Master
Korte, Detlef	RF	Chief Officer
Aden, Nils-Arne	RF	1st Officer
Büchele, Heinz-Ulrich	RF	2nd Officer
Raabe, Konrad	RF	Surgeon
Jahns, Winfried	RF	Boatswain
Fricke, Ingo	RF	AB Seaman
Hödel, Werner	RF	AB Seaman
Meyer, Nicki	RF	AB Seaman
Schrapel, Andreas	RF	AB Seaman
Trinkies, Karsten	RF	AB Seaman
Vor, Hans-Jürgen	RF	AB Seaman
Guzman-Navarette, Werner (Leg 1+2) Lindhorst, Norman (Leg 3)	RF	Chief Engineer
Grund, Helmuth	RF	2nd Engineer
Klinder, Klaus-Dieter	RF	2nd Engineer
Zebrowski, Darius	RF	Electrician
Blohm Volker	RF	Motorman/Deck Fitter
Dehne, Dirk	RF	Motorman
Marcinkowski, Przemyslaw	RF	Motorman
Förster, Tino	RF	Motorman/Apprentice
Leppin, Jörg	RF	Chief Electron. Engineer
Grossmann, Matthias	RF	System Manager
Tiemann, Frank	RF	Chief Cook
Kornaga, Ryszard	RF	2nd Cook
Grübe, Gerlinde	RF	Chief Steward
Kuzon, Ryszard	RF	2nd Steward

*RF - Reederei Forschungsschifffahrt GmbH (RV *Sonne* Shipping Company), Bremen, Germany

2.4 Cruise Narrative

RV *Sonne* departed from Nagasaki, Japan, on April 1 (all time data are given in UTC) and sailed southward to station #1 in the center of the NE-monsoon upwelling cell off the northwestern coast of Luzon Island in the South China Sea (see Fig. 2) The vessel arrived at that station in the early afternoon of April 5. After an (expectedly) unsuccessful attempt to release the sediment trap system SCS-NE-02 in using the deck-unit transponder, the LISST instrument was tested at varying slacking speeds down to water depths of 300 m. Subsequently dredging operations were started (water depth at SCS-NE: 2950 m, system length: 1670 m). The dredge system consisted of a 1000 m rope equipped with grapnels and barbed grapples which was fixed to a 3000 m wire; all wires were spooled on a steel reel clamped into the ship's own mooring gear W 24. However, after having paid out the first 2000 m of the dredge, the capacity of the W 24 became overloaded and the winch had to be stopped. Since the winch was not able to hoist the dredge, the rope had to be cut off. Because of the loss of wire further dredging at station #1 would have required to make full

use of the 8000 m wire on the deep-sea winch W 6. But since any damage of that wire might have to led to cancellation of the coring operations off Vietnam planned for leg 3, it was decided to cancel the dredging operations at this station and at the other deep-water station in the central South China Sea (station #2 [SCS-C-08], water depth: 4300 m, system length: 3120 m).

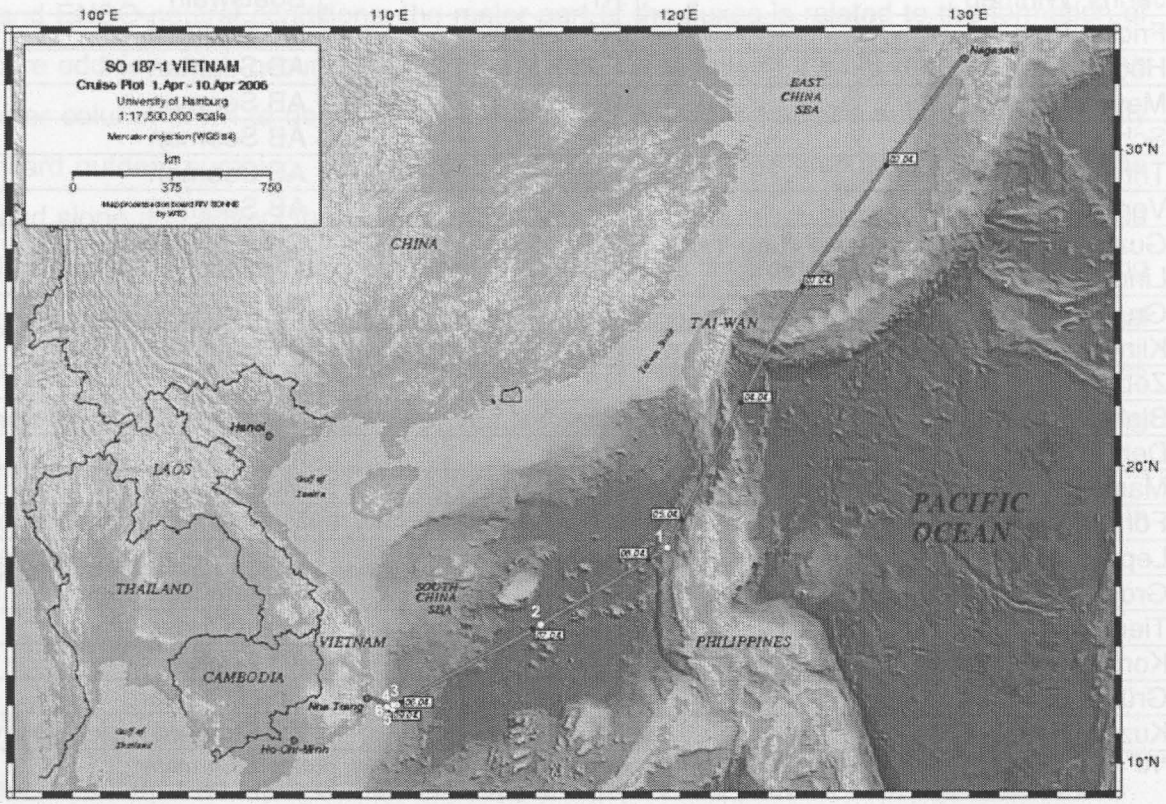

Figure 2. Track of RV *Sonne* cruise 187 Leg 1.

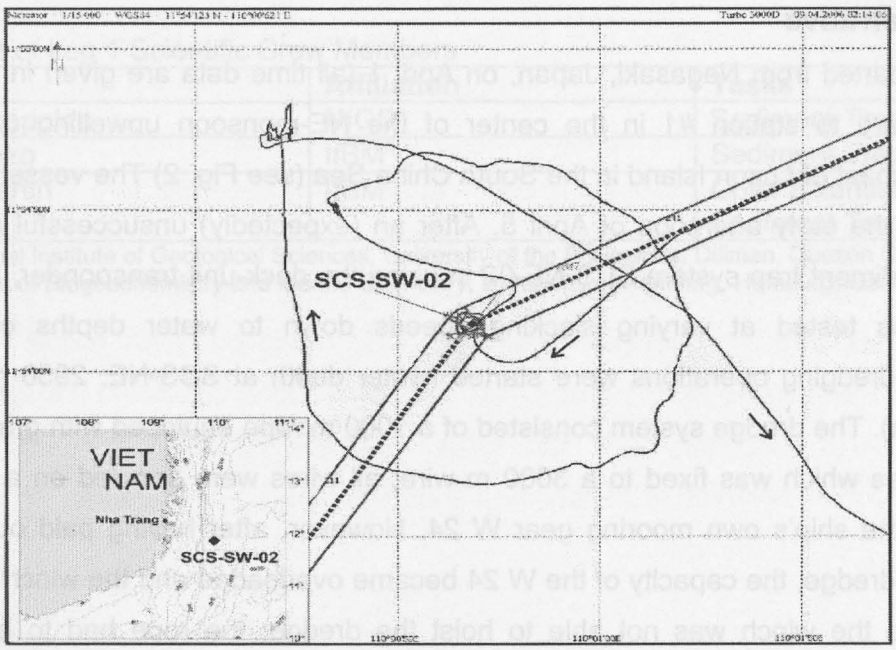

Figure 3. Plot showing the track of RV Sonne during laying-out and towing of the dredging device to recover the mooring system SCS-SW-02 at station #3 (arrows indicate cruising direction).

En route from station #1 to #3 the ship stopped at station #2 on April 6 to test the LISST under open-ocean (low suspended matter) conditions. In the morning of April 8 RV *Sonne* arrived at station #3 where the sediment trap system SCS-SW-02 (water depth: 1889 m, system length: 670 m) was successfully dredged within 8 hours (see Fig. 3), followed by another test run with the LISST instrument (station #4, see Fig. 2). Subsequently, on April 9, an attempt as made to dredge IOW-01 (station #5, 4 nm southwest of SCS-SW-02) which was unsuccessful.

A bathymetric survey was then carried out on the same day with the SIMRAD sonar system to obtain information on a spur-like and steep (22-25% grade) structure centered at 11°59'N, 109°53'E (station #6). Based on ETOPO-2 bathymetric data, the spur extends from the shelf break off Vietnam to the east over a distance of 35 km, rising from 1800 m to 700 m water depth (Fig. 4). Such a structure may induce local upwelling as it bars the western boundary current and may be the source of resusended particulate matter advected into the upwelling zone. On April 9 at 14:31 all station work was completed and RV *Sonne* proceeded westward to Nha Trang where it docked at 01:00 on April 10 (08:00 local time). The scientific equipment was left on board for Leg 3 and the scientific crew disembarked at 11:00.

2.5 Stations and Sampling Procedures

A list of all stations including time, position, water depth and devices employed is given in Table 3.

Station	Date	UTC	Position Latitude	Position Longitude	Water Depth [m]	Device/Activities
SO187/001-1	05.04.06	05:35	17° 18,60' N	119° 34,17' E	2947	Attempt to release mooring SCS-NE-02 by deck-unit transponder system
SO187/001-2	05.04.06	06:40	17° 18,82' N	119° 34,07' E	2949	Lasertransmissometer
SO187/001-3	05.04.06	18:06	17° 18,79' N	119° 33,79' E	2948	Dredging of mooring SCS-NE-02
SO187/002-1	06.04.06	20:59	14° 43,35' N	115° 09,13' E	4303	Lasertransmissometer
SO187/002-2	06.04.06	21:58	14° 43,43' N	115° 9,13' E	4307	Attempt to release mooring SCS-C-08 by deck-unit transponder system
SO187/003-1	08.04.06	02:15	11° 54,15' N	110° 00,70' E	1881	Dredging of mooring SCS-SW-02
SO187/004-1	08.04.06	10:43	11° 52,92' N	110° 02,09' E	1928	Lasertransmissometer
SO187/005-1	09.04.06	01:00	11° 50,18' N	109° 58,53' E	1790	Dredging of mooring IOW-01
SO187/006-1	09.04.06	09:23	11° 51,26' N	109° 58,00' E	1773	SIMRAD sonar bathymetric survey
SO187/006-1	09.04.06	09:34	11° 50,02' N	109° 59,43' E	1820	
SO187/006-1	09.04.06	10:46	12° 00,86' N	109° 57,06' E	1768	
SO187/006-1	09.04.06	11:00	12° 01,02' N	109° 55,03' E	1625	
SO187/006-1	09.04.06	11:42	11° 54,05' N	109° 54,99' E	1667	
SO187/006-1	09.04.06	11:57	11° 54,02' N	109° 52,93' E	1556	
SO187/006-1	09.04.06	12:37	12° 00,83' N	109° 52,91' E	1486	
SO187/006-1	09.04.06	12:50	12° 01,01' N	109° 50,82' E	1304	
SO187/006-1	09.04.06	13:35	11° 53,57' N	109° 50,83' E	1292	
SO187/006-1	09.04.06	14:31	12° 01,02' N	109° 47,94' E	715	

Table 3. Station book SO-187 leg 1

2.6 Preliminary Results

Results of the SIMRAD sonar document that the actual dimensions of the spur-like structure in the southwest monsoon upwelling zone off Nha Trang are significantly different from the ETOPO-2 bathymetric map (see Fig. 4). Its longitudinal extension is only about 30% of

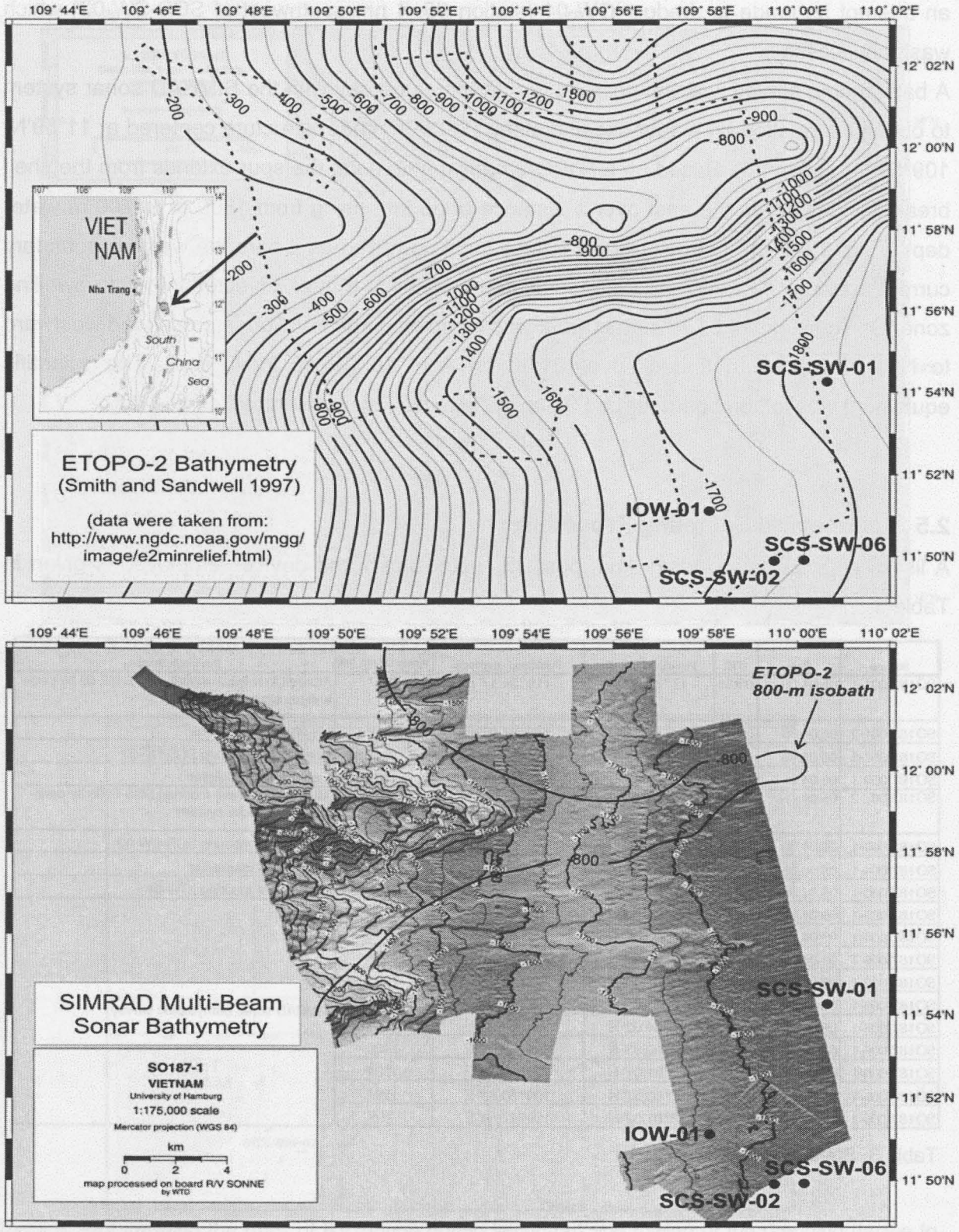

Figure 4. Comparison of the ETOPO-2 with the SIMRAD multi-beam sonar bathymetric data.

the one delineated by the ETOPO-2 data with the SIMRAD 1000-m isobath roughly being positioned at the 200-m ETOPO-2 contour line (Fig. 4). Hence the role of the structure in affecting the sedimentation of biogenic and lithogenic particles in the upwelling zone is of much lesser importance than previously assumed.

The test runs with the Laser In-Situ Scatterometer/Transmissometer have shown that reproducible results are obtained at slacking speeds of 0.2 m/s, independently of whether the instrument is deployed in low or high suspensions regimes.

2.7 References

Smith, W. H. F. and Sandwell, D.T., 1997. Global seafloor topography from satellite altimetry and ship depth soundings. Science, 277: 1956-1962.

Wiesner, M.G., Stattegger, K., Kuhnt, W. and Shipboard Scientific Party, 1999. Cruise Report SONNE 140 – Südmeer III. Berichte-Reports, Institut für Geowissenschaften, Universität Kiel, 7: 1-157.

3. LEG 2: Nha Trang - Nha Trang, 11.04. – 22.04.2006

3.1 Research Programme and Objectives

Leg 2 was part of the ongoing project "Pelagic processes and biogeochemical fluxes in the South China Sea off southern central Vietnam" carried out since 2003 as part of the VIETNAM programme, funded by the German Science Foundation. The objectives of the leg were (i) to identify and characterize the water masses comprising the coastal waters in the SCS and the particulate and dissolved substances in the water column and in the Mekong river plume; (ii) to quantify nitrate based new production and nitrogen fixation along the cruise track and in mesocosm experiments along with a molecular characterization of the species composition; and (iii) to estimate the flux rates in different depth of the water column.

3.2 Previous Studies

Within the framework of the aforementioned project planktological and biogeochemical investigations were performed by Institute of Baltic Sea Research, Germany, jointly with the Institute of Oceanography in Nha Trang (ION), the work of which was funded by Ministry of Science and Technology in Hanoi. The focus of the work was on pelagic processes in the upwelling region off southern central Vietnam, with emphasis on the nitrogen cycle. Seasonal changes in the relative importance of different nitrogen(N)-nutrient sources for primary production (upwelling, riverine input, and fixation of atmospheric N by cyanobacteria) and their impact on pelagic system dynamics were investigated (Dippner et al., submitted). Close collaboration was kept with the physical-oceanographic projects of the Institute of Oceanography of the University of Hamburg and of the ION. These projects elucidated hydrodynamics as the prime forcing of nutrient supply in the investigation area. Over the past three years four cruises were made on board of the Vietnamese research vessel *Nghien Cuu Bien*. A pre-defined grid of stations between Nha Trang and Vung Tau was sampled, but no samples could be obtained from off the Mekong River estuary. The expeditions covered the summer monsoon (cruises VG 3 and VG 7 in 2003 and 2004) and winter monsoon (cruise VG 8 in 2004) seasons as well as the spring inter-monsoon period (cruise VG 4 in 2003).

3.3 Participants

Names, affiliations and tasks of the scientific participants are given in Table 4 (for nautical crew members see Table 2).

Table 4: List of Leg 2 Scientific Crew Members

Member	Affiliation	Tasks
Voß, Maren	IOW*	Chief Scientist
Peinert, Rolf	IOW	Sediment Traps
Dippner, Joachim	IOW	CTD, data manager
Liskow, Iris	IOW	Nutrients
Große, Julia	IOW	Filtration, Chlorphyll
Bombar, Deniz	IOW	N-fixation Experiment
Montoya, Jospeh	Georgia Institute of Technology,USA	N-fixation Experiment
Subramaniam, Ajit	Lamont Doherty Earth Observatory, USA	Bio-optics, Pigments, CDOM
Freing, Alina	IFM-GEOMAR§ Kiel	N_2O
Moisander, Pia	University of Santa Cruz, USA	Molecular Biology
Nguyen, Ngoc Lam	ION#	Phytoplankton
Doan, Nhu Hai	ION	Nanoplankton
Duong, Trung Kiem	ION	Nutrients
Hoang, Trung Du	ION	Respiration
Nguyen, Huu Huan	ION	Chlorophyll
Vo, Van Quang	ION	Fish Larvae
Nguyen, Din Cho	ION	Zooplankton
Pohlmann, Thomas	IfM+ University of Hamburg	CTD
Hein, Hartmut	IfM University of Hamburg	CTD
Andreas Welsch	IfM University of Hamburg	CTD
Nguyen, Kim Vinh	ION	CTD
Nguyen Van Tuan	ION	Oceanography
Tran Van Chung	ION	Oceanography

*IOW – Leibniz Institut für Ostseeforschung (Leibniz Institute of Baltic Sea Research) Rostock, Germany
#ION – Institute of Oceanography, Nha Trang, Vietnam
+IfM – Institut für Meereskunde (Institute of Oceanography), Hamburg, Germany
§IFM-GEOMAR – Leibniz Institute of Marine Sciences, Kiel, Germany

3.4 Cruise Narrative

After the arrival of RV *Sonne* on April 10 in Nha Trang leg 2 scientific equipment was loaded on board and installed on deck and in the laboratories. On April 11 all scientific participants embarked the vessel and continued with the installation of the equipment. In the morning of April 2 *Sonne* departed from Nha Trang and took course to the first station (see Fig. 5). At that station six mesocosms were filled with about 600 litres of water each, mostly from the surface, two were amended with water from the chlorophyll maximum and two others with water from the Mekong river. This river water was supplied by scientists from the ION who

worked in the area only few days before. The experiments were sampled 6 days twice a day at 10:00 in the morning and again in the evening. After filling the tanks, the cruise continued towards the south along the Vietnamese coast and eight more stations were investigated along the way to the Mekong area by means of CTD casts.

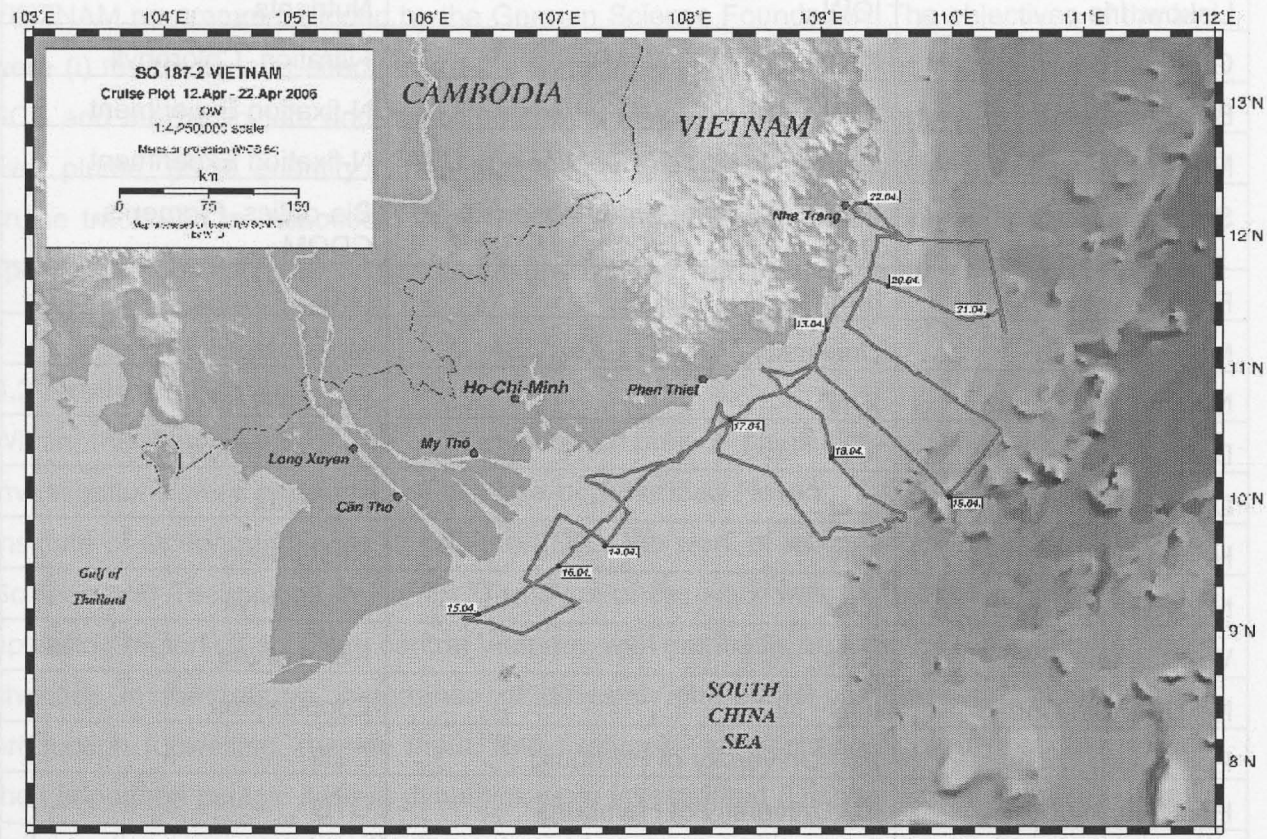

Figure 5a. Track of RV *Sonne* cruise 187 Leg 2.

The work during the cruise was based on data obtained during four previous cruises with RV *Ngien Cuu Bien*. The upwelling sites, the productivity and the species composition had been determined (Loick, 2006). It was suggested that during the SW-monsoon the typical upwelling species were found in a 40-50km wide strip along the coast while further offshore nitrogen fixing species seemed to play a major role. The nitrogen fixation seemed to be concentrated in an area which was influenced by the Mekong River (Voss et al., 2006). Since the Mekong enters the investigation area during the SW-monsoon only it may be an important supplier of micronutrients for the nitrogen fixing species during the SW-monsoon. The salinity was below 33.2 psu and nutrients were below detection limit (Bombar, 2006).

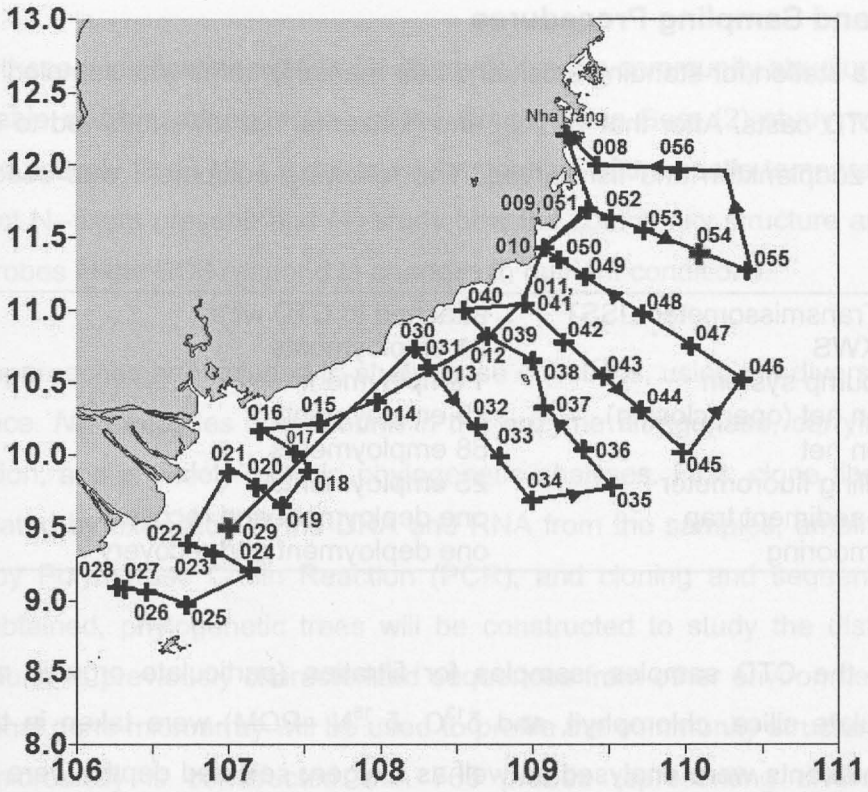

Figure 5b. Cruise track during leg 2 indicating all stations sampled. At station 029 off the mouth of the Mekong River a ADCP mooring was deployed for one day and at station 054 a drifting sediment trap. The triangles indicate the direction of steaming.

During the intermonsoon in April and May the Mekong River flows towards the south. Therefore, during leg 2 we directly headed towards the Mekong estuary to sample along a station grid there (see Fig. 5b). Although massive fishing activity occurred in the region, we could visit all stations within one and a half day. In the morning and in the evening biological/chemical variables were measured from the bottles attached to the CTD. A permanent station in the plume of the river was used to deploy an ADCP and thus record the tidal streams. After recovery of the ADCP, we continued with the transects which stretched perpendicular from the coast. On each transect with 5-6 CTD stations, 3 stations were selected for net tows. A drifter with 3x4 cylindrical traps in 40m, 110m, and 210m depth respectively was deployed at station 44 on April 20, at 12:00 and followed for one day. Hourly, and after six hours in a three-hours- interval CTD casts down to 300m water depth were performed. Nutrients and particulate matter was sampled every six hours. During the drift we sailed only 12 nm towards the north. The data from the sediment traps are meant to link pelagic processes to deep water particles and the long-term time-serie sediment traps deployed by the Institute of Biogeochemistry and Marine Chemistry of the University of Hamburg. RV Sonne arrived in Nha Trang in the morning of April 22. Disembarkation of the scientific crew took place on the same day while deinstallation and unloading of the scientific equipment was carried out on April 22 and in the morning of April 23.

3.5 Stations and Sampling Procedures

Each morning a station for standing stock and rate measurements was sampled starting with one or more CTD casts. After that vertical and horizontal net tows followed to estimate the abundance of zooplankton and fish larvae. The following equipment was used during the cruise:

Laser-Transmissometer LISST	attached to CTD wire
CTD / KWS	91 employments
In situ pump system	1 employment
Plankton net (open/closing)	79 employments
Plankton net	68 employments
Free falling fluorometer	25 employments
Drifting sediment trap	one deployment and recovery
ADCP-mooring	one deployment and recovery

From most of the CTD samples, samples for filtration (particulate organic nitrogen and carbon, particulate silica, chlorophyll, and $\delta^{13}C$, $\delta\ ^{15}N$ –POM) were taken in the morning. Furthermore, nutrients were analysed as well as oxygen; selected depths were sampled for N_2O. Measurements of N_2-fixation and NO_3^- uptake (new production) were carried out in water samples collected at daily process stations and from mesocosm and microcosm experiments on deck. At process stations, N_2-fixation experiments were focused on the surface mixed layer and the pigment maximum, while new production measurements were focused on the nutricline. A $^{15}N_2$-tracer method was used to measure the rate of N_2-fixation in whole water samples, which were passed through a 10 µm mesh after incubation to yield samples of small (<10 µm) and large (>10 µm) particles. CO_2-fixation rates were simultaneously measured in incubation bottles using ^{13}C-bicarbonate; new production was measured with $^{15}NO_3^-$ in separate, short term incubations. All samples were incubated on deck under simulated in-situ conditions. N_2-fixation and new production measurements were performed at 12 stations with in total 254 water samples. The meso- and microcosm time-series experiments produced another 282 samples (Table 4). The N and C isotopic composition of all samples will be measured by isotope ratio mass spectrometry ashore.

Table 4: Summary of experimental samples obtained on Leg 2.

	N_2-fixation < 10 µm	N_2-fixation > 10 µm	New Production
Process Stations	96	96	62
Mesocosms	99	99	36
Microcosms	24	24	–

The goals of these investigations are to (1) characterize the community structure of microbes that are capable of fixing nitrogen (N_2) in the South China Sea; (2) study which of these organisms are actively fixing N_2; (3) get an understanding of the spatio-temporal distributions of the different N_2-fixers present; and (4) study how the community structure and function of N_2-fixing microbes in the SCS respond to changes in nutrient conditions.

Three main approaches are included to study these questions, using the diversity of the *nifH* gene sequence. *NifH* encodes one subunit in the enzyme nitrogenase, carrying out the N_2 fixation reaction, and is widely used in phylogenetic analyses. First, clone libraries for *nifH* will be generated by extraction of the DNA and RNA from the samples, amplification of the *nifH* region by Polymerase Chain Reaction (PCR), and cloning and sequencing. Of the sequences obtained, phylogenetic trees will be constructed to study the distances of the sequences found to previously characterized sequences from other environments. Second, a *nifH* functional gene microarray will be used to profile the community structure in the study area. The microarray is constructed with 768 probes representing diverse groups of organisms containing *nifH*. This method is useful in identifying dominant groups and in studying changes in relative abundances in the communities. Third, probes for quantitative PCR will be designed for quantification of the dominant *nifH* containing groups found by cloning and sequencing. Relative abundances of dominant groups at different sampling sites and depths will be characterized with both quantitative PCR and the microarray. These methods will also detect changes in the gene expression (activity) in different groups over the diel cycle.

During the cruise water samples for these studies were collected from approximately 30 stations along the cruise track. Water was collected from various depths ranging from the euphotic layer to deep water and size fractionated through 10 □m and 0.2 □m pore size filters, then each filter for DNA and RNA analyses were separately stored in liquid nitrogen onboard, and will be transported to the UCSC for analyses. In addition, two experiments were carried out to study the effects of nutrients and source water on the microbial community structure and function. The gene activity was also studied over the diel cycle. The experiments were carried out in parallel with N_2 fixation rate measurements onboard. Additionally, samples were collected from the experiments and most stations for flow cytometric counts of picocyanobacteria.

The effect of tropical river plumes on the marine ecosystem was investigated by means of bio-optics and ocean color satellite remote sensing. Colored Dissolved Organic Matter (CDOM) is a tracer for the river plume, chlorophyll-*a* is an indicator of phytoplankton

biomass, and sea surface temperature is an indicator of upwelling. But to use satellite remote sensing data, these products have to be validated and local algorithms have to be developed if necessary. Therefore, phytoplankton pigments will be analyzed to validate satellite-derived estimates of chlorophyll-*a*. The HPLC pigments also allow to follow the changes in phytoplankton classes in the different water masses and experiments conducted on board.

CDOM samples are taken to study the relationship between CDOM and salinity to see if it follows a simple two end member mixing model. If this is the case, one can use satellite derived CDOM data to map riverine plumes. These maps can then be used to study the effect of the river plume on phytoplankton biomass offshore. Additionally, Dissolved organic carbon (DOC) concentrations are taken to see whether there is a universal relationship between CDOM and DOC. If this is the case, then we can use satellites to map surface DOC concentrations to understand the transport and fate of DOC. The surface water reflectance is measured using a floating spectroradiometer that measures down welling above surface irradiance and upwelling below surface radiance at 13 wavelengths from 340 nm in the ultra violet to 780 nm in the near infra red. These measurements will be used to relate reflectance measured by ocean colour satellites and in water properties such as CDOM absorption and phytoplankton concentrations.

Samples were taken from mesocosms with 6 tanks, two replicates, in 6 days, at 10:00 am. Picoplankton were taken each 10ml, pre-filtered with 20 micrometer, fixed with glutaraldehyde and double stained with acridine orange and DAPI for epifluorescent counting. The results will be compared to the results from flow cytometry. Qualitative phytoplankton samples were taken in the same time for quantified the species composition growing in each tanks. Three quantitative samples were taken from: chlorophyll-max layer, below chlorophyll-max layer and surface layer of station 32 to determine plankton communities of different waters supplied to the mesocosm. Altogether 39 picoplankton and 36 nanoplankton sampled were taken from the experiments for microscopy.

Respiration rates were measured along transects, the Mekong plume stations (55 samples at 14 stations indifferent depth) and in the mesocosms experiments (36 samples in different tanks). The respiration samples were fixed immediately for analysis of initial dissolved oxygen and dark bottles were incubated on incubation tanks for 24 hours.

To identify the characteristics of plankton communities during the intermonsoon samples were taken from different stations in two main areas: off Mekong estuary to identify the effect of the river plume, and within the upwelling area off the southern central coast of Vietnam

(see Fig. 5). A full sampling station included fish larvae and eggs, zooplankton (500 µm and 200 µm nets), phytoplankton, plankton size fraction, nanoplankton, and picoplankton. Plankton size fractionation was done with two net tows (meshsize 200 µm and 50 µm) for one inshore station and one offshore station at each transect. Plankton collected with the 200-µm net was sieved into the following fractions: >2500, 2500-1500, 1500-1000, 1000-330, 330-166 µm. Further plankton samples were taken along the drifter's track every 6 hours in 24 hours from 12:00 h April 20, 2006 to 12:00h April 21, 2006 (see Table 6).

Table 5: Type and number of plankton samples taken during the station work along the transects

Type of Samples	Sample #
Picoplankton, water sample (CTD)	46
Nanoplankton, water sample (CTD)	62
Phytoplankton, water sample (CTD)	66
Phytoplankton, 50 µm, net tow	17
Zooplankton, 200 µm, net tow, intervals	50
Zooplankton, 500 µm, net tow, vertical haul from 100m	17
Fish eggs and larvae, net tow	20
Size-fraction (14 stations)	91

Table 6: Type and number of samples taken during the station work while the drifter was deployed

Type of Sample	Sample #
Nanoplankton, water sample (CTD)	28
Phytoplankton, water sample (CTD)	28
Phytoplankton, 50 µm, net tow	06
Zooplankton, 200 µm, net tow, intervals	20
Zooplankton, 500 µm, net tow, vertical haul from 100 m	05
Fish eggs and larvae, net tow	05

A compilation of all stations including time, position, water depth and devices employed is given in Table 7.

Table 7. Station book SO-187 leg 2

Station	Date	UTC	Position Latitude	Position Longitude	Water Depth [m]	Device/Activities
SO187/007-1	12.04.06	04:57	11°58,09' N	109°36,50' E	142	CTD
SO187/007-2	12.04.06	06:10	11°58,37' N	109°36,68' E	140	Fluorometer
SO187/007-3	12.04.06	07:25	11°58,14' N	109°36,44' E	141	Water pump
SO187/007-4	12.04.06	14:50	11°57,47' N	109°41,01' E	141	CTD
SO187/008-1	12.04.06	17:28	11°59,96' N	109°25,37' E	117	CTD
SO187/009-1	12.04.06	20:00	11°41,29' N	109°21,70' E	97	CTD
SO187/010-1	12.04.06	22:46	11°26,45' N	109°5,70' E	63	CTD
SO187/011-1	13.04.06	01:43	11°2,40' N	108°56,94' E	60	CTD
SO187/011-2	13.04.06	02:00	11°2,37' N	108°56,93' E	60	Fluorometer
SO187/012-1	13.04.06	04:08	10°49,06' N	108°42,22' E	47	CTD
SO187/013-1	13.04.06	07:00	10°36,19' N	108°18,81' E	36	CTD
SO187/013-2	13.04.06	07:14	10°36,13' N	108°18,84' E	36	Fluorometer
SO187/014-1	13.04.06	10:11	10°21,77' N	107°58,94' E	37	CTD
SO187/014-2	13.04.06	10:42	10°21,74' N	107°58,78' E	36	Plankton Closing Net
SO187/015-1	13.04.06	13:26	10°12,80' N	107°35,86' E	58	CTD
SO187/016-1	13.04.06	15:52	10°9,54' N	107°12,70' E	28	CTD
SO187/017-1	13.04.06	17:42	10°0,65' N	107°26,18' E	33	CTD
SO187/018-1	13.04.06	21:05	9°53,35' N	107°31,27' E	32	CTD
SO187/018-2	13.04.06	21:23	9°53,37' N	107°31,35' E	35	Plankton Closing Net
SO187/018-2	13.04.06	21:31	9°53,40' N	107°31,38' E	35	Plankton Closing Net
SO187/018-2	13.04.06	21:35	9°53,41' N	107°31,41' E	35	Plankton Closing Net
SO187/018-2	13.04.06	21:39	9°53,42' N	107°31,44' E	35	Plankton Closing Net
SO187/018-2	13.04.06	21:41	9°53,42' N	107°31,46' E	35	Plankton Closing Net
SO187/018-2	13.04.06	21:46	9°53,44' N	107°31,50' E	35	Plankton Closing Net
SO187/018-2	13.04.06	21:50	9°53,45' N	107°31,54' E	34	Plankton Closing Net
SO187/018-3	13.04.06	21:58	9°53,52' N	107°31,65' E	36	Fish-larvae Net
SO187/019-1	14.04.06	00:00	9°39,00' N	107°21,04' E	35	CTD
SO187/020-1	14.04.06	01:32	9°46,71' N	107°10,80' E	30	CTD
SO187/020-2	14.04.06	02:19	9°46,87' N	107°10,79' E	31	Fluorometer
SO187/020-3	14.04.06	02:43	9°47,00' N	107°10,77' E	31	CTD
SO187/021-1	14.04.06	05:04	9°52,88' N	106°59,83' E	30	CTD
SO187/021-2	14.04.06	05:22	9°52,80' N	106°59,76' E	31	Fluorometer
SO187/021-3	14.04.06	05:32	9°52,75' N	106°59,73' E	31	Plankton Closing Net
SO187/021-3	14.04.06	05:45	9°52,77' N	106°59,68' E	30	Plankton Closing Net
SO187/021-3	14.04.06	05:48	9°52,78' N	106°59,67' E	31	Plankton Closing Net
SO187/021-3	14.04.06	05:56	9°52,76' N	106°59,64' E	30	Plankton Closing Net
SO187/021-3	14.04.06	06:00	9°52,76' N	106°59,63' E	31	Plankton Closing Net
SO187/021-3	14.04.06	06:06	9°52,77' N	106°59,61' E	30	Plankton Closing Net
SO187/021-4	14.04.06	06:12	9°52,76' N	106°59,60' E	31	Fish-larvae Net
SO187/021-4	14.04.06	06:19	9°52,67' N	106°59,79' E	30	Fish-larvae Net
SO187/022-1	14.04.06	09:28	9°23,23' N	106°43,94' E	29	CTD
SO187/023-1	14.04.06	10:40	9°19,24' N	106°54,07' E	29	CTD
SO187/024-1	14.04.06	12:12	9°12,56' N	107°8,44' E	36	CTD
SO187/025-1	14.04.06	15:05	8°58,36' N	106°43,31' E	28	CTD
SO187/026-1	14.04.06	16:45	9°3,61' N	106°27,67' E	29	CTD
SO187/027-1	14.04.06	17:53	9°4,78' N	106°19,13' E	30	CTD
SO187/028-1	14.04.06	22:04	9°5,51' N	106°15,92' E	31	CTD
SO187/028-2	14.04.06	22:16	9°5,50' N	106°15,93' E	32	Plankton Net
SO187/028-2	14.04.06	22:22	9°5,50' N	106°15,93' E	29	Plankton Net
SO187/028-2	14.04.06	22:28	9°5,51' N	106°15,94' E	30	Plankton Net
SO187/028-2	14.04.06	22:31	9°5,52' N	106°15,95' E	29	Plankton Net

Station	Date	UTC	Position Latitude	Position Longitude	Water Depth [m]	Device/Activities
SO187/028-2	14.04.06	22:36	9°5,53' N	106°15,95' E	30	Plankton Net
SO187/028-3	14.04.06	22:42	9°5,53' N	106°15,95' E	33	Plankton Closing Net
SO187/028-4	14.04.06	22:52	9°5,58' N	106°16,05' E	29	Fish-larvae Net
SO187/028-5	14.04.06	23:12	9°5,80' N	106°16,37' E	28	CTD
SO187/029-1	15.04.06	03:55	9°30,04' N	106°59,73' E	31	CTD
SO187/029-2	15.04.06	04:13	9°30,05' N	106°59,73' E	31	Mooring
SO187/029-3	15.04.06	05:05	9°30,05' N	106°59,87' E	33	CTD
SO187/029-4	15.04.06	05:19	9°30,05' N	106°59,87' E	33	Plankton Net
SO187/029-4	15.04.06	05:23	9°30,04' N	106°59,83' E	32	Plankton Net
SO187/029-4	15.04.06	05:26	9°30,05' N	106°59,83' E	32	Plankton Net
SO187/029-4	15.04.06	05:34	9°30,04' N	106°59,82' E	33	Plankton Net
SO187/029-4	15.04.06	05:41	9°30,05' N	106°59,83' E	32	Plankton Net
SO187/029-5	15.04.06	05:47	9°30,04' N	106°59,82' E	32	Plankton Closing Net
SO187/029-6	15.04.06	05:57	9°30,06' N	106°59,90' E	33	Fish-larvae Net
SO187/029-7	15.04.06	06:13	9°30,11' N	107°0,17' E	32	CTD
SO187/029-8	15.04.06	06:30	9°30,11' N	107°0,22' E	32	Fluorometer
SO187/029-9	15.04.06	07:04	9°30,02' N	107°0,02' E	33	CTD
SO187/029-10	15.04.06	08:04	9°30,03' N	106°59,98' E	32	CTD
SO187/029-11	15.04.06	09:03	9°30,07' N	107°0,01' E	31	CTD
SO187/029-12	15.04.06	10:04	9°30,10' N	106°59,92' E	33	CTD
SO187/029-13	15.04.06	10:21	9°30,17' N	106°59,95' E	34	Fluorometer
SO187/029-14	15.04.06	11:03	9°30,22' N	107°0,01' E	31	CTD
SO187/029-15	15.04.06	12:01	9°30,18' N	106°59,96' E	31	CTD
SO187/029-16	15.04.06	13:06	9°30,17' N	106°59,91' E	31	CTD
SO187/029-17	15.04.06	14:04	9°30,07' N	107°0,03' E	31	CTD
SO187/029-18	15.04.06	15:07	9°30,06' N	107°0,05' E	31	CTD
SO187/029-19	15.04.06	16:06	9°30,03' N	106°59,99' E	31	CTD
SO187/029-20	15.04.06	17:04	9°30,01' N	107°0,00' E	34	CTD
SO187/029-21	15.04.06	18:03	9°29,91' N	106°59,45' E	30	CTD
SO187/029-22	15.04.06	19:05	9°29,98' N	106°59,99' E	33	CTD
SO187/029-23	15.04.06	20:05	9°29,99' N	107°0,01' E	33	CTD
SO187/029-24	15.04.06	21:02	9°29,99' N	107°0,00' E	33	CTD
SO187/029-25	15.04.06	22:04	9°29,97' N	107°0,01' E	33	CTD
SO187/029-26	15.04.06	22:16	9°29,96' N	107°0,01' E	32	Plankton Net
SO187/029-26	15.04.06	22:23	9°29,98' N	107°0,01' E	32	Plankton Net
SO187/029-26	15.04.06	22:27	9°29,97' N	107°0,02' E	32	Plankton Net
SO187/029-26	15.04.06	22:32	9°29,99' N	107°0,02' E	32	Plankton Net
SO187/029-26	15.04.06	22:37	9°29,99' N	107°0,02' E	33	Plankton Net
SO187/029-27	15.04.06	22:42	9°29,99' N	107°0,02' E	32	Plankton Closing Net
SO187/029-28	15.04.06	22:48	9°30,01' N	107°0,03' E	32	Fish-larvae Net
SO187/029-29	15.04.06	23:03	9°30,18' N	107°0,26' E	31	CTD
SO187/029-30	15.04.06	23:14	9°30,26' N	107°0,34' E	32	Fish-larvae Net
SO187/029-31	16.04.06	00:03	9°29,76' N	106°59,74' E	29	CTD
SO187/029-32	16.04.06	00:12	9°29,79' N	106°59,79' E	30	Fish-larvae Net
SO187/029-33	16.04.06	01:03	9°29,97' N	107°0,09' E	31	CTD
SO187/029-34	16.04.06	01:16	9°29,99' N	107°0,07' E	31	Fish-larvae Net
SO187/029-35	16.04.06	02:05	9°30,05' N	107°0,02' E	31	CTD
SO187/029-36	16.04.06	03:05	9°30,01' N	106°59,96' E	31	CTD
SO187/029-37	16.04.06	04:06	9°30,03' N	106°59,96' E	32	CTD
SO187/029-38	16.04.06	04:20	9°30,03' N	106°59,96' E	32	Fluorometer
SO187/029-39	16.04.06	05:03	9°30,02' N	106°59,98' E	33	CTD
SO187/029-40	16.04.06	05:17	9°30,01' N	106°59,96' E	33	Plankton Net
SO187/029-40	16.04.06	05:21	9°30,00' N	106°59,96' E	33	Plankton Net
SO187/029-40	16.04.06	05:24	9°29,97' N	106°59,93' E	32	Plankton Net

Table 7. cont.

