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SEA CAROUSEL MEASUREMENTS OF SEABED STABILITY IN MANITOUNUK SOUND, GRANDE BALEINE, HUDSON BAY

prepared by

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1.0 EXECUTIVE SUMMARY

A series of fifteen Sea Carousel deployments were undertaken along the length of Manitounuk Sound, Hudson Bay aboard MV Septentrion between 23^{rd} and 26^{th} August, 1992. The results of these deployments showed that seabed sediments could be sub-divided into two groups on the basis of their response to an applied fluid bed shear stress. Group (1) showed high erosion rates and low resistance to erosion, whereas group (2) showed lower erosion rates and higher resistance to erosion. The two groups segregate into distinct morphological regions. Group (1) is found in the inner and central Sound, whereas group (2) is found on the Sound flanks, sill and mouth. We interpret group (1) to be diagnostic of Holocene mud that floor the Sound. Group (2) is diagnostic of glacio-lacustrine or glacio-marine sediment that crops out at the flanks and sill of the Sound.

These differences notwithstanding, cohesion (or the surface critical shear stress for erosion) and friction angle (increase in strength with depth below the mudline) showed a systematic increase seawards along the length of the Sound. This trend is commensurate with a decreasing sedimentation rate, evident from the thickness of the Holocene sequence seen in seismic section.

Measured erosion rates showed two major Types: Type I erosion - a surface phenomenon at intermediate bed shear stresses, whereby erosion was greatest for the first 60 seconds of stress onset and thereafter decreased in an asymptotically-decaying fashion over a 5-minute period; and Type II erosion - a sub-surface phenomenon at higher bed shear stresses whereby erosion rate peaks during the first 60 seconds of the applied stress but erosion continues for the duration of that applied stress.

Peak erosion rate shows no relationship to applied bed shear stress. It did, however, correlate well with excess bed shear stress (the applied shear stress minus the critical value for erosion onset). This relationship is valid and constant for all stations and all erosion Types.

The tests of this study provide data on three important parameters in the evaluation of seabed erodibility by fluid stresses: (1) the surface critical shear stress for the onset of erosion; (2) the distribution of the critical shear stress with depth below the mudline; and (3) the erosion rate once the critical shear stress has been exceeded.

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FIGURE 6.2.7. The time-series of results from station GB8 (group (1), central Sound). A good data set was collected reflecting 6 speed increments. Data from the first 15 minutes of the experiment were lost. For the remainder, Type II erosion prevailed throughout.

FIGURE 6.2.8. The time-series of results from station GB9 (group (1), central Sound). A good data set was collected reflecting 10 speed increments. No erosion occurred at the first increment (0.08 m/s), Type I erosion prevailed for the subsequent five increments. For the remainder, Type II erosion prevailed throughout.

FIGURE 6.2.9. The time-series of results from station GB10 (group (1), central Sound). A good data set was collected reflecting 10 speed increments. No erosion occurred at the first increment (0.18 m/s), Type I erosion prevailed for the subsequent three increments. For the remainder, Type II erosion prevailed.

FIGURE 6.2.10. The time-series of results from station GB11 (group (2), central Sound). A good data set was collected reflecting 10 speed increments. No clear pattern of erosion was evident due to very low resuspension rates. Also, the drop-off in concentration evident in the middle panel is diagnostic of water loss at the base of the flume. The inference of this is a very hard substrate as the flume did not penetrate into it. Type I erosion was, however, evident for the first 2 speed increments.

FIGURE 6.2.11. The time-series of results from station GB12 (group (1), central Sound). A good data set was collected reflecting 9 speed increments. Also, sediment settling was allowed to take place under still water conditions at the end of the erosion experiment (22.75 to 23.2 GMT). No erosion occurred under the first speed increment (0.22 m/s); Type I erosion prevailed at the subsequent two increments, whereas Type 2 erosion prevailed for the remaining deployment.

FIGURE 6.2.12. The time-series of results from station GB13 (group (2), central Sound). A good data set was collected reflecting 9 speed increments. Notice the irregularity of the speed increments and the lack of coherent speed steps evident in earlier deployments. This attribute of the speed suggests a rough, hard seabed and the generation of turbulent eddies shed from the roughness elements of the bed. Also, note that the maximum velocity is *circa* 0.6 m/s. Over smooth beds (typified by the earlier experiments) the peak velocity (for an equivalent power expenditure by the underwater motor) was *circa* 0.8 m/s. The 25% loss in peak velocity is attributed to turbulent energy dissipation associated with seabed form drag. Also note that virtually no seabed erosion took place at this site.

FIGURE 6.2.13. The time-series of results from station GB14 (group (2), central Sound). Data relevant to 8 speed increments were recorded. Irregularities in the data set between 12.7 and 13.3 GMT are attributed to cabling problems and boat drift. Erosion rates were very low and no clear pattern emerges. Also note the irregular speed and the peak speed of *circa* 0.7 m/s. These indicate a rougher seabed than found at group (1) stations.

FIGURE 6.2.14. The time-series of results from station GB15 (group (2), outer Sound). Data relevant to 10

speed increments were recorded. The drop-off in SSC, evident at station GB11, is also evident here. This together with the low resuspension rates and the low peak current speed suggests a hard, rough seabed.

FIGURE 6.3.1. Applied bed shear stress plotted against depth beneath the seabed for station GB3A. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (2.2 Pa). The slope of the data points describes the failure envelope of the sediment and is proportional to the internal friction angle (87°).

FIGURE 6.3.2. Applied bed shear stress plotted against depth beneath the seabed for station GB4. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (1.4 Pa). The internal friction angle is 65°. Notice the fluidized bed near the surface and the presence of Type Ia, Type Ib and Type II erosion.

FIGURE 6.3.3. Applied bed shear stress plotted against depth beneath the seabed for station GB5. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (0.8 Pa). The friction angle is 50°. Notice the prevalence of Type Ib erosion.

FIGURE 6.3.4. Applied bed shear stress plotted against depth beneath the seabed for station GB6. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (1.2 Pa). The friction angle (of the lower layer) is 52°.

FIGURE 6.3.5. Applied bed shear stress plotted against depth beneath the seabed for station GB7. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (1.3 Pa). The friction angle is 77°. Type Ib erosion dominates near the surface; Type II erosion takes place beneath.

FIGURE 6.3.6. Applied bed shear stress plotted against depth beneath the seabed for station GB8. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (1.8 Pa). The friction angle is 34°.

FIGURE 6.3.7. Applied bed shear stress plotted against depth beneath the seabed for station GB9. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (1.9 Pa). The friction angle (of the lower layer) is 69°. The fluidized state of the near-surface (zero friction angle) together with a measurable cohesion is diagnostic of a gel.

FIGURE 6.3.8. Applied bed shear stress plotted against depth beneath the seabed for station GB10. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (1.5 Pa). The friction angle of the lower layer is variable (non-linear). The fluidized state of the near-surface (zero friction angle) together with a measurable cohesion is diagnostic of a gel.

FIGURE 6.3.9. Applied bed shear stress plotted against depth beneath the seabed for station GB11. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (1.5 Pa).

FIGURE 6.3.10. Applied bed shear stress plotted against depth beneath the seabed for station GB12. The surface intercept is the shear strength of the sediment or the critical shear stress for the onset of erosion (2.0

Pa). The friction angle is constant with depth, 9°.

FIGURE 6.3.11. Applied bed shear stress plotted against depth beneath the seabed for station GB13. No surface intercept is apparent. So the critical shear stress for the onset of erosion is larger than the maximum imposed bed shear stress (6.0 Pa).

FIGURE 6.3.12. Applied bed shear stress plotted against depth beneath the seabed for station GB14. The surface critical shear stress is 2.4 Pa and the friction angle is a constant 84°.

FIGURE 6.3.13. Applied bed shear stress plotted against depth beneath the seabed for station GB15. The surface critical shear stress is 0 Pa (i.e. no yield strength) and the friction angle is a constant 88°.

FIGURE 6.4.1. Seabed erosion rate ($kg/m^2/s$) plotted against applied bed shear stress (Pa) for station GB5. Notice the high degree of scatter for Type I erosion and the near-constant values for Type II erosion of 5×10^{-4} $kg/m^2/s$).