Station	Date	UTC	Position Latitude	Position Longitude	Water Depth [m]	Device/Activities
SO187/029-40	16.04.06	05:28	9° 29,96' N	106° 59,92' E	32	Plankton Net
SO187/029-40	16.04.06	05:32	9° 29,98' N	106° 59,95' E	32	Plankton Net
SO187/029-40	16.04.06	05:36	9° 29,98' N	106° 59,89' E	34	Plankton Net
SO187/029-41	16.04.06	05:41	9° 29,98' N	106° 59,87' E	33	Plankton Closing Net
SO187/029-42	16.04.06	05:49	9° 29,95' N	106° 59,85' E	34	Fish-larvae Net
SO187/029-43	16.04.06	06:07	9° 30,05' N	107° 0,07' E	33	CTD
SO187/029-44	16.04.06	07:09	9° 30,04' N	106° 59,61' E	33	Mooring
SO187/030-1	16.04.06	22:01	10° 43,91' N	108° 13,43' E	28	CTD
SO187/030-2	16.04.06	22:12	10° 43,94' N	108° 13,45' E	28	Plankton Net
SO187/030-2	16.04.06	22:16	10° 43,94' N	108° 13,47' E	28	Plankton Net
SO187/030-2	16.04.06	22:20	10° 43,95' N	108° 13,46' E	29	Plankton Net
SO187/030-2	16.04.06	22:22	10° 43,95' N	108° 13,46' E	28	Plankton Net
SO187/030-2	16.04.06	22:26	10° 43,96' N	108° 13,47' E	28	Plankton Net
SO187/030-3	16.04.06	22:31	10° 43,97' N	108° 13,48' E	28	Plankton Closing Net
SO187/030-4	16.04.06	22:38	10° 43,99' N	108° 13,54' E	29	Fish-larvae Net
SO187/031-1	16.04.06	23:55	10° 36,44' N	108° 18,35' E	36	CTD
SO187/032-1	17.04.06	04:28	10° 11,50' N	108° 37,91' E	77	CTD
SO187/032-2	17.04.06	04:42	10° 11,52' N	108° 37,88' E	77	Fluorometer
SO187/033-1	17.04.06	06:40	9° 59,47' N	108° 47,05' E	91	CTD
SO187/033-2	17.04.06	07:16	9° 59,45' N	108° 47,05' E	90	Plankton Net
SO187/033-2	17.04.06	07:28	9° 59,45' N	108° 47,06' E	91	Plankton Net
SO187/033-3	17.04.06	07:38	9° 59,48' N	108° 47,05' E	91	Plankton Closing Net
SO187/033-3	17.04.06	07:44	9° 59,49' N	108° 47,07' E	90	Plankton Closing Net
SO187/033-3	17.04.06	07:47	9° 59,50' N	108° 47,07' E	91	Plankton Closing Net
SO187/033-3	17.04.06	07:52	9° 59,49' N	108° 47,06' E	91	Plankton Closing Net
SO187/033-3	17.04.06	07:59	9° 59,56' N	108° 47,01' E	90	Plankton Closing Net
SO187/033-3	17.04.06	08:05	9° 59,63' N	108° 46,99' E	91	Plankton Closing Net
SO187/033-4	17.04.06	08:09	9° 59,65' N	108° 46,98' E	90	Plankton Net
SO187/033-5	17.04.06	08:20	9° 59,72' N	108° 46,99' E	90	Fish-larvae Net
SO187/034-1	17.04.06	10:59	9° 41,32' N	108° 59,77' E	129	CTD
SO187/034-2	17.04.06	11:20	9° 41,45' N	108° 59,87' E	129	Plankton Closing Net
SO187/034-2	17.04.06	11:28	9° 41,52' N	108° 59,87' E	130	Plankton Closing Net
SO187/034-2	17.04.06	11:34	9° 41,56' N	108° 59,88' E	130	Plankton Closing Net
SO187/034-2	17.04.06	11:38	9° 41,59' N	108° 59,90' E	130	Plankton Closing Net
SO187/034-3	17.04.06	11:41	9° 41,61' N	108° 59,92' E	130	Plankton Net
SO187/034-3	17.04.06	11:48	9° 41,65' N	108° 59,95' E	130	Plankton Net
SO187/034-4	17.04.06	11:58	9° 41,73' N	109° 0,04' E	130	Fish-larvae Net
SO187/035-1	17.04.06	16:31	9° 46,94' N	109° 31,13' E	1157	CTD
SO187/036-1	17.04.06	20:47	10° 2,33' N	109° 19,84' E	265	CTD
SO187/037-1	17.04.06	23:27	10° 19,35' N	109° 4,34' E	126	CTD
SO187/037-2	17.04.06	23:45	10° 19,32' N	109° 4,35' E	126	Plankton Closing Net
SO187/037-2	17.04.06	23:52	10° 19,27' N	109° 4,36' E	126	Plankton Closing Net
SO187/037-2	17.04.06	23:57	10° 19,24' N	109° 4,37' E	126	Plankton Closing Net
SO187/037-2	18.04.06	00:02	10° 19,21' N	109° 4,38' E	127	Plankton Closing Net
SO187/037-2	18.04.06	00:06	10° 19,19' N	109° 4,38' E	126	Plankton Closing Net
SO187/037-3	18.04.06	00:13	10° 19,13' N	109° 4,41' E	125	Plankton Net
SO187/037-3	18.04.06	00:20	10° 19,12' N	109° 4,40' E	126	Plankton Net
SO187/037-3	18.04.06	00:27	10° 19,09' N	109° 4,40' E	126	Plankton Net
SO187/037-4	18.04.06	00:38	10° 19,11' N	109° 4,45' E	126	Fish-larvae Net
SO187/038-1	18.04.06	03:09	10° 38,78' N	108° 59,99' E	109	CTD
SO187/038-2	18.04.06	03:34	10° 38,77' N	108° 59,97' E	109	Plankton Closing Net
SO187/038-2	18.04.06	03:40	10° 38,74' N	108° 59,95' E	109	Plankton Closing Net
SO187/038-2	18.04.06	03:45	10° 38,72' N	108° 59,94' E	109	Plankton Closing Net
SO187/038-2	18.04.06	03:49	10° 38,72' N	108° 59,94' E	109	Plankton Closing Net

Station	Date	UTC	Position Latitude	Position Longitude	Water Depth [m]	Device/Activities
SO187/038-2	18.04.06	03:54	10° 38,70' N	108° 59,92' E	109	Plankton Closing Net
SO187/038-2	18.04.06	03:59	10° 38,67' N	108° 59,89' E	109	Plankton Closing Net
SO187/038-2	18.04.06	04:07	10° 38,62' N	108° 59,87' E	109	Plankton Closing Net
SO187/038-3	18.04.06	04:13	10° 38,59' N	108° 59,86' E	110	Fish-larvae Net
SO187/038-4	18.04.06	04:22	10° 38,70' N	108° 59,95' E	109	Fluorometer
SO187/039-1	18.04.06	06:28	10° 49,20' N	108° 42,12' E	47	CTD
SO187/039-2	18.04.06	06:46	10° 49,34' N	108° 42,01' E	45	Plankton Closing Net
SO187/039-2	18.04.06	06:53	10° 49,33' N	108° 42,00' E	47	Plankton Closing Net
SO187/039-2	18.04.06	06:56	10° 49,35' N	108° 42,00' E	46	Plankton Closing Net
SO187/039-3	18.04.06	06:58	10° 49,35' N	108° 41,99' E	46	Plankton Net
SO187/039-3	18.04.06	07:02	10° 49,34' N	108° 41,98' E	47	Plankton Net
SO187/039-3	18.04.06	07:07	10° 49,33' N	108° 41,98' E	47	Plankton Net
SO187/039-3	18.04.06	07:11	10° 49,31' N	108° 41,95' E	47	Plankton Net
SO187/039-4	18.04.06	07:22	10° 49,33' N	108° 41,93' E	46	Fish-larvae Net
SO187/040-1	18.04.06	09:02	10° 59,77' N	108° 32,99' E	26	CTD
SO187/040-2	18.04.06	09:10	10° 59,82' N	108° 33,02' E	26	Plankton Closing Net
SO187/040-2	18.04.06	09:14	10° 59,83' N	108° 33,03' E	25	Plankton Closing Net
SO187/040-2	18.04.06	09:17	10° 59,84' N	108° 33,02' E	26	Plankton Closing Net
SO187/040-3	18.04.06	09:19	10° 59,85' N	108° 33,02' E	26	Plankton Net
SO187/040-4	18.04.06	09:24	10° 59,86' N	108° 33,03' E	26	Fish-larvae Net
SO187/040-5	18.04.06	09:34	10° 59,90' N	108° 33,30' E	25	Fluorometer
SO187/041-1	18.04.06	12:14	11° 2,35' N	108° 56,82' E	60	CTD
SO187/041-2	18.04.06	12:27	11° 2,27' N	108° 56,76' E	59	Plankton Closing Net
SO187/041-2	18.04.06	12:32	11° 2,23' N	108° 56,73' E	59	Plankton Closing Net
SO187/041-2	18.04.06	12:35	11° 2,21' N	108° 56,71' E	59	Plankton Closing Net
SO187/041-3	18.04.06	12:37	11° 2,19' N	108° 56,70' E	59	Plankton Net
SO187/041-3	18.04.06	12:42	11° 2,15' N	108° 56,67' E	59	Plankton Net
SO187/041-3	18.04.06	12:46	11° 2,11' N	108° 56,65' E	59	Plankton Net
SO187/041-3	18.04.06	12:51	11° 2,05' N	108° 56,62' E	60	Plankton Net
SO187/041-4	18.04.06	12:58	11° 2,03' N	108° 56,61' E	59	Fish-larvae Net
SO187/041-4	18.04.06	13:05	11° 2,12' N	108° 56,74' E	59	Fish-larvae Net
SO187/042-1	18.04.06	15:25	10° 46,45' N	109° 12,00' E	132	CTD
SO187/042-2	18.04.06	15:42	10° 46,47' N	109° 12,05' E	130	Plankton Closing Net
SO187/042-2	18.04.06	15:49	10° 46,46' N	109° 12,04' E	130	Plankton Closing Net
SO187/042-2	18.04.06	15:53	10° 46,43' N	109° 12,03' E	130	Plankton Closing Net
SO187/042-2	18.04.06	15:54	10° 46,43' N	109° 12,03' E	130	Plankton Closing Net
SO187/042-2	18.04.06	15:58	10° 46,41' N	109° 12,02' E	131	Plankton Closing Net
SO187/042-3	18.04.06	16:00	10° 46,40' N	109° 12,02' E	131	Plankton Net
SO187/042-3	18.04.06	16:07	10° 46,38' N	109° 12,02' E	131	Plankton Net
SO187/042-4	18.04.06	16:19	10° 46,34' N	109° 12,02' E	131	Fish-larvae Net
SO187/043-1	18.04.06	18:38	10° 32,30' N	109° 27,65' E	255	CTD
SO187/044-1	18.04.06	21:00	10° 18,34' N	109° 42,41' E	446	CTD
SO187/045-1	18.04.06	23:34	10° 1,04' N	109° 58,31' E	1530	CTD
SO187/045-1	18.04.06	23:45	10° 1,08' N	109° 58,28' E	1527	CTD
SO187/045-2	18.04.06	23:52	10° 1,08' N	109° 58,26' E	1528	Plankton Closing Net
SO187/045-2	18.04.06	23:59	10° 1,13' N	109° 58,25' E	1531	Plankton Closing Net
SO187/045-2	19.04.06	00:03	10° 1,15' N	109° 58,25' E	1522	Plankton Closing Net
SO187/045-3	19.04.06	00:05	10° 1,15' N	109° 58,25' E	1520	Plankton Net
SO187/045-3	19.04.06	00:07	10° 1,16' N	109° 58,24' E	1524	Plankton Net
SO187/045-3	19.04.06	00:15	10° 1,21' N	109° 58,24' E	1523	Plankton Net
SO187/045-3	19.04.06	00:22	10° 1,25' N	109° 58,26' E	1521	Plankton Net
SO187/045-3	19.04.06	00:38	10° 1,33' N	109° 58,27' E	1526	Plankton Net
SO187/045-4	19.04.06	01:22	10° 1,59' N	109° 58,25' E	1513	CTD
SO187/045-5	19.04.06	02:11	10° 1,61' N	109° 58,20' E	1498	Fish-larvae Net

Table 7. cont.

Station	Date	UTC	Position Latitude	Position Longitude	Water Depth [m]	Device/Activities
SO187/038-2	18.04.06	03:54	10° 38,70' N	108° 59,92' E	109	Plankton Closing Net
SO187/038-2	18.04.06	03:59	10° 38,67' N	108° 59,89' E	109	Plankton Closing Net
SO187/038-2	18.04.06	04:07	10° 38,62' N	108° 59,87' E	109	Plankton Closing Net
SO187/038-3	18.04.06	04:13	10° 38,59' N	108° 59,86' E	110	Fish-larvae Net
SO187/038-4	18.04.06	04:22	10° 38,70' N	108° 59,95' E	109	Fluorometer
SO187/039-1	18.04.06	06:28	10° 49,20' N	108° 42,12' E	47	CTD
SO187/039-2	18.04.06	06:46	10° 49,34' N	108° 42,01' E	45	Plankton Closing Net
SO187/039-2	18.04.06	06:53	10° 49,33' N	108° 42,00' E	47	Plankton Closing Net
SO187/039-2	18.04.06	06:56	10° 49,35' N	108° 42,00' E	46	Plankton Closing Net
SO187/039-3	18.04.06	06:58	10° 49,35' N	108° 41,99' E	46	Plankton Net
SO187/039-3	18.04.06	07:02	10° 49,34' N	108° 41,98' E	47	Plankton Net
SO187/039-3	18.04.06	07:07	10° 49,33' N	108° 41,98' E	47	Plankton Net
SO187/039-3	18.04.06	07:11	10° 49,31' N	108° 41,95' E	47	Plankton Net
SO187/039-4	18.04.06	07:22	10° 49,33' N	108° 41,93' E	46	Fish-larvae Net
SO187/040-1	18.04.06	09:02	10° 59,77' N	108° 32,99' E	26	CTD
SO187/040-2	18.04.06	09:10	10° 59,82' N	108° 33,02' E	26	Plankton Closing Net
SO187/040-2	18.04.06	09:14	10° 59,83' N	108° 33,03' E	25	Plankton Closing Net
SO187/040-2	18.04.06	09:17	10° 59,84' N	108° 33,02' E	26	Plankton Closing Net
SO187/040-3	18.04.06	09:19	10° 59,85' N	108° 33,02' E	26	Plankton Net
SO187/040-4	18.04.06	09:24	10° 59,86' N	108° 33,03' E	26	Fish-larvae Net
SO187/040-5	18.04.06	09:34	10° 59,90' N	108° 33,30' E	25	Fluorometer
SO187/041-1	18.04.06	12:14	11° 2,35' N	108° 56,62' E	60	CTD
SO187/041-2	18.04.06	12:27	11° 2,27' N	108° 56,76' E	59	Plankton Closing Net
SO187/041-2	18.04.06	12:32	11° 2,23' N	108° 56,73' E	59	Plankton Closing Net
SO187/041-2	18.04.06	12:35	11° 2,21' N	108° 56,71' E	59	Plankton Closing Net
SO187/041-3	18.04.06	12:37	11° 2,19' N	108° 56,70' E	59	Plankton Net
SO187/041-3	18.04.06	12:42	11° 2,15' N	108° 56,67' E	59	Plankton Net
SO187/041-3	18.04.06	12:46	11° 2,11' N	108° 56,65' E	59	Plankton Net
SO187/041-3	18.04.06	12:51	11° 2,05' N	108° 56,62' E	60	Plankton Net
SO187/041-4	18.04.06	12:58	11° 2,03' N	108° 56,61' E	59	Fish-larvae Net
SO187/041-4	18.04.06	13:05	11° 2,12' N	108° 56,74' E	59	Fish-larvae Net
SO187/042-1	18.04.06	15:25	10° 46,45' N	109° 12,00' E	132	CTD
SO187/042-2	18.04.06	15:42	10° 46,47' N	109° 12,05' E	130	Plankton Closing Net
SO187/042-2	18.04.06	15:49	10° 46,46' N	109° 12,04' E	130	Plankton Closing Net
SO187/042-2	18.04.06	15:53	10° 46,43' N	109° 12,03' E	130	Plankton Closing Net
SO187/042-2	18.04.06	15:54	10° 46,43' N	109° 12,03' E	130	Plankton Closing Net
SO187/042-2	18.04.06	15:58	10° 46,41' N	109° 12,02' E	131	Plankton Closing Net
SO187/042-3	18.04.06	16:00	10° 46,40' N	109° 12,02' E	131	Plankton Net
SO187/042-3	18.04.06	16:07	10° 46,36' N	109° 12,02' E	131	Plankton Net
SO187/042-4	18.04.06	16:19	10° 46,34' N	109° 12,02' E	131	Fish-larvae Net
SO187/043-1	18.04.06	18:38	10° 32,30' N	109° 27,65' E	255	CTD
SO187/044-1	18.04.06	21:00	10° 18,34' N	109° 42,41' E	446	CTD
SO187/045-1	18.04.06	23:34	10° 1,04' N	109° 58,31' E	1530	CTD
SO187/045-1	18.04.06	23:45	10° 1,08' N	109° 58,28' E	1527	CTD
SO187/045-2	18.04.06	23:52	10° 1,08' N	109° 58,26' E	1528	Plankton Closing Net
SO187/045-2	18.04.06	23:59	10° 1,13' N	109° 58,25' E	1531	Plankton Closing Net
SO187/045-2	19.04.06	00:03	10° 1,15' N	109° 58,25' E	1522	Plankton Closing Net
SO187/045-3	19.04.06	00:05	10° 1,15' N	109° 58,25' E	1520	Plankton Net
SO187/045-3	19.04.06	00:07	10° 1,16' N	109° 58,24' E	1524	Plankton Net
SO187/045-3	19.04.06	00:15	10° 1,21' N	109° 58,24' E	1523	Plankton Net
SO187/045-3	19.04.06	00:22	10° 1,25' N	109° 58,26' E	1521	Plankton Net
SO187/045-3	19.04.06	00:38	10° 1,33' N	109° 58,27' E	1526	Plankton Net
SO187/045-4	19.04.06	01:22	10° 1,50' N	109° 58,25' E	1513	CTD
SO187/045-5	19.04.06	02:11	10° 1,81' N	109° 58,20' E	1498	Fish-larvae Net

Station	Date	UTC	Position Latitude	Position Longitude	Water Depth [m]	Device/Activities
SO187/045-6	19.04.06	02:20	10° 2,05' N	109° 58,39' E	1481	Fluorometer
SO187/046-1	19.04.06	06:20	10° 31,27' N	110° 22,23' E	1772	CTD
SO187/046-2	19.04.06	07:40	10° 31,32' N	110° 21,95' E	1765	Plankton Closing Net
SO187/046-2	19.04.06	07:44	10° 31,32' N	110° 21,95' E	1764	Plankton Closing Net
SO187/046-2	19.04.06	07:49	10° 31,32' N	110° 21,94' E	1769	Plankton Closing Net
SO187/046-2	19.04.06	07:53	10° 31,31' N	110° 21,95' E	1770	Plankton Closing Net
SO187/046-3	19.04.06	07:55	10° 31,32' N	110° 21,97' E	1769	Plankton Net
SO187/046-3	19.04.06	08:02	10° 31,39' N	110° 22,05' E	1766	Plankton Net
SO187/046-3	19.04.06	08:14	10° 31,52' N	110° 22,12' E	1766	Plankton Net
SO187/046-3	19.04.06	08:21	10° 31,67' N	110° 22,18' E	1764	Plankton Net
SO187/046-4	19.04.06	08:35	10° 31,92' N	110° 22,13' E	1762	Fish-larvae Net
SO187/046-5	19.04.06	08:45	10° 32,11' N	110° 21,91' E	1760	Fluorometer
SO187/047-1	19.04.06	11:21	10° 45,09' N	110° 2,11' E	916	CTD
SO187/048-1	19.04.06	14:12	10° 57,36' N	109° 44,87' E	298	CTD
SO187/049-1	19.04.06	17:32	11° 13,40' N	109° 20,63' E	120	CTD
SO187/050-1	19.04.06	19:16	11° 19,35' N	109° 11,60' E	89	CTD
SO187/051-1	19.04.06	22:32	11° 41,03' N	109° 21,47' E	96	CTD
SO187/052-1	19.04.06	23:51	11° 37,50' N	109° 30,52' E	138	CTD
SO187/053-1	20.04.06	01:37	11° 32,62' N	109° 43,48' E	239	CTD
SO187/054-1	20.04.06	04:30	11° 23,23' N	110° 5,29' E	864	Drifter
SO187/054-2	20.04.06	05:24	11° 23,21' N	110° 5,28' E	865	CTD
SO187/054-3	20.04.06	05:45	11° 23,19' N	110° 5,24' E	865	Plankton Closing Net
SO187/054-3	20.04.06	05:52	11° 23,18' N	110° 5,23' E	866	Plankton Closing Net
SO187/054-3	20.04.06	05:57	11° 23,22' N	110° 5,27' E	865	Plankton Closing Net
SO187/054-3	20.04.06	06:00	11° 23,26' N	110° 5,30' E	863	Plankton Closing Net
SO187/054-4	20.04.06	06:02	11° 23,27' N	110° 5,31' E	862	Plankton Net
SO187/054-4	20.04.06	06:08	11° 23,26' N	110° 5,31' E	862	Plankton Net
SO187/054-4	20.04.06	06:15	11° 23,22' N	110° 5,29' E	864	Plankton Net
SO187/054-4	20.04.06	06:22	11° 23,20' N	110° 5,26' E	865	Plankton Net
SO187/054-5	20.04.06	06:37	11° 23,19' N	110° 5,33' E	865	Fish-larvae Net
SO187/054-6	20.04.06	06:45	11° 22,97' N	110° 5,52' E	858	Fluorometer
SO187/054-7	20.04.06	07:19	11° 22,84' N	110° 5,76' E	857	CTD
SO187/054-8	20.04.06	09:25	11° 22,88' N	110° 7,14' E	942	CTD
SO187/054-9	20.04.06	10:21	11° 22,34' N	110° 7,41' E	986	CTD
SO187/054-10	20.04.06	11:19	11° 22,13' N	110° 7,90' E	1008	CTD
SO187/054-11	20.04.06	11:40	11° 22,18' N	110° 7,95' E	1010	Plankton Closing Net
SO187/054-11	20.04.06	11:47	11° 22,20' N	110° 7,97' E	1012	Plankton Closing Net
SO187/054-11	20.04.06	11:52	11° 22,21' N	110° 7,99' E	1012	Plankton Closing Net
SO187/054-11	20.04.06	11:55	11° 22,22' N	110° 7,99' E	1011	Plankton Closing Net
SO187/054-12	20.04.06	11:57	11° 22,22' N	110° 8,00' E	1013	Plankton Net
SO187/054-12	20.04.06	12:04	11° 22,24' N	110° 8,02' E	1014	Plankton Net
SO187/054-13	20.04.06	12:15	11° 22,37' N	110° 8,06' E	1014	Fish-larvae Net
SO187/054-14	20.04.06	14:21	11° 22,63' N	110° 9,21' E	1094	CTD
SO187/054-15	20.04.06	17:22	11° 23,45' N	110° 11,15' E	1252	CTD
SO187/054-16	20.04.06	18:07	11° 23,63' N	110° 12,10' E	1308	Plankton Closing Net
SO187/054-16	20.04.06	18:15	11° 23,66' N	110° 12,21' E	1293	Plankton Closing Net
SO187/054-16	20.04.06	18:20	11° 23,70' N	110° 12,26' E	1287	Plankton Closing Net
SO187/054-17	20.04.06	18:23	11° 23,72' N	110° 12,29' E	1281	Plankton Net
SO187/054-17	20.04.06	18:26	11° 23,74' N	110° 12,32' E	1275	Plankton Net
SO187/054-17	20.04.06	18:33	11° 23,80' N	110° 12,38' E	1286	Plankton Net
SO187/054-18	20.04.06	18:46	11° 24,03' N	110° 12,50' E	1299	Fish-larvae Net
SO187/054-19	20.04.06	20:24	11° 23,80' N	110° 13,65' E	1275	CTD
SO187/054-20	20.04.06	23:21	11° 24,04' N	110° 15,78' E	1239	CTD
SO187/054-21	20.04.06	23:40	11° 24,05' N	110° 15,92' E	1206	Plankton Closing Net

Station	Date	UTC	Position Latitude	Position Longitude	Water Depth [m]	Device/Activities
SO187/054-21	20.04.06	23:47	11° 24,06' N	110° 15,98' E	1236	Plankton Closing Net
SO187/054-21	20.04.06	23:51	11° 24,07' N	110° 16,01' E	1236	Plankton Closing Net
SO187/054-21	20.04.06	23:54	11° 24,07' N	110° 16,03' E	1238	Plankton Closing Net
SO187/054-22	20.04.06	23:56	11° 24,08' N	110° 16,05' E	1243	Plankton Net
SO187/054-22	21.04.06	00:03	11° 24,09' N	110° 16,10' E	1252	Plankton Net
SO187/054-23	21.04.06	00:13	11° 24,18' N	110° 16,22' E	1277	Fish-larvae Net
SO187/054-24	21.04.06	02:28	11° 24,36' N	110° 17,52' E	1247	CTD
SO187/054-25	21.04.06	05:25	11° 25,39' N	110° 19,35' E	1608	CTD
SO187/054-26	21.04.06	05:50	11° 25,54' N	110° 19,47' E	1613	Plankton Closing Net
SO187/054-26	21.04.06	06:00	11° 25,60' N	110° 19,53' E	1613	Plankton Closing Net
SO187/054-27	21.04.06	06:05	11° 25,63' N	110° 19,55' E	1617	Plankton Net
SO187/054-27	21.04.06	06:07	11° 25,64' N	110° 19,57' E	1619	Plankton Net
SO187/054-27	21.04.06	06:15	11° 25,68' N	110° 19,62' E	1620	Plankton Net
SO187/054-28	21.04.06	06:26	11° 25,78' N	110° 19,66' E	1623	Fish-larvae Net
SO187/054-29	21.04.06	07:38	11° 26,21' N	110° 20,17' E	1630	CTD
SO187/054-30	21.04.06	09:09	11° 26,66' N	110° 21,49' E	1764	Drifter
SO187/055-1	21.04.06	10:46	11° 16,94' N	110° 24,09' E	1626	CTD
SO187/056-1	21.04.06	17:24	11° 57,70' N	109° 45,34' E	217	CTD

Table 7. cont.

3.6. Preliminary Results

These results are based on measurements completed on board during the cruise. They are not yet validated but roughly checked for inconsistencies. The characterization of water masses off the Mekong estuary showed lower salinities in this area and higher salinities in the north comparable to the ones measured during the intermonsoon in the year 2004 (Fig. 6) (Voss et al., 2006).

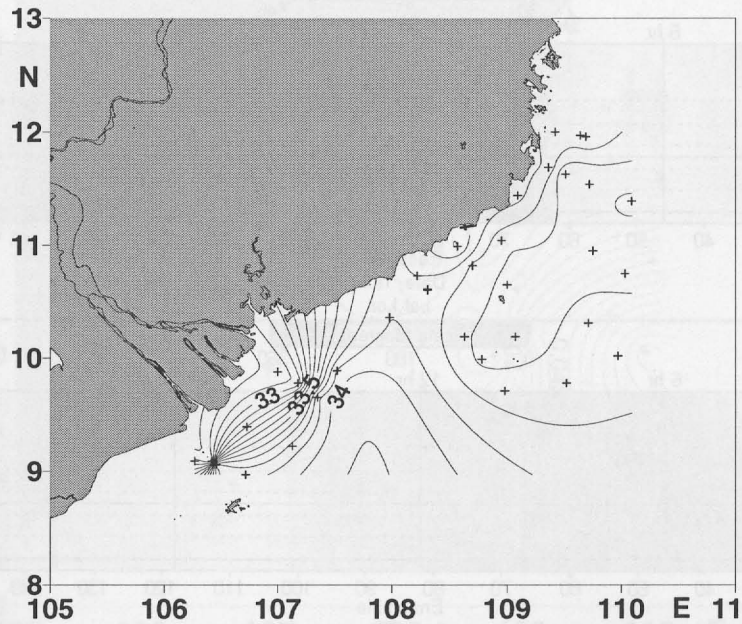

Figure 6. Surface salinity in front of the South-Vietnamese coast during SONNE 187-2. Contour interval is 0.1psu. Crosses mark the sampling stations.

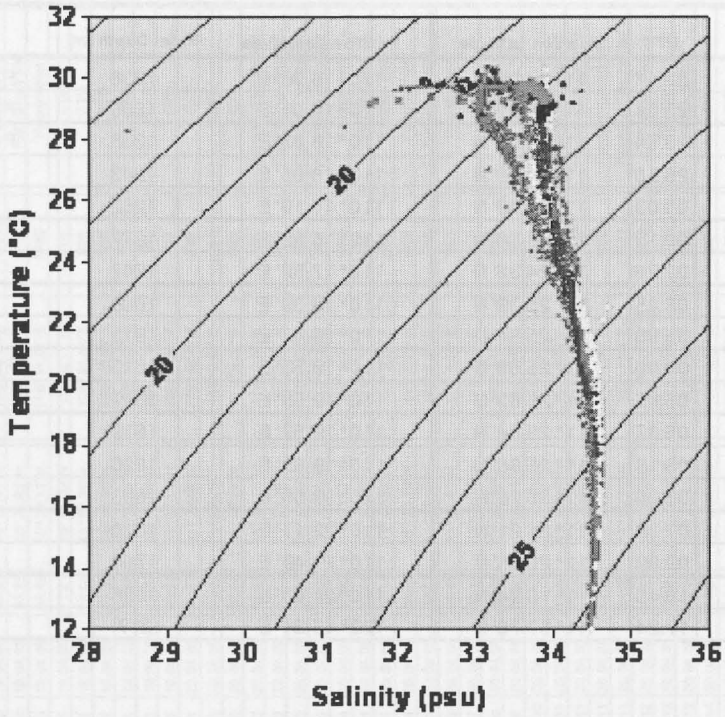

Figure 7. TS-diagram from the previous cruises VG-3 in July 2003 (red dots), VG-4 in April/May 2004 (yellow dots) and SONNE-187 leg 2 transect stations (blue dots), Mekong grid (black triangles) and during ADCP deployment (pink squares).

Low salinities off the Mekong River were especially evident during the 24 hours recording of T/S (Fig.7) where for the first time the daily tidal cycle was recorded in terms of current direction and current speed. (Fig. 8).

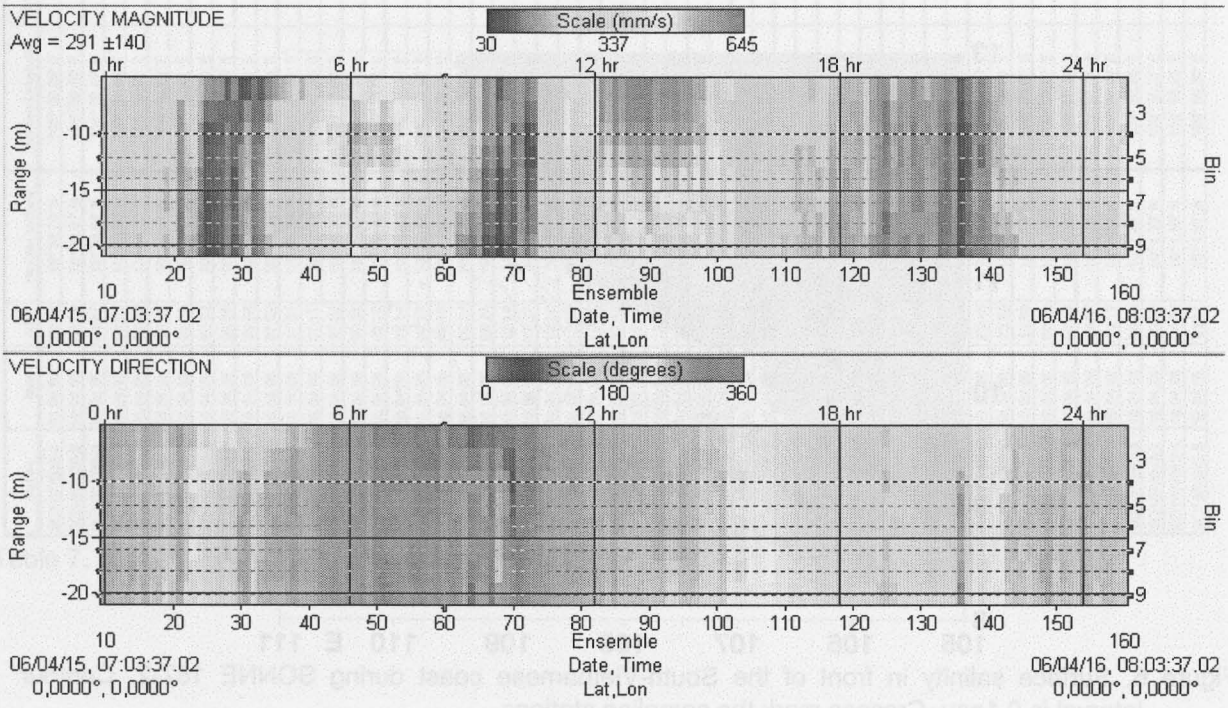

Figure 8. Current speed and direction observed with an ADCP close to the Mekong River estuary.

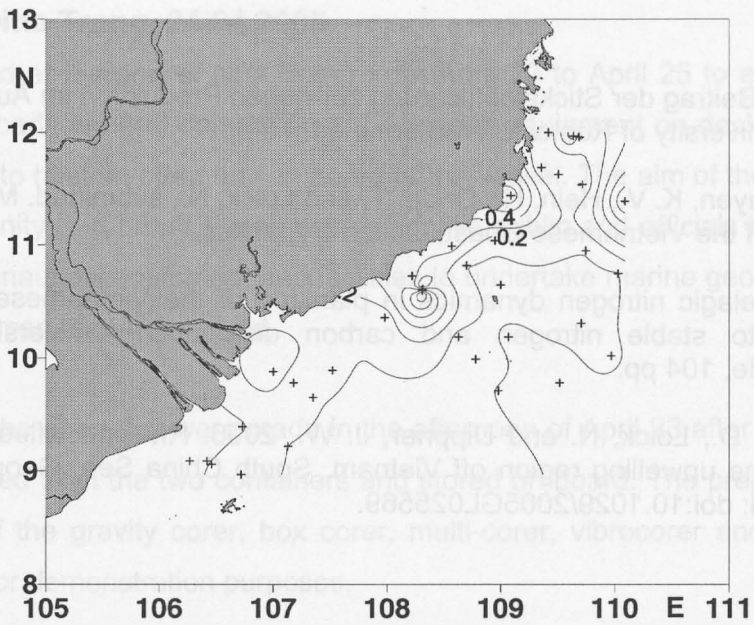

Figure 9: Surface fluorescence in front of the South-Vietnamese coast. Contour interval is 0.1mg/m^3. Crosses mark the sampling stations.

Together with the nutrients and filtration for particulate matter the fluorescence was measured. The fluorescence was elevated along the coast indicating higher concentrations of pigment containing phytoplankton cells (Fig. 9). However, the overall values are very low. Nitrate, representing other nutrient concentrations like PO_4^{3-} , was at detection limit with <0.02 µmol l^{-1}. (Fig. 10). This is typical for the intermonsoon where no nutrients reach these waters.

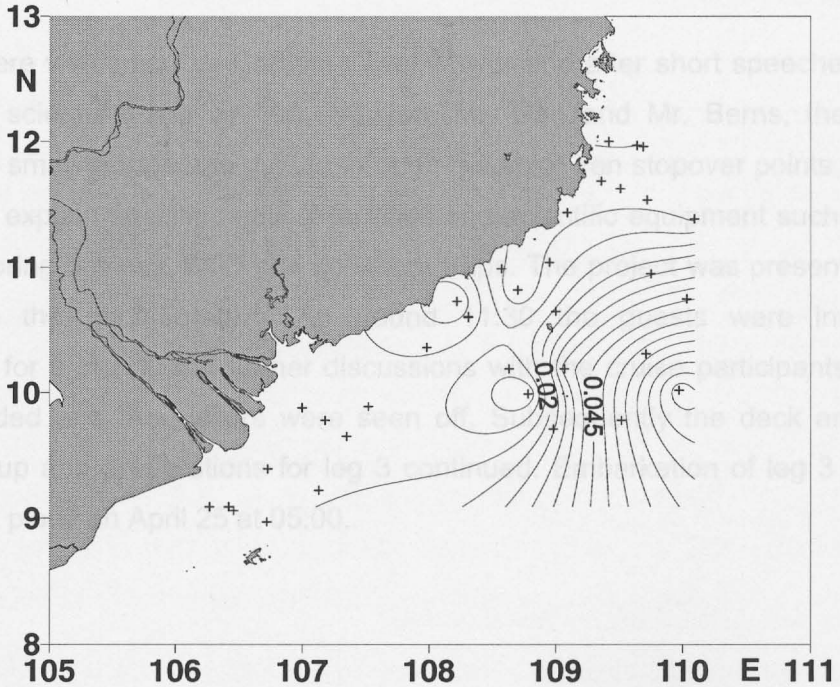

Figure 10: Surface nitrate in front of the South-Vietnamese coast. Contour interval is 0.005 µmol l^{-1}. Crosses mark the sampling stations.

3.7 References

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4. Open Ship: Nha Trang, 24.04.2006

RV *Sonne* docked at the port of Nha Trang from April 22 to April 25 to exchange scientific personnel, to unload/load and deinstall/install scientific equipment on deck and in the ship's laboratories, and to host an open day on board of the vessel. The aim of the open day was to afford an opportunity to a broad Vietnamese scientific public and officials to gain insight into the scientific and nautical equipment and facilities to undertake marine geoscientific research on a modern German research vessel.

Preparations for the open day were made in the afternoon of April 23 after the equipment for leg 3 was unloaded from the two containers and stored on board. The preparations included the installation of the gravity corer, box corer, multi-corer, vibrocorer and a sediment trap system on deck for demonstration purposes.

The reception on board started on April 24 at 08:30 with the arrival of around 50 guests from politics, science and economy. Among the guests were Mrs. Nguyen Thu Hang, vice-president of the people's committee of the Khanh Hoa province, Mr. Rainer Berns, representative of the German Embassy in Hanoi, Dr. Christa Claus, head of the office of the German Academic Exchange Service (DAAD) in Hanoi, Mrs. Nghien Minh Hoa, representative of the Vietnam Ministry of Science and Technology, Hanoi, Mr. Dau Si Thai, representative of the Vietnam Academy of Natural Sciences and Technology, Hanoi, and Mr. Dang Vinh Hue, head to the Vietnam-German friendship society.

The guests were welcomed by Captain Oliver Meyer and after short speeches given by the SO-187 chief scientists and by Mrs. Nguyen, Mr. Dau and Mr. Berns, the visitors were organized into small groups and guided through the ship. Ten stopover points were arranged on the ship to explain specific nautical facilities and scientific equipment such as the dredge system, the coring devices, CTD and sediment traps. The project was presented in the form of posters in the geolaboratory. At around 11:30 the guests were invited into the geolaboratory for a snack and further discussions with the cruise participants. At 12:30 the open ship ended and the visitors were seen off. Subsequently the deck and laboratories were cleared up and preparations for leg 3 continued. Embarkation of leg 3 scientific crew members took place on April 25 at 05:00.

5. LEG 3: Nha Trang - Singapore, 25.04. – 13.05.2006

5.1 Research Programme and Objectives

Investigations in the field of coastal and marine geology within the joint Vietnamese-German project aim at the reconstruction of the hitherto only sparsely known coastal evolution in SE Vietnam during the Holocene period and at the assessment of ongoing hydrodynamic, sedimentdynamic and morphodynamic coastal and shelf processes. The cruise was focused on the Mekong delta. We investigated the late Holocene progradation of the delta onto the shelf, the delta-shelf transition zone, the sediment transport from the distributaries to Ca Mau Peninsula and actual sediment accretion at its southern shore

• to understand the sediment dynamic processes acting in this highly complex delta system what will allow

• to improve the predictability of its future evolution.

Key areas of our project in the frame of SO 187-3 cruise:

(i) the inner shelf adjacent the easternmost distributary (Cua Dai/Cua Tieu) with its transition to the Saigon River mouth and the coastal plain in the NE as direct continuation and expansion previous investigations carried out with the Vietnamese *RV Nghien Cuu Bien*

(ii) the inner shelf around the westernmost part of Ca Mau Peninsula with the southwestward prograding spit-system where we observe today the most intense sediment accretion of the delta area. Transport dynamics of sediments from the Mekong distributaries to and accretion dynamics at Ca Mau Peninsula are not known.

The principal tasks aim to:

(i) reconstruct the influence of short- and longer-term sea-level fluctuations on delta evolution/architecture, namely outbuilding and shoreline migration as natural framework and boundary conditions of the ongoing changes.

(ii) survey of the modern hydrodynamic and sediment-dynamic processes: influence of riverdischarge, tides and waves on sediment dispersion, transport and deposition

- at the transition from the delta to the open shelf
- in the distributaries of the delta
- for the transport paths from the distributaries to Ca Mau Peninsula
- at Ca Mau Peninsula with its spit system

The following thematic issues will be investigated:

(1) Important geomorphologic structures identified by remote sensing (satellite images and aerial photographs) of the Mekong Delta and the adjacent shelf;

(2) Bathymetry, hydro- and morphodynamics of the delta front and prodelta area;

(3) Sediment transport and accretion in the marine part of the delta;
(4) Water and sediment discharge from the Mekong distributaries;
(5) Holocene sea-level change and delta evolution with special regard to the evolution and growth of the Cua Dai/Cua Tieu distributary and the Ca Mau Peninsula;
(6) Recent changes in the deltaic forcing in response to global warming and sea-level rise
(7) Effects of (1) to (6) on infrastructure and on the use of aquatic and mineral resources.

These thematic issues will help in solving important scientific problems concerning the reconstruction of delta evolution and actual growth. High-resolution analysis of sedimentary archives and of ongoing physical processes will allow an analysis of change with extrapolations to improve the predictability of the future evolution of the Mekong Delta.
The focus during cruise SO 187-3 lay on the completion of sediment coring on the SE Vietnam Shelf and a seismic survey of this region.

The research programme also included the recovery and redeployment of two sediment trap moorings in the inner and outer region of the upwelling zone off southeastern Vietnam as part of the VIETFLUX project (see chapter 2.1). The major scientific goal of the sediment trap investigations is to assess the effects of high-amplitude short- and long-term variations in land-ocean-atmosphere interactions on the dynamics and efficiency of the upwelling region Vietnam. This assessment requires quantification of the role of in-situ productivity versus the laterally advected material reworked on the shelves and slopes and redeposited in the South China Sea (see chapter 2.1 for the overall objectives).

5.2 Previous Studies

First results of seismic stratigraphy, sediment dynamics and Holocene sea-level history from the shelf and shore between the Mekong delta and Nha Trang are based on a field trip along the coast of southern Vietnam (2003) and two cruises with the Vietnamese RV *Nghien Cuu Bien* (2004 and 2005).In the northern working area on the narrow shelf around Nha Trang several Quaternary stratigraphic sequences could be identified, remarkable are the thick Holocene highstand deposits (cf. Szczuciński and Stattegger, 2001; Schimanski and Stattegger, 2005). The northernmost part of the Sunda Shelf off SE Vietnam is starved in late Quaternary deposits. The most prominent morphological feature is the course of the incised paleo-Mekong valley system with its deglacial sedimentary fill. The principal paleo-valley extends eastward of the northern modern distributaries. Investigations on sediment-surface bedforms revealed large fields of sandwaves/subaqueous dunes and areas of linear furrows which indicate southwestward sediment movement.

In the framework of the Vietnamese German cooperation in marine research the project *Land-ocean-atmospheric interactions in the coastal zone of Southern Vietnam* was launched in 2003. The sub-project *Holocene Coastal Evolution* was set up to reconstruct in space and time the hitherto only sparsely known coastal evolution in SE-Vietnam during the Holocene period. Main tasks of the initial proposal were (i) recording and analysing major sedimentbodies and sediment surfaces to reveal (ii) depositional patterns and stratigraphic architecture; and (iii) the principal hydrodynamic and sediment-dynamic processes in the coastal and shelf zone; (iv) evaluating and balancing the terrigenous sediment input; and (v) investigating the magnitude and influence of short and longer term sea-level fluctuations and coastline migration.

5.3 Participants

Names, affiliations and tasks of the scientific participants are given in Table 11 (for nautical crew members see Table 2).

Table 11: List of Leg 3 Scientific Crew Members

Member	Affiliation	Tasks
Stattegger, Karl	IfG*	Chief Scientist
Wiesner, Martin	IfBM+	Sediment Traps, Sediments
Schwarzer, Klaus	IfG	Sediments, Coring
Lahajnar, Niko	IfBM	Sediment Traps, LISST, Coring
Schimanski, Alexander	IfG	Sediments, Coring
Unverricht, Daniel	IfG	Sediments, Coring
Stichel, Torben	IfG	Sediments
Steen, Eric	IfG	Coring
Kagelmacher, Anna	IfBM	Sediment Traps, Sediments
Heyckendorf, Kay	MPI# University of Hamburg	X-ray Radiographies, Sediments
Amann, Thorben	IfBM	Sediments
Heidemann, Ulrich	IfG	Sediments, Coring
Wetzel, Andreas	GPI§ University of Basel	X-ray Radiographies, Sediments
Jagodzinski, Robert	Institute of Geology, University of Poznan, Poland	Sediments, LISST
Szczucinski, Witold	Institute of Geology, University of Poznan, Poland	Sediments
Le, Xuan Thuyen	IMGG§§	Sediments
Nguyen, Ba Minh	IMGG	Sediments
Phung, Van Phach	IMGG	Sediments
Nguyen, Trung Thanh	IMGG	Sediments

Member	Affiliation	Tasks
Do, Huy Cuong	IMGG	X-ray Radiographies, Sediments
De Silva, Leopoldo	NIGS**	Sediments
Peleo-Alampay, Alyssa	NIGS	Sediments, LISST

*IfG – Institut für Geowissenschaften (Institute of Geosciences) University of Kiel, Germany
+IfBM – Institut für Biogeochemie und Meereschemie (Institute of Biogeochemistry and Marine Chemistry), University of Hamburg, Germany
#MPI – Mineralogical-Petrographical Institute
§GPI – Geological-Paleontological Institute
§§IMGG – Institute of Marine Geology and Geophysics, Hanoi
**NIGS – National Institute of Geological Sciences, University of the Philippines, Diliman

5.4 Cruise Narrative

The cruise track of SO-187/Leg 3 focussed on specific areas and track lines on the continental shelf and continental slope of Southeast and South-Vietnam (see Fig. 11) to complete the shallow seismic survey and the sediment sampling carried out during two cruises with the Vietnamese research vessel *Nghien Cuu Bien* in the years 2004 and 2005. Primary goal was sediment coring which was not possible with the Vietnamese vessel.

RV *Sonne* departed from Nha Trang on April 25 at 10:30 local time. Our survey started at 11:30. In the working area NE of Nha Trang, off Hon Gom Peninsula, 90 miles Parasound-profiles were recorded, 3 sediment stations were cored and sampled by laser diffraction particle sizer (LISST), giant box corer (GBC) and gravity corer (GC).

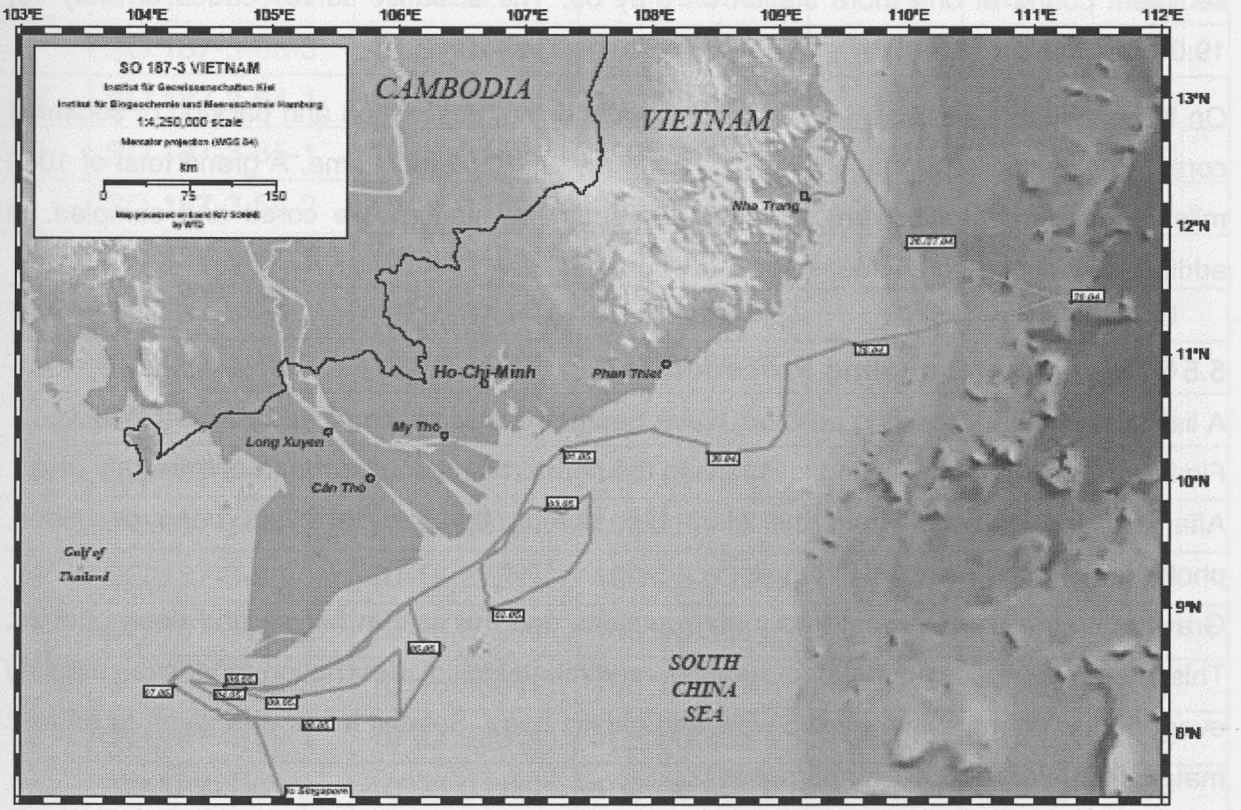


Figure 11 . Track of RV *Sonne* cruise 187 Leg 3.

On April 26 we conducted a Parasound transect (120 miles) from Hon Gom Peninsula southeastward to the position of a sediment trap on the lower continental slope at 1850 m waterdepth and a second station at 2250 m waterdepth (11°24' N, 111 °16' E). At both stations sediment traps could be successfully recovered and deployed. In addition two sediment stations near the trap positions were cored and sampled by LISST, GBC and GC on April 27 and 28.

After a 10 hours transit we continued work on the continental shelf of SE Vietnam south of 11° N, between 109°30' E and 107 °30' E. Here 350 miles Parasound profiles were recorded and 15 sediment stations were sampled by LISST, GBC, GC and vibrocorer (VC) between April 29 and May 01.

We continued our work off the Mekong delta with 200 miles Parasound profiling and with the coring and sampling of 10 sediment stations in the area of incised and refilled channels of the Mekong River formed during and after the glacial lowstand between 107°30' E and 106 ° 30' E during May 02 and 03.

Moving further westward we recorded 400 miles Parasound-profiles in the south and in the west of Camau Peninsula between 106°30' E and 104 °E on May 03 and 04. Based on the Parasound-profiles we cored and sampled 30 sediment stations by LISST, GBC, GC and VC in a second loop between May 06 and 08. We completed the Parasound-profiling and sediment coring at one more station on May 09. The scientific survey ended on May 09, 19:00 local time.

On the transit to Singapore we completed the opening, description and packing of sediment cores. We arrived at Singapore harbour on May 12, 10:00 local time. A grand total of 1080 miles Parasound-profileswere recorded, 61 sediment stations we cored and sampled. In addition we recovered and deployed 2 sediment traps.

5.5 Stations and Sampling Procedures

A list of all stations including position, water depth and devices employed is given in table 12. Figures 12 and 13 show coring locations in the northern and southern part of the study area.
After sucking of water from the giant box corers, the sediment has been described, photographed and sampled in detail.
Gravity cores have been cut into meter sections and the split in halves and been opened. This step was followed by photography, sedimentological description and sub-sampling every 50 cm onboard into plastic vials and plastic bags. Special focus was given to organic material for later AMS dating purposes.
Vibrocores have carefully been split into halves and completely sampled using small plastic containers.

Table 12: Overview of sediment stations (GBC - giant box corer; GC-12 - gravity corer (12m); VC-3 – vibrocorer (3m))

Number	Code	Position latitude	Position longitude	Water-depth, m	Device	Core l., cm
01	SO 187-3-57-1	12°24.705'N	109°29.477'E	119	GBC	43-49
	SO 187-3-57-2	12°24.692'N	109°29.474'E	119	GC-6	482
02	SO 187-3-58-1	12°45.943'N	109°24.066'E	29	GBC	22
	SO 187-3-58-2	12°45.939'N	109°24.066'E	29	GC-6	393
03	SO 187-3-59-1	12°37.400'N	109°31.711'E	133	GBC	42
	SO 187-3-59-2	12°37.380'N	109°31.708'E	133	GC-6	231
	SO 187-3-59-3	12°37.360'N	109°31.704'E	133	GC-6	135
04	SO 187-3-60-1	11°49.917'N	110°00.378'E	1859	GBC	30
	SO 187-3-60-2	11°50.027'N	110°00.538'E	1864	GC-12	757
05	SO 187-3-61-1	11°25.471'N	111°16.992'E	2227	GBC	35-38
	SO 187-3-61-2	11°25.470'N	111°16.982'E	2226	GC-12	927
06	SO 187-3-62-1	11°03.231'N	109°28.296'E	127	GBC	22
	SO 187-3-62-2	11°03.227'N	109°28.291'E	127	VC-3	26
	SO 187-3-62-3	11°03.402'N	109°28.285'E	126	VC-3	empty
07	SO 187-3-63-1	10°54.932'N	109°03.544'E	109	GBC	27
	SO 187-3-63-2	10°54.927'N	109°03.556'E	109	GC-6	55
	SO 187-3-63-3	10°54.947'N	109°03.539'E	109	GC-6	245
08	SO 187-3-64-1	10°54.798'N	109°03.060'E	107	GBC	10
09	SO 187-3-65-1	10°38.148'N	109°02.179'E	112	GBC	40
	SO 187-3-65-2	10°38.174'N	109°02.191'E	112	GC-6	174
	SO 187-3-65-3	10°38.146'N	109°02.195'E	112.5	GC-6	185
9B	SO 187-3-66-1	10°15.328'N	108°54.704'E	87	GBC	39
	SO 187-3-66-2	10°15.345'N	108°54.690'E	87	GC-6	163
	SO 187-3-66-3	10°15.345'N	108°54.705'E	87	GC-6	153
10	SO 187-3-67-1	10°13.091'N	108°25.731'E	56	GBC	59
	SO 187-3-67-2	10°13.067'N	108°25.716'E	56	GC-6	311
11	SO 187-3-68-1	10°16.872'N	108°25.302'E	60	GBC	40
	SO 187-3-68-2	10°16.879'N	108°25.304'E	60	GC-6	577
	SO 187-3-68-3	10°16.886'N	108°25.317'E	60	GC-12	747
13	SO 187-3-69-1	10°22.985'N	108°00.786'E	43	GBC	34
	SO 187-3-69-2	10°23.011'N	108°00.801'E	42	GC-12	1000
14	SO 187-3-70-1	10°22.283'N	108°00.708'E	41,5	GBC	35
15	SO 187-3-71-1	10°24.256'N	108°00.599'E	38	GBC	37

Number	Code	Position latitude	Position longitude	Water-depth, m	Device	Core l., cm
	SO 187-3-71-2	10°24.246'N	108°00.587'E	38	GC-12	715
16	SO 187-3-72-1	10°15.327'N	107°17.291'E	26	GBC	30
	SO 187-3-72-2	10°15.339'N	107°17.335'E	26	GC-6	509
17	SO 187-3-73-1	10°14.125'N	107°16.744'E	31	GBC	37
	SO 187-3-73-2	10°14.114'N	107°16.747'E	31	GC-6	572
	SO 187-3-73-3	10°14.131'N	107°16.741'E	30	GC-12	838
18	SO 187-3-74-1	10°13.854'N	107°16.675'E	29	GBC	36
	SO 187-3-74-2	10°13.910'N	107°16.664'E	30	GC-6	400
19	SO 187-3-75-1	10°06.578'N	107°06.616'E	21	GBC	18
	SO 187-3-75-2	10°06.563'N	107°06.642'E	21	VC-3	empty
20	SO 187-3-76-1	09°28.950'N	106°49.166'E	24	GBC	28
	SO 187-3-76-2	09°28.952'N	106°49.163'E	24	GC-3	empty
	SO 187-3-76-3	09°28.956'N	106°49.159'E	23	VC-3	empty
21	SO 187-3-77-1	09°21.678'N	106°37.767'E	24	GBC	empty
	SO 187-3-77-2	09°21.639'N	106°37.727'E	24	GS	17
	SO 187-3-77-3	09°21.657'N	106°37.717'E	25	GC-3	empty
	SO 187-3-77-B1	09°21.552'N	106°37.656'E	25	GBC	5
22	SO 187-3-78-1	08°58.436'N	106°41.765'E	32	GS	20
	SO 187-3-78-2	08°58.434'N	106°41.779'E	32	VC-3	199
23	SO 187-3-79-1	09°08.436'N	107°04.193'E	33	GBC	19
	SO 187-3-79-2	09°08.413'N	107°04.192'E	33	VC-3	220
	SO 187-3-79-3	09°08.402'N	107°04.194'E	33	VC-3	272
24	SO 187-3-80-1	09°14.095'N	107°16.993'E	38	GBC	5
	SO 187-3-80-2	09°14.097'N	107°16.995'E	38	VC-3	18
25	SO 187-3-81-1	09°15.490'N	107°19.998'E	38	GBC	15
	SO 187-3-81-2	09°15.491'N	107°19.996'E	38	VC-3	182
26	SO 187-3-82-1	09°30.988'N	107°30.148'E	39	GBC	15-26
	SO 187-3-82-2	09°30.986'N	107°30.137'E	39	GC-3	224
26B	SO 187-3-83-1	09°53.919'N	107°29.827'E	31	GBC	10-20
	SO 187-3-83-2	09°53.916'N	107°29.825'E	32	VC-3	technical problem
	SO 187-3-83-3	09°53.921'N	107°29.824'E	32	GC-3	empty
27	SO 187-3-84-1	09°43.966'N	107°17.213'E	33	GBC	23
	SO 187-3-84-2	09°43.965'N	107°17.217'E	33	GC-3	empty
27B	SO 187-3-85-1	09°47.807'N	107°02.111'E	27	GBC	15-21

Number	Code	Position latitude	Position longitude	Water-depth, m	Device	Core l., cm
	SO 187-3-85-2	09°47.815'N	107°02.112'E	29	GC-3	empty
	SO 187-3-85-3	09°47.838'N	107°02.199'E	27	VC-3	177
	SO 187-3-85-4	09°47.815'N	107°02.106'E	27	VC-3	245
30	SO 187-3-87-1	09°02.546'N	106°04.549'E	20	GBC	empty
	SO 187-3-87-2	09°02.558'N	106°04.533'E	20	GBC	pieces of hardground
	SO 187-3-87-3	09°02.565'N	106°04.523'E	20	GBC	empty
	SO 187-3-87-4	09°02.543'N	106°04.552'E	20	VC-3	empty
33	SO 187-3-86-1	08°44.465'N	106°09.819'E	27	GBC	16
	SO 187-3-86-2	08°44.463'N	106°09.822'E	27	VC-3	264
34	SO 187-3-91-1	08°26.642'N	105°14.654'E	31	GBC	55
	SO 187-3-91-2	08°26.641'N	105°14.640'E	30	GC-6	overfilled
	SO 187-3-91-3	08°26.640'N	105°14.628'E	30	GC-9	867
35	SO 187-3-92-1	08°25.253'N	105°11,930'E	30	GBC	60
	SO 187-3-92-2	08°25.253'N	105°11,933'E	30	GC-9	749
36	SO 187-3-93-1	08°23.280'N	105°06.765'E	32	GBC	68
	SO 187-3-93-2	08°23.288'N	105°06.752'E	32	GBC	480
37	SO 187-3-94-1	08°22.281'N	104°38.058'E	24	GBC	32
38	SO 187-3-95-1	08°22.751'N	104°37.209'E	29	GBC	36
	SO 187-3-95-2	08°22.753'N	104°37.207'E	29	GC-3	overfilled
	SO 187-3-95-3	08°22.752'N	104°37.213'E	29	GC-6	50
	SO 187-3-95-4	08°22.751'N	104°37.216'E	29,5	GC-6	445
39	SO 187-3-96-1	08°24.492'N	104°34.303'E	31	GBC	35
	SO 187-3-96-2	08°24.485'N	104°34.264'E	31	GC-3	overfilled
	SO 187-3-96-3	08°24.494'N	104°34.242'E	31	GC-9	684
40	SO 187-3-97-1	08°24.721'N	104°33.854'E	30	GBC	1-4
	SO 187-3-97-2	08°24.721'N	104°33.854'E	30	GBC	0-15
	SO 187-3-97-3	08°24.725'N	104°33.855'E	31	VC-3	17
41	SO 187-3-98-1	08°27.695'N	104°28.385'E	30	GBC	50
	SO 187-3-98-2	08°27.693'N	104°28.362'E	30	GC-6	130
42	SO 187-3-99-1	08°28.068'N	104°27.582'E	30	GBC	51
	SO 187-3-99-2	08°28.072'N	104°27.581'E	30	GC?	?
43	SO 187-3-100-1	08°31.411'N	104°20.161'E	28	GBC	30
	SO 187-3-100-2	08°31.414'N	104°20.156'E	28	GC-3	full
	SO 187-3-100-3	08°31.415'N	104°20.153'E	28	GC-9	707

Number	Code	Position latitude	Position longitude	Water-depth, m	Device	Core l., cm
44	SO 187-3-101-1	08°30.089'N	104°18.145'E	30	GBC	overfilled
	SO 187-3-101-2	08°30.112'N	104°18.154'E	30	GBC	overfilled
	SO 187-3-101-3	08°30.108'N	104°18.145'E	30	GBC	87
	SO 187-3-101-4	08°30.098'N	104°18.147'E	30	GC-9	580
45	SO 187-3-102-1	08°26.636'N	104°13.588'E	29	GBC	33
	SO 187-3-102-2	08°26.622'N	104°13.586'E	29	GC-3	full
	SO 187-3-102-3	08°26.636'N	104°13.606'E	29	GC-6	461
46	SO 187-3-103-1	08°25.731'N	104°12.419'E	28	GBC	27
	SO 187-3-103-2	08°25.721'N	104°12.433'E	28	GC-6	545
47	SO 187-3-104-1	08°22.567'N	104°13.244'E	26	GBC	23
	SO 187-3-104-2	08°22.556'N	104°13.234'E	26	GC-3	overfilled
	SO 187-3-104-3	08°22.556'N	104°13.234'E	26	GC-6	546
48	SO 187-3-105-1	08°11.352'N	104°31.116'E	25	GBC	26
	SO 187-3-105-2	08°11.368'N	104°31.111'E	25	GC-6	582
	SO 187-3-105-3	08°11.371'N	104°31.123'E	25	GC-6	481
49	SO 187-3-106-1	08°11.218'N	104°33.691'E	26	GBC	38
	SO 187-3-106-2	08°11.213'N	104°33.691'E	26	GC-6	545
50	SO 187-3-107-1	08°09.357'N	104°34.387'E	27.5	GBC	44
	SO 187-3-107-2	08°09.359'N	104°34.381'E	27	GC-3	178
	SO 187-3-107-3	08°09.328'N	104°34.375'E	27	GC-3	378
51	SO 187-3-108-1	08°07.003'N	104°57.039'E	32	GBC	45
	SO 187-3-108-2	08°07.006'N	104°57.037'E	32	GC-6	full
	SO 187-3-108-3	08°07.005'N	104°57.037'E	32	GC-9	737
52	SO 187-3-109-1	08°07.011'N	105°14.504'E	33	GBC	45
	SO 187-3-109-2	08°06.964'N	105°14.523'E	33	GC-6	384
53	SO 187-3-110-1	08°07.070'N	105°16.829'E	32	GBC	38
54	SO 187-3-111-1	08°07.020'N	105°22.960'E	34	GBC	45
	SO 187-3-111-2	08°06.997'N	105°22.954'E	35	GC-6	300
55	SO 187-3-112-1	08°06.998'N	105°23.349'E	33	GBC	41
	SO 187-3-112-2	08°06.998'N	105°23.354'E	33	GC-9	726
56	SO 187-3-113-1	08°07.019'N	105°28.852'E	32	GBC	40
	SO 187-3-113-2	08°06.990'N	105°28.861'E	32	GC-3	177
	SO 187-3-113-3	08°06.998'N	105°28.860'E	32	VC-3	empty
	SO 187-3-113-4	08°06.991'N	105°28.860'E	32	VC-3	145

Number	Code	Position latitude	Position longitude	Water-depth, m	Device	Core l., cm
	SO 187-3-113-5	08°06.987'N	105°28.858'E	32.5	GC	empty
57	SO 187-3-114-1	08°06.983'N	105°35.515'E	32	GBC	39
	SO 187-3-114-2	08°06.979'N	105°35.511'E	32	GC-3	299
	SO 187-3-114-3	08°06.984'N	105°35.506'E	32	GC-6	525
58	SO 187-3-115-1	08°07.056'N	105°36.163'E	32	GBC	38
	SO 187-3-115-2	08°07.035'N	105°36.180'E	32.5	GC-6	500
59	SO 187-3-116-1	08°06.935'N	105°56.333'E	33	GBC	33
	SO 187-3-116-2	08°06.960'N	105°56.332'E	32	GC-6	527
60	SO 187-3-117-1	08°07.013'N	105°56.808'E	32	GBC	31
	SO 187-3-117-2	08°07.008'N	105°56.794'E	32	GC-6	empty
	SO 187-3-117-3	08°07.008'N	105°56.801'E	32	VC-3	empty
	SO 187-3-117-4	08°07.008'N	105°56.797'E	32	GC-3	185
61	SO 187-3-118-1	08°22.500'N	104°37.782'E	31	GC-2	61
	SO 187-3-118-2	08°22.502'N	104°37.780'E	31	GC-2	31

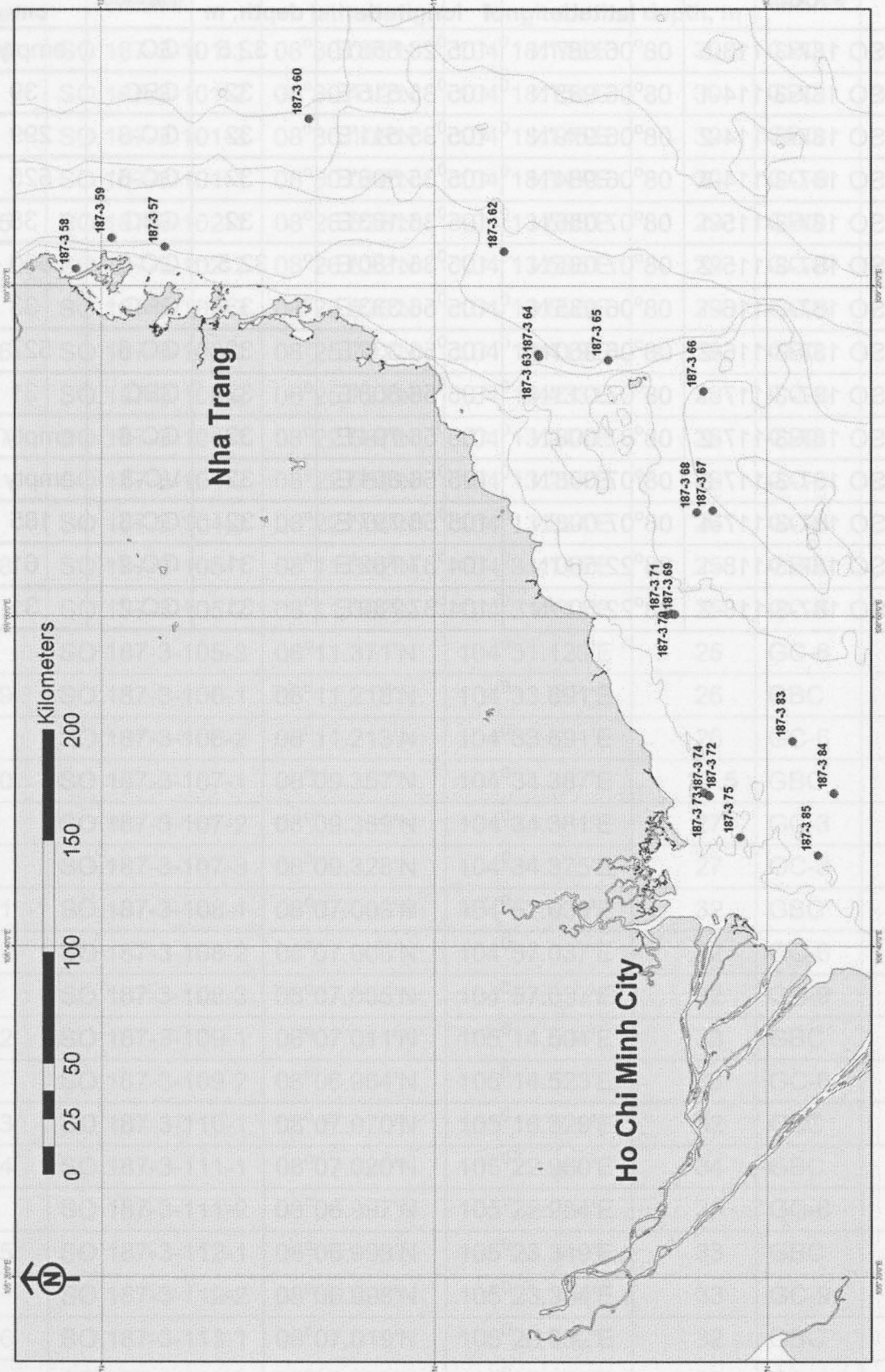


Figure 12. Coring locations in the northern part of the study area.

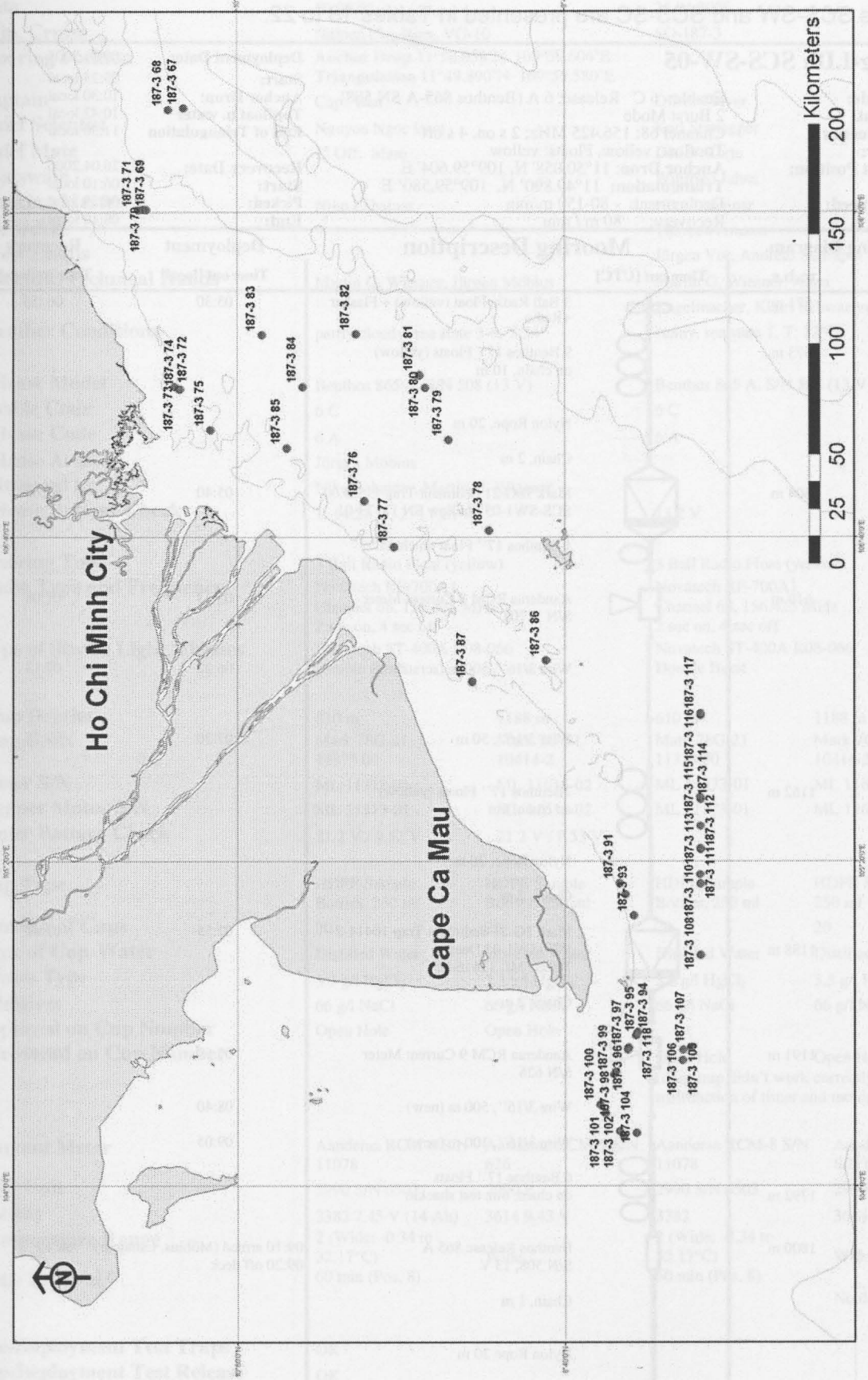


Figure 13. Coring locations in the southern part of the study area.

Recovery and deployment details as well as collection schedules of the two sediment trap moorings SCS-SW and SCS-SC are presented in Tables 13 to 22.

Mooring-I.D.: SCS-SW-05

Release Code:	Enable: 6 C Release: 6 A (Benthos 865-A SN 508)	**Deployment Date:**	09.05.2005
Strobe Light:	2 Burst Mode	**Start:**	05:25 local
Radio Frequency:	Channel 68; 156.425 MHz; 2 s on, 4 s off	**Anchor Drop:**	10:30 local
Float Color:	Topfloat: yellow, Floats: yellow	**Topfloat u. water**	10:42 local
Deployment Position:	**Anchor Drop:** 11°50.058' N, 109°59.604' E	**End of Triangulation**	11:30 local
	Triangulation: 11°49.890' N, 109°59.580' E	**Recovery Date:**	26.04.2006
Buoyancy speed:	Deployment: - 80-150 m/min	**Start:**	06:10 local
	Recovery: 80 m / min	**Picked:**	06:50 local
		End:	08:10 local

Mooring Diagram		Mooring Description	Deployment	Recovery
m.a.b.	m.b.s.	Time out [UTC]	Time out [local]	Time in [local]
1254 m	571 m	3 Ball Radio Float (yellow) + Flasher +Radio	05:30	06 :55
1252 m	573 m	9 Benthos 17'' Floats (yellow) on chain, 10 m		
		Nylon Rope, 20 m		
		Chain, 2 m		
1221 m	604 m	Mark 78G-21 Sediment Trap 11373.00 SCS-SW1-05 Shallow SN 11373-01	05:40	07:00
		1 Benthos 17'' Float on chain		
12145m	610 m	Aanderaa RCM 8 Current Meter S/N 11708	05:43	07:08
		Wire 3/16'', 500 m (scratched)	06:30	07:13
		Wire 3/16'', 50 m	07:20	07:28
663 m	1162 m	7Benthos 17'' Floats (yellow) on chain, 6m		
		Nylon Rope, 20 m		
		Chain, 2 m		
637 m	1188 m	Mark 7G-21 Sediment Trap 10414-2 SCS-SW1-05 Deep Timer: ML 11616-02	07:55	07:40
		Chain, 2 m		
634 m	1191 m	Aanderaa RCM 9 Current Meter S/N 626	07:59	07:40
		Wire 3/16'', 500 m (new)	08:40	
		Wire 3/16'', 100 m (new)	09:05	
33 m	1792 m	6 Benthos 17'' Floats on chain, 6m, test shackle		
25 m	1800 m	Benthos Release 865 A S/N 508, 13 V	09:10 armed (Möbius, Lahajnar) 09:20 off deck	08:10
		Chain, 1 m		
		Nylon Rope 20 m		
		Chain, 2 m		
0 m	1825 m	Anchor (2 Rail Wheels)	10:30 anchor drop	

Table 13. Mooring diagram of SCS-SW-05

SCS-SW-05	Deployment		Recovery	
Date	09.05.05		26.04.2006	
Ship, Cruise	Nghien Cuu Bien, VG-10		SO-187-3	
Mooring Position	**Anchor Drop** 11°50.058'N 109°59.604'E **Triangulation** 11°49.890'N 109°59.580'E			
Captain	Capt. Ban		Oliver Meyer	
Chief Scientist	Nguyen Ngoc Lam		Karl Stattegger	
Chief Mate	1st Off. Mam		Detlev Korte	
Boatswain			Winfried Jahns	
Mooring Master	Niko Lahajnar		Niko Lahajnar	
Recorder			Thorben Amann	
Crew Hands			Jürgen Vor, Andreas Schrapel	
Scientific/Technical Hands	Martin G. Wiesner, Jürgen Möbius		Martin G. Wiesner, Anna Kagelmacher, Klaus Schwarzer	
Weather Conditions	partly cloudy, sea state 3-6, T:34°		sunny, sea state 1, T: 32°C	
Release Model	Benthos 865 A, S/N 508 (13 V)		Benthos 865 A, S/N 508 (13 V)	
Enable Code	6 C		6 C	
Release Code	6 A		6 A	
Release Armed	Jürgen Möbius			
Witnessed by	Niko Lahajnar, Martin G. Wiesner			
Release Battery Check	1: 14.27 V 2: 14.28 V		13.2 V	
Mooring Top	3 Ball Radio Float (yellow)		3 Ball Radio Float (yellow)	
Radio Type and Frequency	Novatech RF-700A1 Channel 68, 156.425 MHz 2 sec on, 4 sec off		Novatech RF-700A1 Channel 68, 156.425 MHz 2 sec on, 4 sec off	
Type of Strobe Light, Flashes	Novatech ST-400A R08-066 Double Burst		Novatech ST-400A R08-066 Double Burst	
Trap Depths	610 m	1188 m	610 m	1188 m
Frame S/N	Mark 78G-21 11373.00	Mark 7G-21 10414-2	Mark 78G-21 11373.00	Mark 7G-21 10414-2
Timer S/N	ML 11373-01	ML 11616-02	ML 11373-01	ML 11616-02
Stepper Motor S/N	ML 11373-01	ML 11616-02	ML 11373-01	ML 11616-02
Timer Battery Check	21.2 V / 9.52 V	21.2 V / 9.53 V		
Cup Type	HDPE Sample Bottles, 250 ml	HDPE Sample Bottles, 250 ml	HDPE Sample Bottles, 250 ml	HDPE Sample Bottles, 250 ml
Number of Cups	20	20	20	20
Type of Cup-Water	Distilled Water	Distilled Water	Distilled Water	Distilled Water
Poison Type	3.3 g/l $HgCl_2$	3.3 g/l $HgCl_2$	3.3 g/l $HgCl_2$	3.3 g/l $HgCl_2$
Additives	66 g/l NaCl	66 g/l NaCl	66 g/l NaCl	66 g/l NaCl
Deployed on Cup Number	Open Hole	Open Hole		
Recovered on Cup Number			Open Hole (deep trap didn't work correctly!! Electronic malfunction of timer and motor!)	Open Hole
Current Meter	Aanderaa RCM-8 S/N 11078	Aanderaa RCM-9 S/N 626	Aanderaa RCM-8 S/N 11078	Aanderaa RCM-9 S/N 626
DSU Unit	2990 S/N 6503	2990 E	2990 S/N 6503	2990 E
Battery	3382 7.45 V (14 Ah)	3614 9.43 V	3382	3614
Temperature Range	2 (Wide: -0.34 to 32.17°C)	Wide	2 (Wide: -0.34 to 32.17°C)	Wide
Time Interval	60 min (Pos. 8)		60 min (Pos. 8)	No data!
Pre-Deployment Test Traps	OK			
Pre-Deployment Test Release	OK			
Pre-Deployment Test Current Meter	OK			

Table 14. Deployment and recovery sheet of SCS-SW-05

Mooring-I.D.: SCS-SW-06

Release Code:	Enable: 6 C Release: 6 A (Benthos 865-A SN 508)	**Deployment Date:**	27.04.2006
Strobe Light:	2 Burst Mode	**Start:**	05:00 local
Radio Frequency:	Channel 68; 156.425 MHz; 2 s on, 4 s off	**Anchor Drop:**	07:44 local
Float Color:	Topfloat: yellow, Floats: yellow	**Topfloat u. water**	07:49 local
Deployment Position:	Anchor Drop: 11°50.06' N, 110°00.19' E	**End of Triangulation**	
	Topfloat u. water: 11°49.66'N 110°00.25'E	**Recovery Date:**	
Buoyancy speed:	Deployment: - 80 m/min	**Start:**	
	Recovery:	**End:**	

Mooring Diagram m.a.b.	Mooring Diagram m.b.s.	Mooring Description	Deployment Time out [local]	Recovery Time in [local]
1244 m	606 m	3 Ball Radio Float (yellow) + Flasher +Radio	05 :07	
1242 m	608 m	9 Benthos 17'' Floats (yellow) on chain, 10 m	05:07	
		Nylon Rope, 20 m		
		Chain, 2 m		
1220 m	630 m	Mark 78G-21 Sediment Trap 11373.00 SCS-SW-06 Shallow SN 11373-01	05:18	
		1 Benthos 17'' Float on chain		
1214 m	636 m	Aanderaa RCM 8 Current Meter S/N 11708	05:18	
		Wire 3/16'', 500 m		
		Wire 3/16'', 50 m		
662 m	1188 m	7Benthos 17'' Floats (yellow) on chain, 6m	05:52	
		Nylon Rope, 20 m		
		Chain, 2 m		
636 m	1214 m	Mark 7G-21 Sediment Trap 10414-2 SCS-SW-06 Deep Timer: ML 11616-02	05:56	
		Chain, 2 m		
		Wire 3/16'', 100 m		
		Wire 3/16'', 500 m		
33 m	1817 m	6 Benthos 17'' Floats on chain, 6m, test shackle	06:30	
25 m	1825 m	Benthos Release 865 A S/N 508, 13 V	06:30 Lahajnar/Amann/Wiesner	
		Chain, 1 m		
		Nylon Rope 20 m		
		Chain, 2 m		
0 m	1850 m	Anchor (3 Rail Wheels)	07:44	

Table 15. Mooring diagram of SCS-SW-06.

SCS-SW-06	Deployment	
Date	27.04.2006	
Ship, Cruise	SO-187-3	
Mooring Position	11°49.93' N 110°00.20' E	
Captain	Oliver Meyer	
Chief Scientist	Karl Stattegger	
Chief Mate	Detlev Korte	
Boatswain	Winfried Jahns	
Mooring Master	Niko Lahajnar	
Recorder	Anna Kagelmacher	
Crew Hands	Andreas Schrapel	
Scientific/Technical Hands	Martin G. Wiesner, Klaus Schwarzer Thorben Amann	
Weather Conditions	sunny, sea state 1-2, T:29°	
Release Model	Benthos 865 A, S/N 508 (13 V)	
Enable Code	6 C	
Release Code	6 A	
Release Armed	Thorben Amann	
Witnessed by	Niko Lahajnar, Martin G. Wiesner	
Release Battery Check	1: 14.82 V 2: 14.82 V	
Mooring Top	3 Ball Radio Float (yellow)	
Radio Type and Frequency	Novatech RF-700A1 Channel 68, 156.425 MHz 2 sec on, 4 sec off	
Type of Strobe Light, Flashes	Novatech ST-400A R08-066 Double Burst	
Trap Depths	630 m	1214 m
Frame S/N	Mark 7G-21 10414-2	Mark 78G-21 11373.00
Timer S/N	ML 11616-02	ML 11373-01
Stepper Motor S/N	ML 11616-02	ML 11373-01
Timer Battery Check	21.2 V / 9.53 V	21.2 V / 9.52 V
Cup Type	HDPE Sample Bottles, 250 ml	HDPE Sample Bottles, 250 ml
Number of Cups	20	20
Type of Cup-Water	Distilled Water	Distilled Water
Poison Type	3.3 g/l $HgCl_2$	3.3 g/l $HgCl_2$
Additives	66 g/l NaCl	66 g/l NaCl
Deployed on Cup Number	Open Hole	Open Hole
Recovered on Cup Number		
Current Meter	Aanderaa RCM-8 S/N 11078	
DSU Unit	2990 S/N 6503	
Battery	3382 7.48 V (14 Ah)	
Temperature Range	2 (Wide: -0.34 to 32.17°C)	
Time Interval	60 min (Pos. 8)	
Pre-Deployment Test Traps	OK	
Pre-Deployment Test Release	OK	
Pre-Deployment Test Current Meter	OK	

Table 16. Deployment sheet of SCS-SW-06.

Mooring-I.D.: SCS-SC-01

Release Code:	Enable: 1 C Release: 1 A Benthos 865-A SN 756, 13V	**Deployment Date:**	08.05.2005
Strobe Light:	2 Burst-Mode	**Start:**	08:30 local
Radio Frequency:	none	**Anchor Drop:**	13:24 local
Float Color:	Topfloat: yellow, Floats: red	**Topfloat u. water:**	13:32 local
Deployment Position:	**Anchor Drop**: 11°24.242' N, 111°16.657' E	**End of triangulation**	14:40 local
	Triangulation: 11°24.210'N 111°16.662'E	**Recovery Date:**	27.04.2006
Buoyancy speed:	Deployment: - 130 m/min	**Start:**	14:30
	Recovery: 80 m/min	**Pickup:**	16:46
		End:	16:46

Mooring Diagram		Mooring Description	Deployment	Recovery
m.a.b.	m.b.s.	Time out [UTC]	Time out [local]	Time in [local]
1393 m	857 m	3 Ball Radio Float + Flasher (yellow)	08:35	15:37
1390 m	860 m	G-6600-3 Triple Float (red)		
1389 m	861 m	G-6600-3 Triple Float (red)		
		Nylon Rope 20 m		
		Chain, 2 m		
1366 m	884 m	Mark 7G-21 Sediment Trap SCS-SW2-01 Shallow S/N 10426-1; Timer: 11616-03	08:50	15:43
		Chain with Benthos Float 17''		
1360 m	890 m	Aanderaa RCM 8 Current Meter S/N 11775	08:54	15:46
		Wire 3/16'' 500 m (scratched)	09:50	16:06
		Wire 3/16'' 200 m	10:15	16:16
		Wire 3/16'' 100 m (scratched)	10:30	16:22
558 m	1692 m	G-6600-3 Triple Float		entanglement
557 m	1163 m	G-6600-3 Triple Float		entanglement
		Nylon Rope 20 m		
		Chain, 2 m		
533 m	1717 m	Mark 7G-21 Sediment Trap SCS-SW2-01 Deep S/N 10426-2; Timer: 11616-01	11:10	16:22 entanglement
		Chain, 2 m		
528 m	1722 m	Aanderaa RCM9 MK2 Current Meter S/N 574	11:15	16:22 entanglement
		Wire 3/16'' 500 m (new)		
27 m	2223 m	G-6600-3 Triple Float		16:46
		Chain, 1m		
25 m	2225 m	Benthos Release 865 A S/N 756, 13V	13:00 armed (Lahajnar, Wiesner) 13:05 off deck	16:46
		Chain, 1 m		
		Nylon Rope 20 m		
		Chain, 2 m		
0 m	2250 m	Anchor (3 Rail Wheels)	13:24 Anchor drop	

Table 17. Mooring diagram of SCS-SC-01.

SCS-SC-01	Deployment		Recovery	
Date	08.05.05		27.04.2006	
Ship, Cruise	Nghien Cuu Bien, VG-10		Sonne 187-3	
Mooring Position	Anchor Drop: 11°24.242'N 111°16.657'E Triangulation: 11°24.210'N 111°16.662'E			
Captain	Capt. Ban		Oliver Meyer	
Chief Scientist	Nguyen Ngoc Lam		Karl Stattegger	
Chief Mate	1st Off. Mam		Detlev Korte	
Boatswain			Winfried Jahns	
Mooring Master	Niko Lahajnar		Niko Lahajnar	
Recorder			Anna Kagelmacher	
Crew Hands			Andreas Schrapel	
Scientific/Technical Hands	Martin G. Wiesner, Jürgen Möbius		Martin Wiesner, Thorben Amann, Klaus Schwarzer	
Weather Conditions	partly cloudy, sea state 1-4, T: 34°		Sunny, sea 1-2, T: 31°C	
Release Model	Benthos 865 A, S/N 756 (13 V)		Benthos 865 A, S/N 756 (13 V)	
Enable Code	1 C		1 C	
Release Code	1 A		1 A	
Release Armed	Niko Lahajnar			
Witnessed by	Jürgen Möbius, Martin G. Wiesner			
Release Battery Check	1: 14.57 V 2: 14.55 V			
Mooring Top	Top Float (yellow)		Top Float (yellow)	
Radio Type and Frequency	None		none	
Type of Strobe Light, Flashes	Novatech ST-400A R-08-067		Novatech ST-400A R-08-067	
Trap Depths	884 m	1717 m	884 m	1717 m
Frame S/N	Mark 7G-21 10426-1	Mark 7G-21 10426-2	Mark 7G-21 10426-1	Mark 7G-21 10426-2
Timer S/N	ML 11616-03	ML 11616-01	ML 11616-03	ML 11616-01
Stepper Motor S/N	ML 11616-03	ML 11616-01	ML 11616-03	ML 11616-01
Timer Battery Check	21.2 V / 9.48 V	21.1 V / 9.51 V	18.7V / 9.35 V	18.8 V / 9.37 V
Cup Type	HDPE Sample Bottles 250 ml		HDPE Sample Bottles 250 ml	
Number of Cups	20	20	20	20
Type of Cup-Water	Distilled Water	Distilled Water	Distilled Water	Distilled Water
Poison Type	3.3 g/L $HgCl_2$	3.3 g/L $HgCl_2$	3.3 g/L $HgCl_2$	3.3 g/L $HgCl_2$
Additives	66 g/L NaCl	66 g/L NaCl	66 g/L NaCl	66 g/L NaCl
Deployed on Cup Number	Open Hole	Open Hole		
Recovered on Cup Number			Open Hole	Open Hole
Current Meter	Aanderaa RCM 8 S/N 11775	Aanderaa RCM-9 S/N 574	Aanderaa RCM 8 S/N 11775	Aanderaa RCM-9 S/N 574
DSU Unit	2990 S/N 8275	2990 E S/N 12199	2990 S/N 8275	2990 E S/N 12199
Battery	3382 7.45 V (14 Ah)	3614 9.44 V	3382 7.45 V (14 Ah)	3614
Temperature Range	2 (Wide: -0.34 to 32.17°C)	Wide	2 (Wide: -0.34 to 32.17°C)	Wide
Time Interval	60 min (Pos. 8)	60 min	60 min (Pos. 8)	60 min
Pre-Deployment Test Traps	OK			
Pre-Deployment Test Release	OK			
Pre-Deployment Test Current Meter	OK			

Table 18. Deployment and recovery sheet of SCS-SC-01.

Mooring-I.D.: SCS-SC-02

Release Code:	Enable: 1 C Release: 1 A Benthos 865-A SN 756, 13V	**Deployment Date:**	28.04.2006
Strobe Light:	2 Burst-Mode	**Start:**	15:00
Radio Frequency:	none	**Anchor Drop:**	17:35
Float Color:	Topfloat: yellow, Floats: red	**Topfloat u. water:**	17:41
Deployment Position:	Anchor Drop: 11°24.23'N 111°16.61'E	**End:**	18:05
	Topfloat u. water: 11° 24.77'N 111°16.54'E	**Recovery Date:**	
Buoyancy speed:	Deployment: - 80 m/min	**Start:**	
	Recovery:	**Pickup:**	
		End:	

Mooring Diagram		Mooring Description	Deployment	Recovery
m.a.b.	**m.b.s.**	**Time out [UTC]**	**Time out [local]**	**Time in [local]**
1125 m	1175 m	3 Ball Radio Float + Flasher (yellow)	15:09	
1123 m	1177 m	G-6600-3 Triple Float (red)		
1122 m	1178 m	G-6600-3 Triple Float (red)	15:09	
		Nylon Rope 20 m		
		Chain, 2 m		
1100 m	1200 m	Mark 7G-21 Sediment Trap SCS-SW2-01 Shallow S/N 10426-1; Timer: 11616-03	15:12	
		Chain with Benthos Float 17''		
1097 m	1203 m	Aanderaa RCM 8 Current Meter S/N 11775	15:12	
		Wire 3/16'' 500 m (new)	15:39	
		Wire 3/16'' 20 m	15:41	
		Wire 3/16'' 20 m	15:47	
557 m	1743 m	G-6600-3 Triple Float		
556 m	1744 m	G-6600-3 Triple Float		
		Nylon Rope 20 m	15 :55	
		Chain, 2 m		
533 m	1767 m	Mark 7G-21 Sediment Trap SCS-SW2-01 Deep S/N 10426-2; Timer: 11616-01	15:55	
		Chain, 2 m		
528 m	1770 m	Aanderaa RCM9 MK2 Current Meter S/N 574	15:55	
		Wire 3/16'' 500 m	17:18 (stop of deployment due to fishing boats)	
27 m	2273 m	G-6600-3 Triple Float		
		Chain, 1m		
25 m	2275 m	Benthos Release 865 A S/N 756, 13V	17:16 armed (Lahajnar, Wiesner) 17:19 off board	
		Chain, 1 m		
		Nylon Rope 20 m		
		Chain, 2 m		
0 m	2300 m	Anchor (3 Rail Wheels)	17:35 Anchor drop	

Table 19. Mooring diagram of SCS-SC-02.

SCS-SC-02	Deployment	
Date	28.04.2006	
Ship, Cruise	SO-187-3	
Mooring Position	11° 24.41 'N 111° 16.59 'E	
Captain	Oliver Meyer	
Chief Scientist	Karl Stattegger	
Chief Mate	Detlev Korte	
Boatswain	Winfried Jahns	
Mooring Master	Niko Lahajnar	
Recorder	Anna Kagelmacher	
Crew Hands	Andreas Schrapel	
Scientific/Technical Hands	Martin G. Wiesner, Thorben Amann, Klaus Schwarzer	
Weather Conditions	partly cloudy, sea state 2, T: 30°	
Release Model	Benthos 865 A, S/N 756 (13 V)	
Enable Code	1 C	
Release Code	1 A	
Release Armed	Niko Lahajnar	
Witnessed by	Martin G. Wiesner, Thorben Amann	
Release Battery Check	1: 15.33 V 2: 15.37 V	
Mooring Top	Top Float (yellow)	
Radio Type and Frequency	None	
Type of Strobe Light, Flashes	Novatech ST-400A R-08-067	
Trap Depths	1200 m	1767 m
Frame S/N	Mark 7G-21	Mark 7G-21
	10426-1	10426-2
Timer S/N	ML 11616-03	ML 11616-01
Stepper Motor S/N	ML 11616-03	ML 11616-01
Timer Battery Check	23.6 V / 9.64 V	23.6 V / 9.75 V
Cup Type	HDPE Sample Bottles 250 ml	
Number of Cups	20	20
Type of Cup-Water	Distilled Water	Distilled Water
Poison Type	3.3 g/L $HgCl_2$	3.3 g/L $HgCl_2$
Additives	66 g/L NaCl	66 g/L NaCl
Deployed on Cup Number	Open Hole	Open Hole
Recovered on Cup Number		
Current Meter	Aanderaa RCM 8 S/N 11775	Aanderaa RCM-9 S/N 574
DSU Unit	2990 S/N 8275	2990 E S/N 12199
Battery	3382 7.66 V (14 Ah)	3614 9.44 V
Temperature Range	2 (Wide: -0.34 to 32.17°C)	Wide
Time Interval	60 min (Pos. 8)	60 min
		Turbidity Sensor 3612 0-100 NTU, S/N 1147
Pre-Deployment Test Traps	OK	
Pre-Deployment Test Release	OK	
Pre-Deployment Test Current Meter	OK	

Table 20. Deployment sheet of SCS-SC-02.