FIGURE 6.4.2. Seabed erosion rate ($kg/m^2/s$) plotted against applied bed shear stress (Pa) for station GB6. Notice the apparent increase of Type I erosion with stress, and the near-constant values for Type II erosion of 7×10^{-4} $kg/m^2/s$).

FIGURE 6.4.3. Seabed erosion rate ($kg/m^2/s$) plotted against applied bed shear stress (Pa) for station GB7. Notice the wide scatter in erosion rates (10^{-5} to 10^{-2} $kg/m^2/s$) for both Types of erosion.

FIGURE 6.4.4. Peak erosion rate, time-averaged over 60 seconds, plotted against time-averaged bed shear stress (Pa) for all stations. There is no apparent correlation between the two variables.

FIGURE 6.4.5. Peak erosion rate, time-averaged over 60 seconds, plotted against excess (applied stress minus yield strength) bed shear stress (Pa) for all stations. A significant log/linear correlation now exists ($r = 0.67$; $n = 23$). The relationship holds for all stations and for all Types of erosion.

FIGURE 7.1. The surface critical shear stress for erosion and internal friction angle (A), surface water content and bulk density (B), and vane shear strength (C) for each station plotted with distance along Manitounuk Sound. There is a clear trend of increasing strength and friction angle down the Sound to the sill. This is commensurate with an increase in bulk density and a decrease in water content. Vane shear strength also shows a trend similar to the cohesion detected by the Carousel. Stations GB11 and GB13 do not fit the overall trend as they were located on the flank of Manitounuk Sound, and on its sill respectively. Here, consolidated glacio-lacustrine sediments crop out.

FIGURE 7.2. The surface critical shear stress for erosion and internal friction angle (A), bulk density and water content (B), and vane shear strength (C) for a transect off the proposed outfall of the James Bay II development. Notice the relatively high values at the Sound margins and the lowest values at the central part of the Sound.

4.0 THE SEA CAROUSEL

Sea Carousel, named after the carousels of Postma (1967) and Hydraulic Research Limited (Burt, 1984), is a benthic annular flume designed for field use in intertidal and subtidal settings. The carousel is 1.0 m in radius with an annulus 0.15 m wide and 0.30 m high (Figure 4.1; see Amos, Grant *et al.* 1992). It weighs approximately 150 kg in air and 40 kg in water and is made entirely of aluminium. Flow in the annulus is induced by rotating a movable lid that is driven by a 0.35 hp DC motor powered from the surface. Eight small paddles, spaced equidistantly beneath the lid, induce a flow of water in the annulus. The width of the annulus (D) was made 0.15 m to give a relative roughness (e/D) ≈ 0.004 (where the wall roughness, e ≈ 0.0006 m; after Shames, 1962). The water depth in the annulus was minimized to 0.25 m to ensure conditions for Nikuradse's "rough-pipe zone of flow" wherein changes in wall friction factor with changes in Reynolds number are at a minimum (Shames, 1962).

A schematic diagram of the Sea Carousel configuration is shown in Figure 4.2. It is equipped with three optical backscatter sensors (OBS's; Downing, 1983). Two of these are located non-intrusively on the inner wall of the annulus at heights of 0.03 and 0.18 m above the skirt (the skirt is a horizontal flange situated around the outer wall of the annulus 0.04 m above the base; it was designed to standardize penetration of the flume into the seabed; see Figure 4.3). The third OBS detects ambient particle concentration outside the annulus, or it may be used to detect internal sediment concentration at a height between the other two. The OBS sensors give linear responses to particle concentration (of a constant size) for both mud and sand over a concentration range of 0.1 to 50 g/L (Downing and Beach, 1989). They are unaffected by flows below 1.5 m/s and are stable through time. A sampling port is situated in the outer wall of the annulus at a height of 0.2 m above the skirt through which water samples can be drawn to calibrate the three sensors under well mixed conditions.

A Marsh/McBirney current meter (model 511) is located on the centreline of the annulus at a height of 0.16 m above the skirt. It was used to detect the instantaneous azimuthal and vertical components of flow within the annulus (U_y and U_w respectively). Mean tangential lid rotational speed ($\bar{U}_r$) is detected through a shaft end-coder that rests on the lid. Controller boards for each sensor and the necessary power (12 VDC) are derived from an underwater pod located above the annulus. Output voltages from all sensors are digitized and transformed to scientific units on a Campbell Scientific CR10 data logger and stored on a Campbell Scientific SM192 storage module (storage capacity of 96,000 data values), also located in the underwater pod. The data logger is interrogated and programmed from the surface using a microcomputer linked to the data logger through an RS232 interface. Maximum sampling rate of all channels is approximately 2 Hz, whereas U_y and U_w may be logged at rates up to 10.66 Hz. All channels may be monitored and displayed on the surface computer allowing the operator to control the experiment interactively. Bed shear stress is varied in time by varying the power supplied to the underwater motor up to 350 watts via a surface power supply. The data stored from each deployment may be downloaded remotely through the RS232 cable at the end of each experiment and the storage module re-initialized.

A window is located in the inner flume wall for purposes of observing and recording the mechanics of bed failure. A perspex wedge at the base of the window, sections the sediment upon deployment. Thus the upper 20 mm of sediment and the lower 10 cm of the water column can be viewed. Visual observations are made using a Sony Handycam 8 mm video recorder model CCD-V101 held in an Amphibico Amphibian V101 underwater housing. Light is provided by two 100 watt underwater lights powered from the surface. The housing has a lens that corrects for underwater geometric distortions and so is suitable for accurate image scaling. The camera lens is located approximately 20 mm from the window. Horizontal and vertical scale lines are present on the window and situated within the field of view. The camera images 100 frames/s. A co-axial cable connects the camera to a surface monitor for real-time detection. Video records are stored on a standard VHS video cassette recorder also at the surface. Sequential video images are digitized for particle trajectories at varying heights above the bed. From these, velocity profiles may be constructed. From such profiles, thicknesses of the logarithmic part of the benthic boundary layer may be determined and the friction velocities computed. These latter values can be calibrated against laboratory measures.

Dispersion of suspended sediment out of the rotating annulus was observed on the video to take place during submerged deployments of Sea Carousel. Dispersion results from exchanges of water mass between the annulus (at concentration SSC_1) and the open marine environment (at concentration SSC_o) where $SSC_1 > SSC_o$. The rate of diffusion of mass (M) may be defined per unit cross-section area as

$$\partial M/\partial t = - \delta \, \partial SSC/\partial x \qquad (1)$$

where δ is the coefficient of diffusivity (L^2T^{-1}) and x is a typical horizontal length scale, which in our case is unknown. Similarly, the change in mass in Sea Carousel may be defined as

$$\partial M/\partial t = - \delta \, \partial SSC/\partial x \; A\varepsilon/V \qquad (2)$$

where A is the area over which diffusion takes place (0.012 m^2), V is the volume of Sea Carousel (0.218 m^3), and ε is an efficiency term dependent on the azimuthal velocity ($\varepsilon \propto \bar{U}_y$). Measurements of $\partial M/\partial t$ at different constant azimuthal velocities yield a concentration half-life ($SSC_{½}$) of 2400 seconds, setting $\varepsilon = \bar{U}_y$ and $\partial SSC/\partial x$ to (SSC_1 - SSC_0), the quotient (- $\delta A/\partial x$) is derived

$$\partial M = - 3.3 \times 10^{-3}(SSC_1 - SSC_o)\bar{U}_y \, \partial t \qquad (3).$$

The loss of mass through dispersion, calculated using equation (3) is added to measured annulus mass (SSC x V) to derive a measure of the total mass.

The transform of azimuthal velocity to bed shear stress and the subsequent derivation of erosion rate is the subject of Amos, Grant *et al.* (1992).

The application of the Sea Carousel to natural marine sediments and the analysis of results so derived is dealt with in detail in Amos, Daborn *et al.* (1992). These results have been accepted in the international scientific literature and the method has been rigorously evaluated through peer review.

5.0 DATA COLLECTION

A total of fifteen (15) stations were occupied in the Sea Carousel survey of Hudson Bay. GB1 and GB2 were carried out aboard CSS Hudson. Results from these stations were of poor quality due to ship and wave motion. Stations GB3 to GB15 were carried out aboard MV Septentrion. It is the results of these deployments that are reported herein.

A summary of the stations occupied is given in Table 5.1. Video records of events at the seabed were recorded in all cases using a VHS system (video 2) and a super-8 underwater video camera (video 1). These videos are available for inspection, but have not formed part of this report.

The geographic locations of the Sea Carousel stations in Manitounuk Sound are shown in Figure 5.1. They extend along the length of the Sound and were principally collected within the deepest part. The exception was a shore-oblique transect off the proposed outfall site of the James Bay II project. The substrate surficial geology is also shown in the Figure and provides useful information to interpret the results of this survey.

Stations GB5, GB6 and GB7 were occupied in the inner Sound where a thick unconsolidated sedimentary sequence exists. The mean sedimentation rate in this region we estimate to be *circa* 0.007 m/a.

Stations GB4, GB12, GB12 and GB14 were collected in the central Sound. Here, the mean sedimentation rate from the seismic records is interpreted to be *circa* 0.0015 m/a.

Stations GB11, GB13, GB3, GB14 and GB15 were collected respectively on the Sound flank, sill and outer regions. The seismic records show this region to be one of outcropping glacio-lacustrine or glacio-marine sediments, or by a thin Holocene sequence deposited at a mean sedimentation rate of 0.0007 m/a. This is close to the value reported by d'Anglejan and Birksham (1988).

STAT #	SAMPLE #	LATITUDE	LONGITUDE	DEPTH (m)	TIME (mins)	SUB-SAMPLE	VIDEO 1/2
GB1	014	55 16.75	77 49.63	42	98		Y/Y
GB2	040	55 32.02	77 32.62	41	68		Y/Y
GB3A	078S	55 27.74	77 28.79	10	32	6	Y/Y
GB3B	079S	55 27.74	77 28.79	10	36	3	Y/Y
GB4	080S	55 35.24	77 16.86	21	84	8	N/Y
GB5	081S	55 41.92	77 06.46	11	120	10	Y/Y
GB6	082S	55 39.92	77 10.04	24	119	10	Y/Y
GB7	083S	55 37.28	77 13.87	18	119	11	N/Y
GB8	084S	55 31.57	77 21.91	13	120	11	Y/Y
GB9	085S	55 31.63	77 21.92	13	65	11	Y/Y
GB10	086S	55 31.73	77 22.89	18	146	11	Y/Y
GB11	087S	55 31.51	77 25.07	12	125	11	Y/Y
GB12	088S	55 31.45	77 24.43	43	125	11	Y/Y

GB13	089S	55 28.55	77 28.02	23	122	11	N/Y
GB14	090S	55 29.68	77 27.21	42	135	8	Y/Y
GB15	091S	55 22.09	77 40.97	18	56	11	Y/Y

Table 5.1. A summary of the Sea Carousel deployments undertaken aboard CSS Hudson and MV Septentrion (Video 1 - Sony Hi8; Video 2 - Osprey Camera/VHS (low resolution)).

6.0 RESULTS

6.1 Sensor calibration

The calibration of the three OBS sensors to suspended sediment concentration was undertaken by pump sampling from the port in the side of the flume. One litre water samples were so collected at regular intervals throughout each deployment, yielding approximately 10 samples from each site.

Water samples were sub-sampled and analyzed for: (1) suspended sediment concentration; (2) chlorophyll concentration; and (3) phaeophytin. Sediment concentration was determined by two separate methods: (1) vacuum filtration through 47 mm diameter Nuclepore filters with a 1.0 micron pore diameter; and (2) by the Swinnex syringe method onto glass fibre filters. A reasonable correlation was achieved between the two methods at sites where suspension of seabed material took place.

Stations fell into two groups on the basis of the concentration of suspended matter (SSC): group (1) GB4, GB5, GB6, GB7, GB8, GB9 and GB10; and group (2) GB3, GB11, GB13, GB14 and GB15.

Group (1) yielded a good correlation between the two methods for determining SSC ($r^2 = 0.822$). Group (2) by contrast yielded a poor correlation ($r^2 = 0.305$) indicating the uncertainty of results at these stations. Group (1) was characterized by SSC varying up to 2000 mg/L, whereas the maximum SSC of group (2) was 450 mg/L.

The correlation between SSC derived from the Swinnex method and OBS voltage for group (1) is as follows:

$$SSC_{OBS1} = 3.184 OBS_{voltage} - 62 \qquad (r^2 = 0.822) \qquad (4).$$

The equivalent correlation for group (2) is:

$$SSC_{OBS1} = 1.356 OBS_{voltage} + 98 \qquad (r^2 = 0.305) \qquad (5).$$

OBS1 was at the same approximate height above the bed as the pump sample port and so a direct correlation is possible. OBS3 is, however, closer to the bed. Given that natural benthic boundary layers exhibits a gradient in sediment concentration, we cannot assume that the concentrations that we measured were those evident at the height of OBS3. It is, on the other hand, reasonable to assume that the slope of the OBS3 sensor response will be the same as that of OBS1 given that this was the case under laboratory experimentation (Amos, Grant *et al.* 1992). The offset of OBS3 may be determined by equating OBS readings (and SSC values) during the still water period at the beginning of each time-series.

6.2 Time-series of measurements

The calibrated time-series from each of the 14 stations occupied along the length of Manitounuk Sound (GB3A - GB15) are shown respectively in Figures 6.2.1 to 6.2.14. Each Figure comprises three panels. The uppermost panel shows the azimuthal (tangential) and vertical velocities within the flume, recorded by the Marsh-McBirney current meter. In general, they illustrate a 5 minute still-water test period, followed by 10 increments of progressively greater flow. The duration of each increment is between 5 and 10 minutes. The flow in each increment is held constant for this time.

The middle panel shows the levels of SSC determined within the flume by OBS1 and OBS3, and the ambient SSC determined from OBS2. The raw SSC time-series is the actual SSC value within the flume which is subject to the effects of dispersion. OBS1 and OBS3 are corrected for the dispersion.

The lower panel shows the rate of erosion from the bed. It is determined from the rate of change of SSC. Results are expressed in terms of $kg/m^2/s$.

Three stations were attempted on 23rd August, 1992 (GB3A, GB3B and GB4). The results from these stations were irregular as high winds caused the MV Septentrion to drift off station, thus dragging the Carousel. Four stations were successfully completed in the inner Sound on 24th August (GB5, GB6, GB7 and GB8). A further four stations were completed in the central Sound on 25th August (GB9, GB10, GB11 and GB12), and three stations were completed in the central and outer Sound on 26th August (GB13, GB14 and GB15).

Current speed in the flume was increased in a series of regular steps. The speed at each increment was held constant. This procedure follows closely that usually adopted in laboratory studies of sediment erodibility. Each step represents a constant increase in power output of the driving motor, which is proportional to the energy supplied to the system. Notice that the rate of speed increase ($\partial^2\bar{U}_y/\partial t^2$) falls off in an exponentially-decaying fashion with power input. This limits the application of the flume to a maximum current speed of *circa* 1.0 m/s. The current speed at a given level of power input varies according to the efficiency of the system. This efficiency is largely controlled by the degree of turbulent drag induced by bed roughness. As this varied, the precise speed also varied.

The time-series support the conclusion that our stations fall into two groups: group (1) GB4, GB5, GB6, GB7, GB8, GB9 and GB10; and group (2) GB3, GB11, GB13, GB14 and GB15. The differentiation is the same as that observed in the filtering of pumped samples. Group (1) stations showed a stable and ordered set of current speed increments with time: 0.28, 0.40, 0.52, 0.60, 0.66, 0.70, 0.74, 0.77, 0.80 m/s. Group (2), on the other hand, shows lower current speeds and greater instabilities (macroturbulent events): 0.15, 0.23, 0.32, 0.40, 0.46, 0.50, 0.53, 0.58, 0.62 m/s. The maximum current speed for group (2) is approximately 25% less than that of group (1). The inference is that group (1) has a smoother seabed than group (2) and is less susceptible to turbulent drag. This, of course, assumes no changes in the mechanical efficiency of the Sea Carousel.