SCS-SC-01 Shallow

Event 01 of 21 @ 05/10/2005 00:01:00
Event 02 of 21 @ 05/27/2005 00:01:00
Event 03 of 21 @ 06/13/2005 00:01:00
Event 04 of 21 @ 06/30/2005 00:01:00
Event 05 of 21 @ 07/17/2005 00:01:00
Event 06 of 21 @ 08/03/2005 00:01:00
Event 07 of 21 @ 08/20/2005 00:01:00
Event 08 of 21 @ 09/06/2005 00:01:00
Event 09 of 21 @ 09/23/2005 00:01:00
Event 10 of 21 @ 10/10/2005 00:01:00
Event 11 of 21 @ 10/27/2005 00:01:00
Event 12 of 21 @ 11/13/2005 00:01:00
Event 13 of 21 @ 11/30/2005 00:01:00
Event 14 of 21 @ 12/17/2005 00:01:00
Event 15 of 21 @ 01/03/2006 00:01:00
Event 16 of 21 @ 01/20/2006 00:01:00
Event 17 of 21 @ 02/06/2006 00:01:00
Event 18 of 21 @ 02/23/2006 00:01:00
Event 19 of 21 @ 03/12/2006 00:01:00
Event 20 of 21 @ 03/29/2006 00:01:00
Event 21 of 21 @ 04/15/2006 00:01:00

SCS-SC-01-Deep

Event 01 of 21 @ 05/10/2005 00:01:00
Event 02 of 21 @ 05/27/2005 00:01:00
Event 03 of 21 @ 06/13/2005 00:01:00
Event 04 of 21 @ 06/30/2005 00:01:00
Event 05 of 21 @ 07/17/2005 00:01:00
Event 06 of 21 @ 08/03/2005 00:01:00
Event 07 of 21 @ 08/20/2005 00:01:00
Event 08 of 21 @ 09/06/2005 00:01:00
Event 09 of 21 @ 09/23/2005 00:01:00
Event 10 of 21 @ 10/10/2005 00:01:00
Event 11 of 21 @ 10/27/2005 00:01:00
Event 12 of 21 @ 11/13/2005 00:01:00
Event 13 of 21 @ 11/30/2005 00:01:00
Event 14 of 21 @ 12/17/2005 00:01:00
Event 15 of 21 @ 01/03/2006 00:01:00
Event 16 of 21 @ 01/20/2006 00:01:00
Event 17 of 21 @ 02/06/2006 00:01:00
Event 18 of 21 @ 02/23/2006 00:01:00
Event 19 of 21 @ 03/12/2006 00:01:00
Event 20 of 21 @ 03/29/2006 00:01:00
Event 21 of 21 @ 04/15/2006 00:01:00

SCS-SW-05 Shallow

Event 01 of 21 @ 05/10/2005 00:01:00
Event 02 of 21 @ 05/27/2005 00:01:00
Event 03 of 21 @ 06/13/2005 00:01:00
Event 04 of 21 @ 06/30/2005 00:01:00
Event 05 of 21 @ 07/17/2005 00:01:00
Event 06 of 21 @ 08/03/2005 00:01:00
Event 07 of 21 @ 08/20/2005 00:01:00
Event 08 of 21 @ 09/06/2005 00:01:00
Event 09 of 21 @ 09/23/2005 00:01:00
Event 10 of 21 @ 10/10/2005 00:01:00
Event 11 of 21 @ 10/27/2005 00:01:00
Event 12 of 21 @ 11/13/2005 00:01:00
Event 13 of 21 @ 11/30/2005 00:01:00
Event 14 of 21 @ 12/17/2005 00:01:00
Event 15 of 21 @ 01/03/2006 00:01:00
Event 16 of 21 @ 01/20/2006 00:01:00
Event 17 of 21 @ 02/06/2006 00:01:00
Event 18 of 21 @ 02/23/2006 00:01:00
Event 19 of 21 @ 03/12/2006 00:01:00
Event 20 of 21 @ 03/29/2006 00:01:00
Event 21 of 21 @ 04/15/2006 00:01:00

Table 21. Retrieved rotation schedules of the sediment traps SCS-SC-01 and SCS-SW-05 (Note: malfunction of deep trap at SCS-SW-05).

SCS-SC-02 Shallow

Schedule verication

Event 1 of 22 = 04/28/2006 12:00:00 (test)
Event 2 of 22 = 05/10/2006 00:01:00
Event 3 of 22 = 05/27/2006 00:01:00
Event 4 of 22 = 06/13/2006 00:01:00
Event 5 of 22 = 06/30/2006 00:01:00
Event 6 of 22 = 07/17/2006 00:01:00
Event 7 of 22 = 08/03/2006 00:01:00
Event 8 of 22 = 08/20/2006 00:01:00
Event 9 of 22 = 09/06/2006 00:01:00
Event 10 of 22 = 09/23/2006 00:01:00
Event 11 of 22 = 10/10/2006 00:01:00
Event 12 of 22 = 10/27/2006 00:01:00
Event 13 of 22 = 11/13/2006 00:01:00
Event 14 of 22 = 11/30/2006 00:01:00
Event 15 of 22 = 12/17/2006 00:01:00
Event 16 of 22 = 01/03/2007 00:01:00
Event 17 of 22 = 01/20/2007 00:01:00
Event 18 of 22 = 02/06/2007 00:01:00
Event 19 of 22 = 02/23/2007 00:01:00
Event 20 of 22 = 03/12/2007 00:01:00
Event 21 of 22 = 03/29/2007 00:01:00
Event 22 of 22 = 04/15/2007 00:01:00

SCS-SC-02 Deep

Schedule Verification

Event 1 of 22 = 04/28/2006 13:30:00 (test)
Event 2 of 22 = 05/10/2006 00:01:00
Event 3 of 22 = 05/27/2006 00:01:00
Event 4 of 22 = 06/13/2006 00:01:00
Event 5 of 22 = 06/30/2006 00:01:00
Event 6 of 22 = 07/17/2006 00:01:00
Event 7 of 22 = 08/03/2006 00:01:00
Event 8 of 22 = 08/20/2006 00:01:00
Event 9 of 22 = 09/06/2006 00:01:00
Event 10 of 22 = 09/23/2006 00:01:00
Event 11 of 22 = 10/10/2006 00:01:00
Event 12 of 22 = 10/27/2006 00:01:00
Event 13 of 22 = 11/13/2006 00:01:00
Event 14 of 22 = 11/30/2006 00:01:00
Event 15 of 22 = 12/17/2006 00:01:00
Event 16 of 22 = 01/03/2007 00:01:00
Event 17 of 22 = 01/20/2007 00:01:00
Event 18 of 22 = 02/06/2007 00:01:00
Event 19 of 22 = 02/23/2007 00:01:00
Event 20 of 22 = 03/12/2007 00:01:00
Event 21 of 22 = 03/29/2007 00:01:00
Event 22 of 22 = 04/15/2007 00:01:00

SCS-SW-06 Shallow

Schedule Verification

Event 1 of 22 = 04/27/2006 00:01:00 (test)
Event 2 of 22 = 05/10/2006 00:01:00
Event 3 of 22 = 05/27/2006 00:01:00
Event 4 of 22 = 06/13/2006 00:01:00
Event 5 of 22 = 06/30/2006 00:01:00
Event 6 of 22 = 07/17/2006 00:01:00
Event 7 of 22 = 08/03/2006 00:01:00
Event 8 of 22 = 08/20/2006 00:01:00
Event 9 of 22 = 09/06/2006 00:01:00
Event 10 of 22 = 09/23/2006 00:01:00
Event 11 of 22 = 10/10/2006 00:01:00
Event 12 of 22 = 10/27/2006 00:01:00
Event 13 of 22 = 11/13/2006 00:01:00
Event 14 of 22 = 11/30/2006 00:01:00
Event 15 of 22 = 12/17/2006 00:01:00
Event 16 of 22 = 01/03/2007 00:01:00
Event 17 of 22 = 01/20/2007 00:01:00
Event 18 of 22 = 02/06/2007 00:01:00
Event 19 of 22 = 02/23/2007 00:01:00
Event 20 of 22 = 03/12/2007 00:01:00
Event 21 of 22 = 03/29/2007 00:01:00
Event 22 of 22 = 04/15/2007 00:01:00

SCS-SW-06 Deep

Schedule Verification

Event 1 of 22 = 04/27/106 00:01:00 (test)
Event 2 of 22 = 05/10/106 00:01:00
Event 3 of 22 = 05/27/106 00:01:00
Event 4 of 22 = 06/13/106 00:01:00
Event 5 of 22 = 06/30/106 00:01:00
Event 6 of 22 = 07/17/106 00:01:00
Event 7 of 22 = 08/03/106 00:01:00
Event 8 of 22 = 08/20/106 00:01:00
Event 9 of 22 = 09/06/106 00:01:00
Event 10 of 22 = 09/23/106 00:01:00
Event 11 of 22 = 10/10/106 00:01:00
Event 12 of 22 = 10/27/106 00:01:00
Event 13 of 22 = 11/13/106 00:01:00
Event 14 of 22 = 11/30/106 00:01:00
Event 15 of 22 = 12/17/106 00:01:00
Event 16 of 22 = 01/03/107 00:01:00
Event 17 of 22 = 01/20/107 00:01:00
Event 18 of 22 = 02/06/107 00:01:00
Event 19 of 22 = 02/23/107 00:01:00
Event 20 of 22 = 03/12/107 00:01:00
Event 21 of 22 = 03/29/107 00:01:00
Event 22 of 22 = 04/15/107 00:01:00

Table 22. Input rotation schedules of the sediment traps SCS-SC-02 and SCS-SW-06.

5.6 Preliminary Results

An overview over boxcores including short sediment description is given in table 23

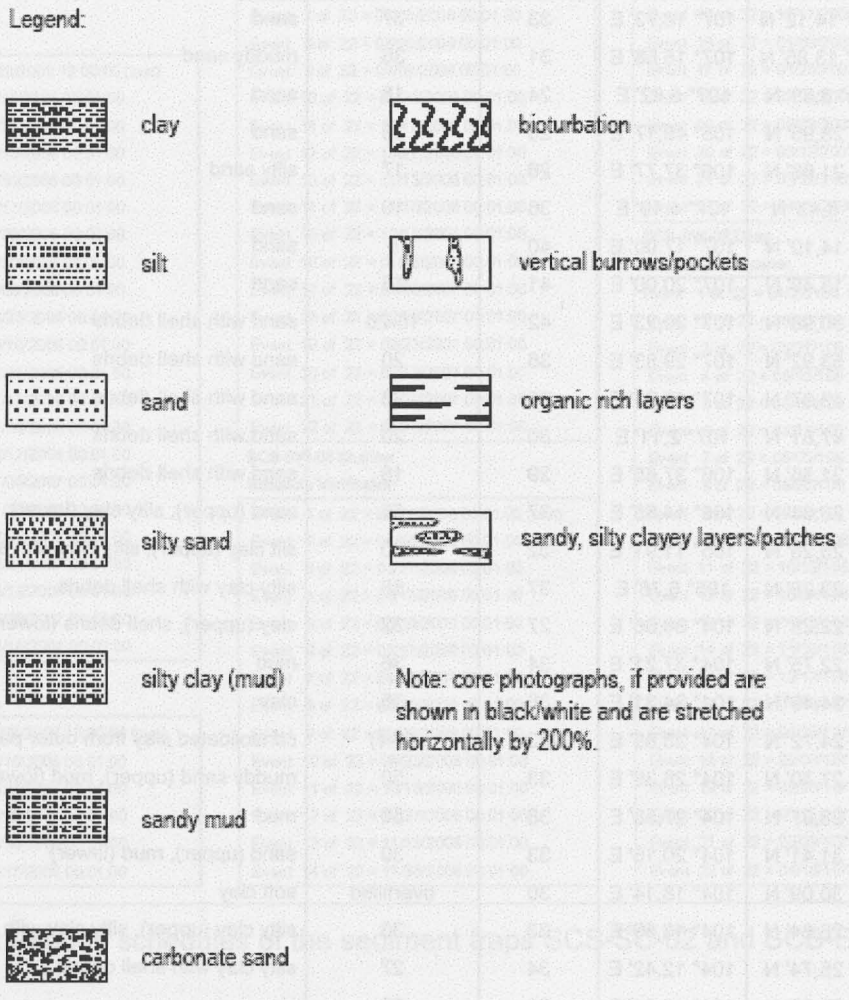
Table 23. Overview of boxcores

Station	Position Lat	Position Lon	Depth [m]	Recovery [cm]	Sediment type
SO187 057-1	12° 24,70' N	109° 29,49' E	123	43-49	homogeneous mud
SO187 058-1	12° 45,94' N	109° 24,07' E	32	22	silt (upper part) to mud (lower part)
SO187 059-1	12° 37,44' N	109° 31,70' E	137	~40	sandy silt
SO187 060-1	11° 50,05' N	110° 0,56' E	1863	30	mud (upper), clay (lower)
SO187 061-1	11° 25,47' N	111° 16,99' E	2219	35-38	clay
SO187 062-1	11° 3,23' N	109° 28,30' E	130	22	shell debris with sandy to muddy matrix
SO187 063-1	10° 54,93' N	109° 3,54' E	112	27	silty sand (upper), clay (lower)
SO187 064-1	10° 54,79' N	109° 3,07' E	110	10	silty sand (upper), clay (lower)
SO187 065-1	10° 38,14' N	109° 2,17' E	116	40	silty sand
SO187 066-1	10° 15,33' N	108° 54,70' E	91	39	sand
SO187 067-1	10° 13,09' N	108° 25,73' E	59	50-60	muddy sand
SO187 068-1	10° 16,87' N	108° 25,30' E	67	40	sandy mud
SO187 069-1	10° 22,99' N	108° 0,84' E	45	34	muddy sand (upper), silty to clayey sand (lower)
SO187 070-1	10° 23,28' N	108° 0,71' E	45	35	silty to clayey sand
SO187 071-1	10° 24,26' N	108° 0,60' E	44	37	sandy mud (upper), silty sand (lower)
SO187 072-1	10° 15,33' N	107° 17,30' E	28	30	silty sand
SO187 073-1	10° 14,12' N	107° 16,73' E	33	37	sand
SO187 074-1	10° 13,85' N	107° 16,68' E	31	36	muddy sand
SO187 075-1	10° 6,58' N	107° 6,62' E	24	18	sand
SO187 076-1	9° 28,95' N	106° 49,17' E	25	28	sand
SO187 077-1	9° 21,68' N	106° 37,77' E	26	17	silty sand
SO187 079-1	9° 8,43' N	107° 4,19' E	36	19	sand
SO187 080-1	9° 14,10' N	107° 17,00' E	40	5	sand
SO187 081-1	9° 15,49' N	107° 20,00' E	41	15	sand
SO187 082-1	9° 30,98' N	107° 30,23' E	42	15-26	sand with shell debris
SO187 083-1	9° 53,92' N	107° 29,83' E	36	20	sand with shell debris
SO187 084-1	9° 43,97' N	107° 17,21' E	35	23	sand with shell debris
SO187 085-1	9° 47,81' N	107° 2,11' E	30	20	sand with shell debris
SO187 086-1	9° 21,56' N	106° 37,65' E	29	16	sand with shell debris
SO187 091-1	8° 26,64' N	105° 14,65' E	37	55	sand (upper), silty clay (lower)
SO187 092-1	8° 25,25' N	105° 11,91' E	32	60	silt clay (upper), silty clay with shell debris (lower)
SO187 093-1	8° 23,28' N	105° 6,76' E	37	68	silty clay with shell debris
SO187 094-1	8° 22,28' N	104° 38,06' E	27	32	clay (upper), shell debris (lower)
SO187 095-1	8° 22,75' N	104° 37,21' E	34	36	mud
SO187 096-1	8° 24,49' N	104° 34,31' E	36	35	clay
SO187 097-1	8° 24,72' N	104° 33,85' E	33	(1-4)	consolidated clay from outer part of box corer
SO187 098-1	8° 27,70' N	104° 28,39' E	33	50	muddy sand (upper), mud (lower)
SO187 099-1	8° 28,07' N	104° 27,58' E	38	50	mud
SO187 100-1	8° 31,41' N	104° 20,16' E	33	30	sand (upper), mud (lower)
SO187 101-1	8° 30,09' N	104° 18,14' E	30	overfilled	soft clay
SO187 102-1	8° 26,64' N	104° 13,59' E	33	33	silty clay (upper), silty clay with shell debris (lower)
SO187 103-1	8° 25,74' N	104° 12,42' E	34	27	silty clay with shell debris
SO187 104-1	8° 22,57' N	104° 13,24' E	28	23	clay

Station	Position Lat	Position Lon	Depth [m]	Recovery [cm]	Sediment type
SO187 105-1	8° 11,35' N	104° 31,11' E	27	26	clay with some shell debris
SO187 106-1	8° 11,21' N	104° 33,70' E	29	38	mud
SO187 107-1	8° 9,35' N	104° 34,39' E	29	44	mud to sandy mud
SO187 108-1	8° 7,00' N	104° 57,04' E	38	45	muddy sand
SO187 109-1	8° 7,01' N	105° 14,50' E	39	45	sandy clay
SO187 110-1	8° 6,97' N	105° 16,83' E	34	38	sand
SO187 111-1	8° 7,02' N	105° 22,97' E	36	45	clayey sand to sandy clay (upper to lower)
SO187 112-1	8° 7,00' N	105° 23,35' E	39	41	sandy clay
SO187 113-1	8° 7,02' N	105° 28,85' E	35	40	clayey sand
SO187 114-1	8° 6,98' N	105° 35,51' E	34	39	sand
SO187 115-1	8° 7,05' N	105° 36,16' E	35	38	silty sand
SO187 116-1	8° 6,93' N	105° 56,33' E	35	33	silty sand
SO187 117-1	8° 7,01' N	105° 56,81' E	34	31	silty sand

Initial core descriptions and seismic records

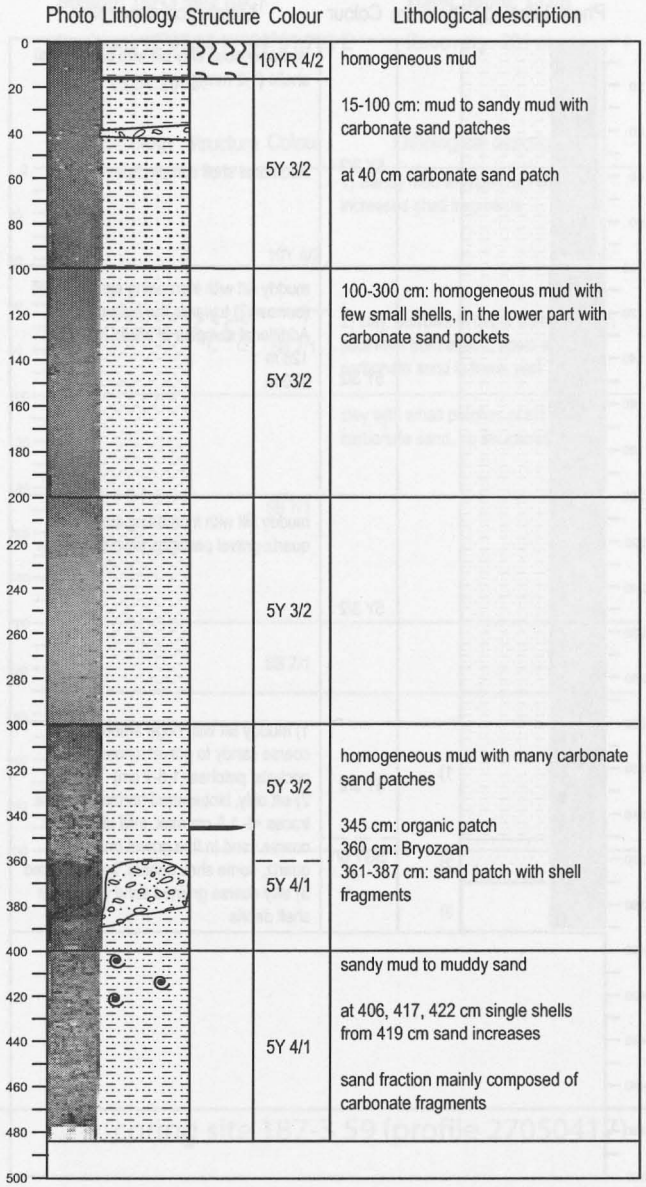
On the following pages we present core descriptions and seismic records. The seismic profiles have either been recorded during cruises VG-5 and VG-9 with the vietnamese RV Nghien Cuu Bien using a boomer system, or during SO 187 leg 3 using the Parasound system.

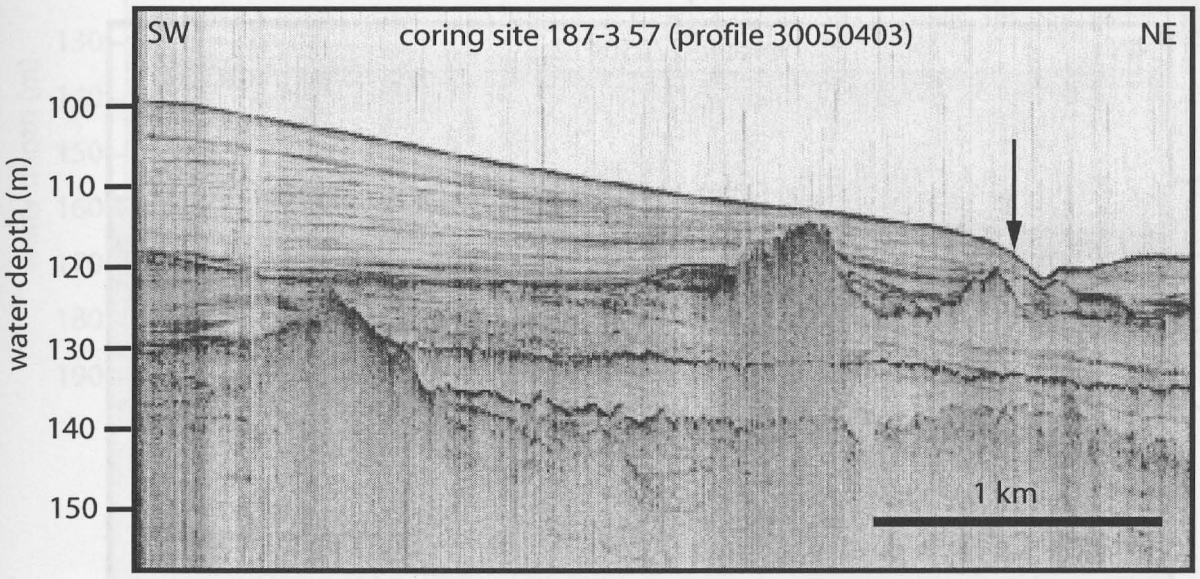


Station: 187-3 57-2 (GC) **Water depth: 119 m**

Position: 12°24,692 N/109°29,474E **Recovery: 482 cm**

Date: 25.04.06

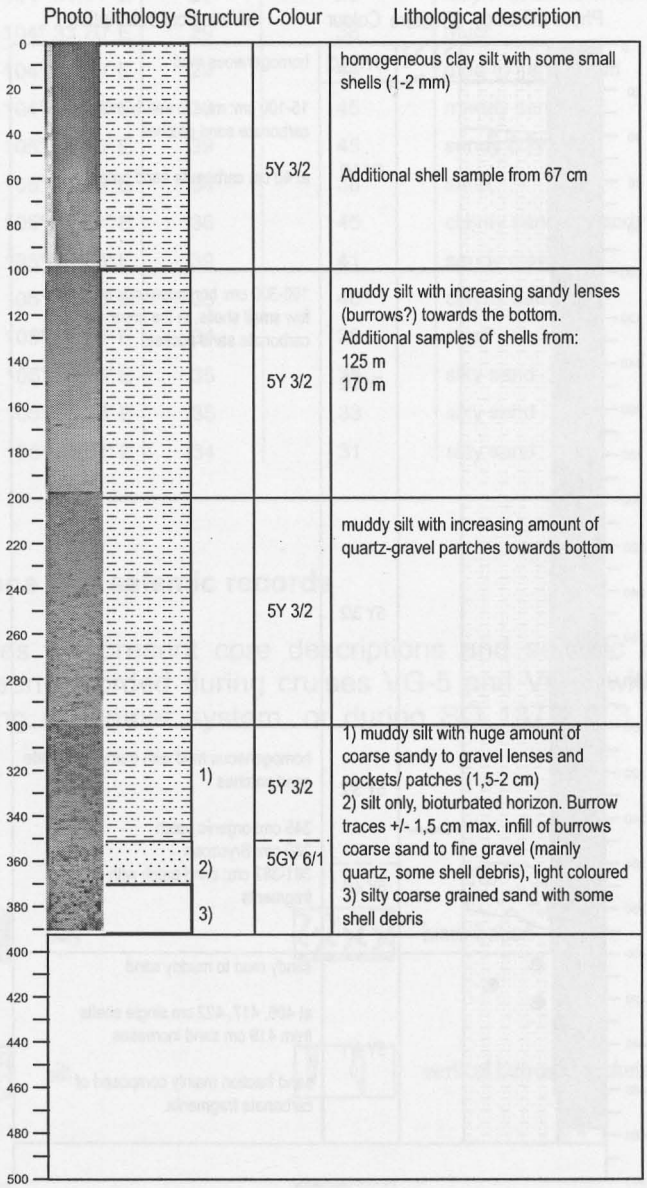


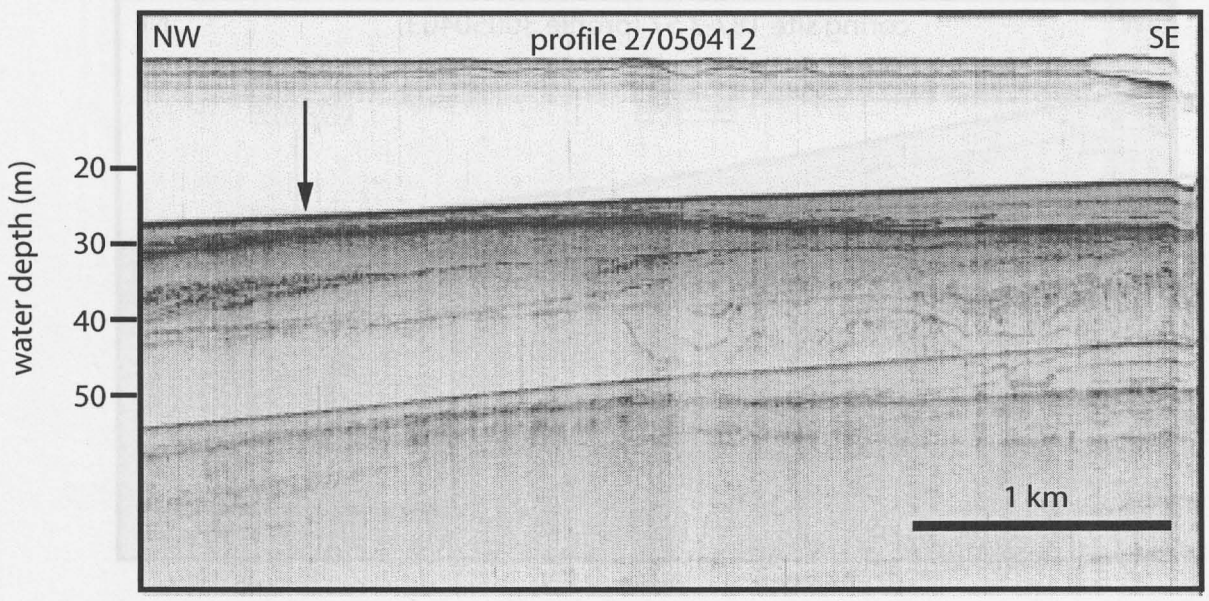


Station: 187-3 58-2 (GC) **Water depth: 29 m**

Position: 12°45,939'N / 109°24,062E **Recovery: 393 cm**

Date: 25.04.2006

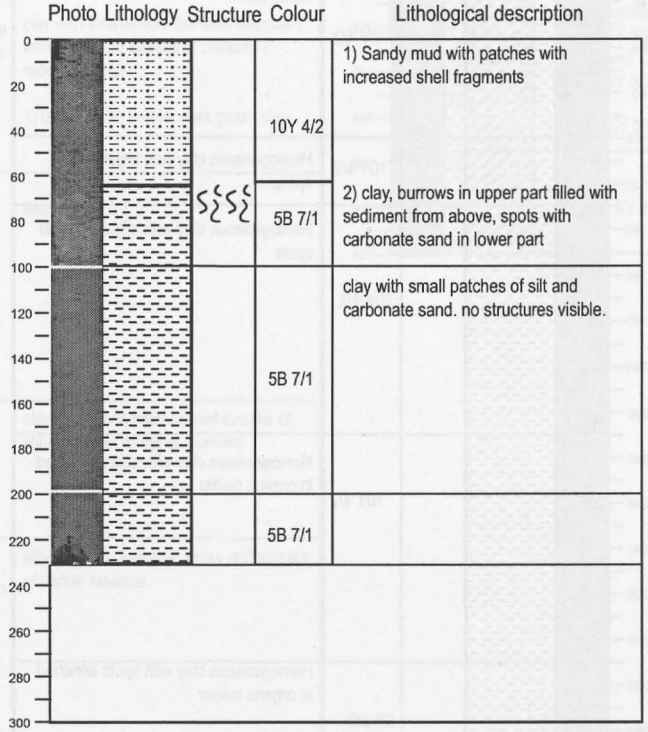


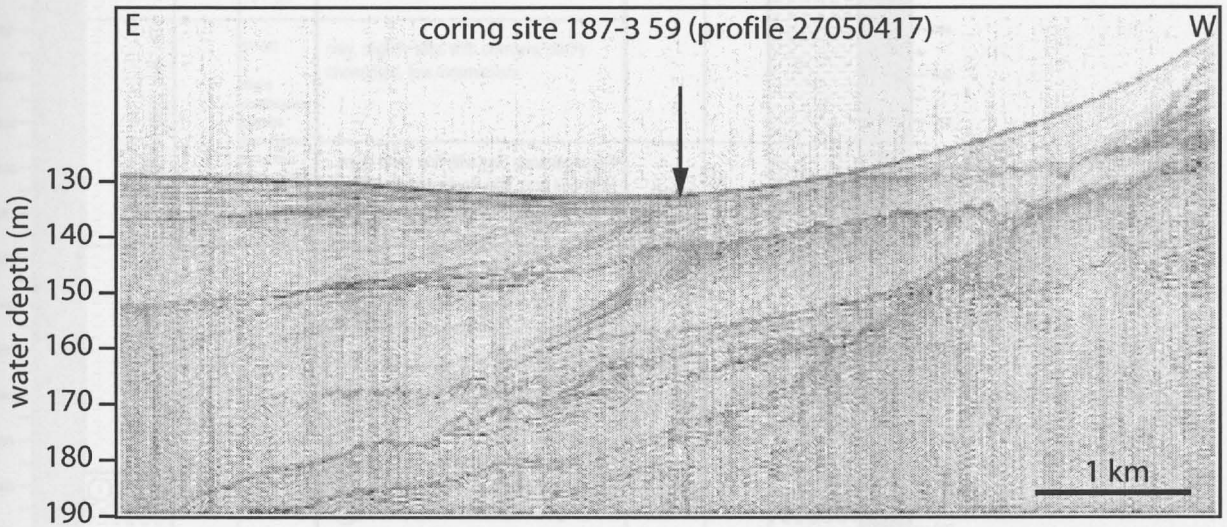


Station: 187-3 59-2 (GC) **Water depth: 133m**

Position: 12°37,38 N/109°31,708 E **Recovery: 231 m**

Date: 25.04.2006

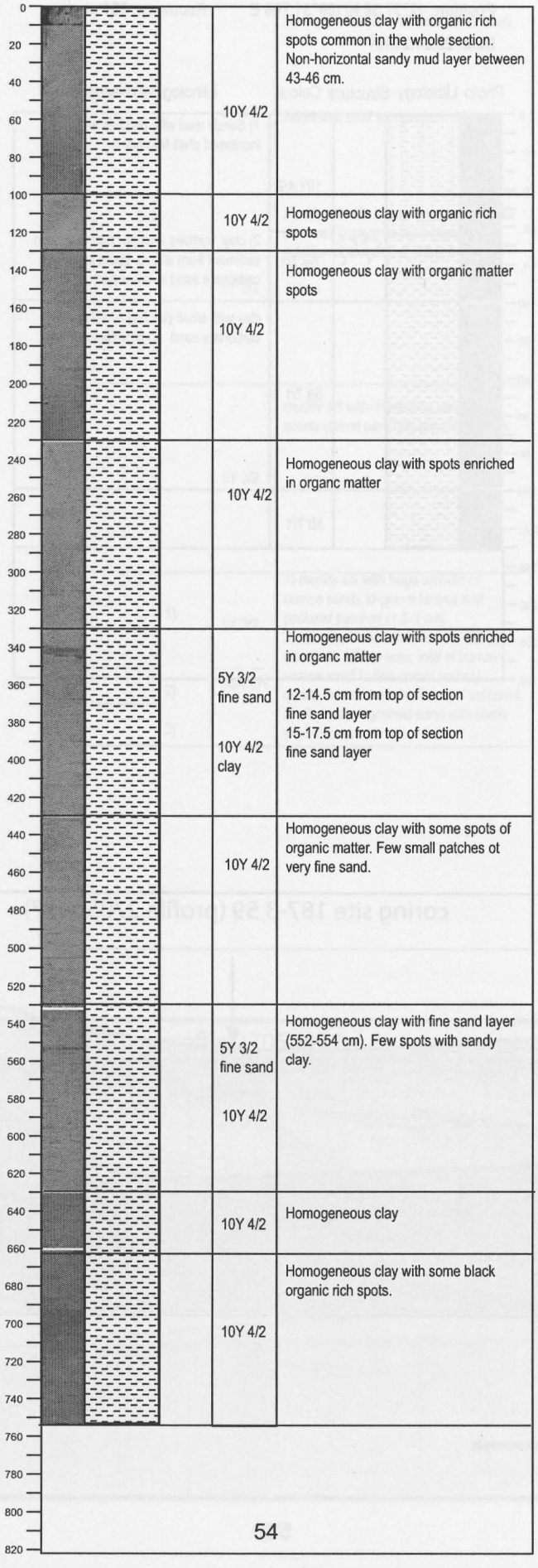




Station: 187-3 - 60-2 (GC) **Water depth: 1864 m**

Position: 11°50.097'N / 110°0.637E **Recovery: 757 m**

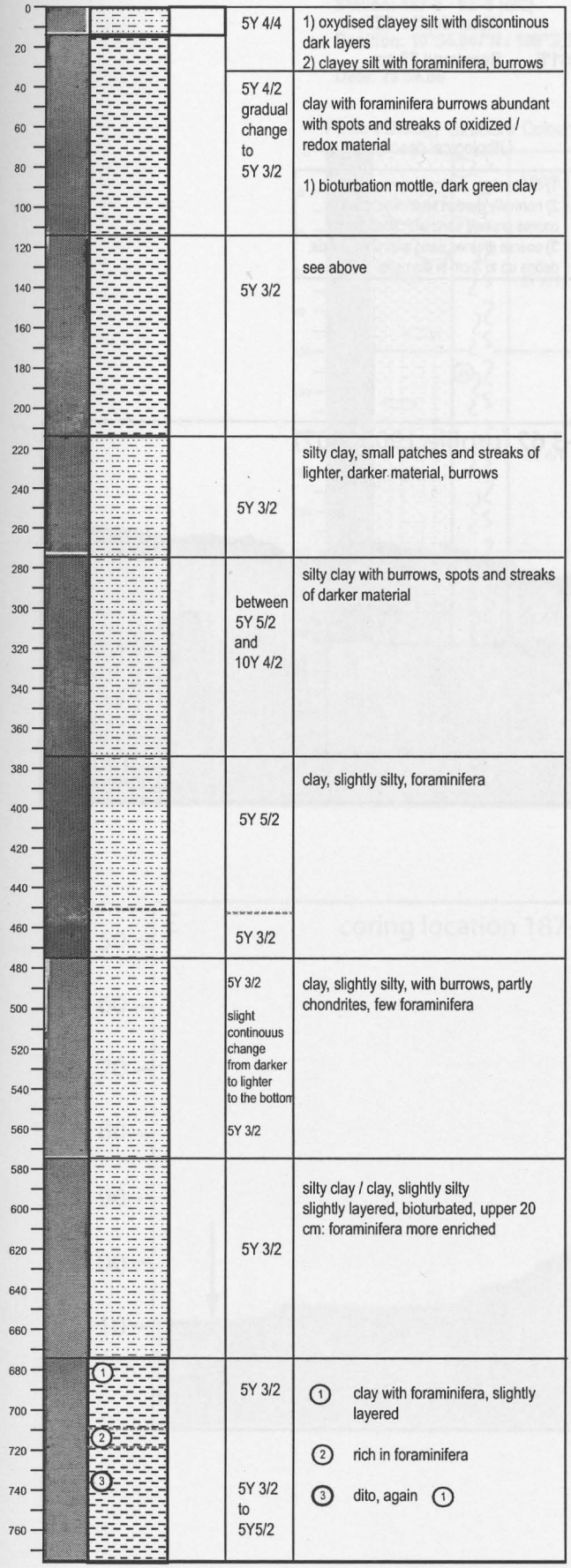
Date: 26.04.2006

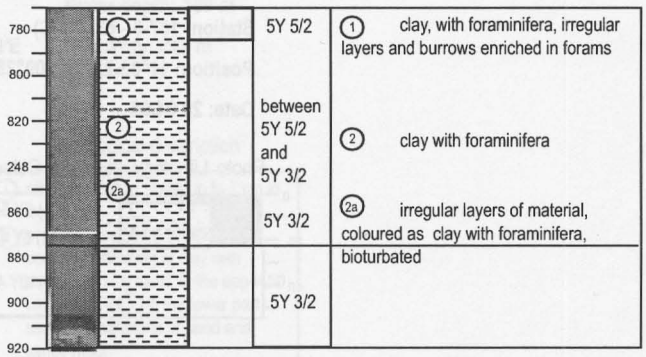


Station: 187-3-61-2 (GC) **Water depth: 2226 m**

Position: 11°25,470'N / 111°16,982'E **Recovery: 927 cm**

Date: 27.04.06

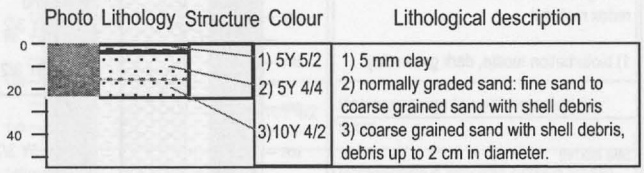


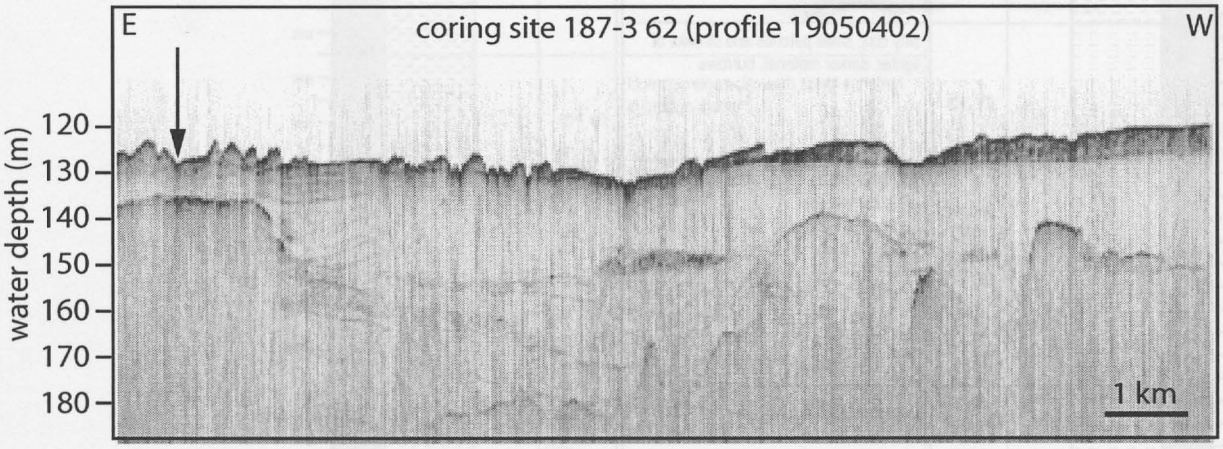


Station: 187-3 - 62-2 (GC) **Water depth: 127 m**

Position: 11°03.227'N /109°28.991'E **Recovery: 26 cm**

Date: 29.04.06

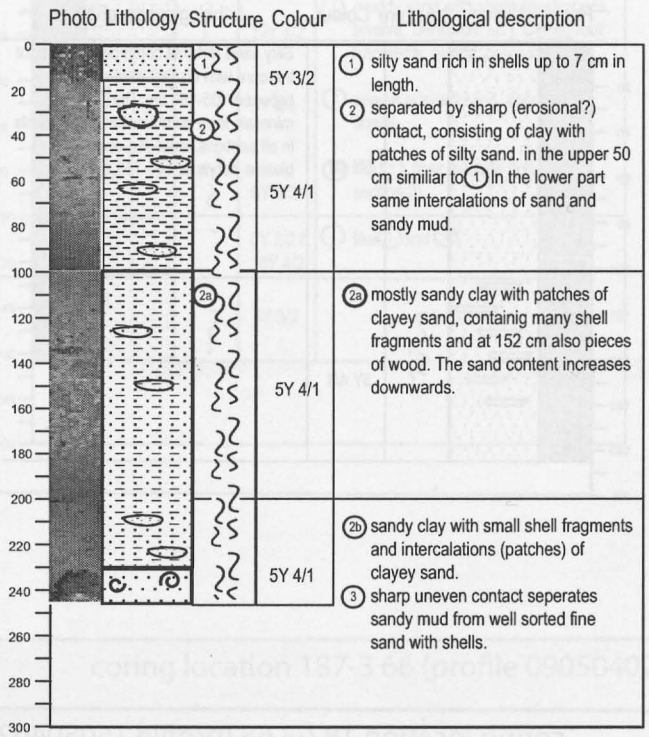


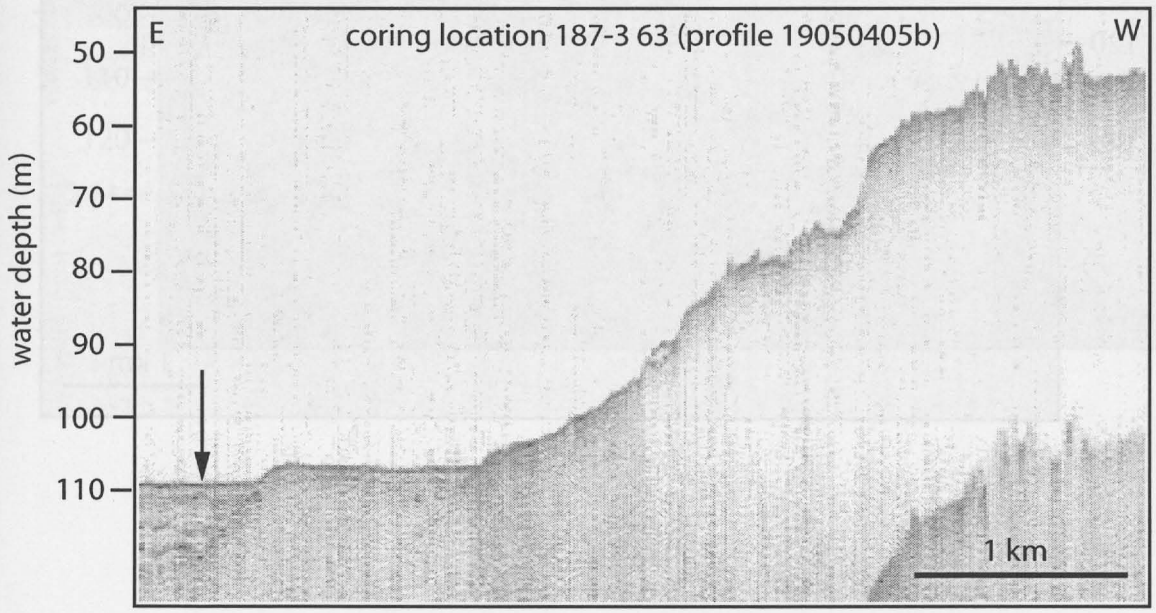


Station: 187-3 - 63 -3 (GC) **Water depth: 109 m**

Position: 10°54.947'N / 109°3,539'E **Recovery: 245 m**

Date: 29.04.06

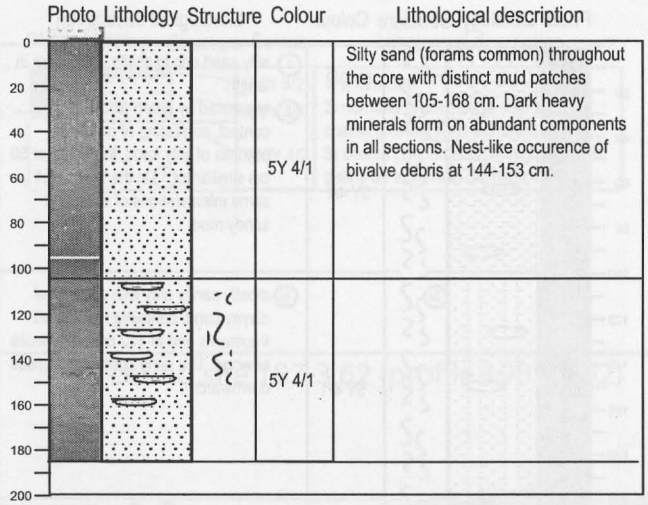


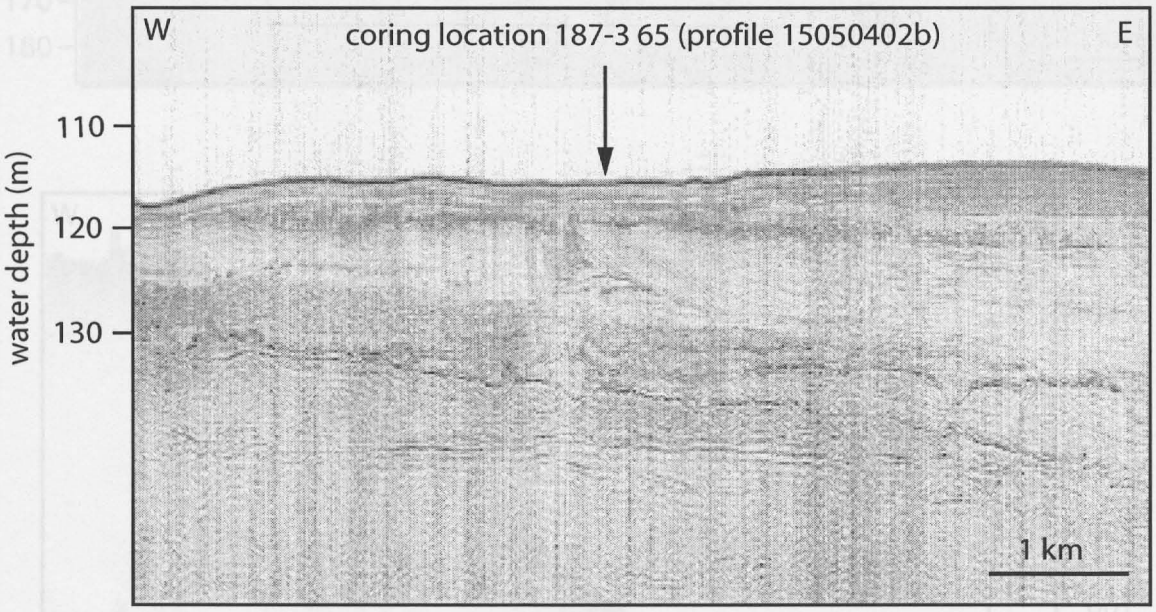


Station: 187-3 - 65 -3 (GC) **Water depth: 112.5 m**

Position: 10°38.146'N / 109°2.195'E **Recovery: 185 m**

Date: 29.04.06

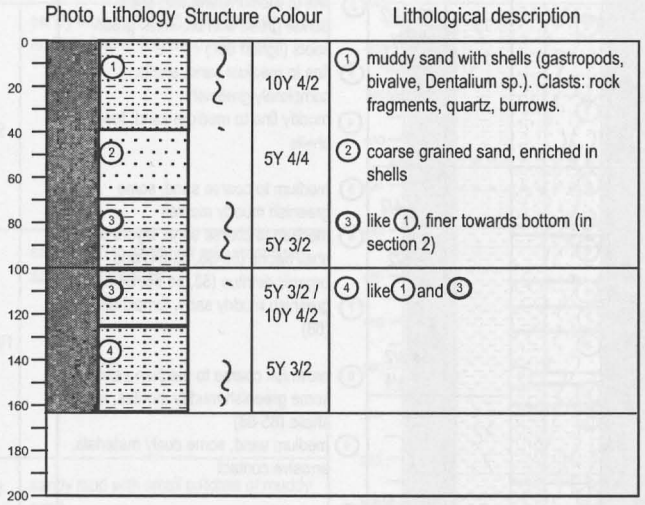


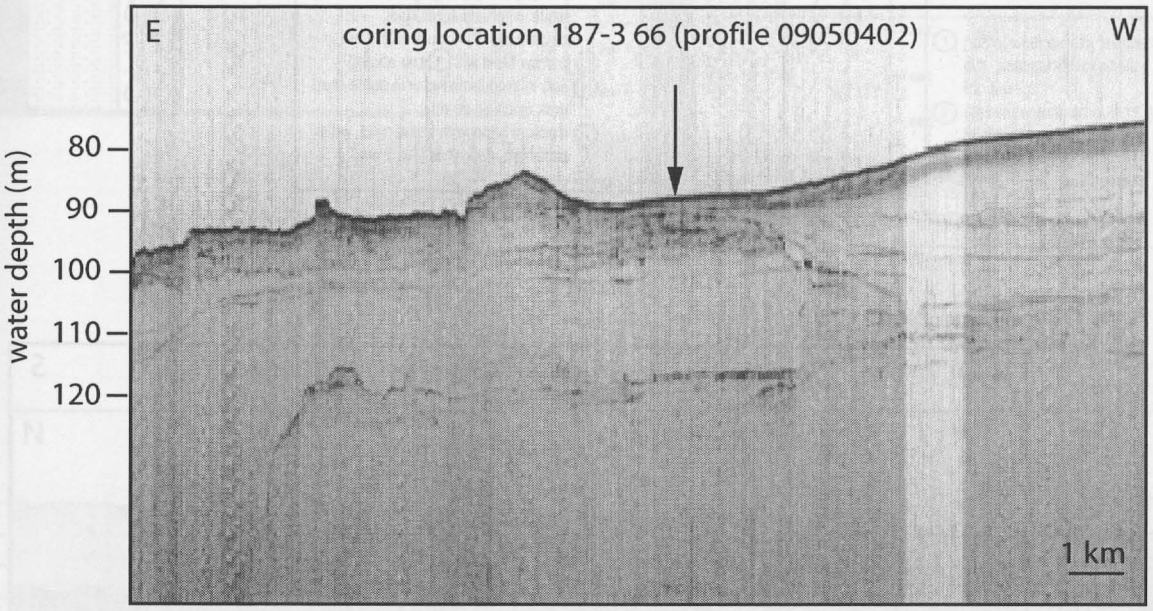


Station: 187-3-66-2 (GC) **Water depth: 87 m**

Position: 10°15.345'N / 108°54.690'E **Recovery: 163 cm**

Date:29.04.06

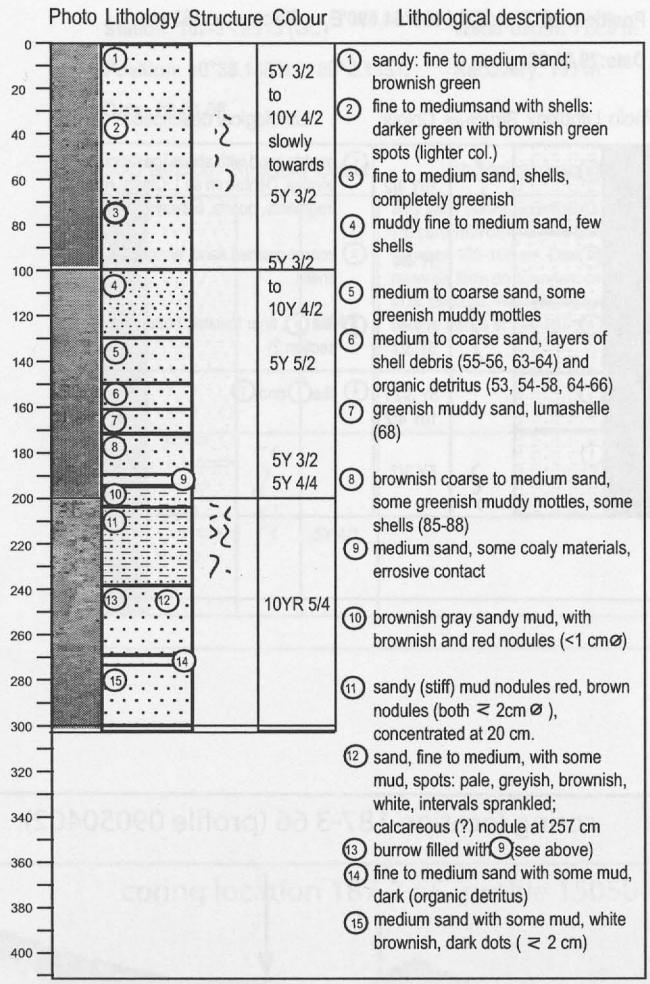


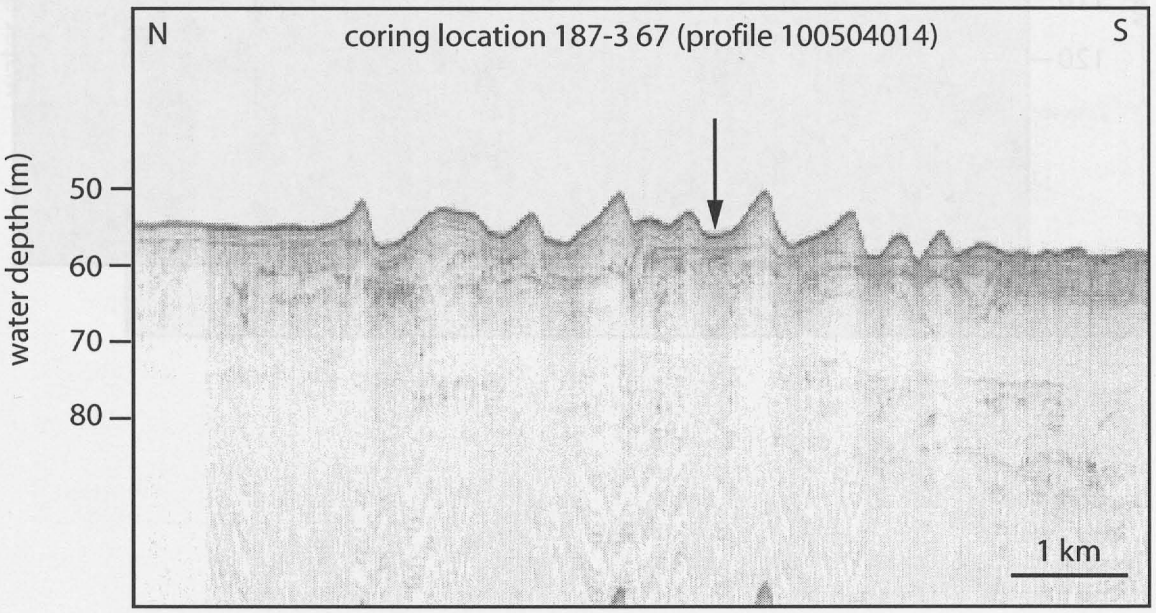


Station: 187-3-67-2 (GC) **Water depth: 56 m**

Position: 10°13.067'N / 108°25.716'E **Recovery: 311 cm**

Date: 30.04.06

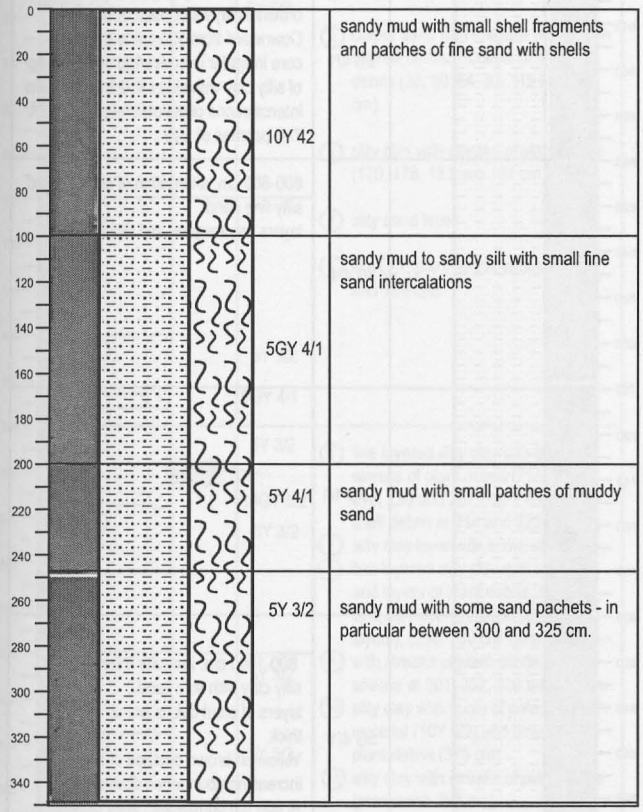


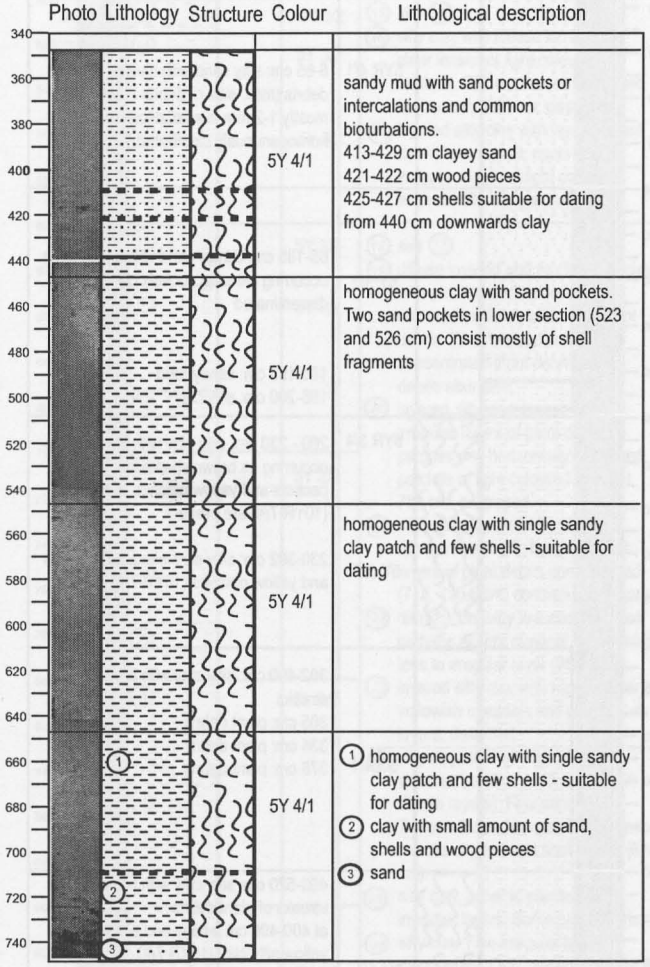


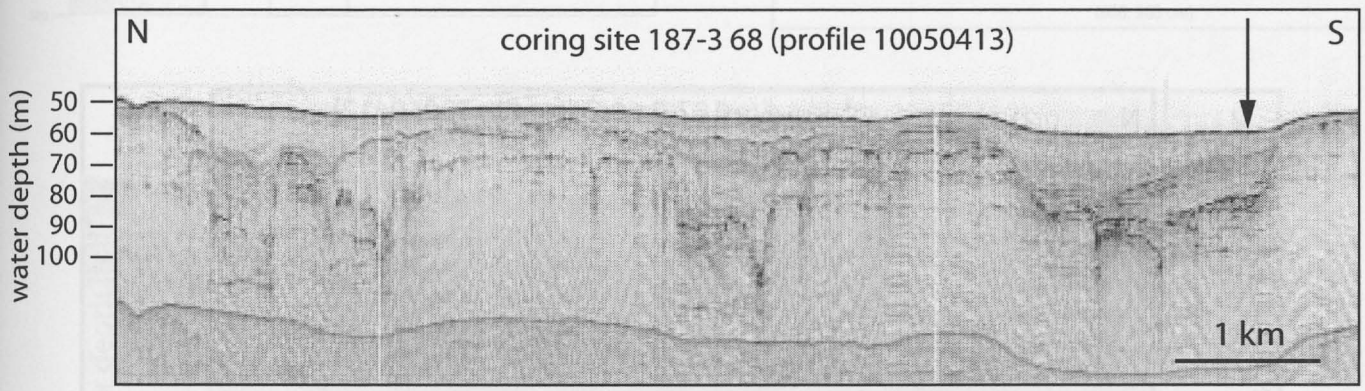
Station: 187-3 - 68-3 (GC) **Water depth: 60 m**

Position: 10°16,886'N / 108°25,317'E **Recovery: 747 cm**

Date: 30.04.2006







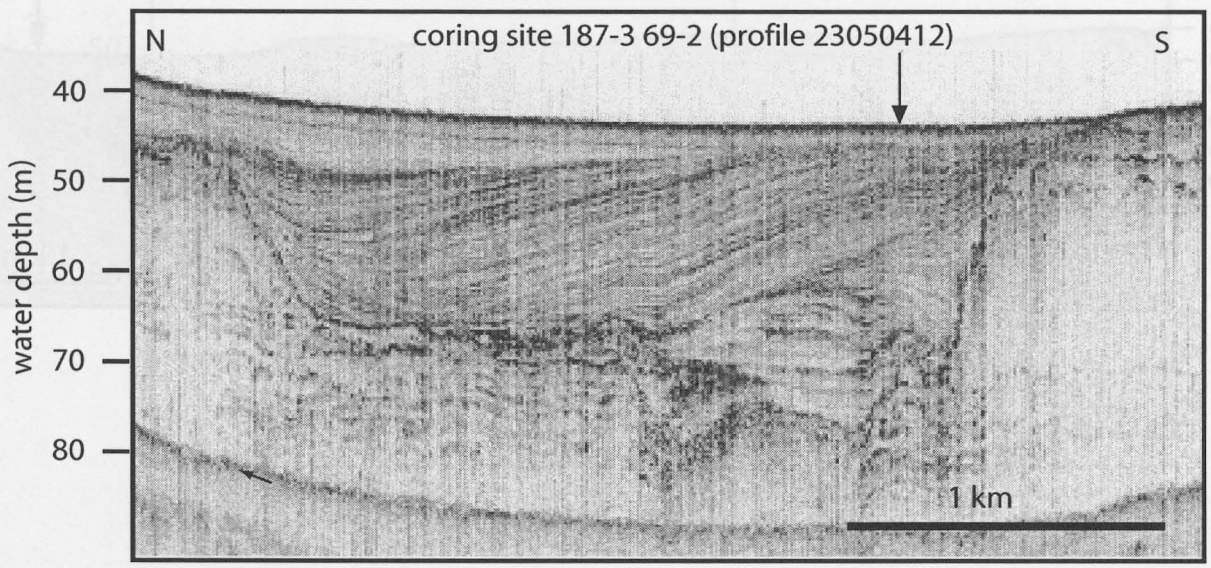
Station: 187-3 - 69-2 (GC) **Water depth: 42 m**

Position: 10°23,011'N / 108°00,801'E **Recovery: 1000 cm**

Date: 30.04.2006

Photo	Lithology	Structure	Colour	Lithological description
0–100		none	10Y 4/2	0-6 cm: muddy sand
			5YR 4/1	6-65 cm: silty sand with bivalve shell debris (max. size of debris = 2cm) mostly 1-2 mm in size, debris is ± homogenuously distributed.
100–200			5Y 3/2	65-185 cm: clayey sand with shell debris occurring either in pockets or disseminated
				185-198 cm: sandy mud
				198-200 cm: silty clay
200–300			5YR 3/4	200 - 230 cm: silty clay with plant debris occurring as brownish streaks, sand pockets and yellow patches of clay (10YR 7/4) are present.
			5Y 3/2	230-302 cm: silty clay with sand pockets and yellow patches (10YR 7/4) of clay
300–400			5G 4/1	302-400 cm: silty clay with brownish streaks 305 cm: plant debris 334 cm: plant debris 378 cm: plant debris
400–500			5G 4/1	400-520 cm: silty clay with brownish streaks of plant debris at 400-406 cm lenses and pockets of yellow silty clay (10YR 7/4) 419 cm: Gastropod shell 486 cm: silt concretion (2 cm in size)

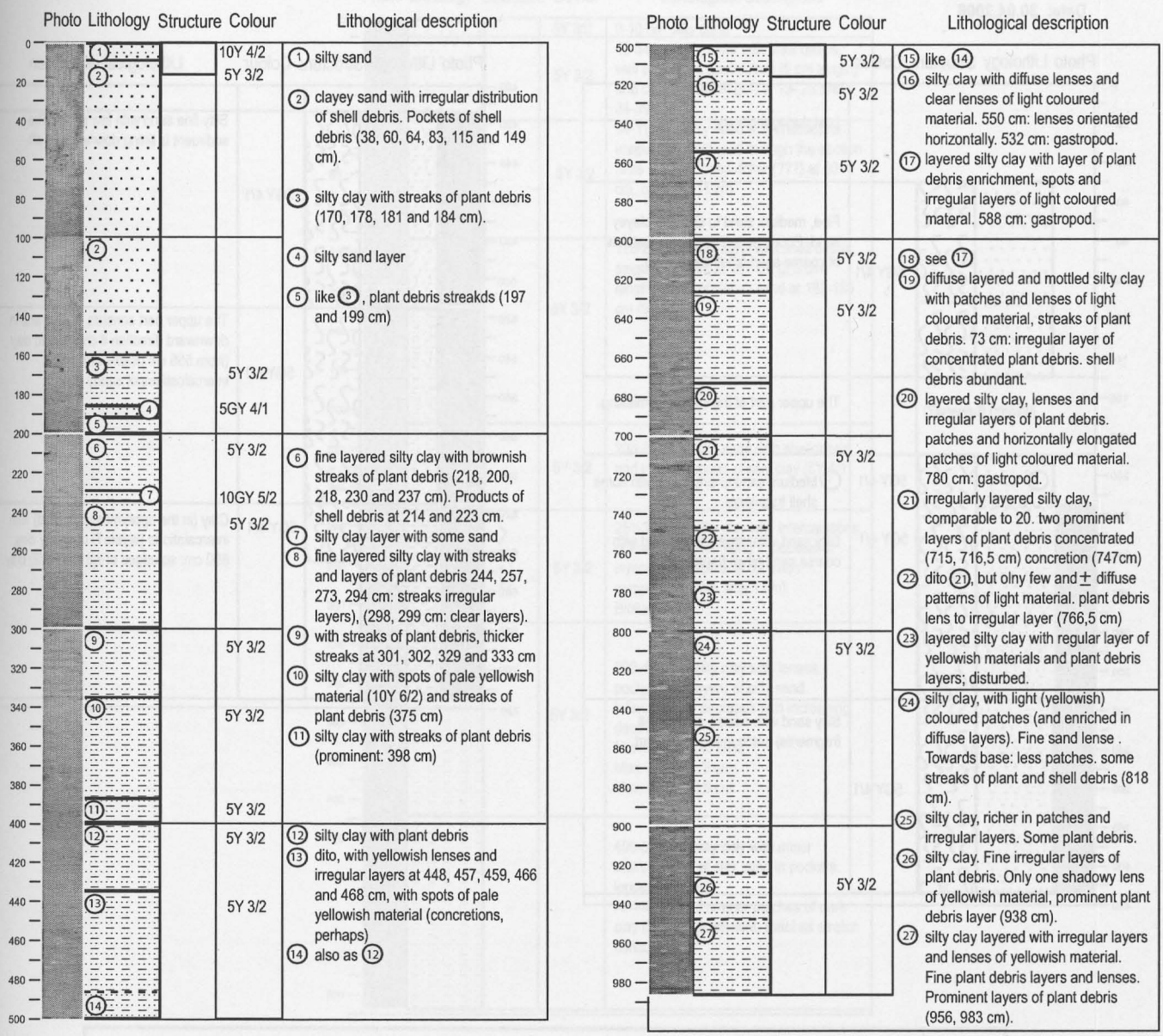
Photo	Lithology	Structure	Colour	Lithological description
500–600			5G 4/1	520-600 cm: silty clay as above with brownish layers of plant debris. Downward from 520 cm to the end of core irregular interlayering and wedging of silty clay with silty sand and lense-like intercalations of yellowish-brown (10YR 7/4) patches of clay
600–700			5G 4/1	600-800 cm: alternation of silty clay and silty fine sand. layers are irregular and dipping
700–800			5G 4/1	
800–900			5G 4/1	800-1000 cm: irregular interlayers of silty clay with silty sand. layers of plant debris are up to 5 mm thick. Yellowish-brown patches of silty clay, increasing abundance downcore. At 866 cm burrow with shell debris.
900–1000			5G 4/1	

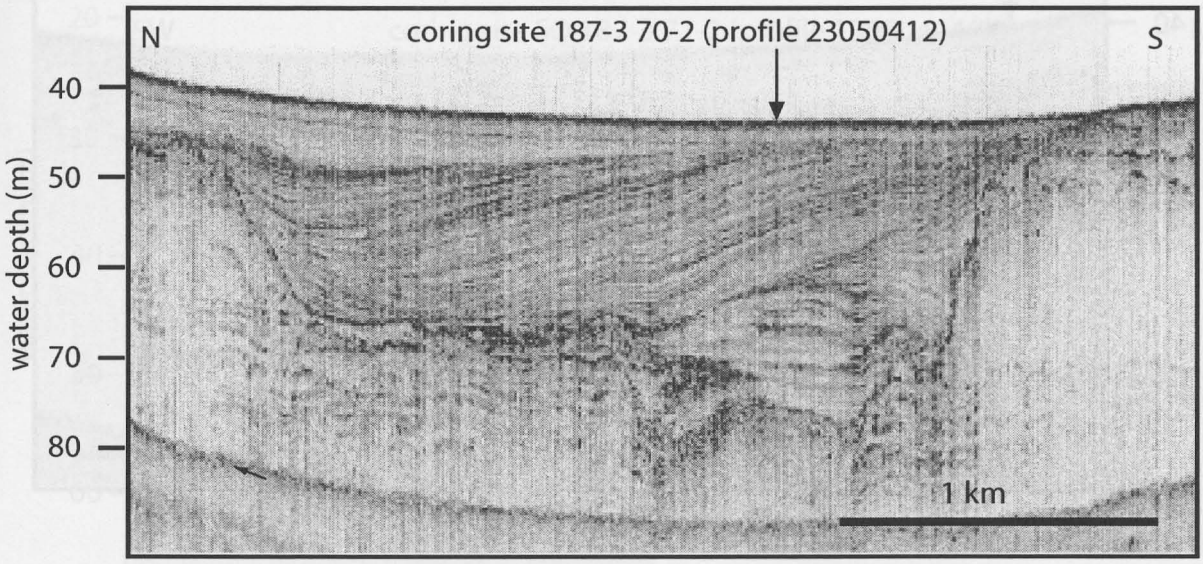


Station: 187-3 - 70-2 (GC) **Water depth: 43 m**

Position: 10°23,294'N / 108°0,798'E **Recovery: 986 cm**

Date: 30.04.2006

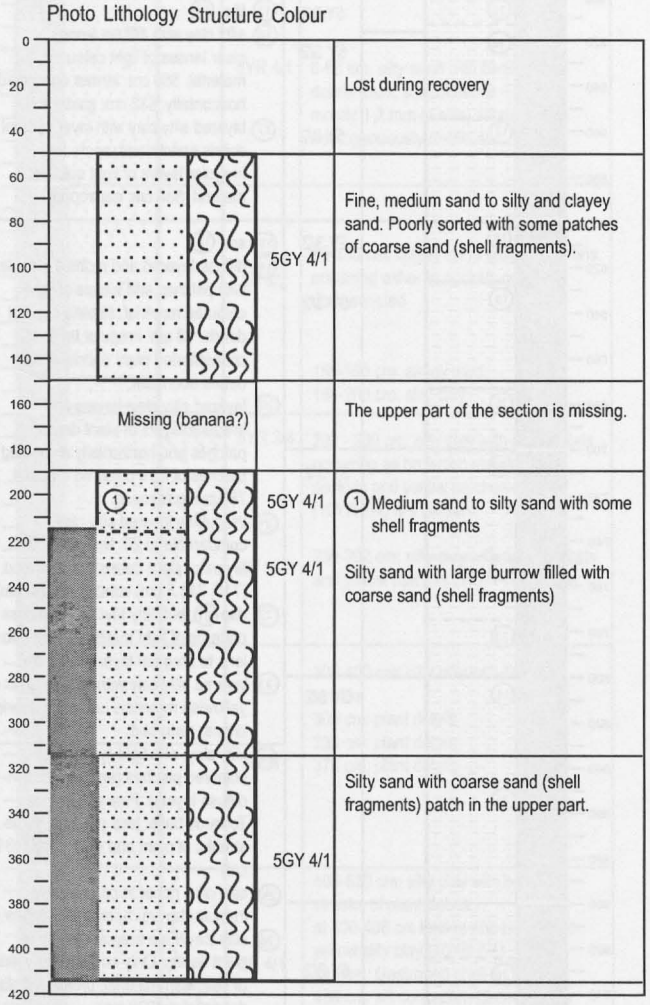


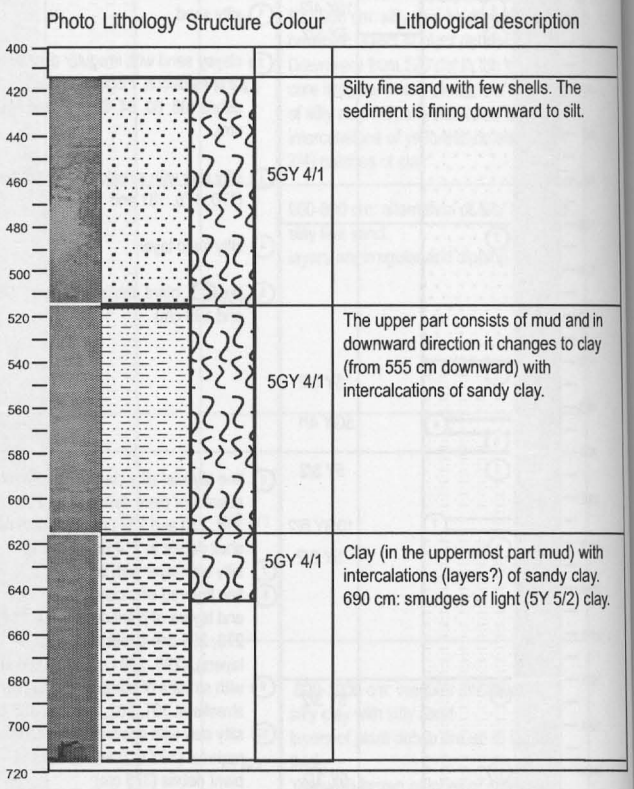


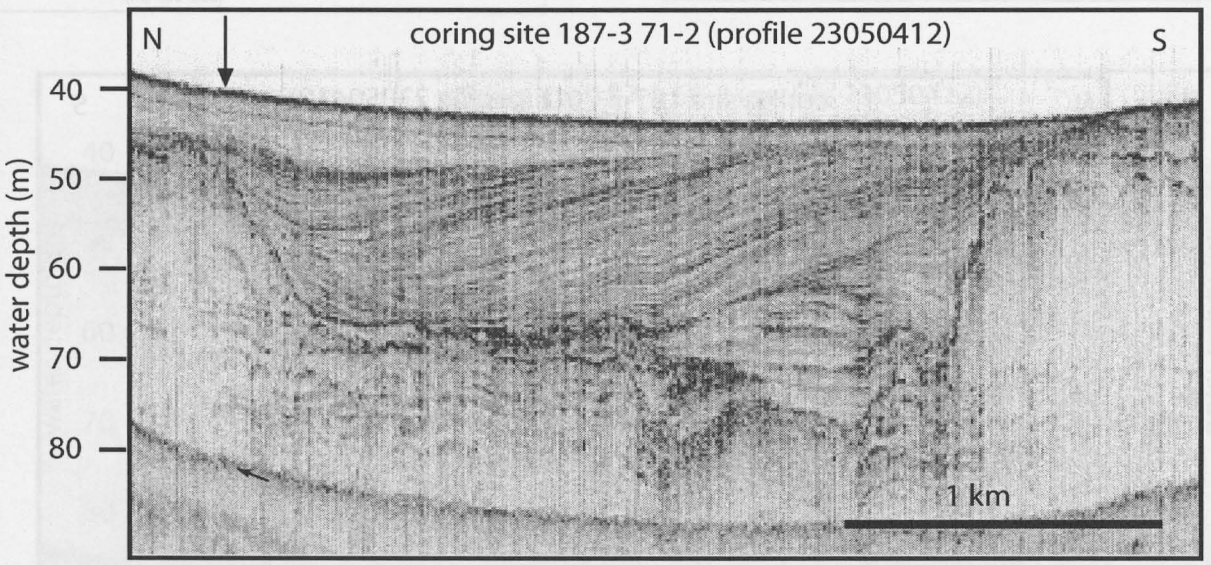
Station: 187-3 - 71-2 (GC) **Water depth: 38 m**

Position: 10°24,246'N / 108°0,587'E **Recovery: 715 cm**

Date: 30.04.2006







Station: 187-3 - 72-2 (GC) **Water depth: 26 m**

Position: 10°15,339'N / 107°17,335 E **Recovery: 509 cm**

Date: 30.04.2006

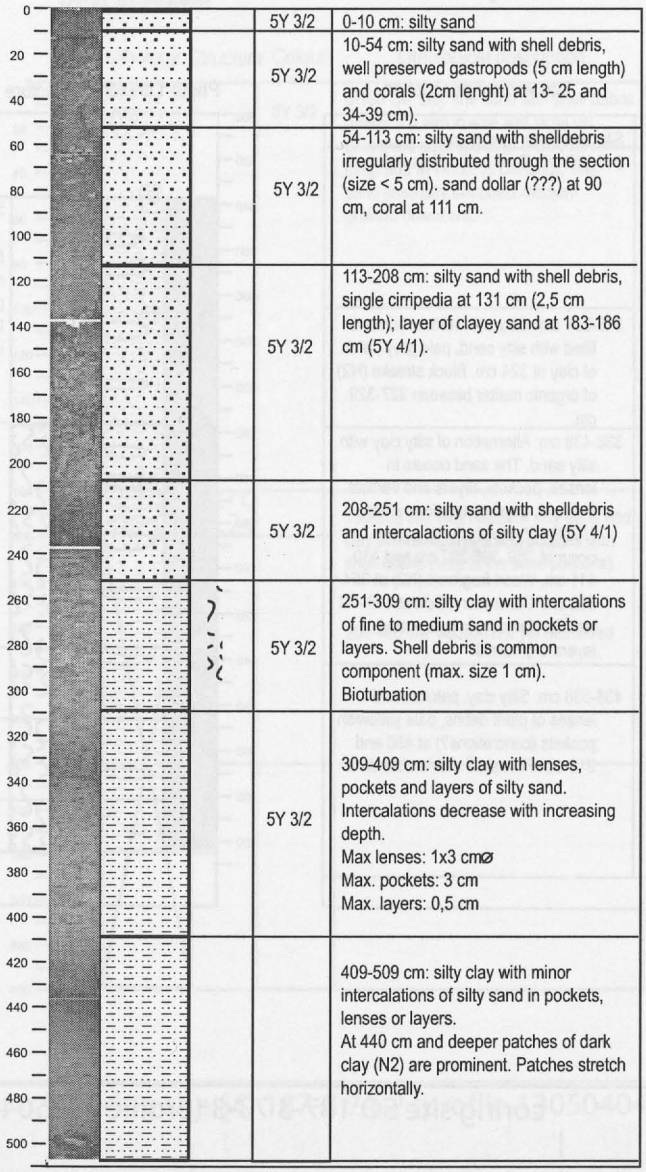
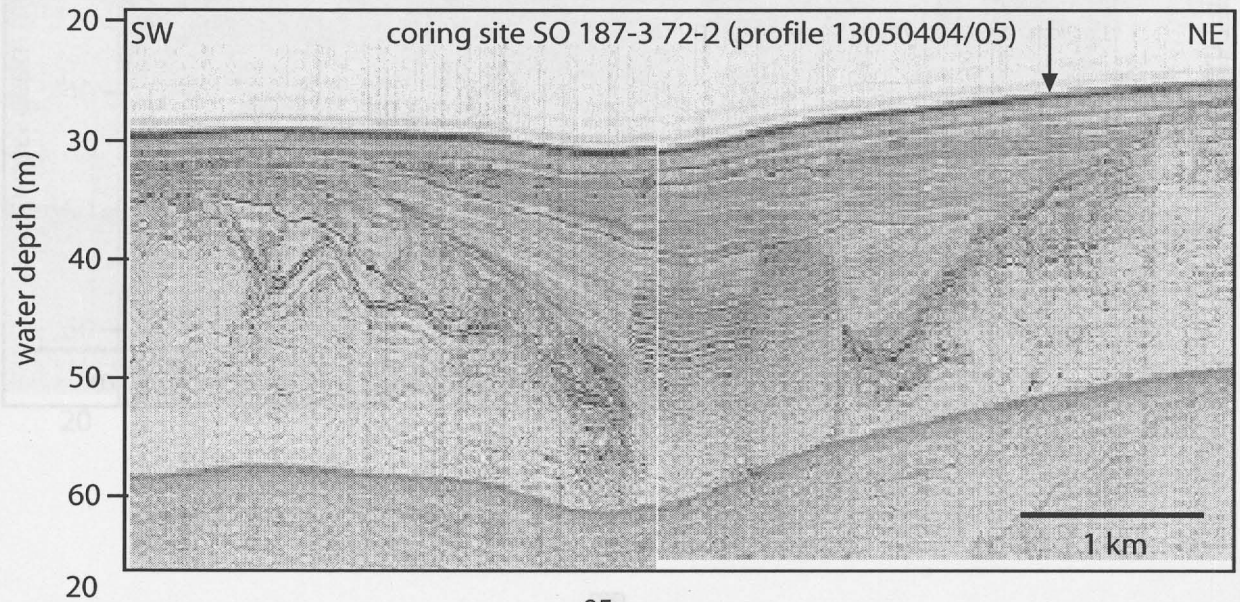


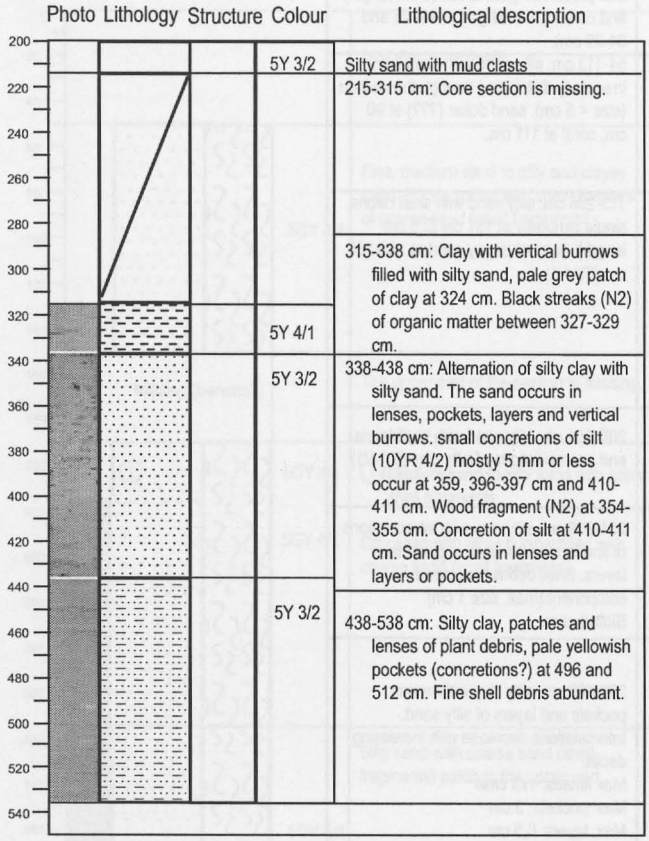
Photo Lithology Structure	Colour	Lithological description
	5Y 3/2	0-10 cm: silty sand
	5Y 3/2	10-54 cm: silty sand with shell debris, well preserved gastropods (5 cm length) and corals (2cm lenght) at 13- 25 and 34-39 cm).
	5Y 3/2	54-113 cm: silty sand with shelldebris irregularly distributed through the section (size < 5 cm). sand dollar (???) at 90 cm, coral at 111 cm.
	5Y 3/2	113-208 cm: silty sand with shell debris, single cirripedia at 131 cm (2,5 cm length); layer of clayey sand at 183-186 cm (5Y 4/1).
	5Y 3/2	208-251 cm: silty sand with shelldebris and intercalactions of silty clay (5Y 4/1)
	5Y 3/2	251-309 cm: silty clay with intercalations of fine to medium sand in pockets or layers. Shell debris is common component (max. size 1 cm). Bioturbation
	5Y 3/2	309-409 cm: silty clay with lenses, pockets and layers of silty sand. Intercalations decrease with increasing depth. Max lenses: 1x3 cmø Max. pockets: 3 cm Max. layers: 0,5 cm
		409-509 cm: silty clay with minor intercalations of silty sand in pockets, lenses or layers. At 440 cm and deeper patches of dark clay (N2) are prominent. Patches stretch horizontally.

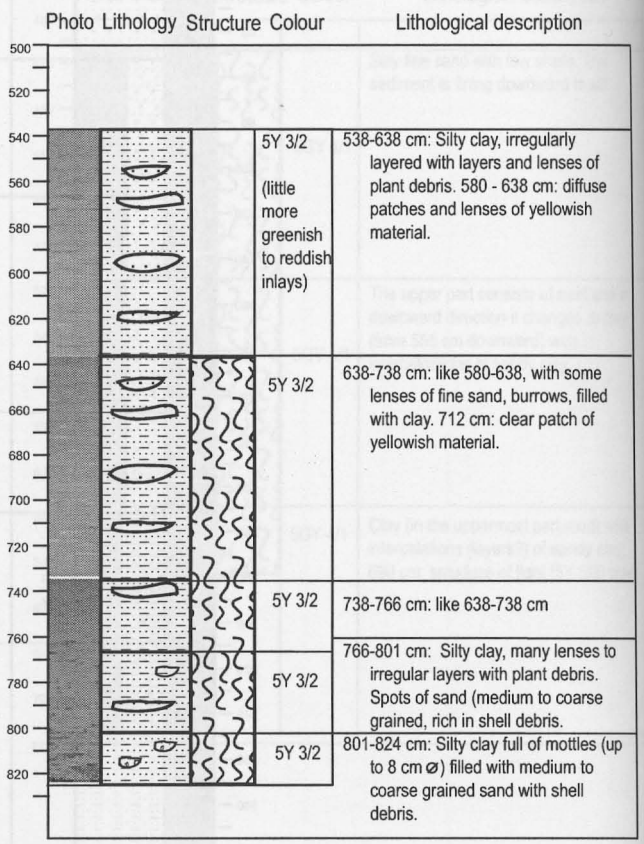


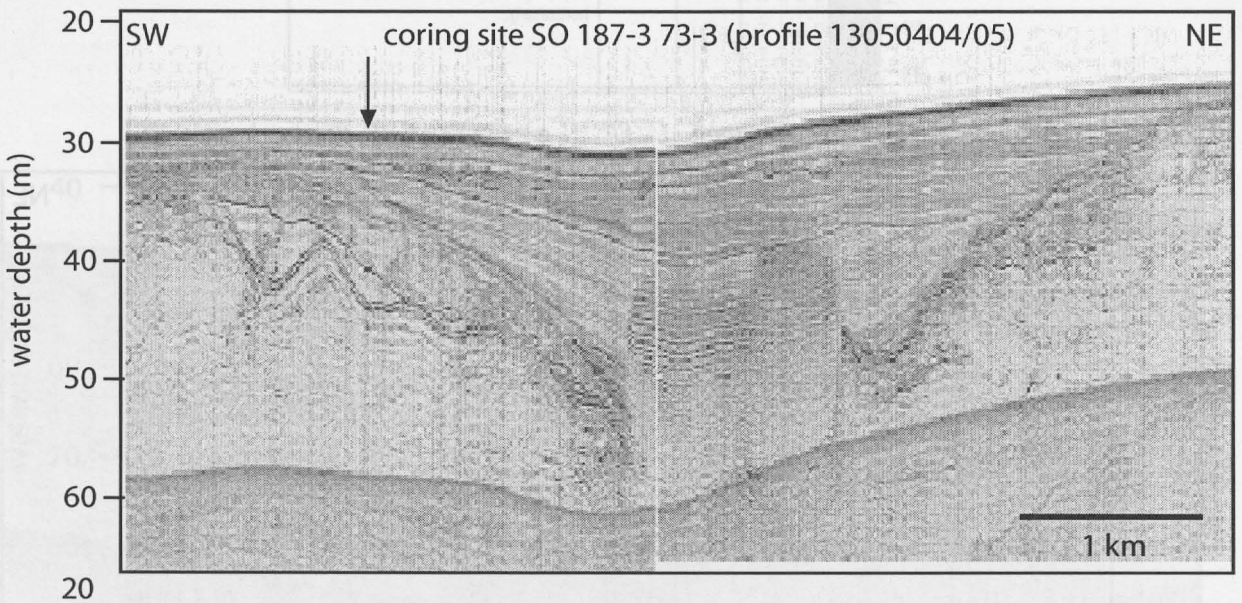
Station: 187-3 -73-3 (GC) **Water depth: 31 m**