The raw SSC trends for group (1) show a general decrease with time due to dispersion out of the flume to the surrounding clearer waters. After application of the dispersion correction, two major trends in SSC for group

(1) become evident: Type I erosion and Type II erosion. Type I erosion shows an exponential decay in concentration increase, which becomes asymptotic within 3 to 5 minutes of flow onset. Concentration increase is greatest within the first 60 seconds of flow onset. This corresponds to rapid bed erosion at the onset of flow followed by an asymptotically decreasing erosion rate to zero within the subsequent 5 minutes. This Type of erosion is always the first to take place, i.e. it is diagnostic of the sediment surface layers, and occurs at lower current speeds (< 0.5 m/s).

Type II erosion shows a constant increase in SSC with time (over our step interval). Peak erosion takes place at the beginning of the speed step interval, but does not decrease to zero. Type II erosion follows Type I erosion. It typically occurs at higher speeds (> 0.5 m/s). An interpretation of the two Types of erosion is given in Amos, Daborn *et al.* (1992).

The trends in SSC for group (2) are less clear. The reasons for this are: (1) large fluctuations in current speed associated with macro-turbulent events caused by form drag; (2) discontinuous data sets due to boat drift; and (3) additional losses of sediment at the base of the flume made evident in the video tapes.

6.3 Critical shear stresses

The critical shear stress for erosion is defined by two parameters: (1) surface cohesion; and (2) the internal friction angle. Surface cohesion is also known as the critical shear stress for the onset of erosion and is equated with surface bed shear strength. The increase of this parameter with depth is proportional to the friction angle.

Figures 6.3.1 to 6.3.13 illustrate plots of applied bed shear stress (a transform of current speed; see Amos, Grant *et al.* 1992) against computed eroded depth. The eroded depth is a mean value derived from the total mass detected in suspension, divided by the surface area of the flume and the sediment bulk density (assumed to be 1300 kg/m^3). The surface intercept of the data points is cohesion and the slope of the failure envelop is a measure of internal friction angle.

The characteristic "loops" and "clusters" in the plots express the step increases in current speed, and the subsequent erosion to an equilibrium depth on the failure envelop. In the case of Type I erosion, the "loops" and "clusters" are well developed and typify the top of each plot. Type II erosion, which prevails beneath the region of Type I erosion, shows a more constant trend of stress versus depth, often at a different slope (friction angle) to the surface material. The changes in slope of the friction angle may express the microfabric of the sediment and changes in bulk physical properties.

Table 6.3.1 summarizes the results of cohesion and internal friction angle for Manitounuk Sound. In general, group (1) shows cohesion less than 2.0 Pa and friction angles varying up to 80°. Group (2) shows a seabed much more resistant to erosion and higher friction angles. The magnitude of the friction angles presented here are greater than those typical associated with foundation analysis. However, it must be emphasised that we are dealing with very low effective stresses and a poorly understood skin phenomenon.

Stations GB6, GB9, GB10 and GB12 have near-surface friction angles approaching zero. This indicates that the sediment is fluidized. Nevertheless, there is evidence of yield strength (cohesion) which suggests that these sediments behave more as gels than fluids.

STATION	DEPTH m	COHESION Pa	F.A. degrees	PEAK SPD m/s	PEAK SSC mg/L
GB3(2)	10	2.2	87	0.68	450
GB4(1)	21	1.4	65	0.58	1500
GB5(1)	11	0.8	50	0.82	1100
GB6(1)	24	1.2	52	0.75	1900
GB7(1)	18	1.3	77	0.78	550
GB8(1)	13	1.8	34	0.78	750
GB9(1)	13	1.9	69	0.80	900
GB10(1)	18	1.5	0	0.82	2000
GB11(2)	12	--	--	0.75	125
GB12(1)	43	2.0	9	0.72	1300
GB13(2)	23	> 6.0	90	0.59	20
GB14(2)	42	2.4	84	0.67	300
GB15(2)	18	0.0	88	0.62	150

Table 6.3.1. A summary of results on seabed stability from the stations in Manitounuk Sound, Hudson Bay. (F.A. is the friction angle; peak current speed and peak SSC refer to the maximum observed values for each deployment. The bracketed numbers under station refer to the group designation.

6.4 Erosion rates

Type I erosion rate is variable with time, and so it is difficult to define it in terms of an applied stress. For present purposes, we have defined Type I erosion rate as the mean value occurring within the first 60 seconds of stress onset. Type II erosion, by contrast, shows less time variability but is also subject to a wide scatter.

Figures 6.4.1 to 6.4.3 show erosion rate plotted against applied bed shear stress for stations GB5, GB6 and GB7 respectively. The Figures serve to illustrate the wide degree in scatter of the data, but the clear segregation between Type I and Type II erosion. Whereas Type I erosion appears to increase with bed shear stress, Type II erosion appears to be constant. This differentiation becomes clearer when we combine results from all stations. In Figure 6.4.4 we plot the peak erosion rate (again, the mean of the first 60 seconds of stress onset) against the prevailing bed shear stress. Notice the scatter in Type I erosion (varying between 10^{-4} to 10^{-2} $kg/m^2/s$) and the relatively constant value of Type II erosion (10^{-3} $kg/m^2/s$).

The scatter of these data is significantly reduced when we plot erosion rate against the excess bed shear stress i.e. the bed shear stress minus that required to cause failure (Figure 6.4.5). The resulting plot shows a log/linear relationship with excess bed shear stress (estress) that is applicable to both Type I and Type II erosion. This relationship takes the form:

$$\text{Erosion} = \partial M/\partial t = 6.5 \times 10^{-4} \times 10^{(0.67 \text{estress})} \qquad (6).$$

7.0 INTERPRETATION

A clear trend in cohesion and friction angle takes place along Manitounuk Sound. Both increase systematically down the Sound to the sill located adjacent to Paint Islands. This smooth trend is clearly demonstrated in Figure 7.1 and serves to illustrate the confidence that may be placed on the results so obtained. It suggests that the deposition rate decreases from the inner Sound outwards. Exceptions to this trend are found at stations GB11 and at stations seawards of the sill (GB3, GB13, GB14 and GB15). These all fall within group (2). GB11 was taken on the flank of the Manitounuk Islands where we presume sedimentation rates to be low. Station GB13 was situated on an outcrop of glacio-lacustrine sediment that may be dated at 7000 - 8000 years BP. Its relatively-high degree of stability is, therefore, not surprising. Station GB15 is located at the mouth of Manitounuk Sound and is typical of non-cohesive silts or very-fine sand where bedload has been observed to take place (Amos *et al.* 1993).

A transect of stations was undertaken off the proposed outfall site of the James Bay II development. A plot of the cohesion and friction angles for these sites is shown in Figure 7.2. Notice that the lowest values of cohesion and friction angle are found in the deeper central channel of the Sound, and the highest values are found on the shallower flanks. Stations GB8, GB9 and GB11 are subject to ice reworking. It is perhaps this effect, together with relatively-low deposition rates on the flanks, that leads to higher values.

8.0 RECOMMENDATIONS

Core samples have been collected at each of the Sea Carousel stations. Analysis of the physical bulk properties of these cores using standard geotechnical tests, would provide valuable data on the extrapolation of these surficial responses to deeper in the section. This would be of particular benefit in cases where erosion to depths greater than 0.10 m is anticipated.

Biological sub-samples were undertaken in association with the pumped samples for sediment. The purpose of these was to determine the influence of erosion on the organic carbon fluxes to the water column, which may be an important source to the food chain. Analyses of these samples would provide a valuable link between erosion and habitat stability; an issue that may be central to the EARP agenda for Grande Baleine.

This study deals only with the erosion of sediment from a deposited seabed. In order to fully understand the cycle of sediment stability of a region, one must also address the suspended sediments of Manitounuk Sound. In particular, the threshold for the onset of deposition must be determined for the range of concentrations and salinities prevailing, as well as the mass settling rate of suspended material also as a function of concentration and salinity.

The video tapes of the seabed in the flume during each deployment have been recorded. These have not been analysed as part of this report. A systematic account of seabed failure at different bed shear stresses would provide valuable supplimentary data to those included herein.

9.0 CONCLUSIONS

The results pertaining to the erodibility of seabed sediments in Manitounuk Sound show systematic trends that may be used for accurate numerical simulation. The trends in the critical shear stress for erosion are suggestive of a general decrease in deposition seawards along the Sound. This trend is also evident in the thickness of Holocene muds detected in the seismic survey of the region aboard MV Septentrion (Figure 5.1).