Position: 10°14,131'N / 107°16,741'E **Recovery: 624 cm**

Date: 01.05.2006



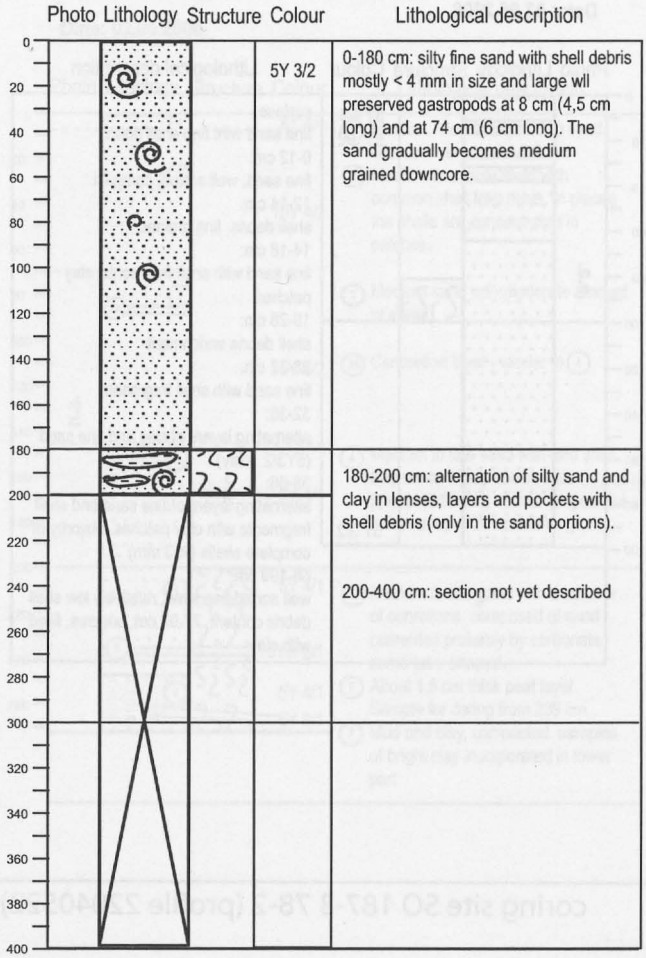


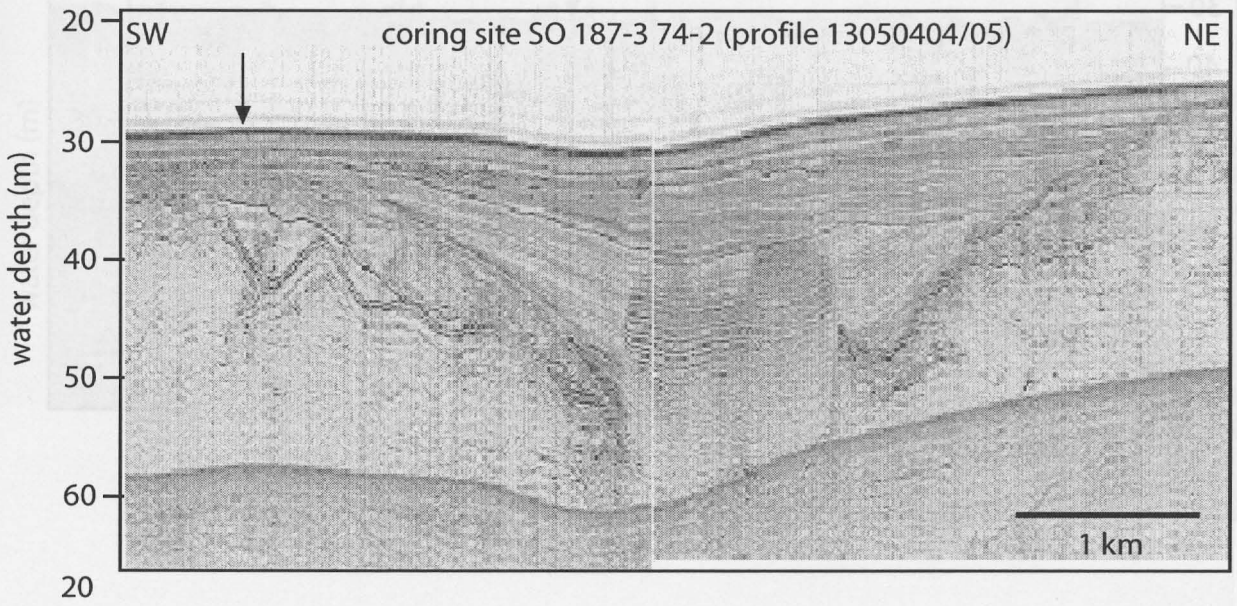


Station: 187-3 - 74-2 (GC) **Water depth: 30 m**

Position: 10°13,910'N / 107°16,664'E **Recovery: 400 cm**

Date: 01.05.2006

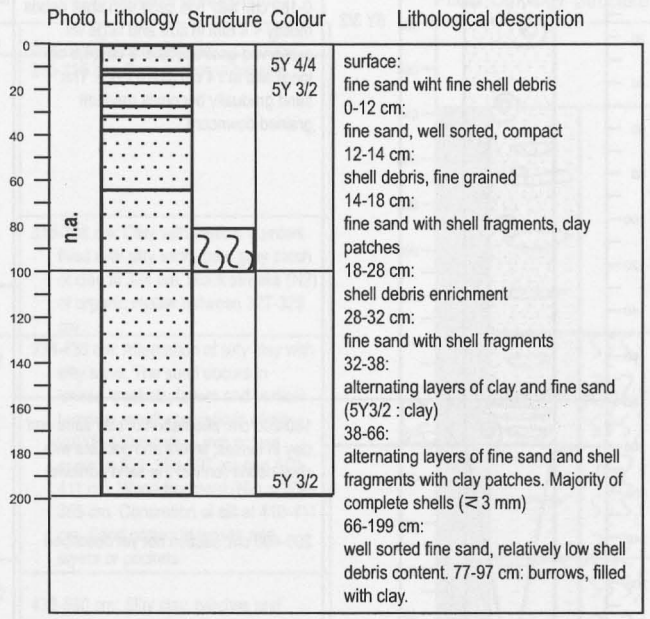


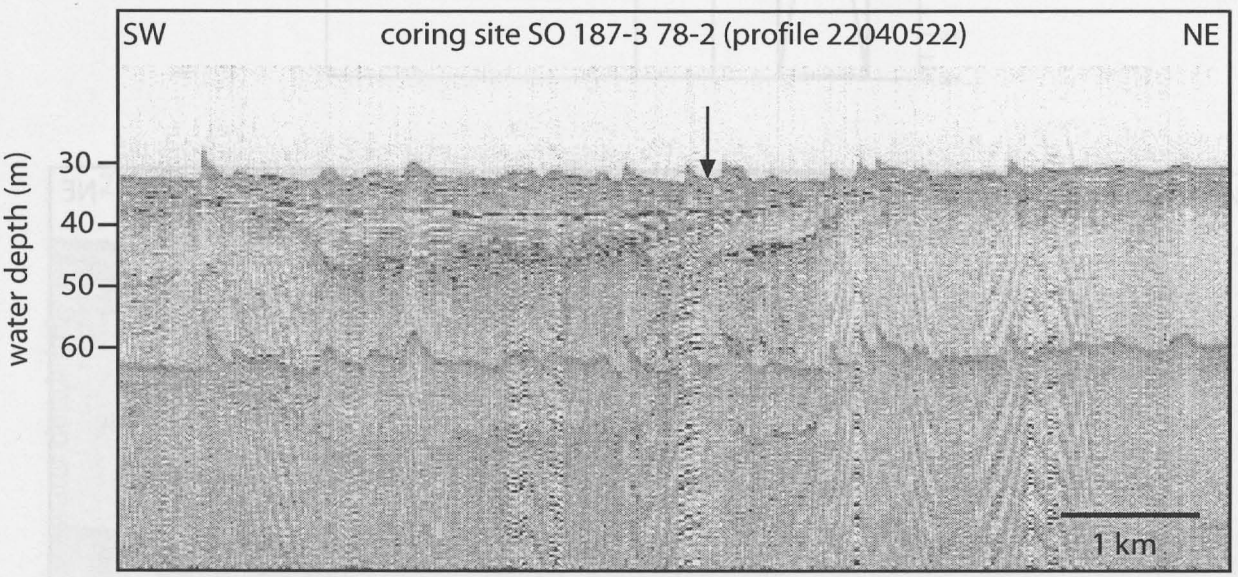


Station: 187-3 - 78-2 (VC) **Water depth: 32 m**

Position: 8°58,434'N / 106°41,779'E **Recovery: 199 cm**

Date: 02.05.2006

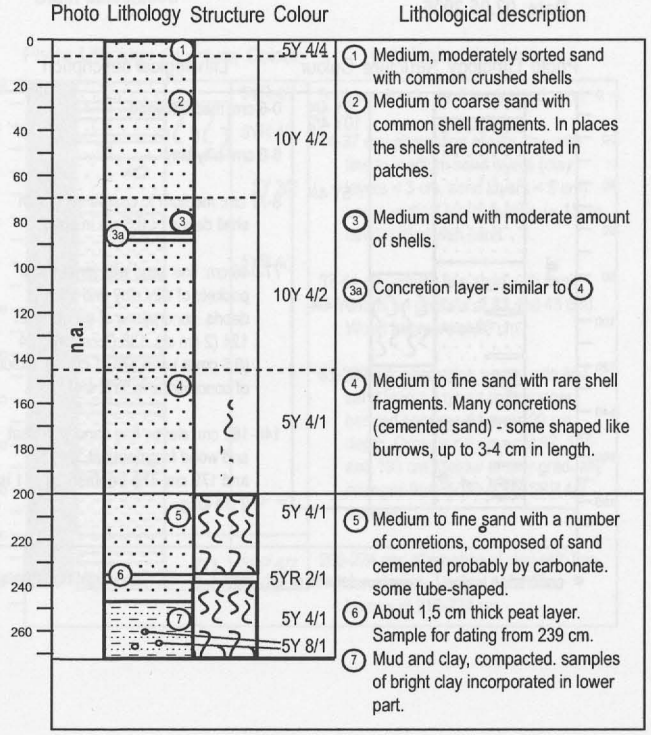


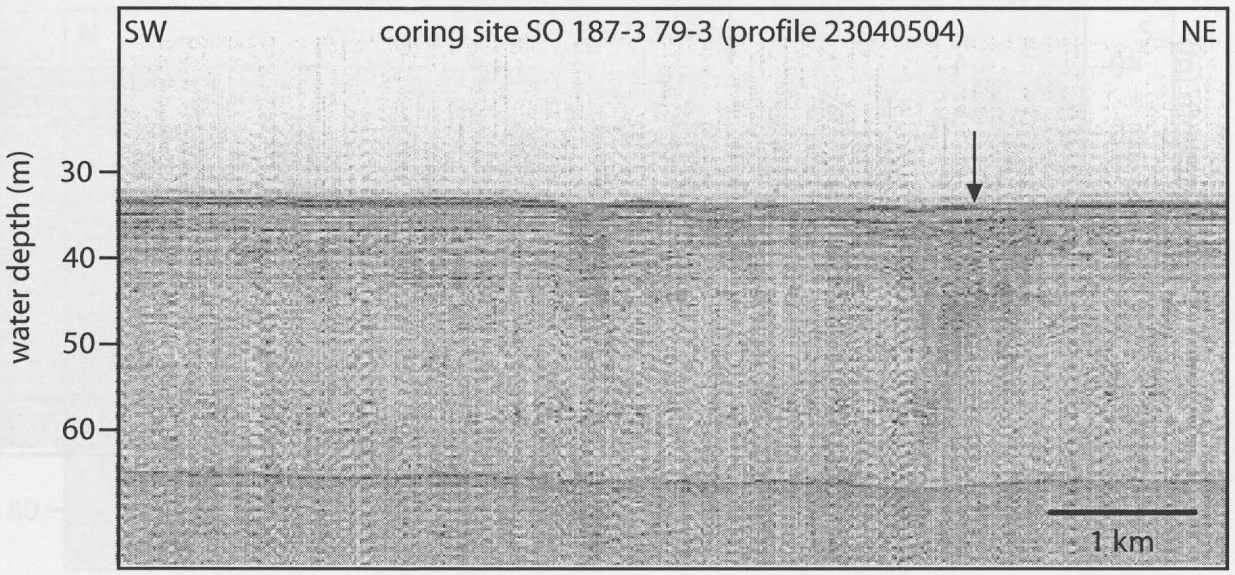


Station: 187-3 - 79-3 (VC) **Water depth: 33 m**

Position: 09°08,402'N / 107°04,149'E **Recovery: 272 cm**

Date: 02.05.2006

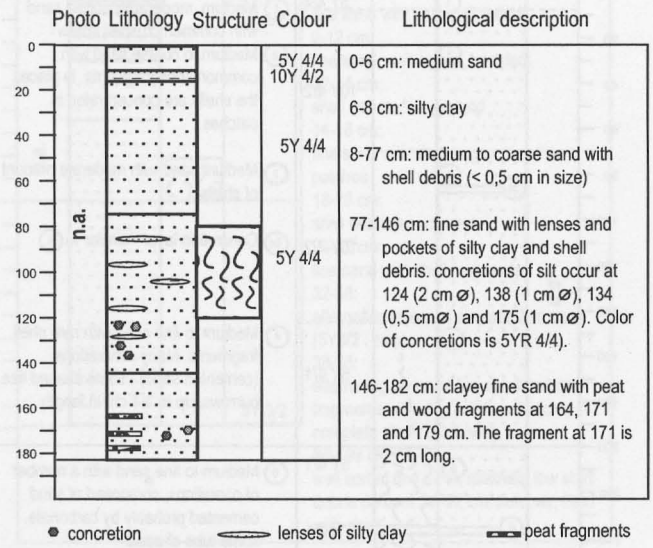


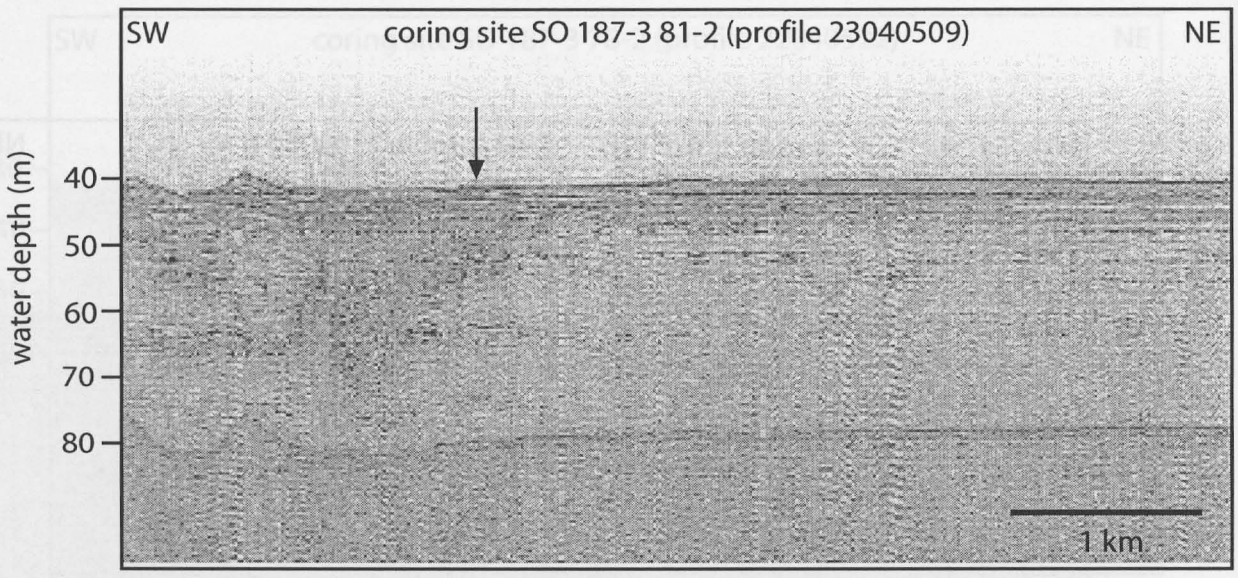


Station: 187-3 - 81-2 (VC) **Water depth: 38 m**

Position: 09°15,490'N / 107°19,998'E **Recovery: 182 cm**

Date: 02.05.2006

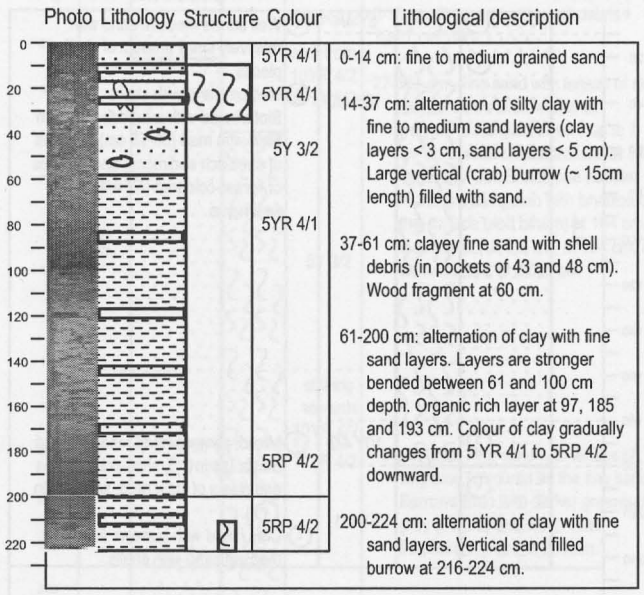


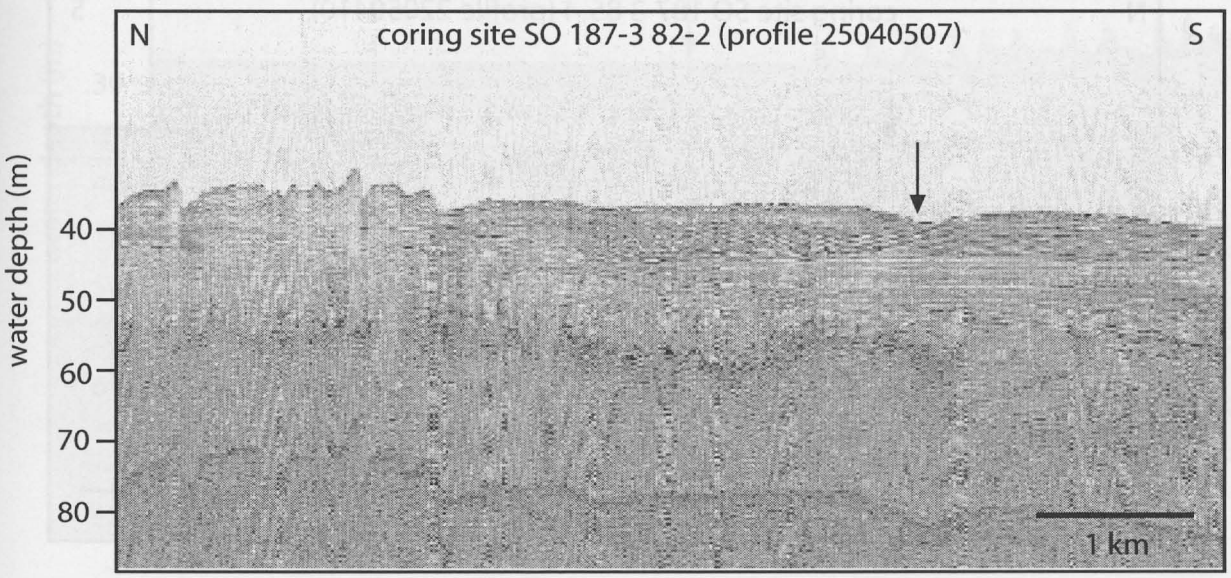


Station: 187-3 - 82-2 (GC) **Water depth: 39 m**

Position: 09°30,986'N / 107°30,197'E **Recovery: 224 cm**

Date: 02.05.2006

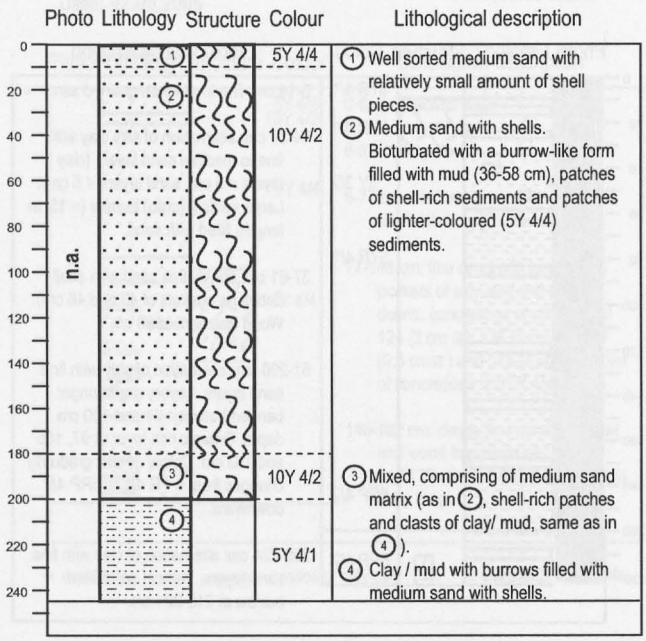




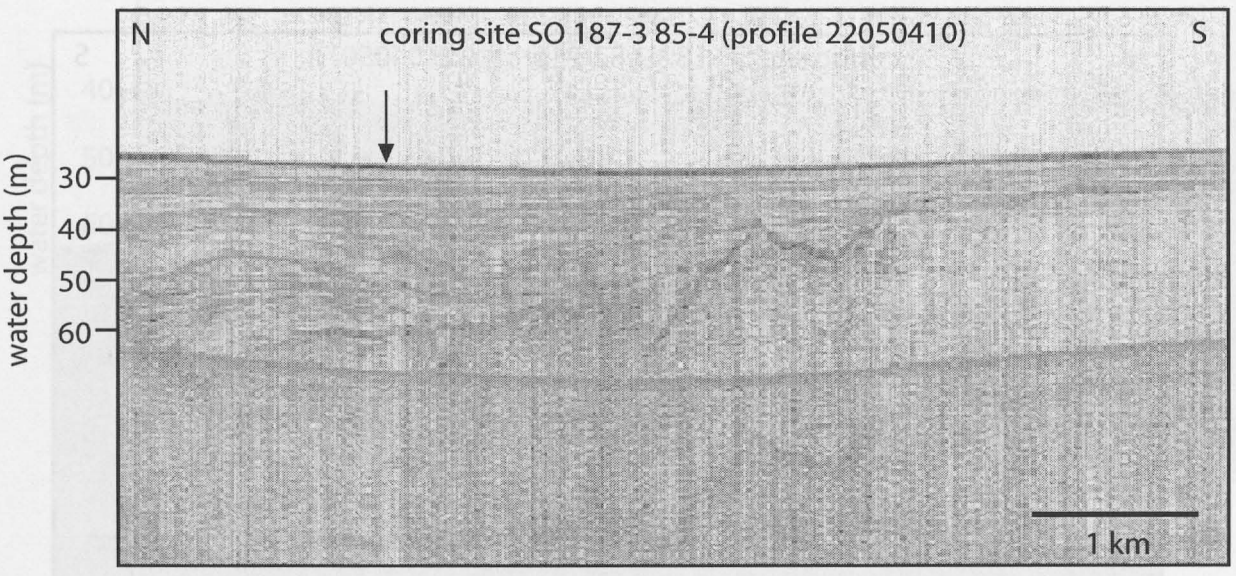
Station: 187-3 - 85-4 (VC) **Water depth: 27 m**

Position: 09°47,815'N / 107°02,106'E **Recovery: 245 cm**

Date: 03.05.2006 **Interval: 0*-245 cm**



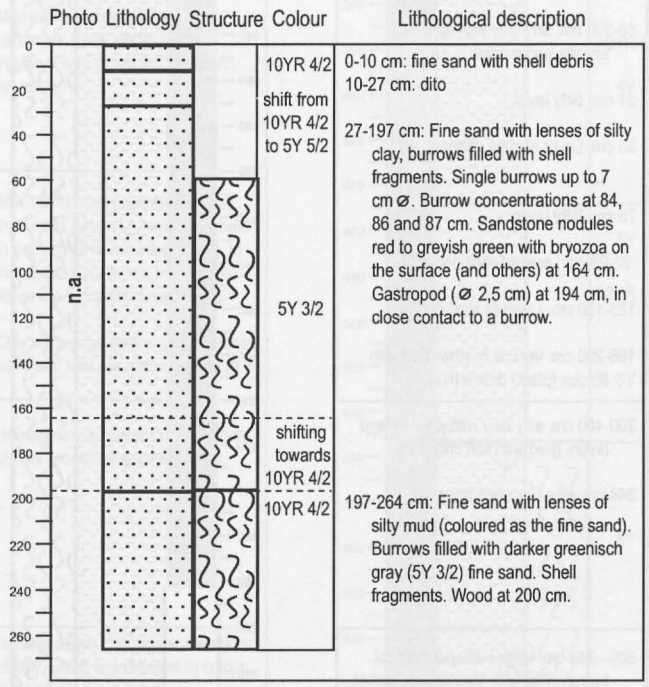
* Upper 42 cm lost during recovery.

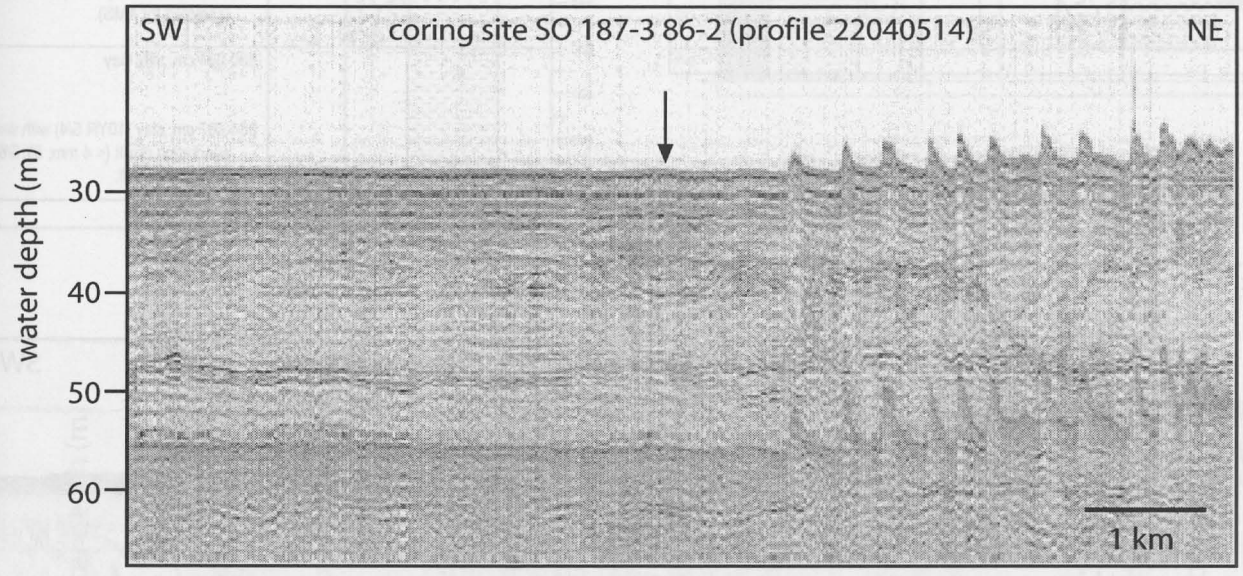


Station: 187-3 - 86-2 (VC) **Water depth: 27 m**

Position: 08°44,463'N / 106°09,822'E **Recovery: 264 cm**

Date: 05.05.2006

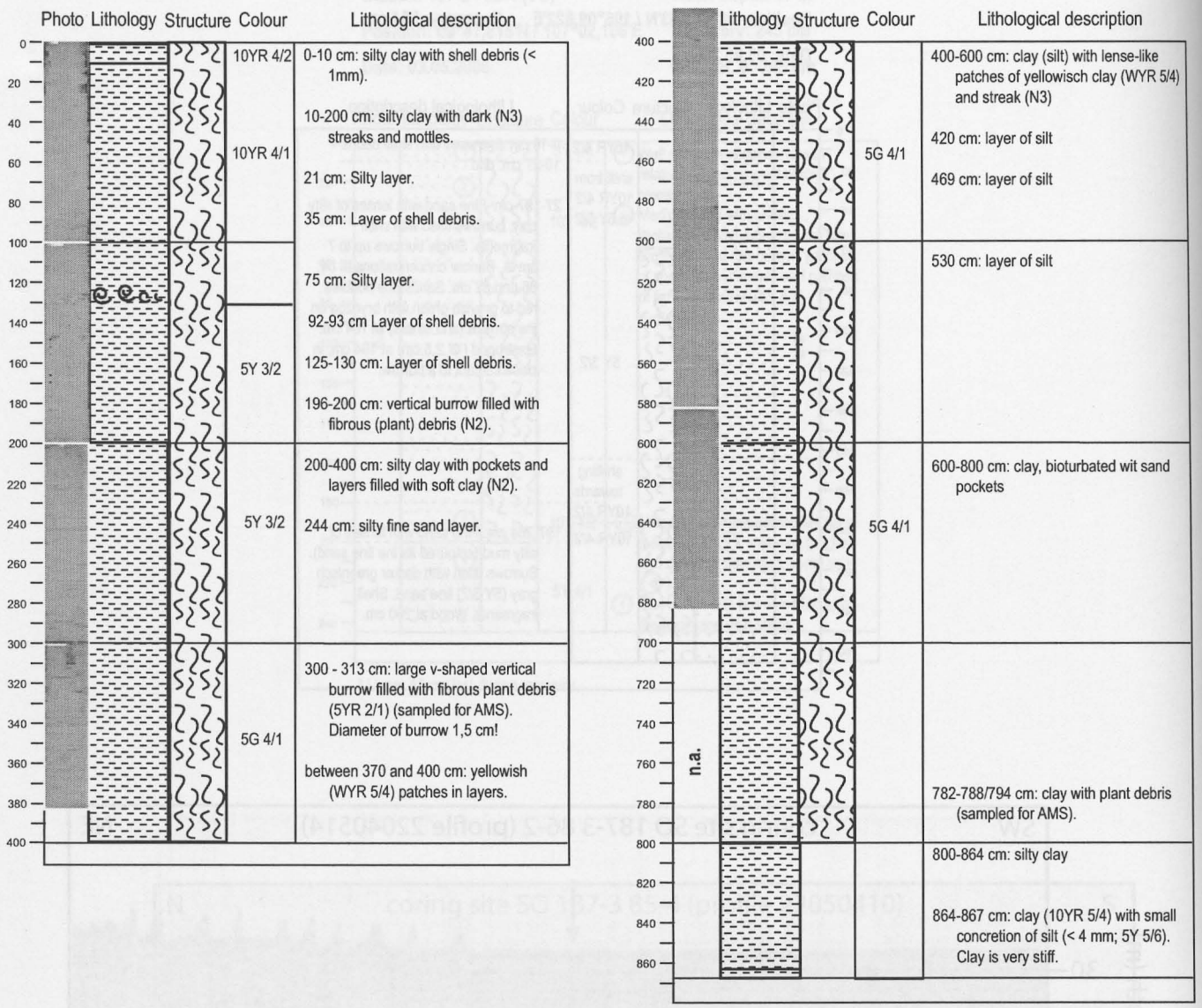


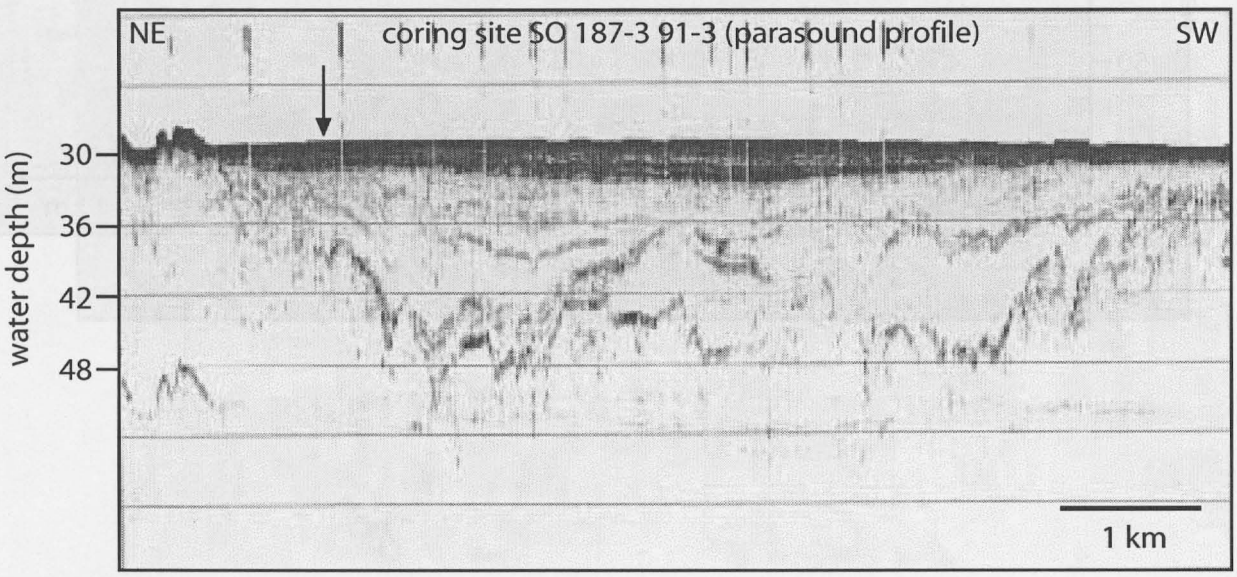


Station: 187-3 - 91-3 (GC) **Water depth: 30 m**

Position: 08°26.640'N / 105°14,628'E **Recovery: 867 cm**

Date: 05.05.2006

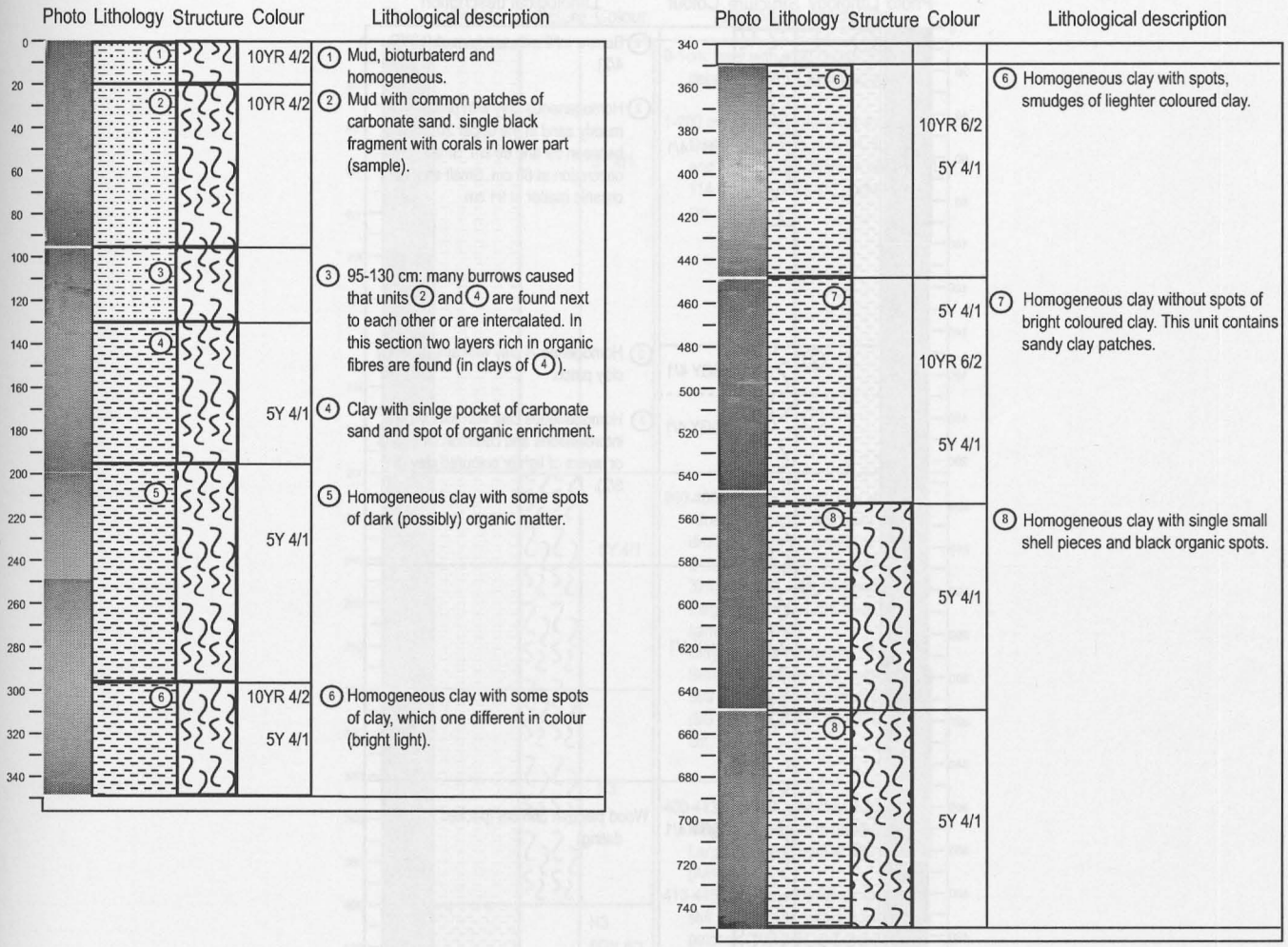


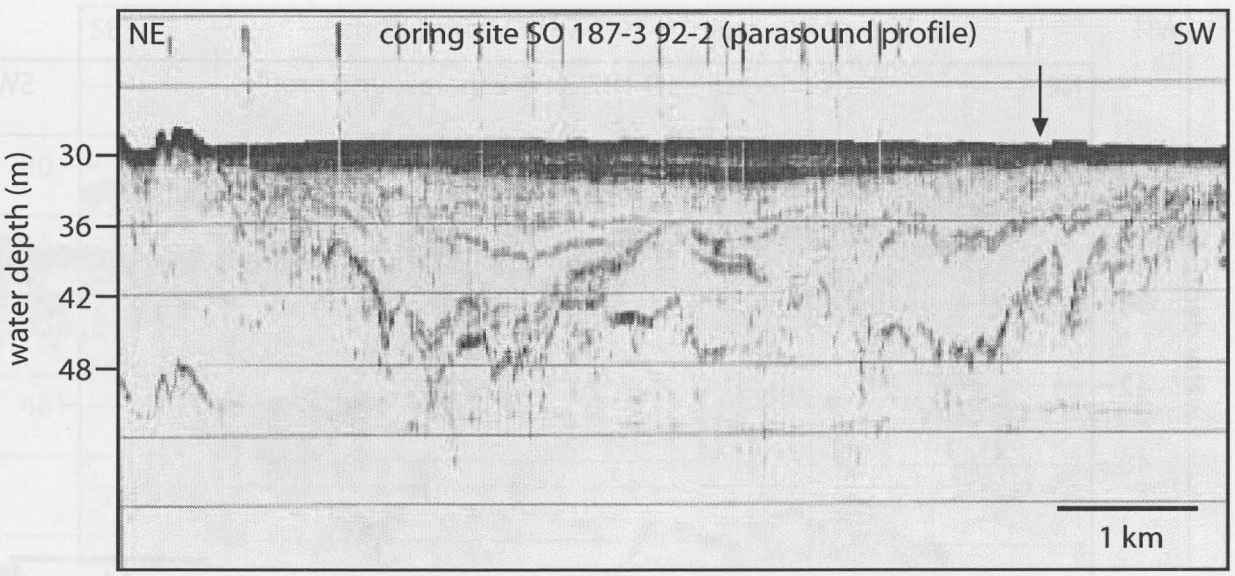


Station: 187-3 - 92-2 (GC) **Water depth: 30 m**

Position: 08°25,253'N / 105°11,933'E **Recovery: 749 cm**

Date: 05.05.2006

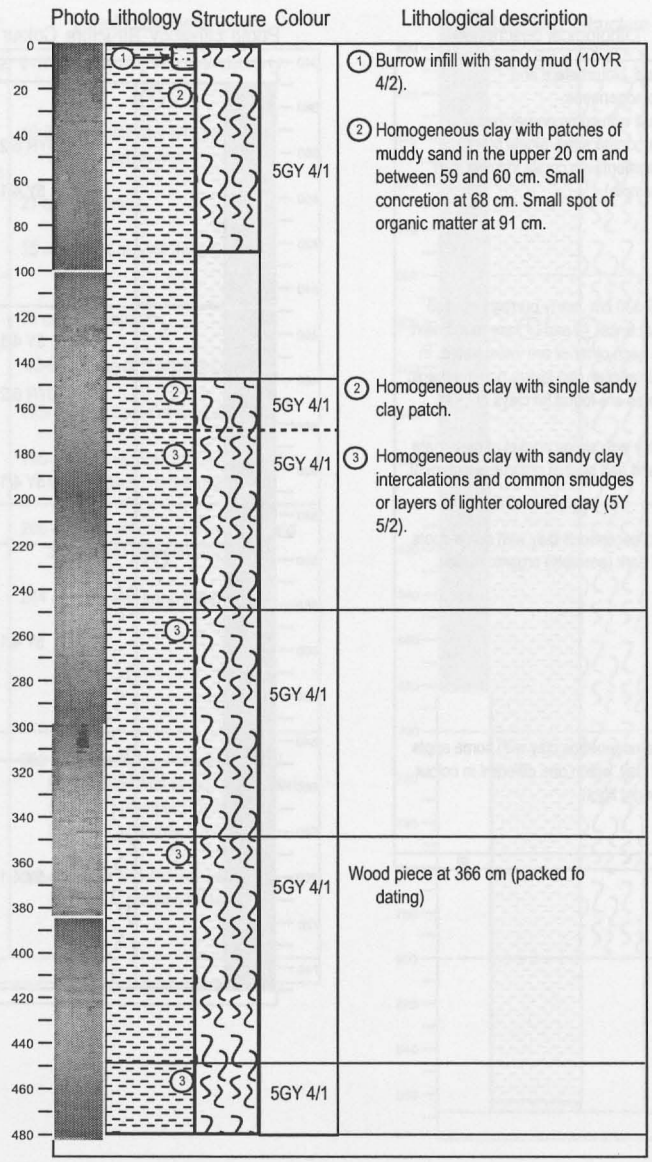


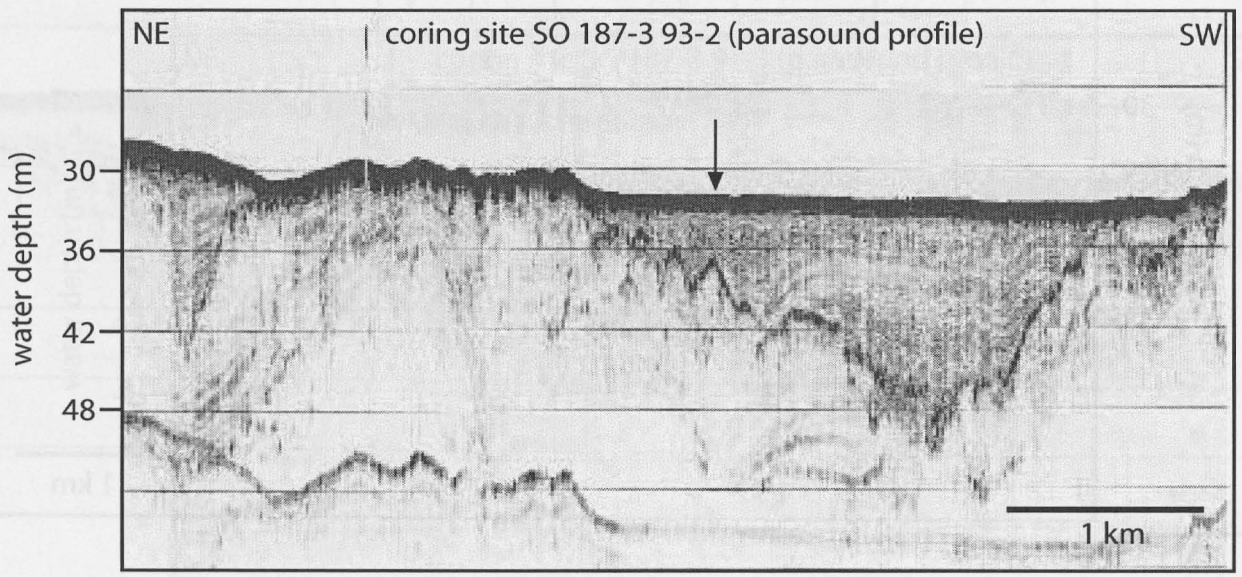


Station: 187-3 - 93-2 (GC) **Water depth: 32 m**

Position: 08°23,288'N / 105°06,752'E **Recovery: 480 cm**

Date: 05.05.2006

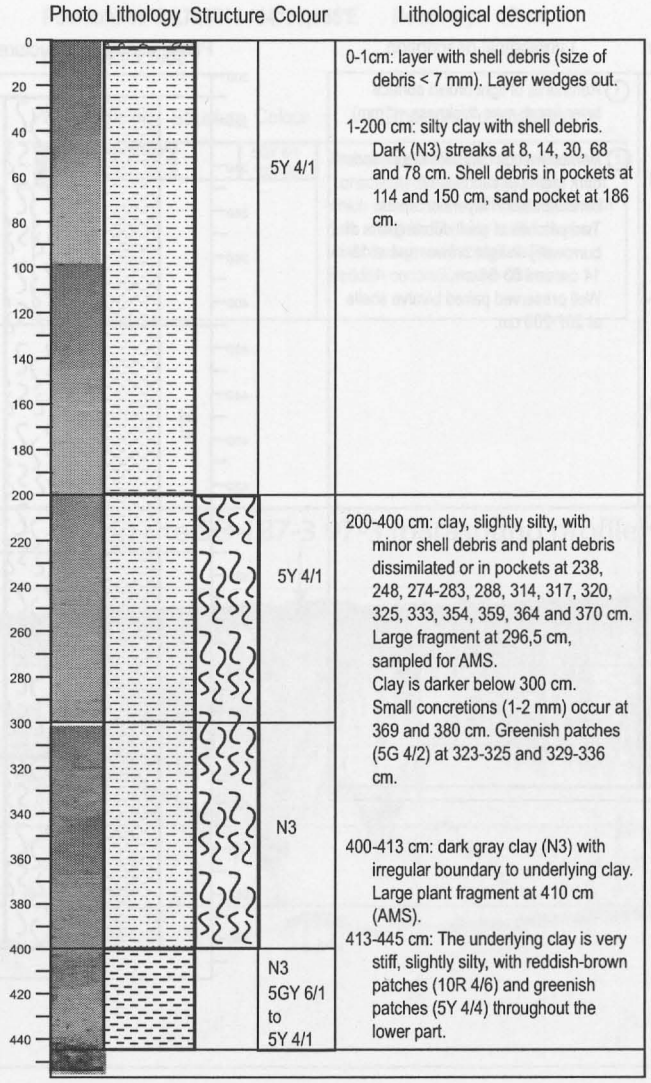


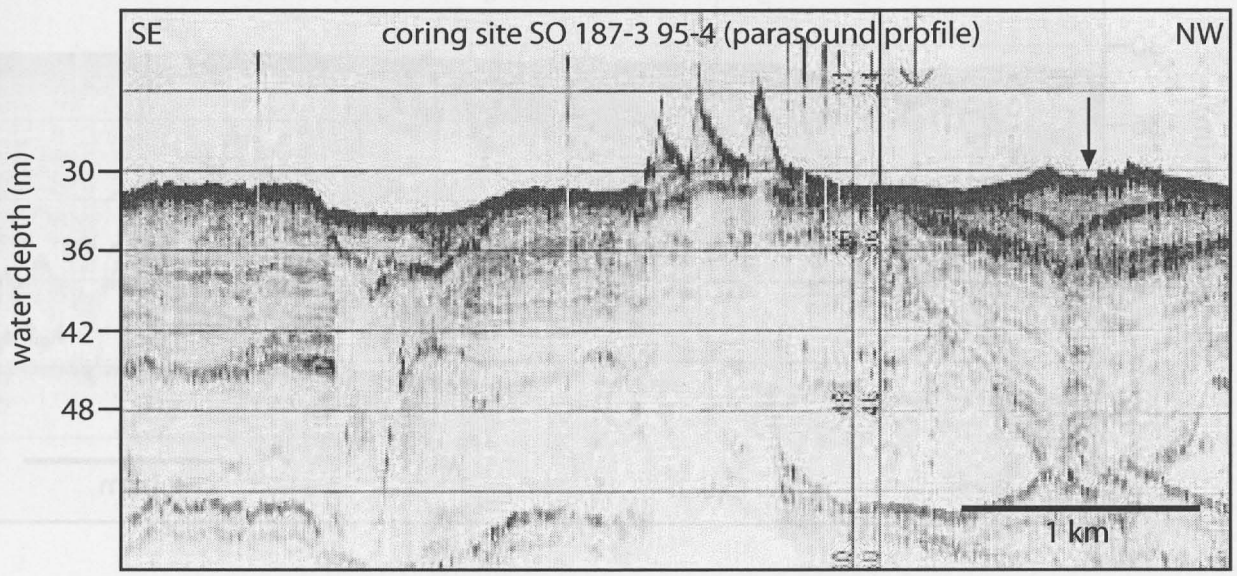


Station: 187-3 - 95-4 (GC) **Water depth: 34 m**

Position: 08°22,751'N / 104°37,216'E **Recovery: 445 cm**

Date: 06.05.2006

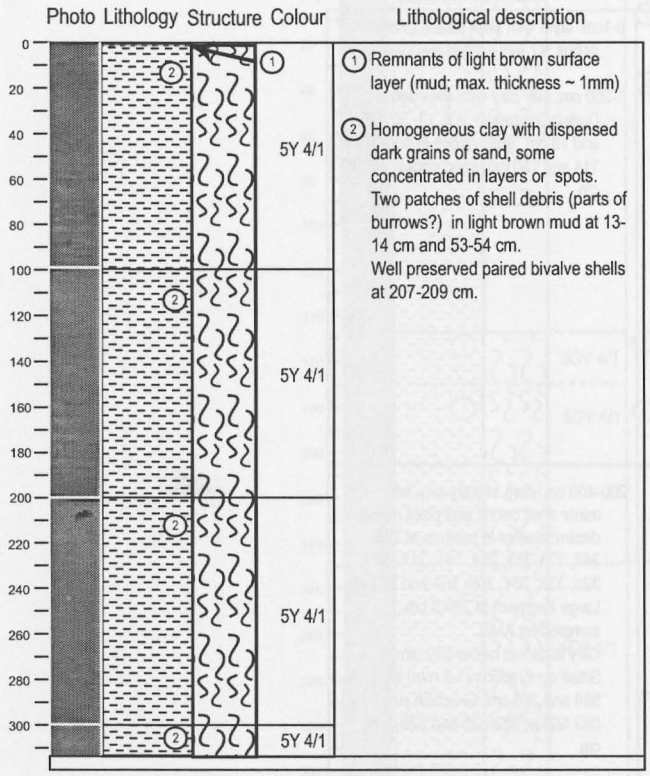


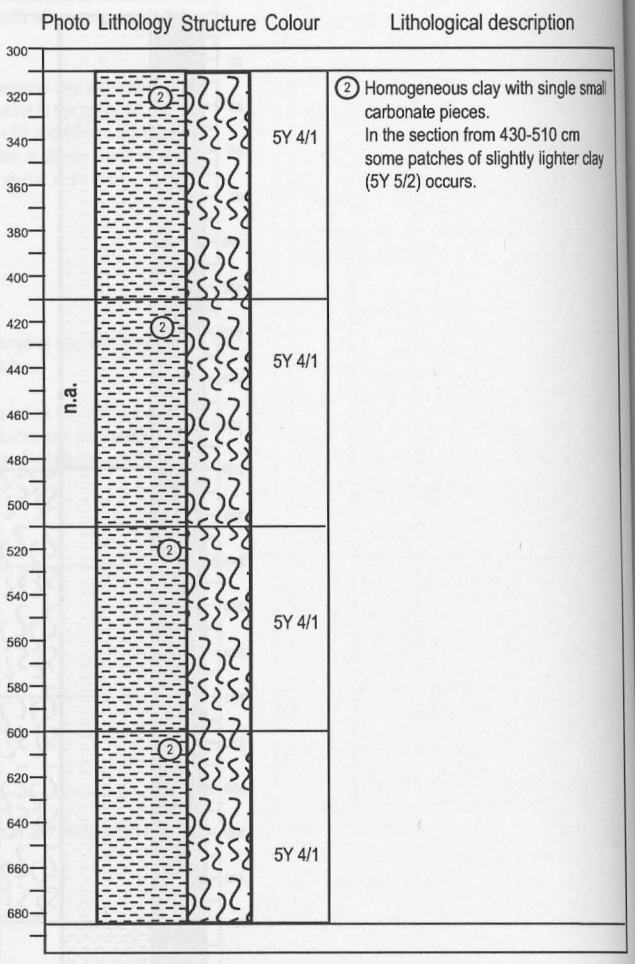


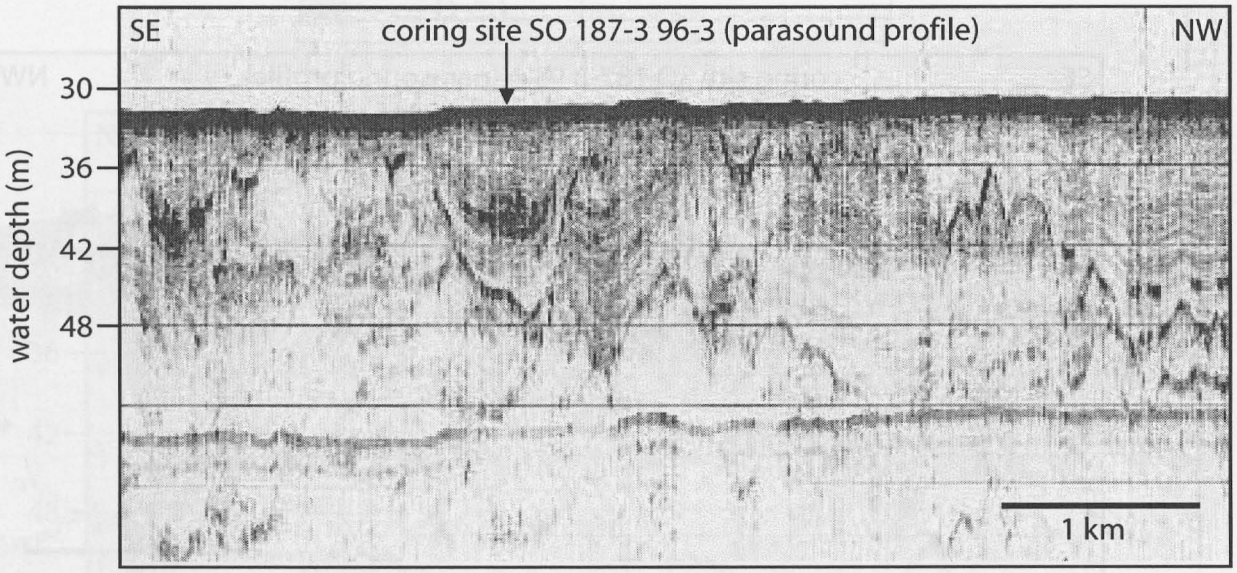
Station: 187-3 - 96-3 (GC) **Water depth: 31 m**

Position: 08°24,494'N / 104°34,242'E **Recovery: 684 cm**

Date: 06.05.2006





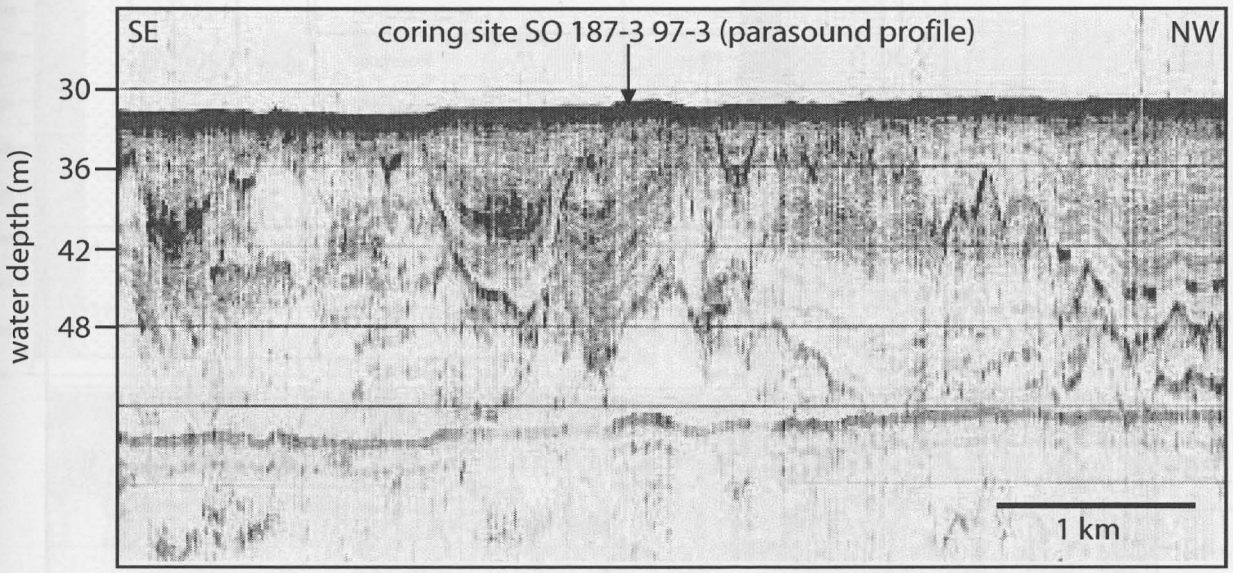


Station: 187-3 - 97-3 (VC) **Water depth: 31 m**

Position: 08°24,725'N / 104°33,855'E **Recovery: 17 cm**

Date: 06.05.2006

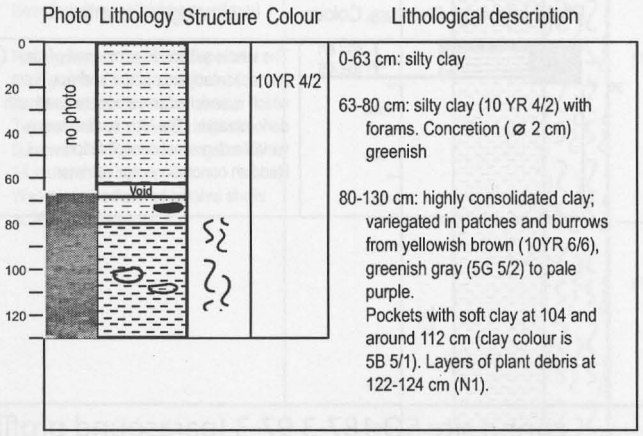
Photo	Lithology	Structure	Colour	Lithological description
0 – 20			5GY 6/1 10R 4/6	The whole section is composed of clay (consolidated) except the surfrace 1 cm, which is enriched in carbonate sand with dark minerals. The clay section has a variable degree of consolidation. Reddish concretions are common.

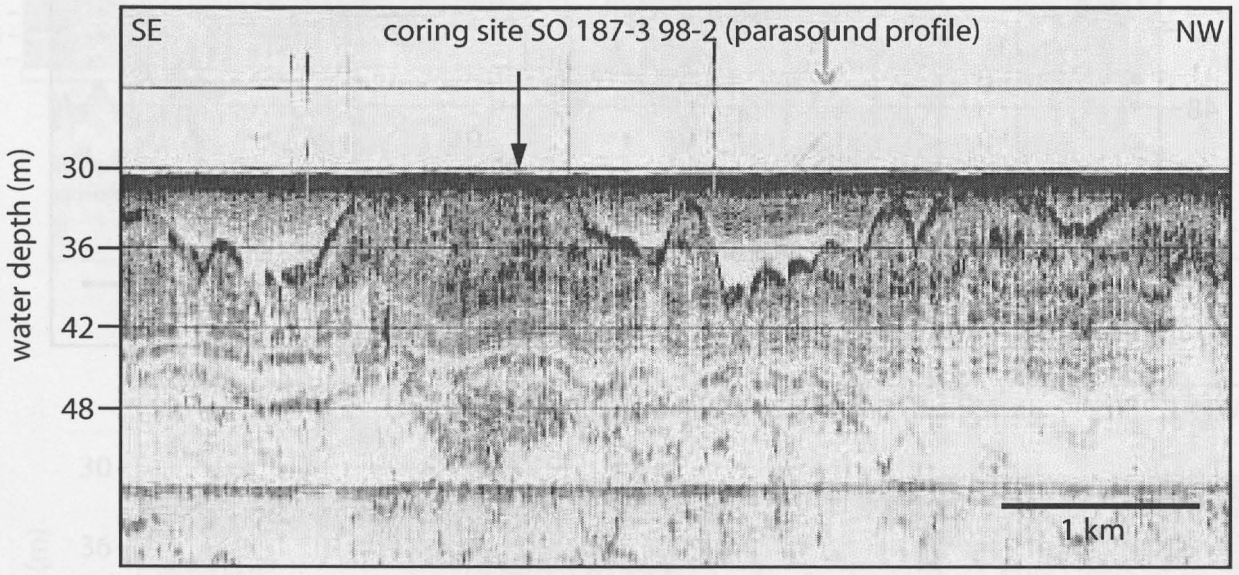


Station: 187-3 - 98-2 (GC) **Water depth: 30 m**

Position: 08°27,693'N / 104°28,362'E **Recovery: 130 cm**

Date: 06.05.2006

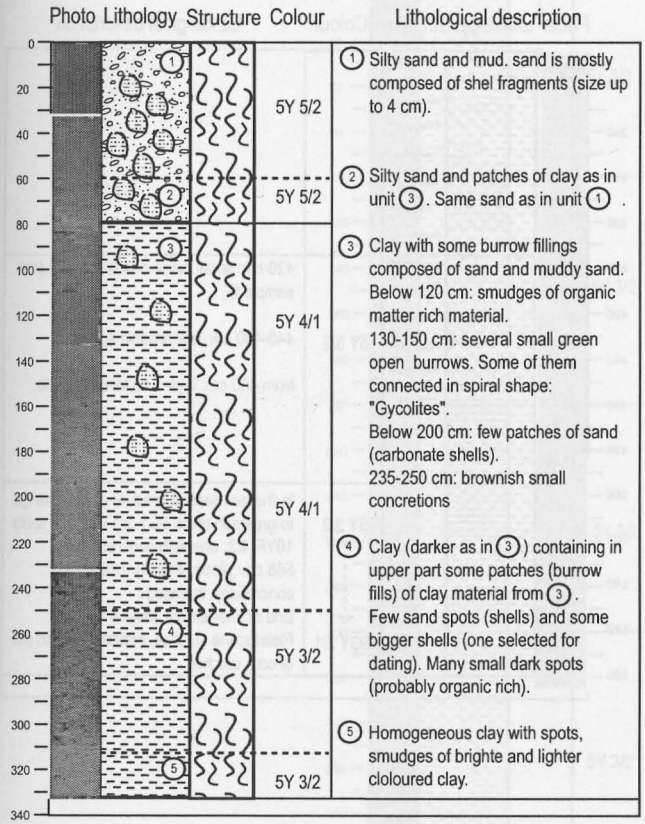


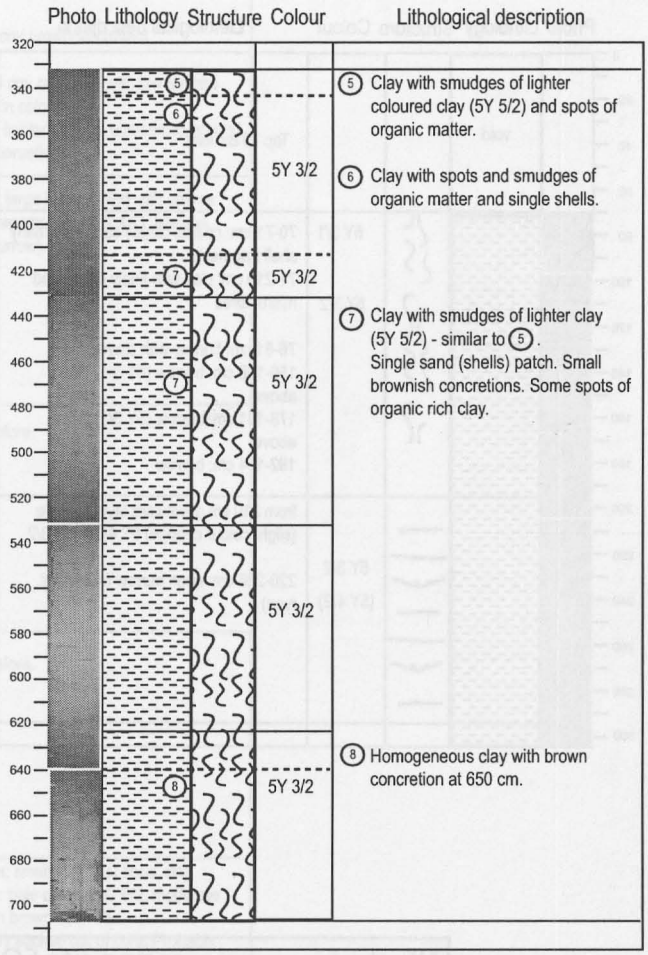


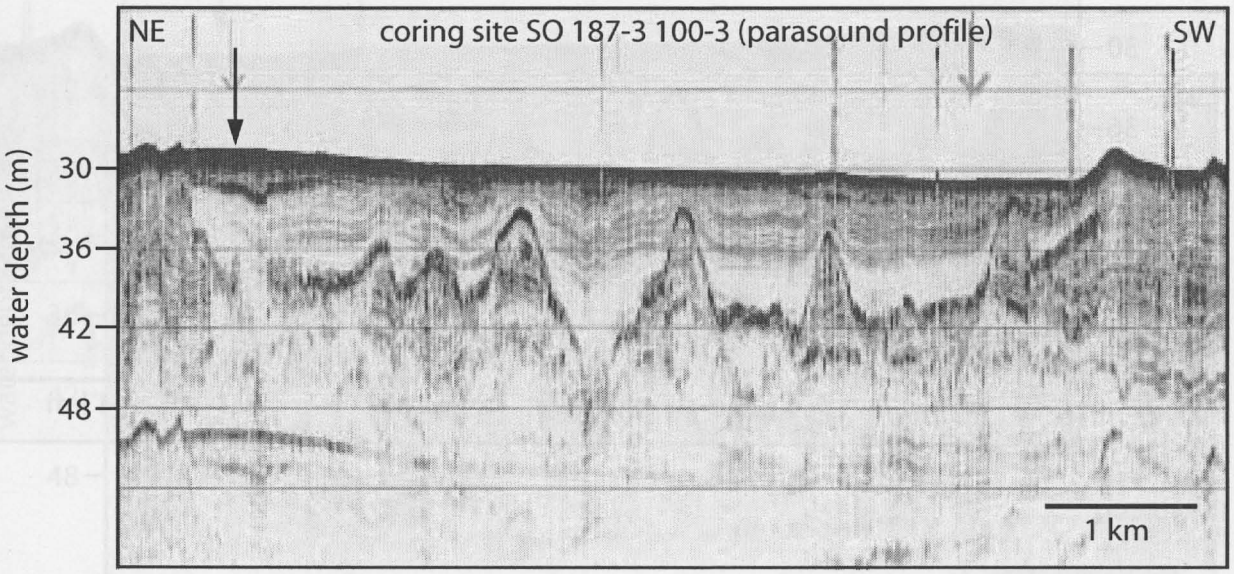
Station: 187-3 - 100-3 (GC) **Water depth: 28 m**

Position: 08°31,415'N / 104°20,153'E **Recovery: 707 cm**

Date: 06.05.2006



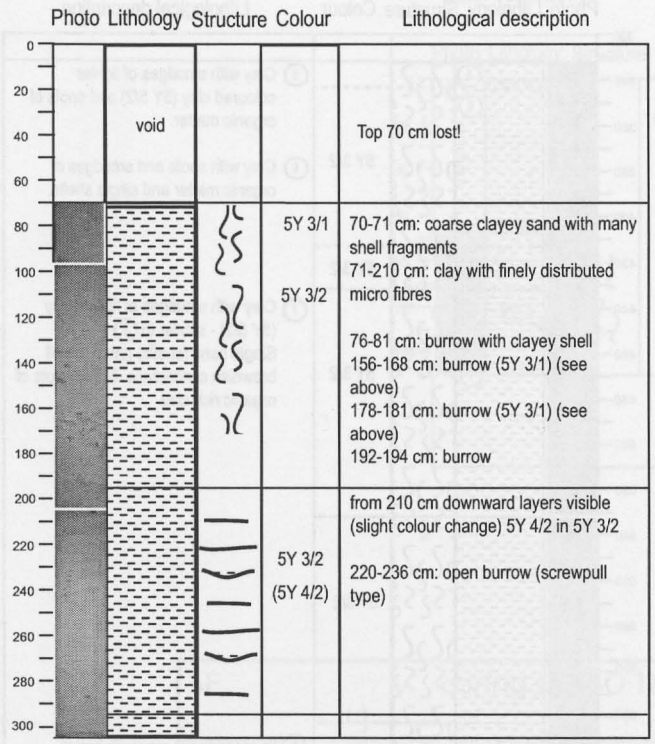


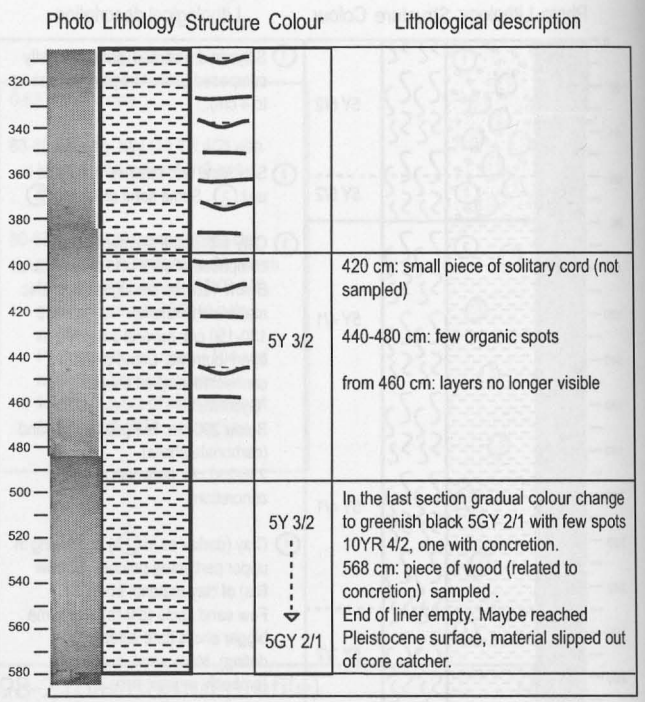


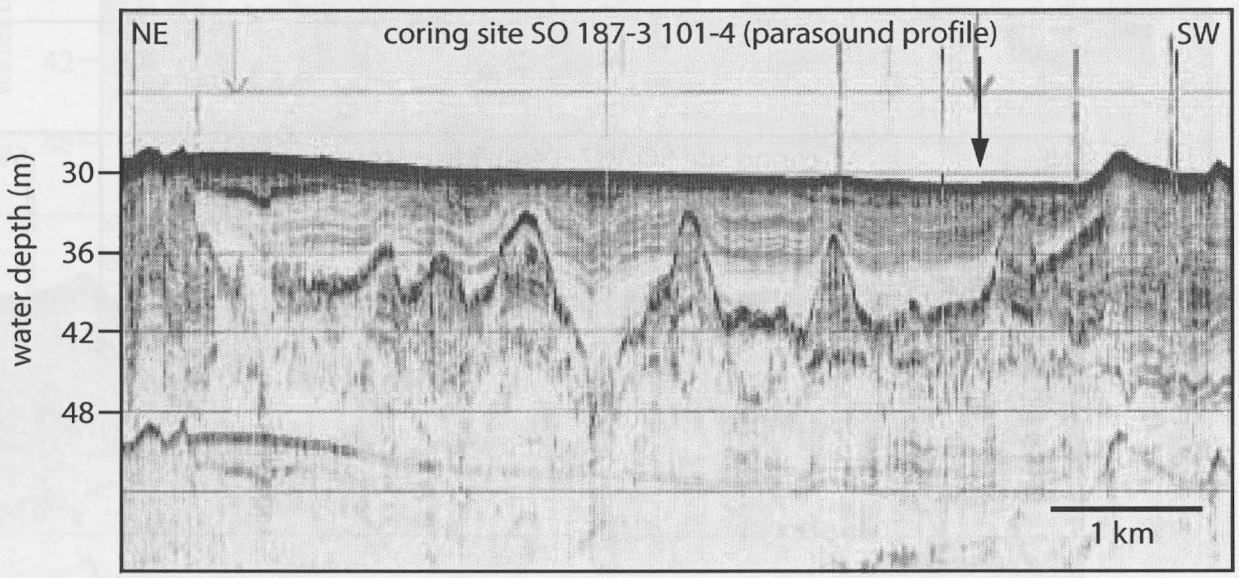
Station: 187-3 - 101-4 (GC) **Water depth: 30 m**

Position: 08°30.098'N / 104°18.147'E **Recovery: 580 cm**

Date: 06.05.06



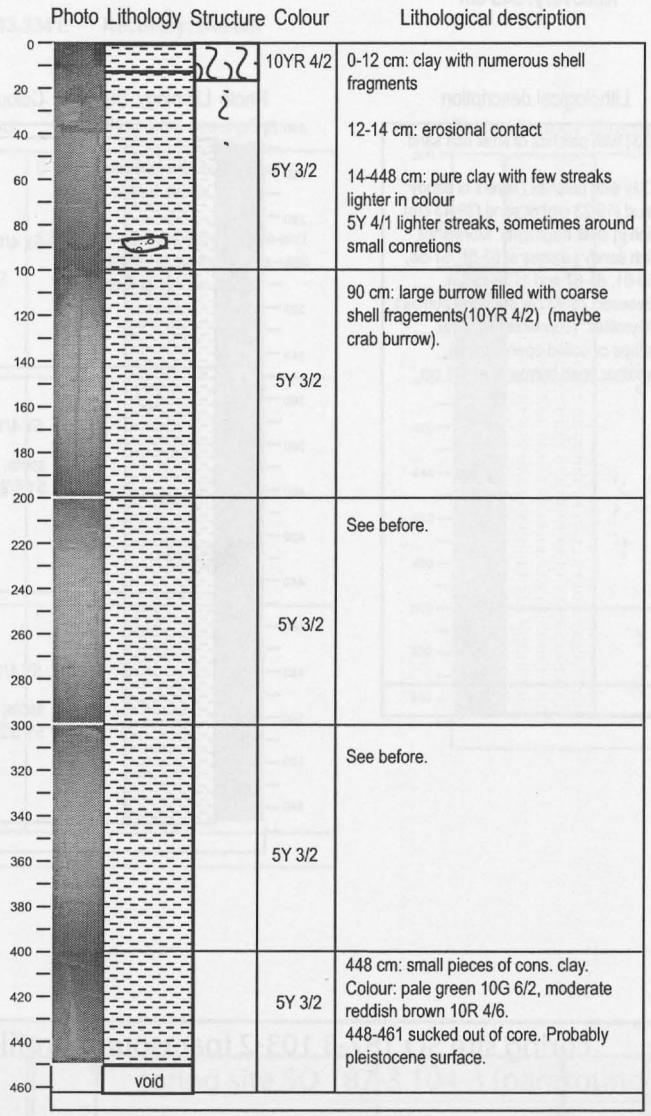


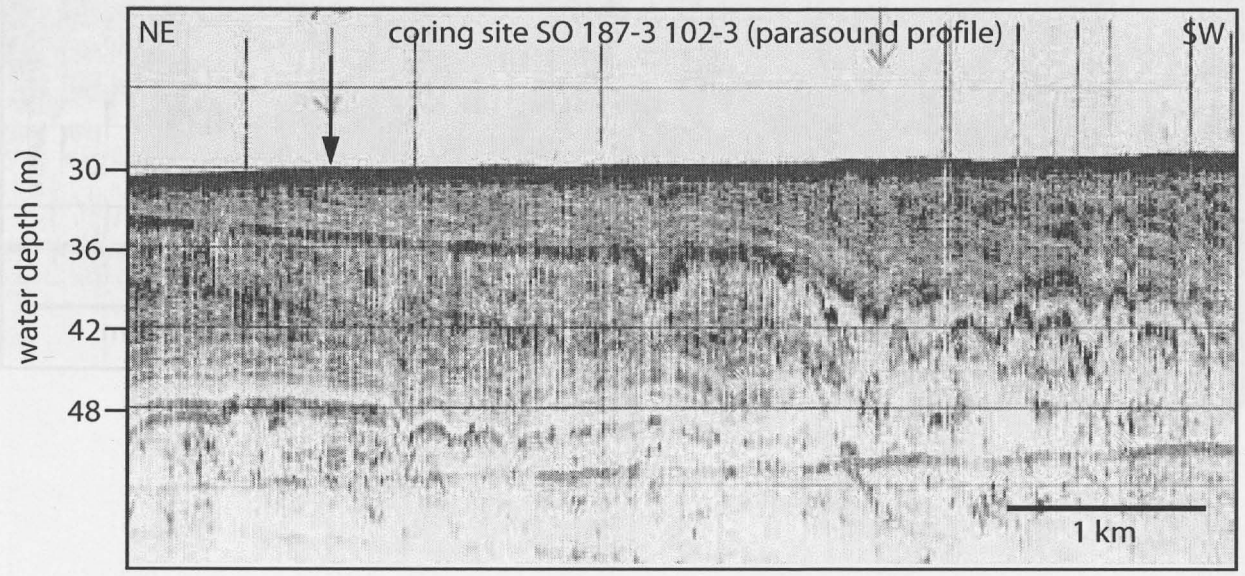


Station: 187-3 - 102-3 (GC) **Water depth: 29 m**

Position: 08°26,636'N / 104°13,606'E **Recovery: 461 (448) cm**

Date: 06.05.2006

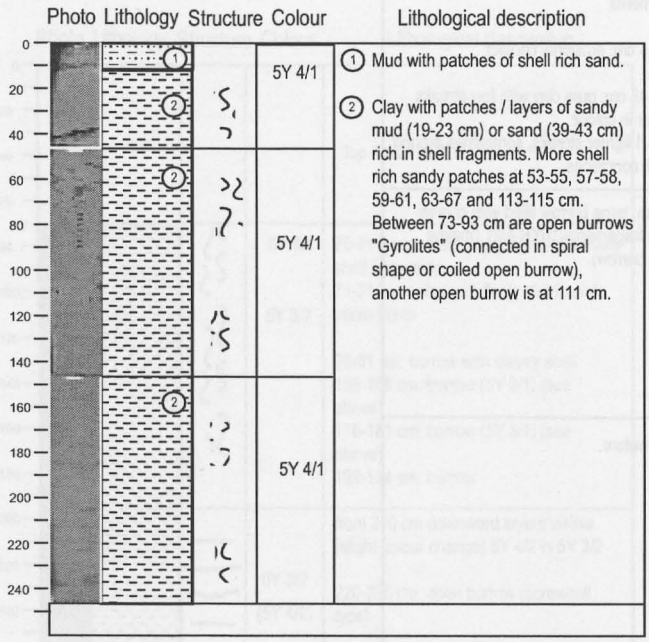


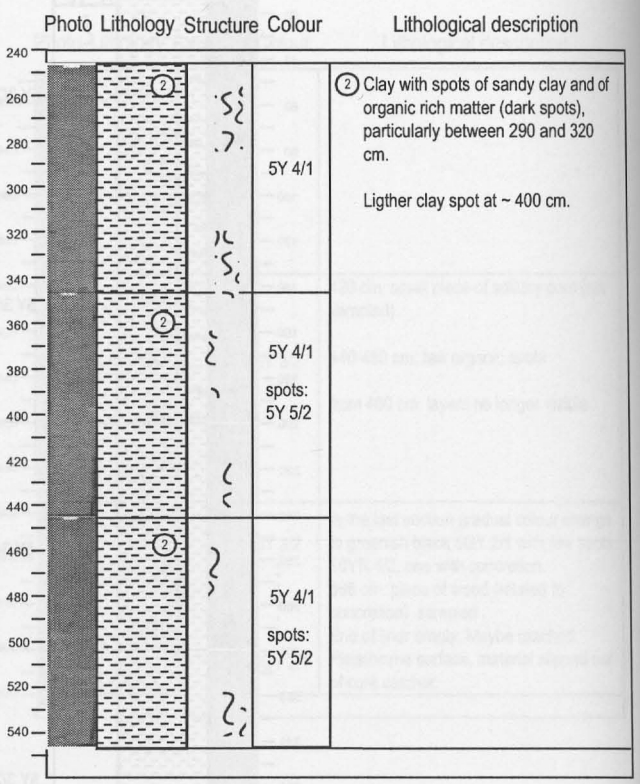


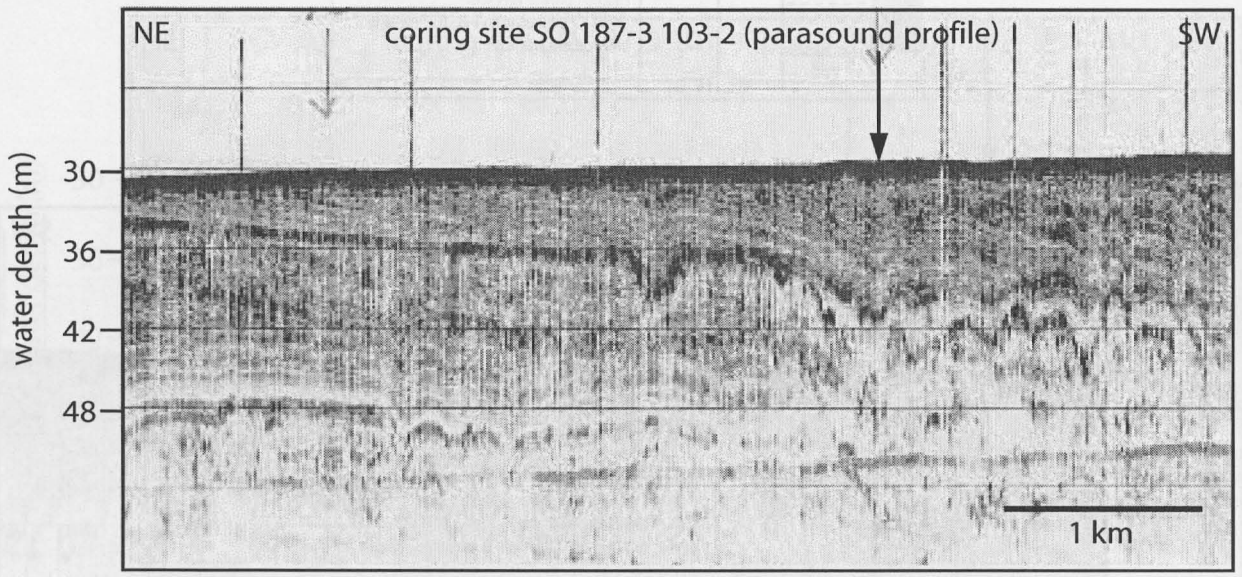
Station: 187-3 - 103-2 (GC) **Water depth: 28 m**

Position: 08°25,721'N / 104°12,433'E **Recovery: 545 cm**

Date: 07.05.2006



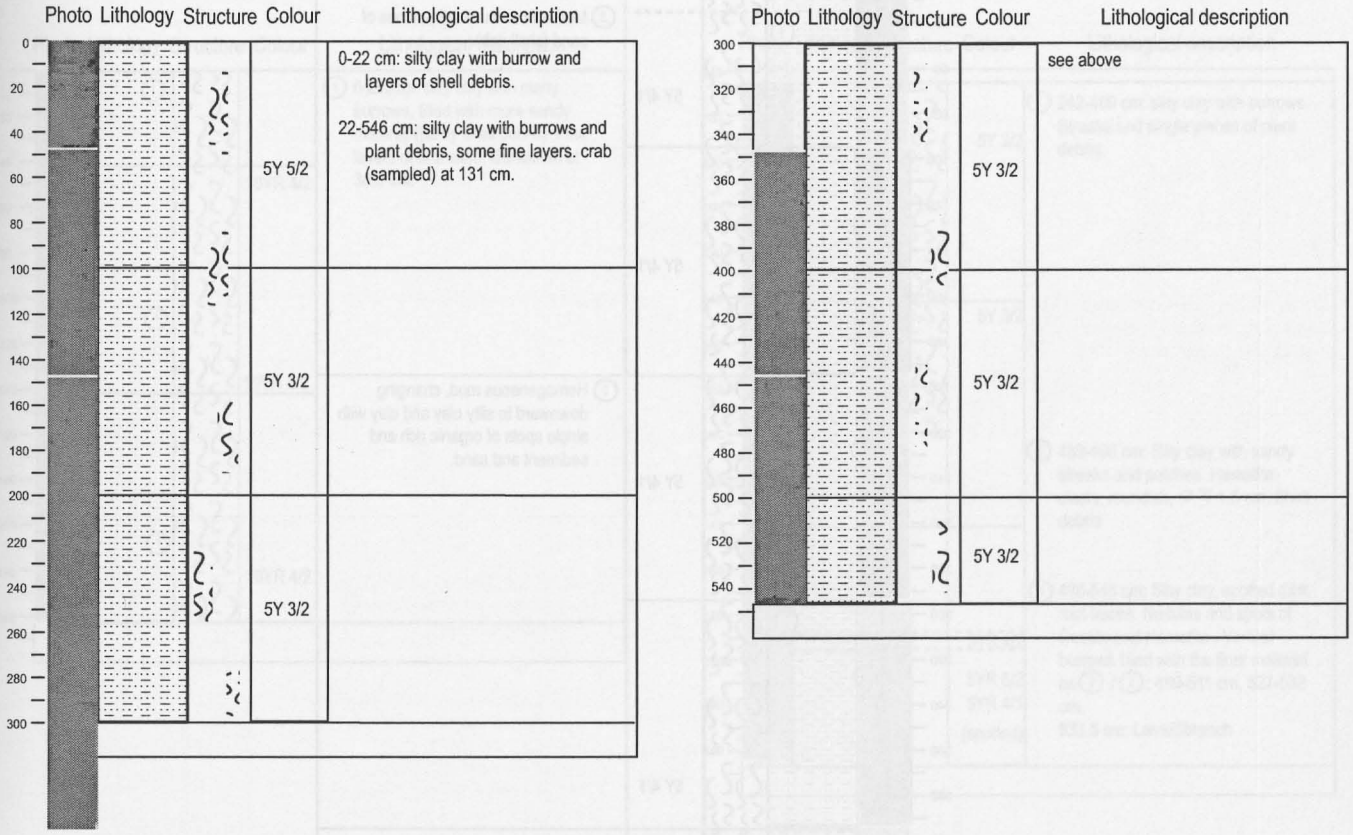


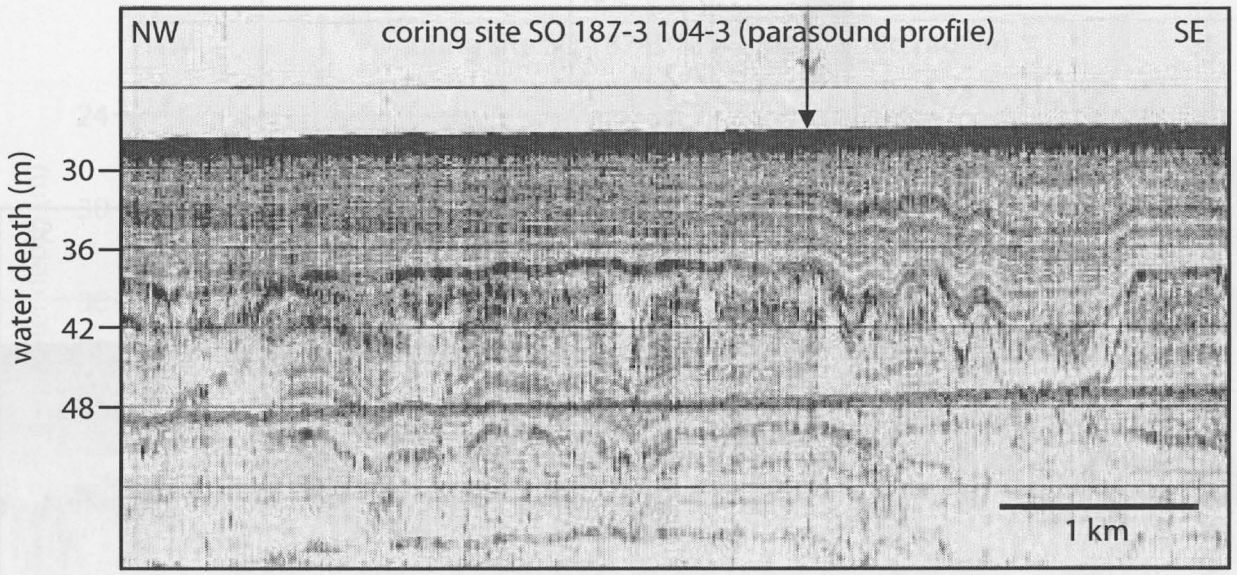


Station: 187-3 - 104-3 (GC) **Water depth: 26 m**

Position: 08°22,556'N / 104°13,234'E **Recovery: 546 cm**

Date: 07.05.2006

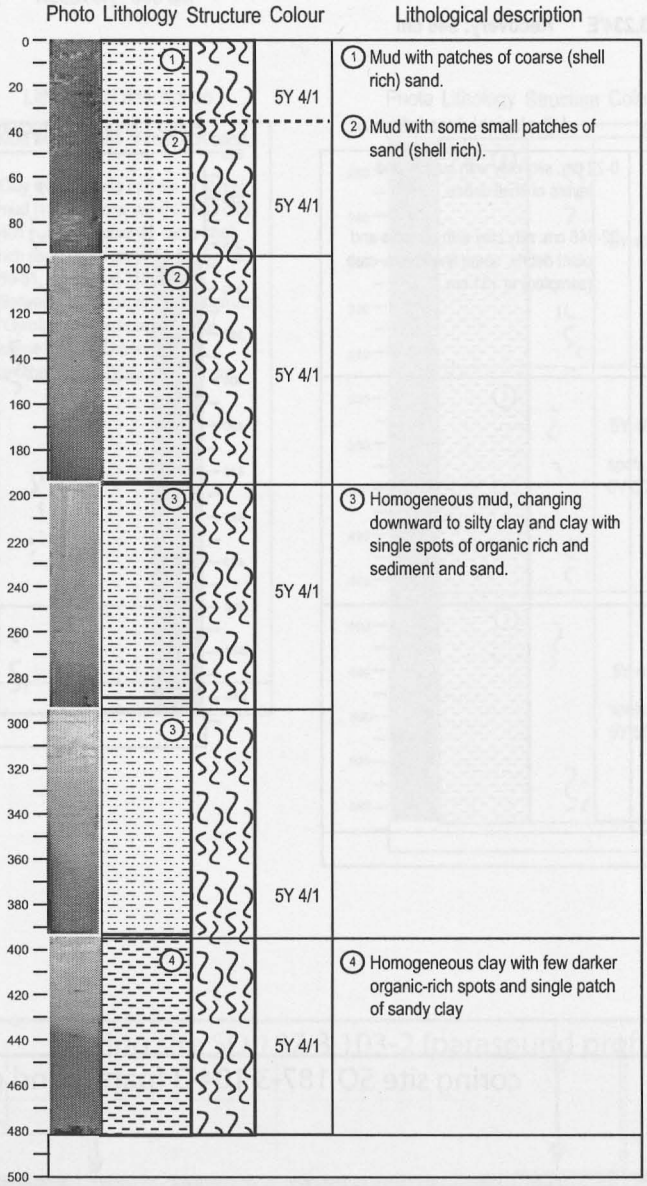


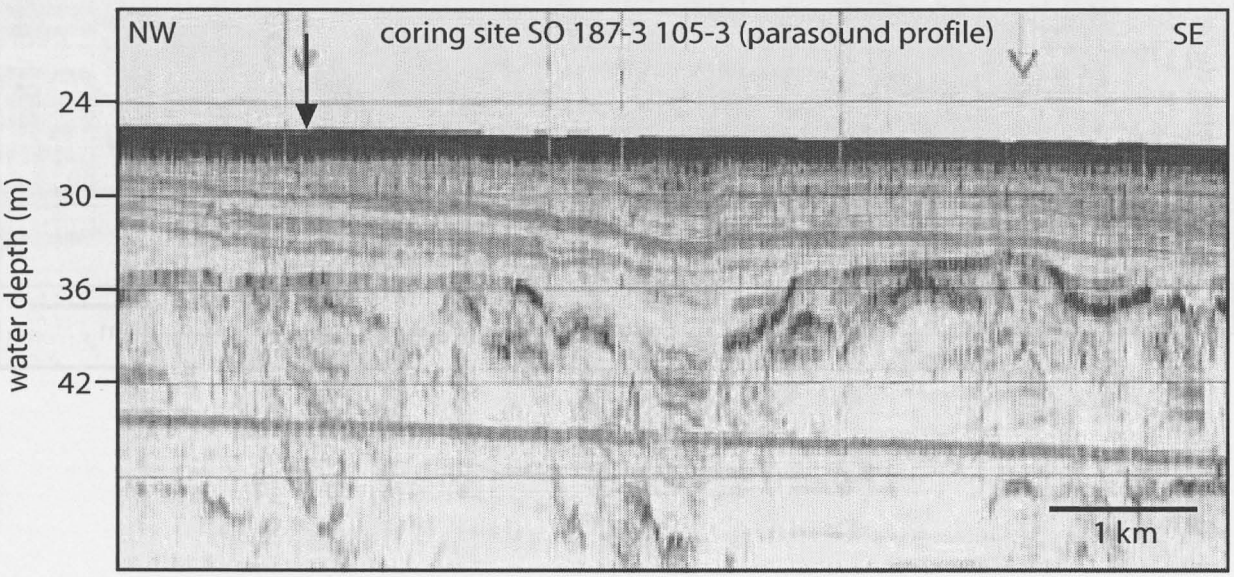


Station: 187-3 - 105-3 (GC) **Water depth: 25 m**

Position: 08°11,371'N / 104°31,123'E **Recovery: 481 cm**

Date: 07.05.2006

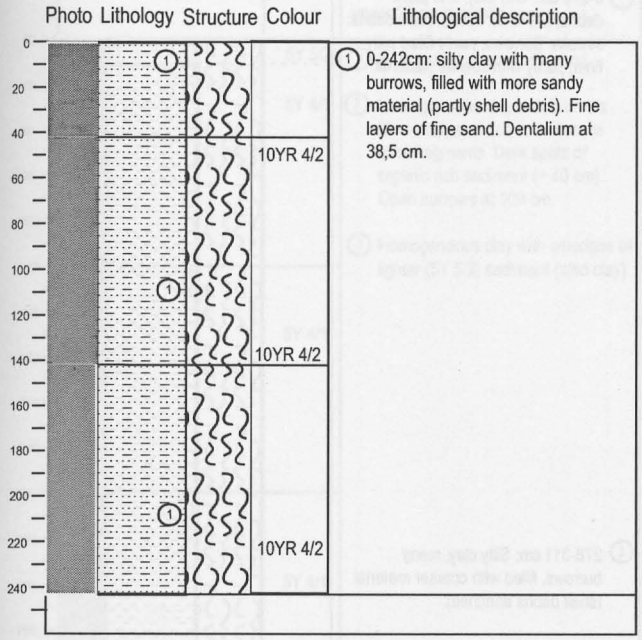


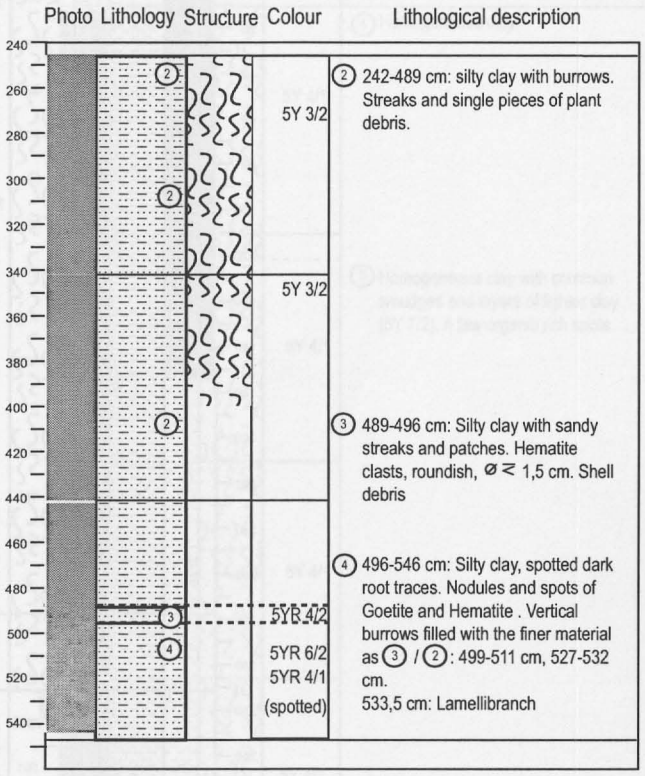


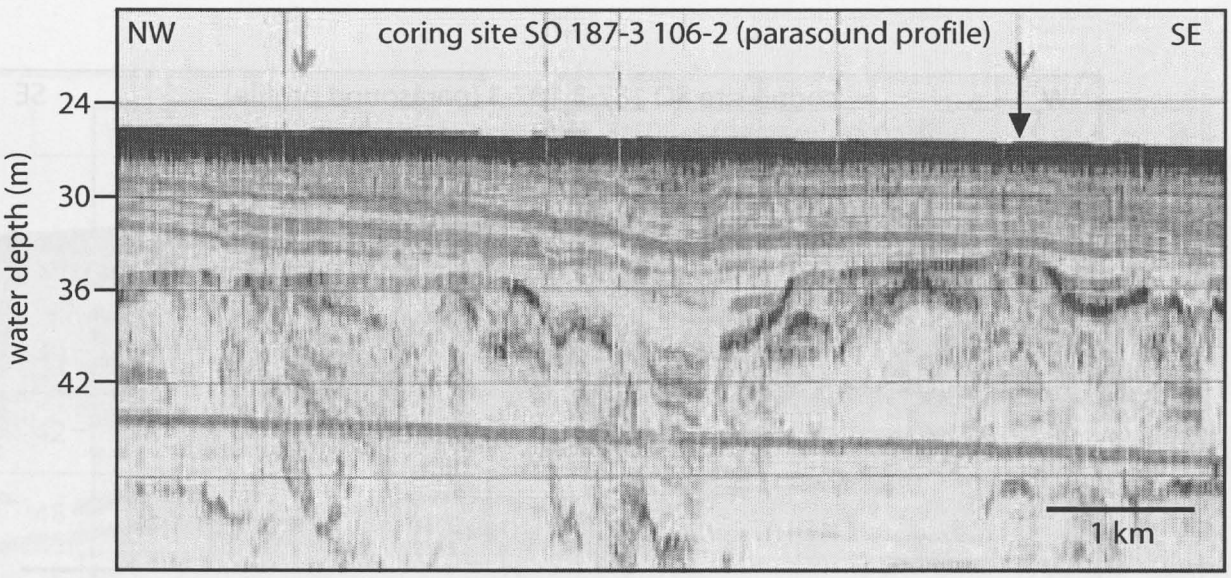
Station: 187-3 - 106-2 (GC) **Water depth: 26 m**