The stations of this survey fall into two groups that are distinct in their erosion character: group (1) GB4, GB5, GB6, GB7, GB8, GB9, GB10 and GB12; and group (2) GB3, GB11, GB13, GB14 and GB15. Group (1) is diagnostic of high erosion rates and low sediment strength. Group (2) is diagnostic of low erosion rates and high sediment strength.

Group (1) is prevalent in the inner and central Sound and typifies the channel that occupies the Sound's length. It typifies erosion of the Holocene mud that was deposited in Manitounuk Sound over the last 7000 years. Group (2) is prevalent in the outer Sound and the shallow flanks and sill. It typifies erosion of glacio-lacustrine or glacio-marine sediments that crop out at the sill, at the flanks, and at the mouth of Manitounuk Sound.

The rate of sediment erosion (E) follows a well-defined log/linear relationship with the excess bed shear stress (estress). This relationship takes the form:

$$E = \partial M/\partial t = 6.5 \times 10^{-4} \times 10^{(0.67 estress)} \qquad (7).$$

This relationship holds for all stations in both groups and for all Types of erosion.

10.0 LIMITATIONS

The computation of erosion rate, though scientifically accepted, assume a dispersion rate of particulate matter from the flume due to leakage around the lid. The rate has been determined for a situation where the base is well sealed. The computation of total eroded mass accounts for loses due to dispersion around the lid in order to conserve mass. At two stations (GB11 and GB15) this rate of dispersion was invalid through, we presume, leakage at the base. Results from these stations must therefore be considered to be the minimum of possible values.

This study deals only with the erosion of material that has become deposited on the seabed of Manitounuk Sound. We presume that it represents the layer deposited during the previous spring freshet (2 months earlier). However, the consolidation history, microfabric and biological activity at our stations are unknown. Consequently, extrapolation of these results to elsewhere is not recommended.

11.0 REFERENCES

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Shames, I. 1962. Mechanics of Fluids. Publ. McGraw-Hill Book Company,New York: 555p.

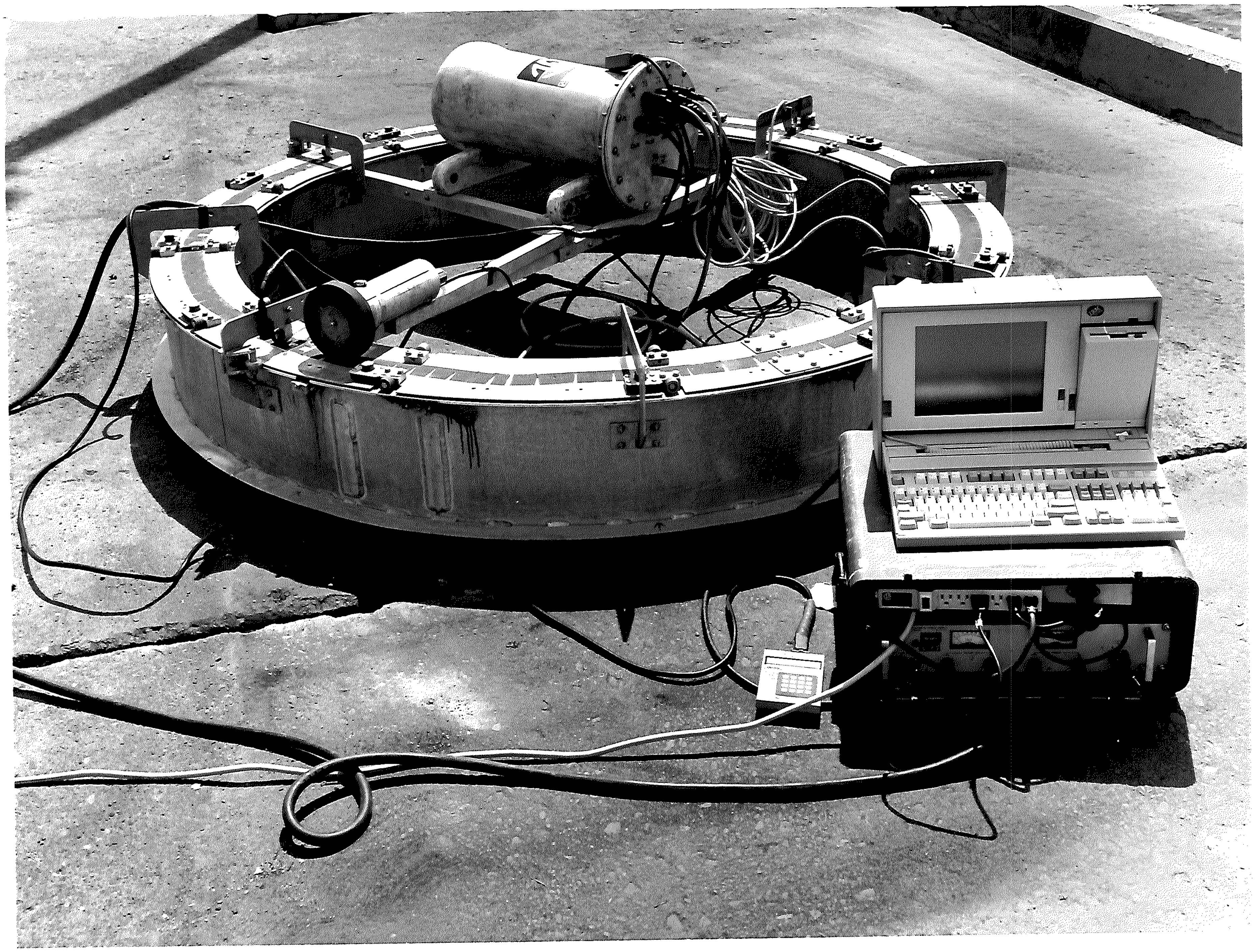


FIGURE 4.1

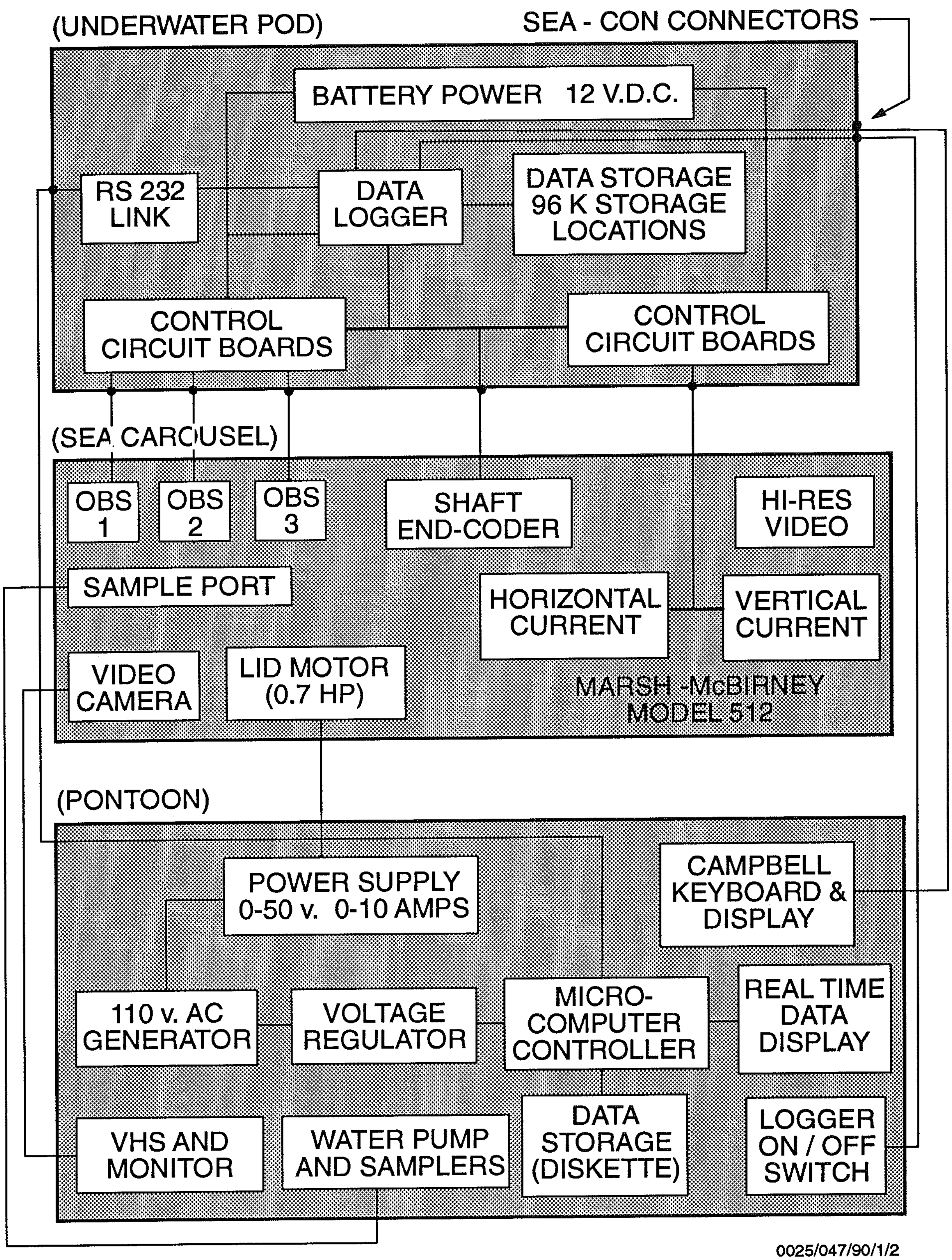

(UNDERWATER POD)
SEA - CON CONNECTORS
BATTERY POWER 12 V.D.C.
RS 232 LINK
DATA LOGGER
DATA STORAGE 96 K STORAGE LOCATIONS
CONTROL CIRCUIT BOARDS
CONTROL CIRCUIT BOARDS
(SEA CAROUSEL)
OBS 1
OBS 2
OBS 3
SHAFT END-CODER
HI-RES VIDEO
SAMPLE PORT
HORIZONTAL CURRENT
VERTICAL CURRENT
VIDEO CAMERA
LID MOTOR (0.7 HP)
MARSH -McBIRNEY MODEL 512
(PONTOON)
POWER SUPPLY 0-50 v. 0-10 AMPS
CAMPBELL KEYBOARD & DISPLAY
110 v. AC GENERATOR
VOLTAGE REGULATOR
MICRO-COMPUTER CONTROLLER
REAL TIME DATA DISPLAY
VHS AND MONITOR
WATER PUMP AND SAMPLERS
DATA STORAGE (DISKETTE)
LOGGER ON / OFF SWITCH
0025/047/90/1/2

FIGURE 4.2

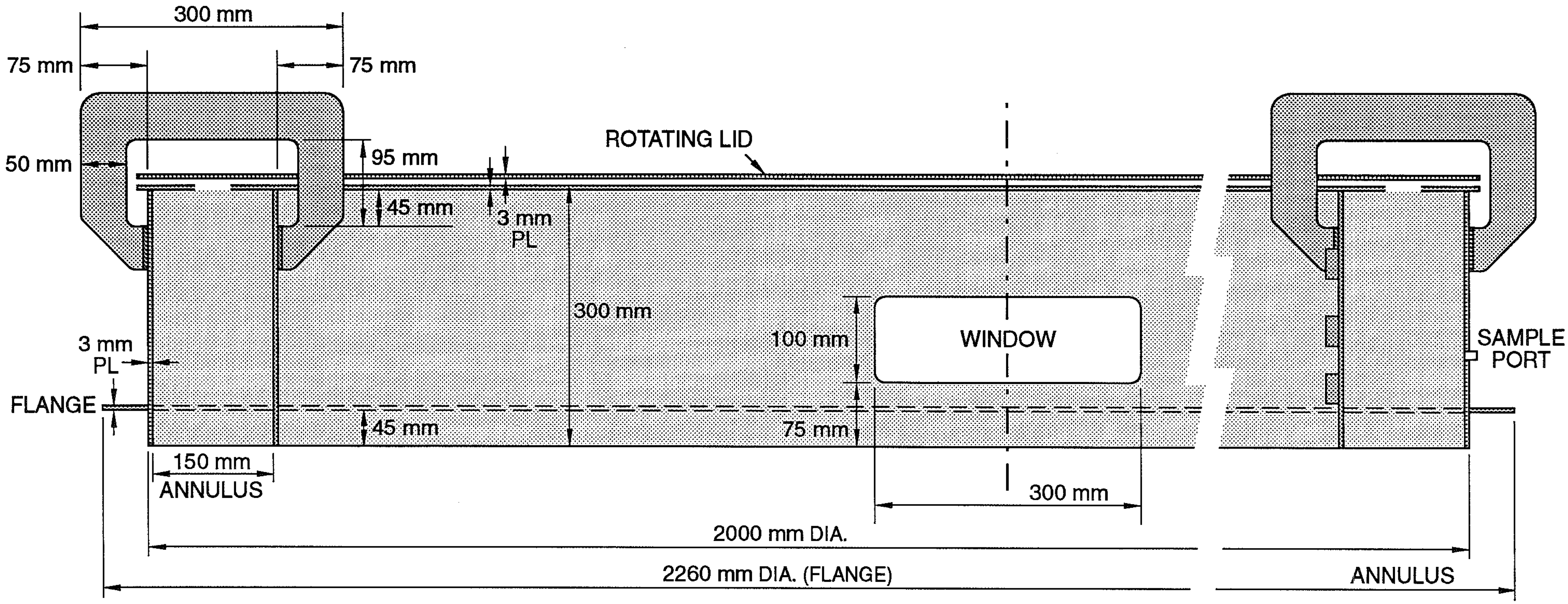
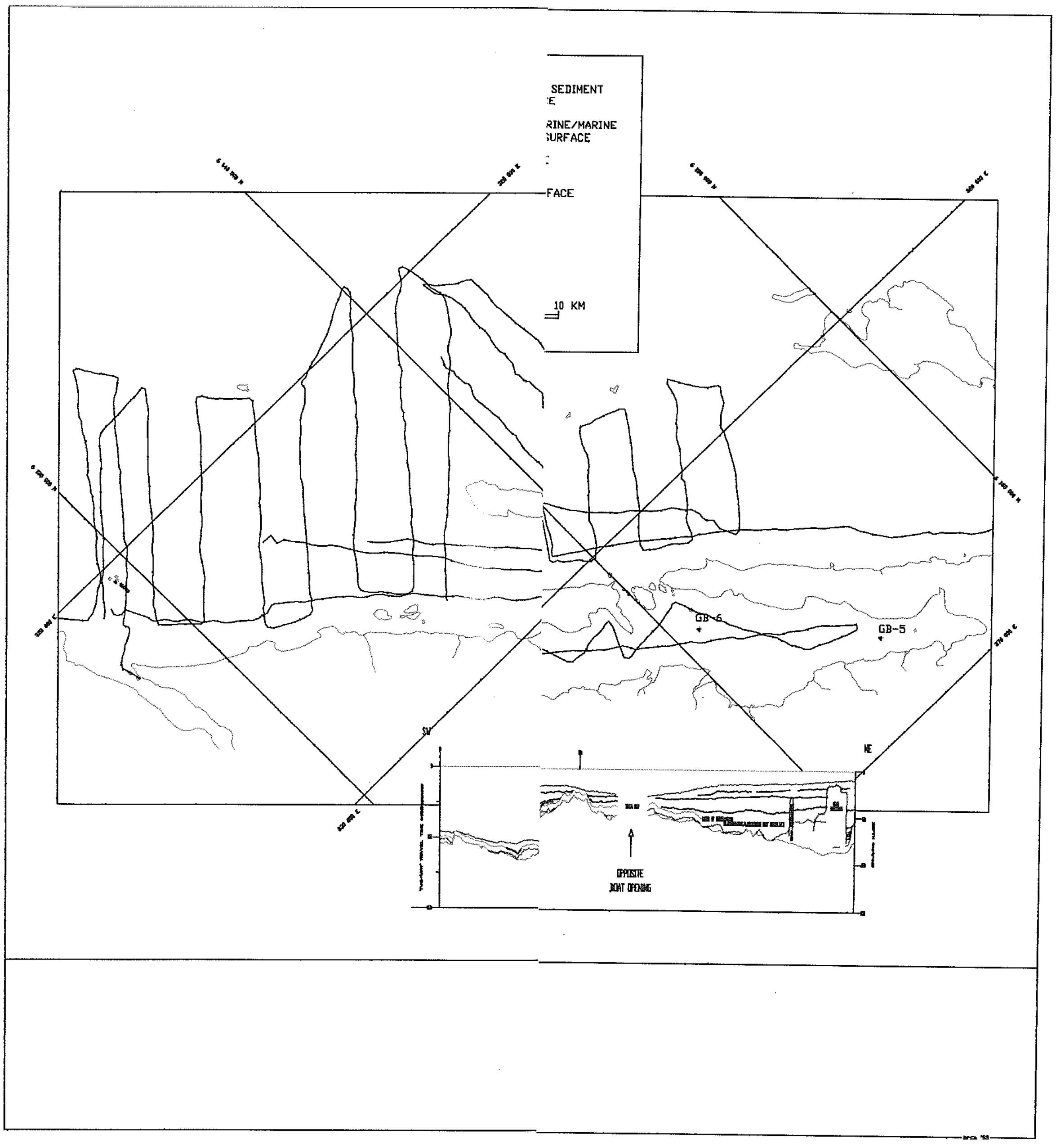
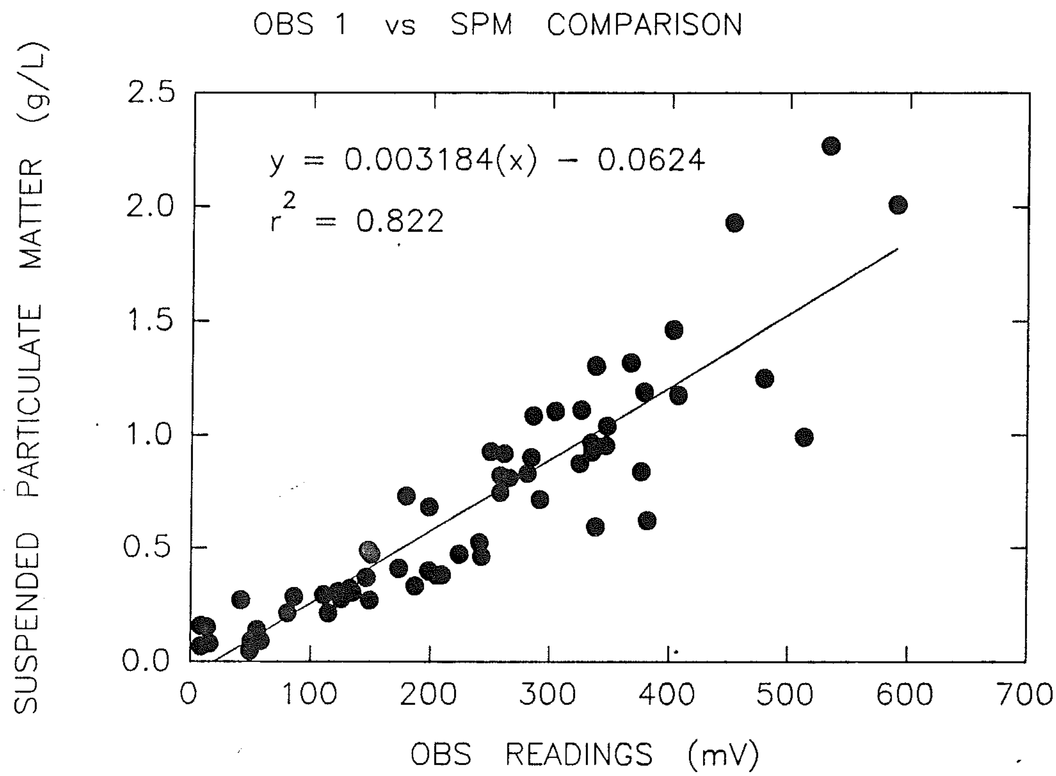