Position: 08°11,213'N / 104°33,691'E **Recovery: 545 cm**

Date: 07.05.2006



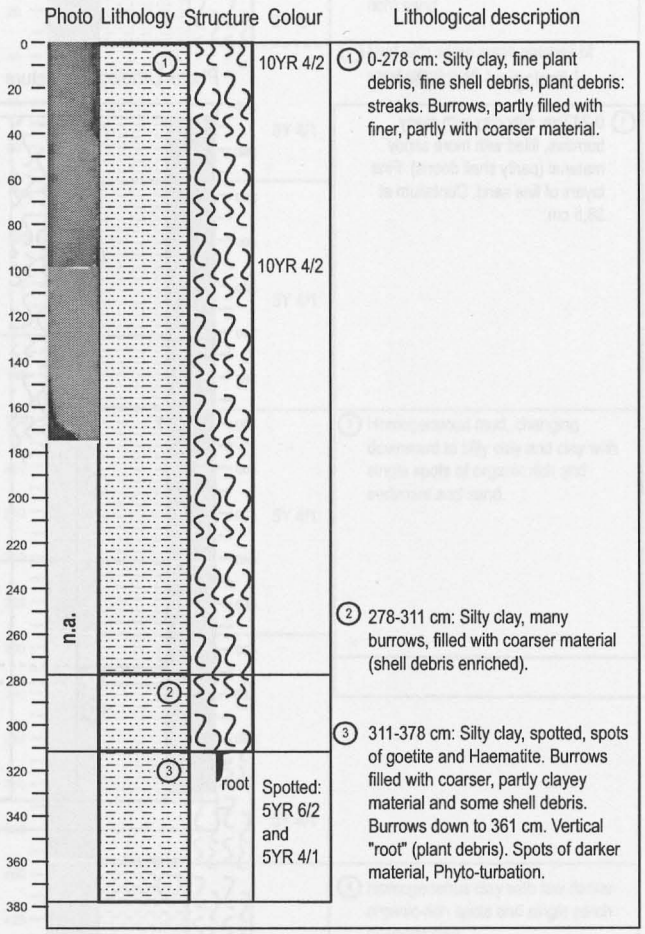


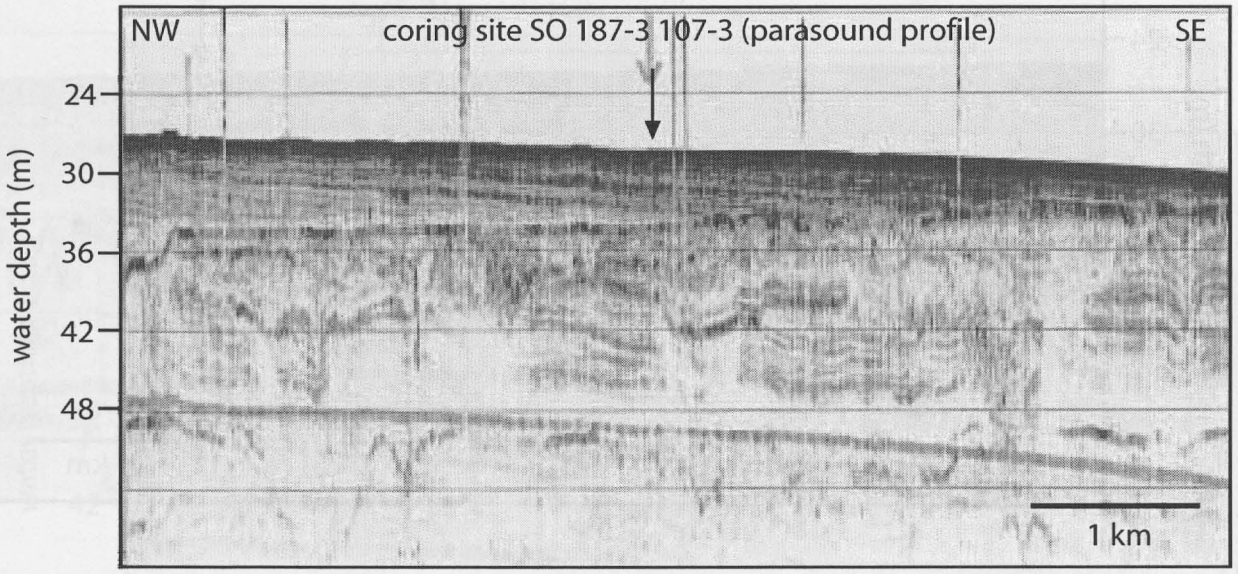


Station: 187-3 - 107-3 (GC) **Water depth: 27 m**

Position: 8°09,328'N/104°34,375'E **Recovery: 378 cm**

Date: 07.05.2006

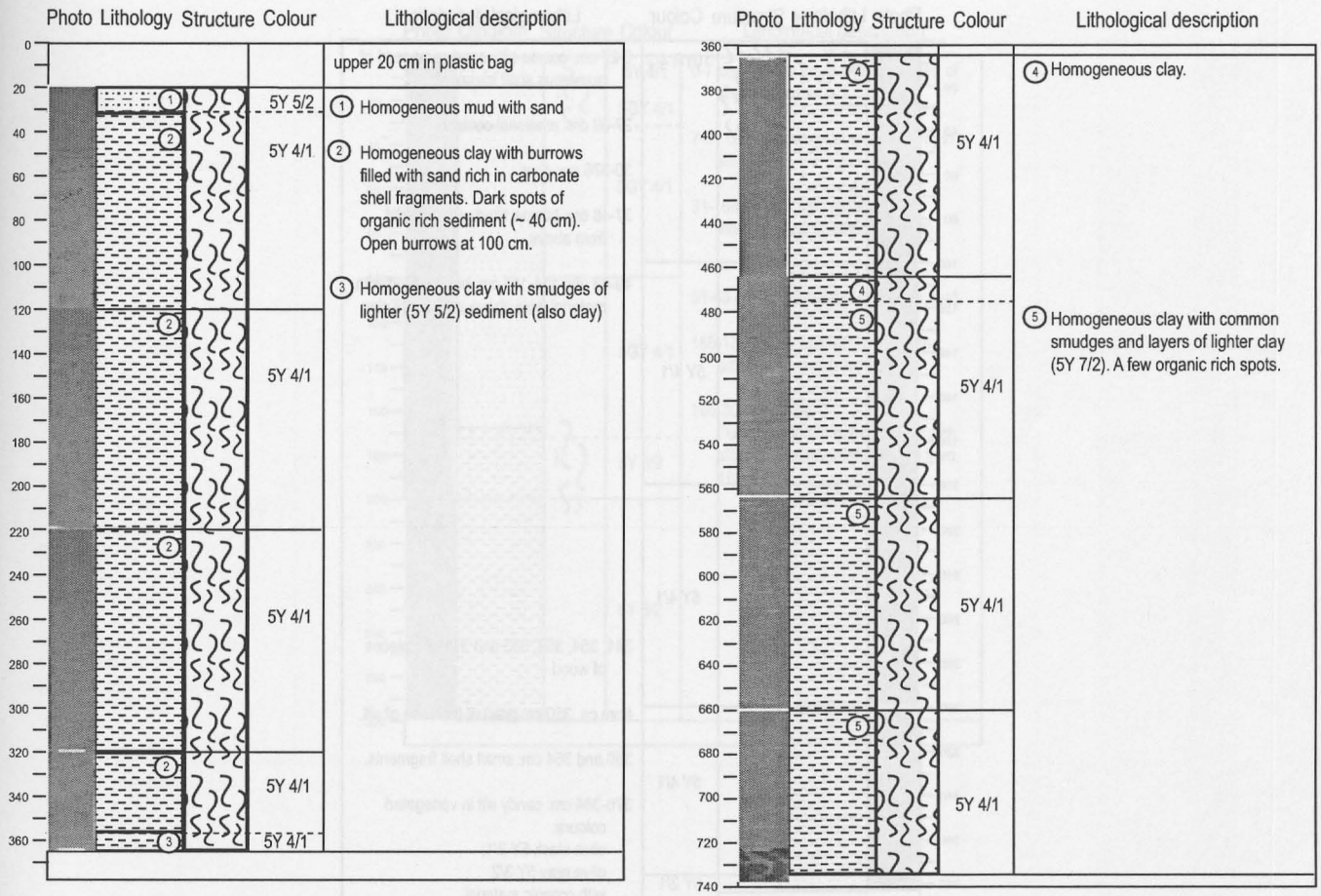


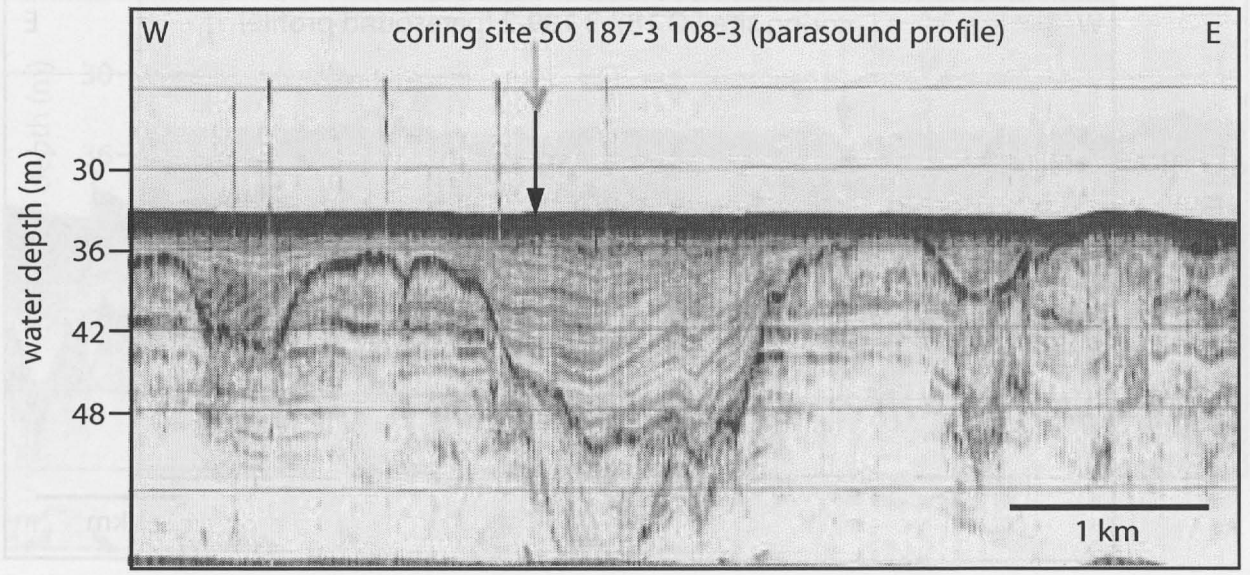


Station: 187-3 -108-3 (GC) **Water depth: 32 m**

Position: 08°07,005'N / 104°57,037'E **Recovery: 737 cm**

Date: 07.05.2006

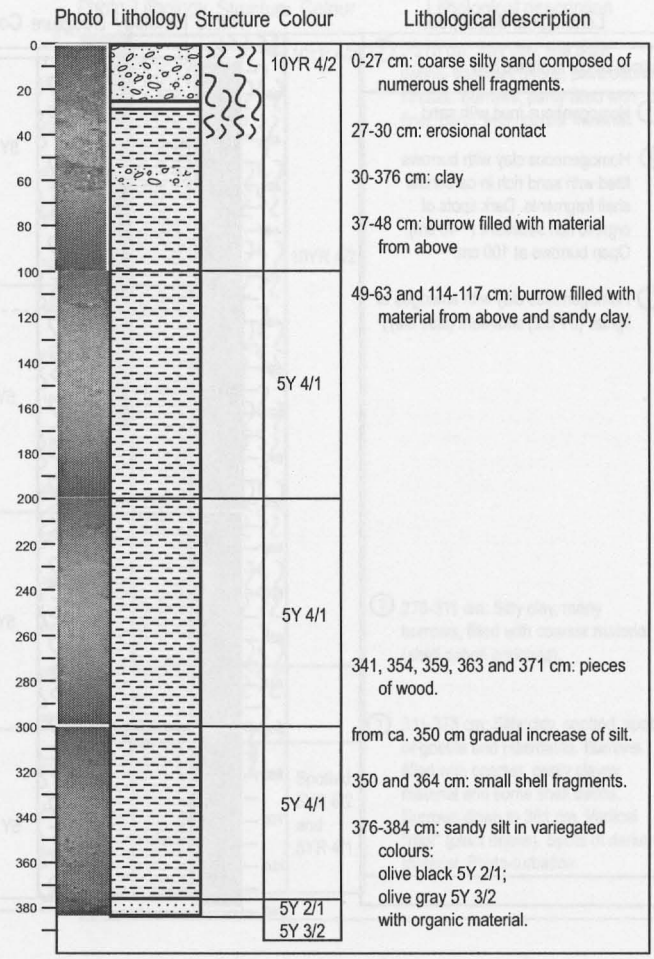


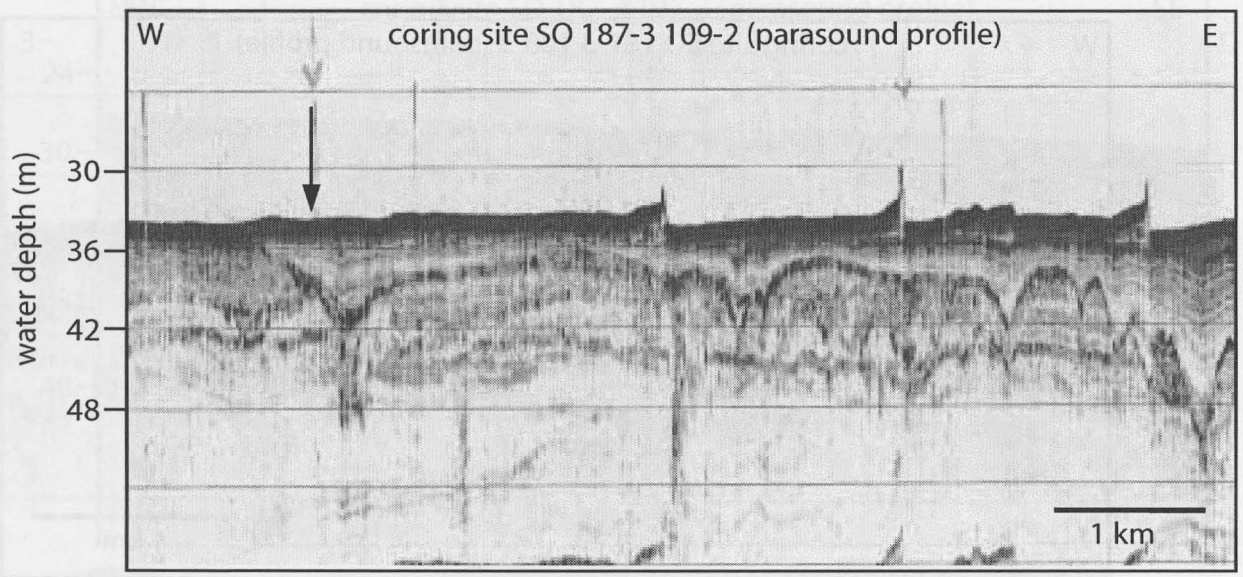


Station: 187-3 -109-2 (GC) **Water depth: 33 m**

Position: 08°06,964'N / 105°14,523'E **Recovery: 384 cm**

Date: 07.05.2006

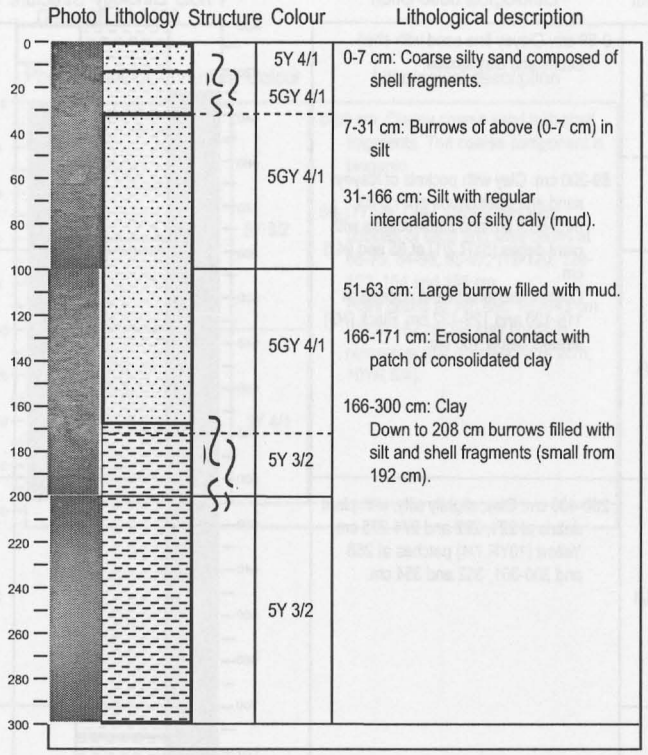


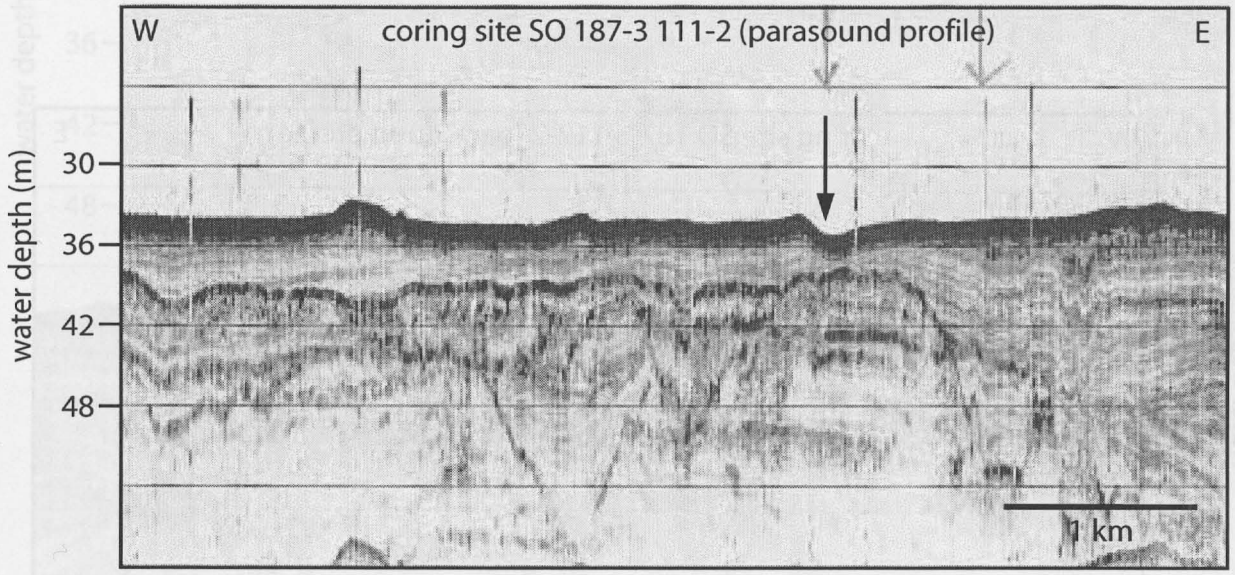


Station: 187-3 - 111-2 (GC) **Water depth: 35 m**

Position: 08°06,997'N / 105°22,954'E **Recovery: 300 cm**

Date: 07.05.2006

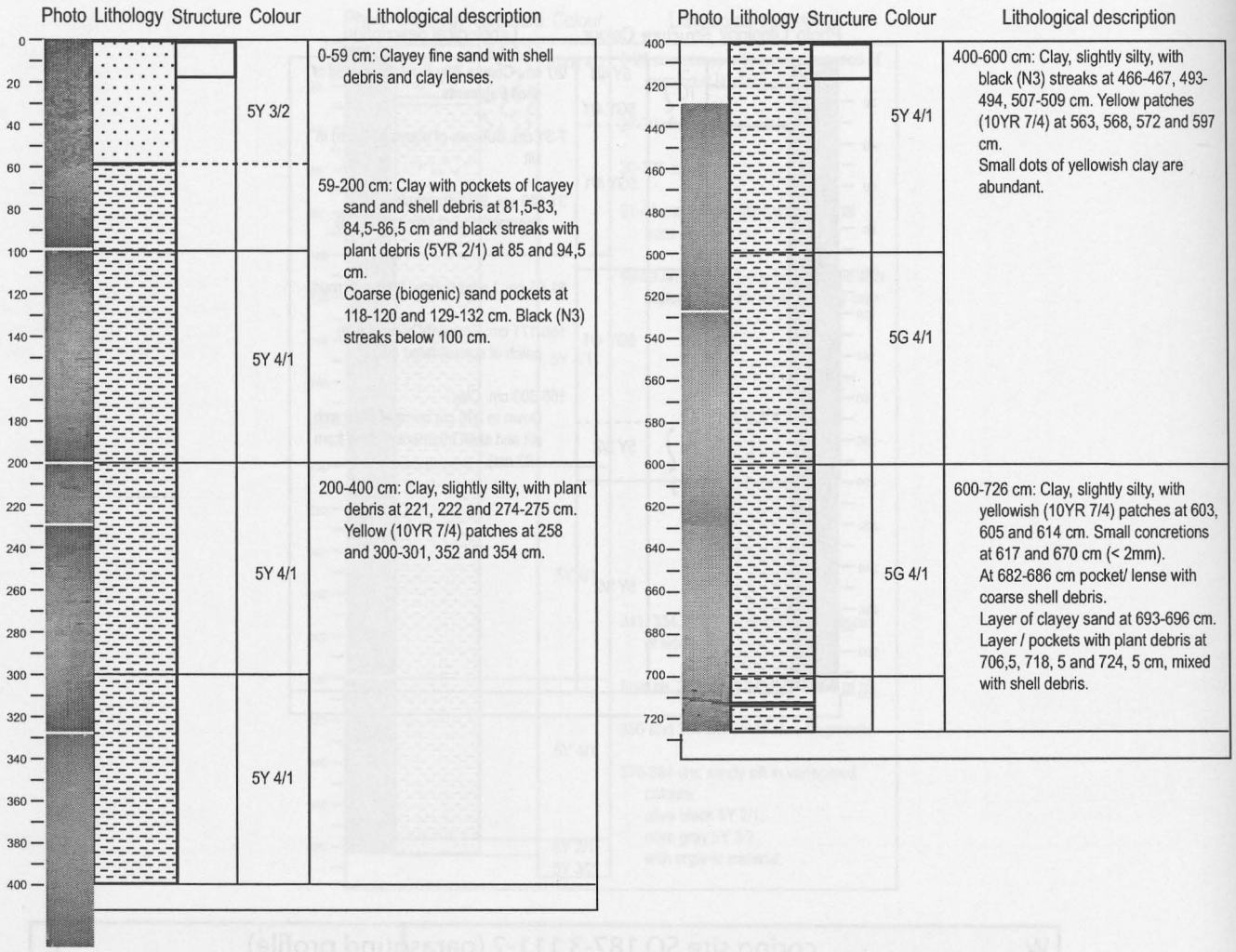


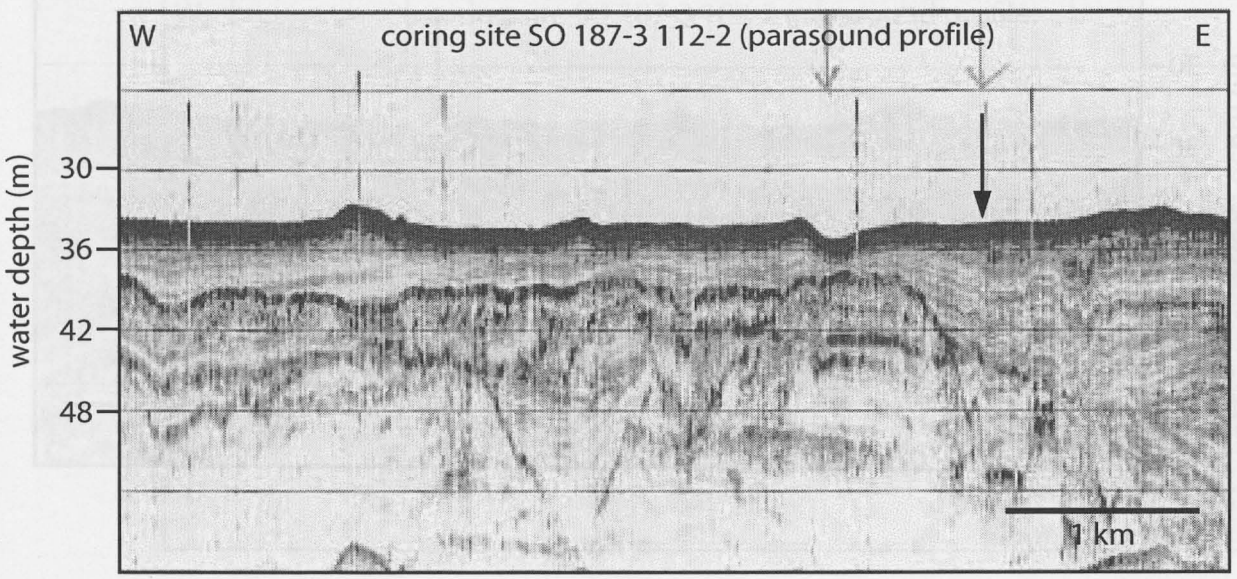


Station: 187-3 - 112-2 (GC) **Water depth: 33 m**

Position: 08°06,998'N / 105°23,335'E **Recovery: 726 cm**

Date:

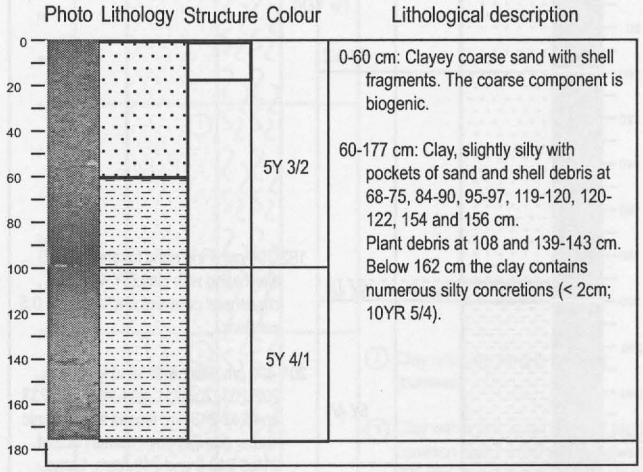


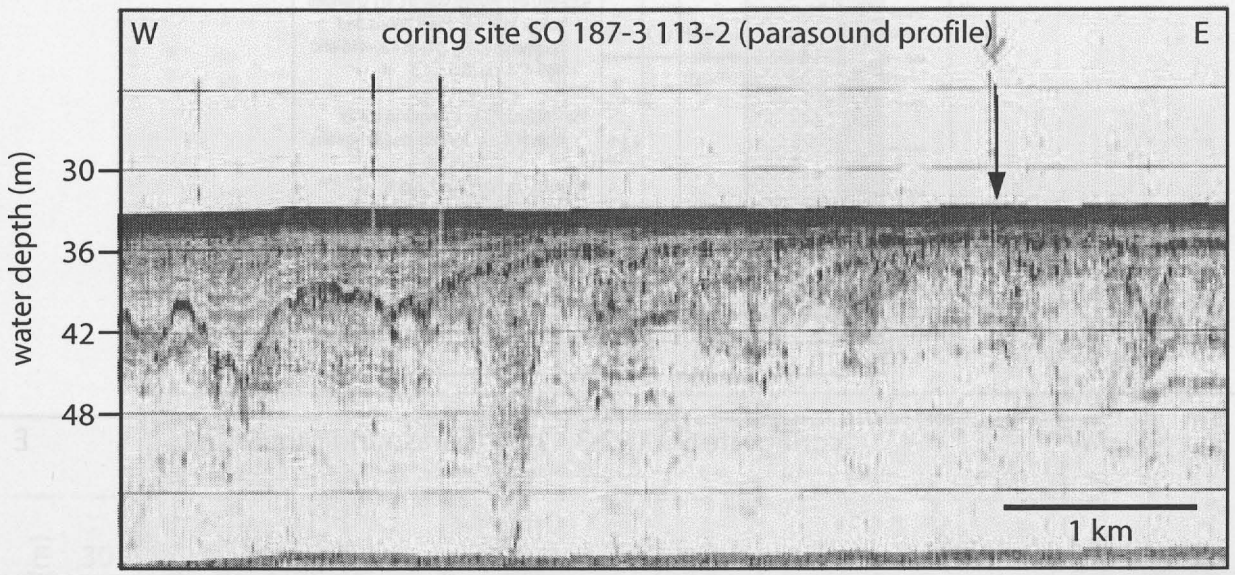


Station: 187-3 - 113-2 (GC) **Water depth: 32 m**

Position: 08°06,990'N / 105°28,861'E **Recovery: 177 cm**

Date: 08.05.2006

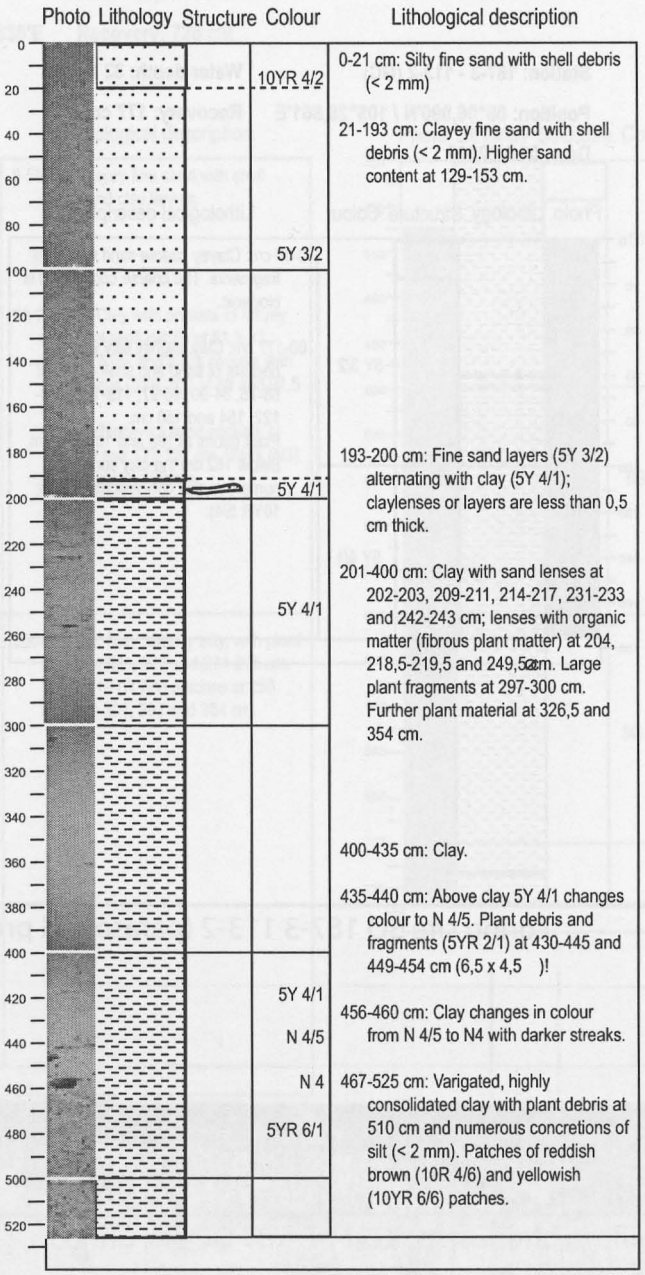


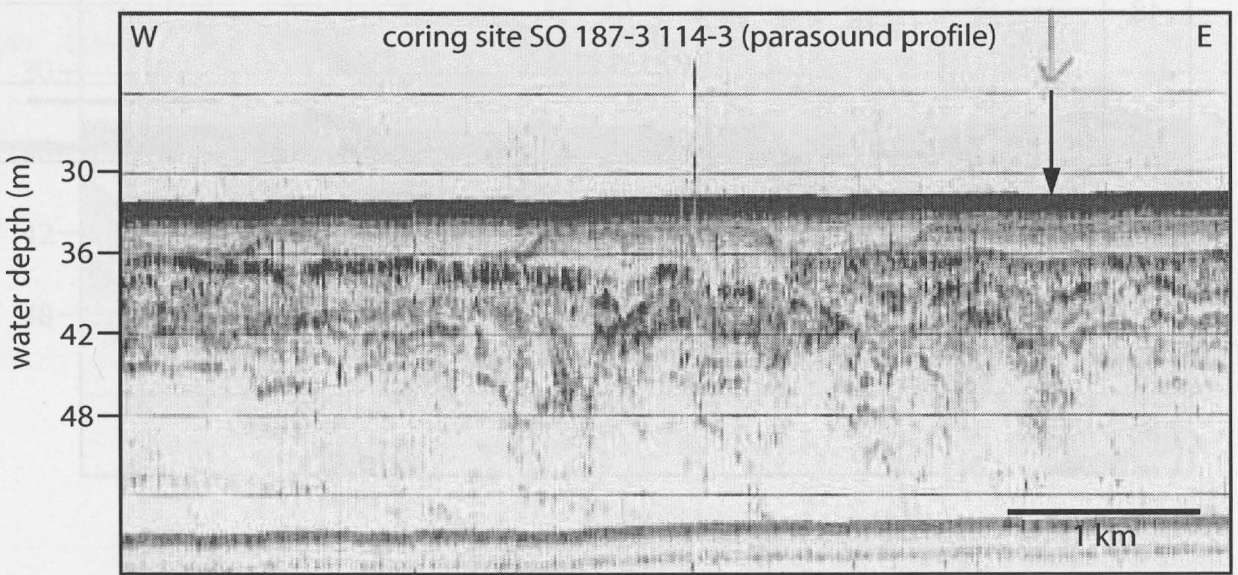


Station: 187-3 -114-3 (GC) **Water depth: 32 m**

Position: 08°06,984'N / 105°35,506'E **Recovery: 525 cm**

Date: 08.05.2006

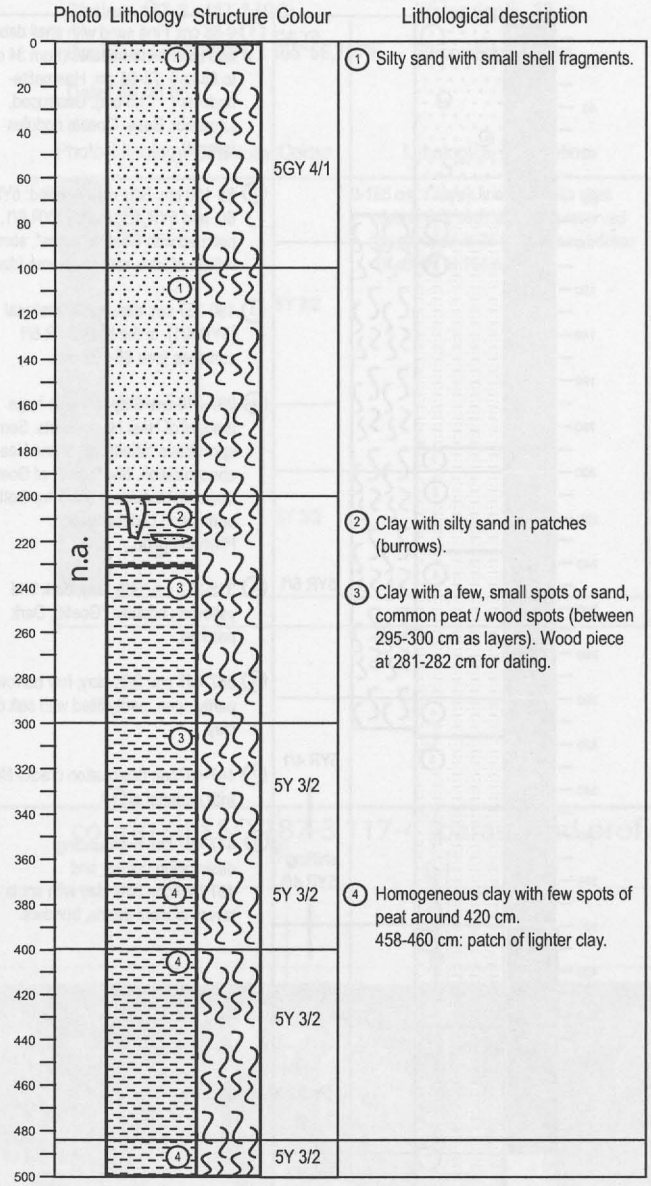


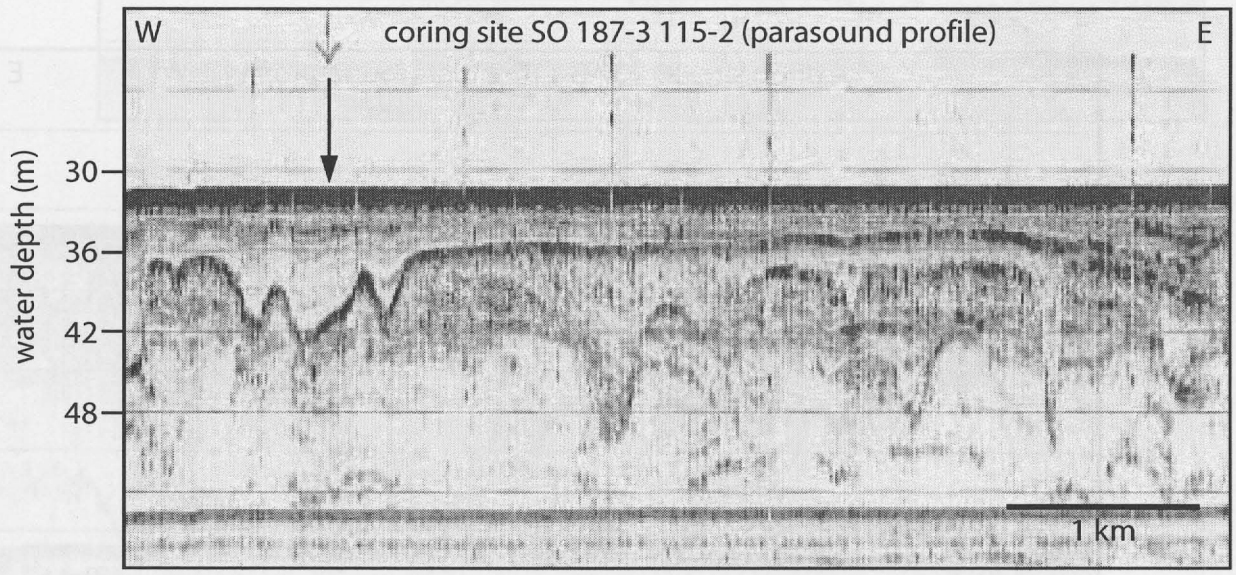


Station: 187-3 - 115-2 (GC) **Water depth: 32.5 m**

Position: 08°07,035'N / 105°36,180'E **Recovery: 500 cm**

Date: 08.05.2006

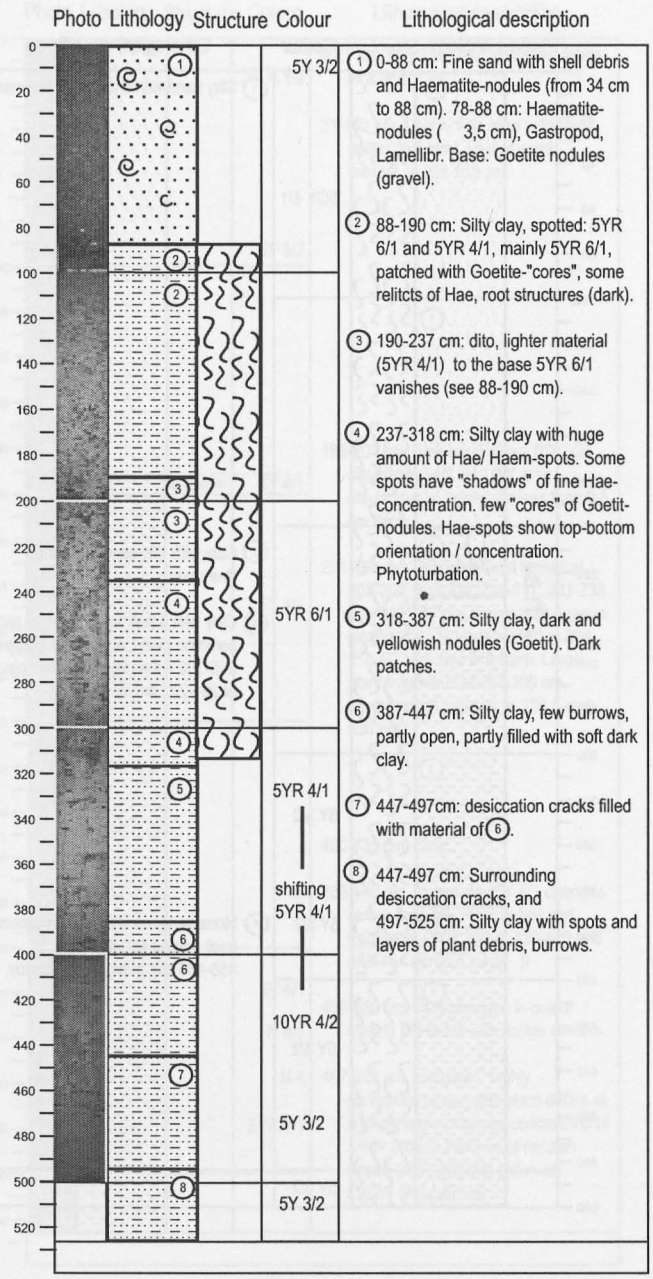


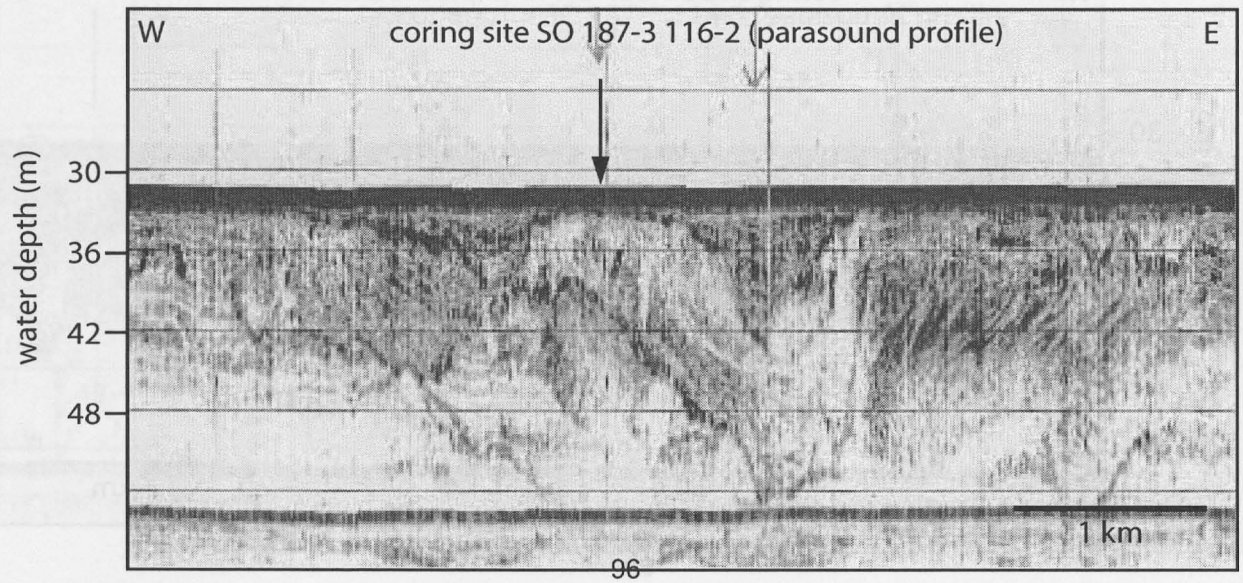


Station: 187-3 - 116-2 (GC) **Water depth: 32 m**

Position: 08°06,960'N / 105°56,332'E **Recovery: 527 cm**

Date: 08.05.2006

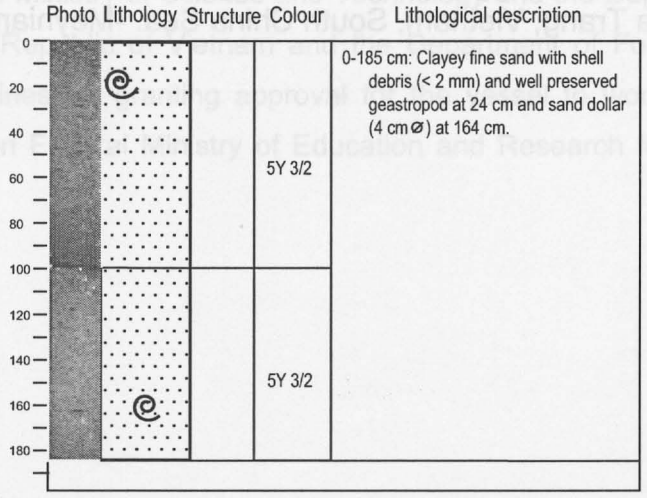


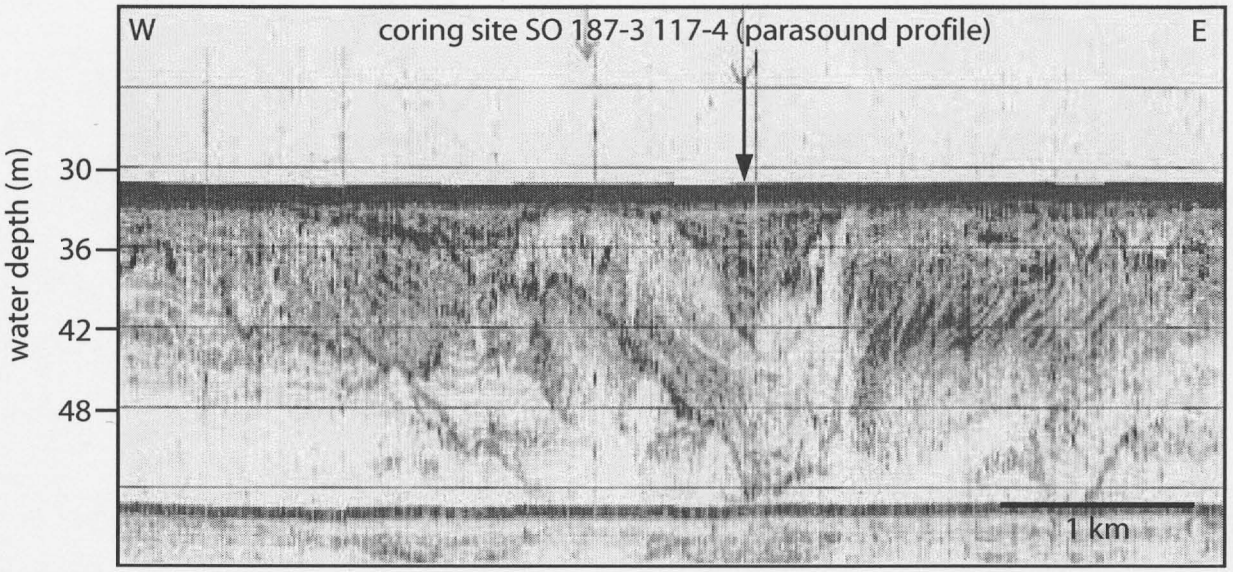


Station: 187-3 - 117-2 (GC) **Water depth: 32 m**

Position: 08°07,008'N / 105°56,797'E **Recovery: 185 cm**

Date: 08.05.06





5.7 References

Schimanski, A. and Stattegger, K., 2005, Deglacial and Holocene evolution of the Vietnam shelf: stratigraphy, sediments and sea-level change. Marine Geology, 214, 365-387.

Szczuciński, W. and Stattegger, K. ,2001, Style and rate of shelf sedimentation offshore Nha Trang, Vietnam, South China Sea. -Meyniana 53, 143-162.

6. Acknowledgements

The SO-187 scientific party thanks the captain, officers and crew of RV *Sonne* for their excellent work and assistance during the cruise; our partner institutions in Vietnam for assisting in the cruise logistics and in the export and import custom formalities for the scientific equipment; the Ministry of Science and Technology and the Department of Foreign Affairs of the Socialist Republic of Vietnam and the Department of Foreign Affairs of the Republic of the Philippines for granting approval for the vessel to work in their territorial waters; and the German Federal Ministry of Education and Research for financial support (grant no. 03G187A).