300 mm
75 mm
75 mm
50 mm
95 mm
45 mm
3 mm
PL
ROTATING LID
300 mm
100 mm
WINDOW
3 mm
PL
FLANGE
45 mm
75 mm
150 mm
ANNULUS
300 mm
SAMPLE
PORT
2000 mm DIA.
2260 mm DIA. (FLANGE)
ANNULUS

FIGURE 4.3


SEDIMENT
RINE/MARINE
SURFACE
FACE
10 KM
GB-6
GB-5
SW
NE
OPPOSITE


OBS 1 vs SPM COMPARISON
y = 0.003184(x) - 0.0624
r2 = 0.822
SUSPENDED PARTICULATE MATTER (g/L)
OBS READINGS (mV)
0.0
0.5
1.0
1.5
2.0
2.5
0
100
200
300
400
500
600
700

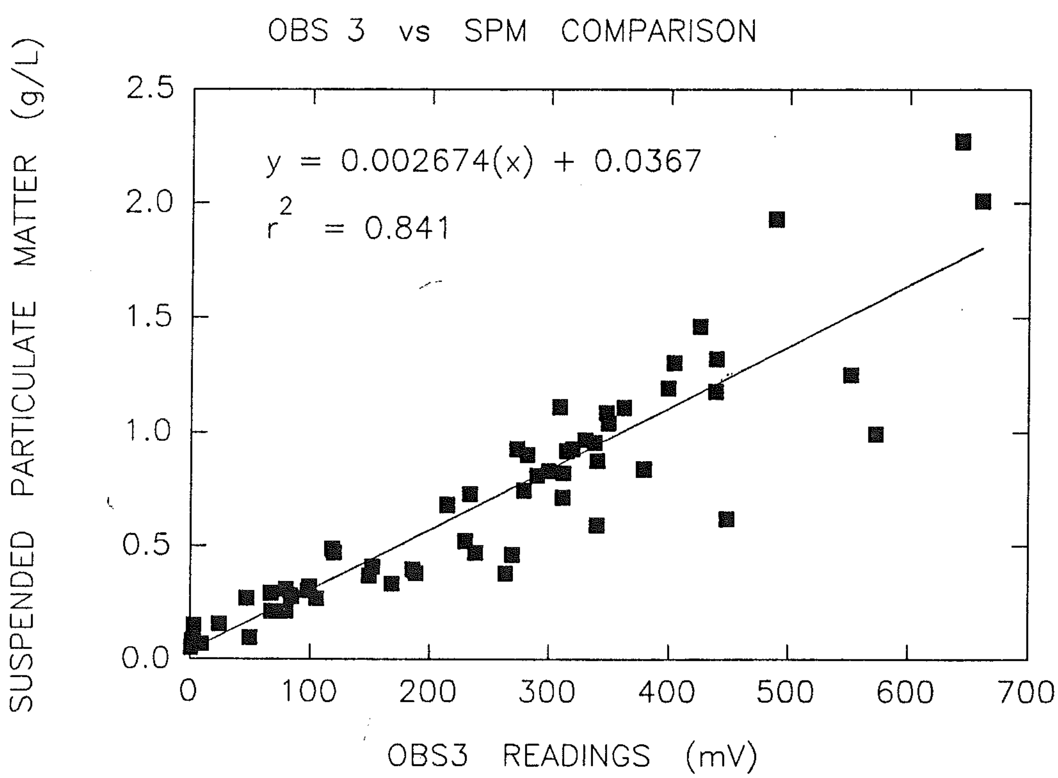

OBS 3 vs SPM COMPARISON
y = 0.002674(x) + 0.0367
r2 = 0.841
SUSPENDED PARTICULATE MATTER (g/L)
OBS3 READINGS (mV)
0.0
0.5
1.0
1.5
2.0
2.5
0
100
200
300
400
500
600
700

FIGURE 6.1.1

SEA CAROUSEL – GRANDE BALEINE

STATION GB3A – 23 AUGUST, 1992

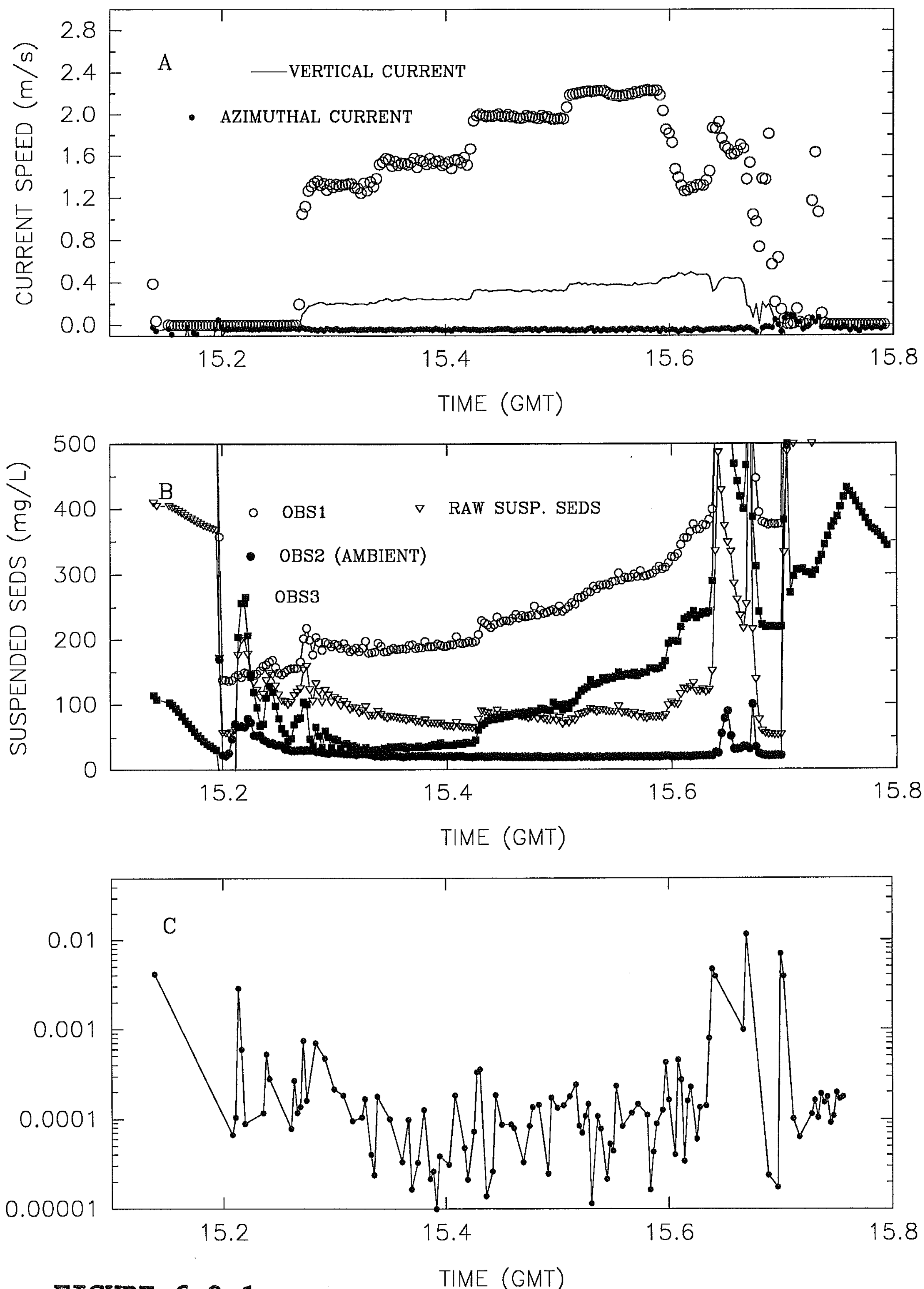


FIGURE 6.2.1

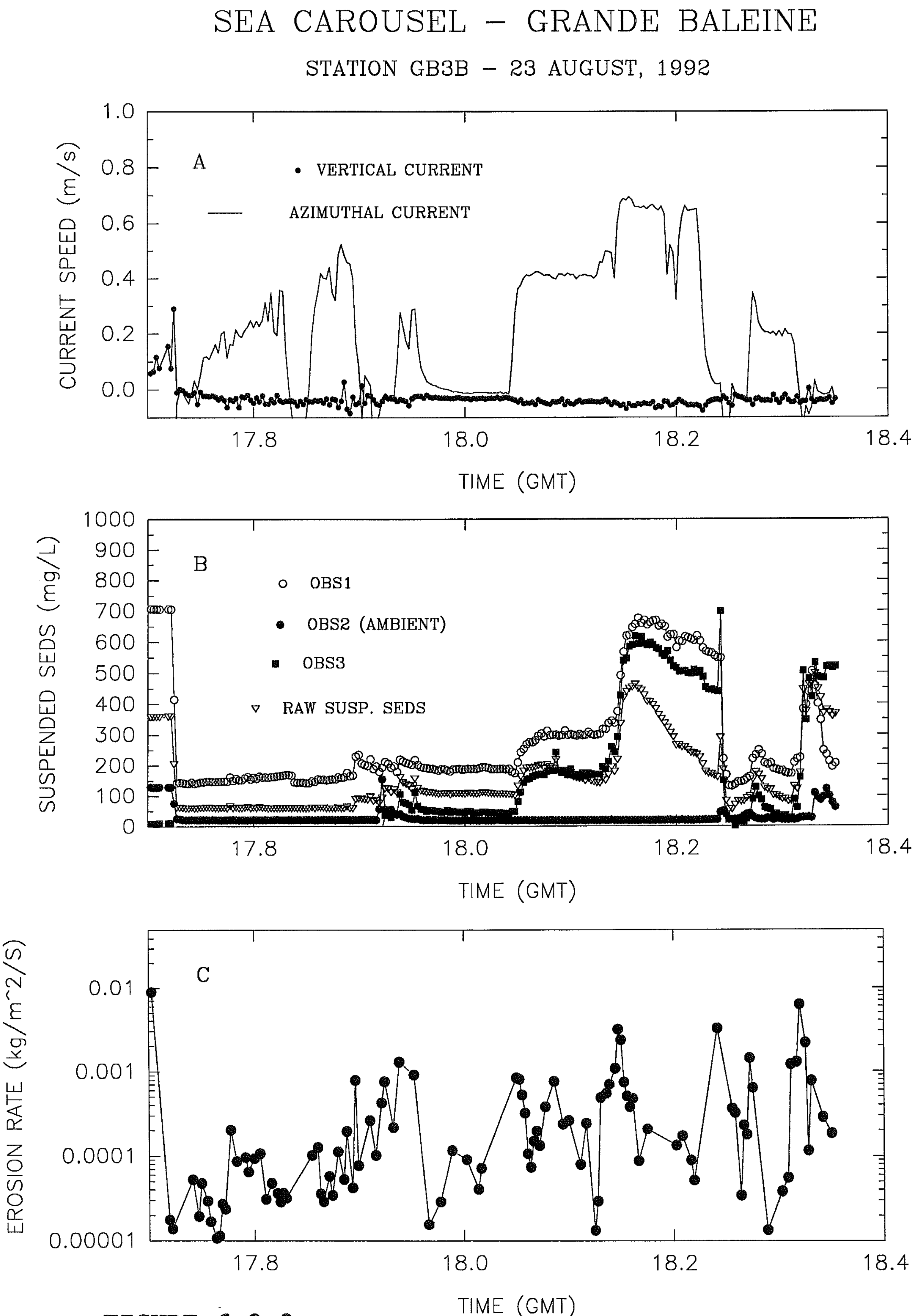

SEA CAROUSEL - GRANDE BALEINE
STATION GB3B - 23 AUGUST, 1992
A
• VERTICAL CURRENT
AZIMUTHAL CURRENT
CURRENT SPEED (m/s)
1.0
0.8
0.6
0.4
0.2
0.0
17.8
18.0
18.2
18.4
TIME (GMT)
B
OBS1
OBS2 (AMBIENT)
OBS3
RAW SUSP. SEDS
SUSPENDED SEDS (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
17.8
18.0
18.2
18.4
TIME (GMT)
C
EROSION RATE (kg/m^2/S)
0.01
0.001
0.0001
0.00001
17.8
18.0
18.2
18.4
TIME (GMT)

FIGURE 6.2.2

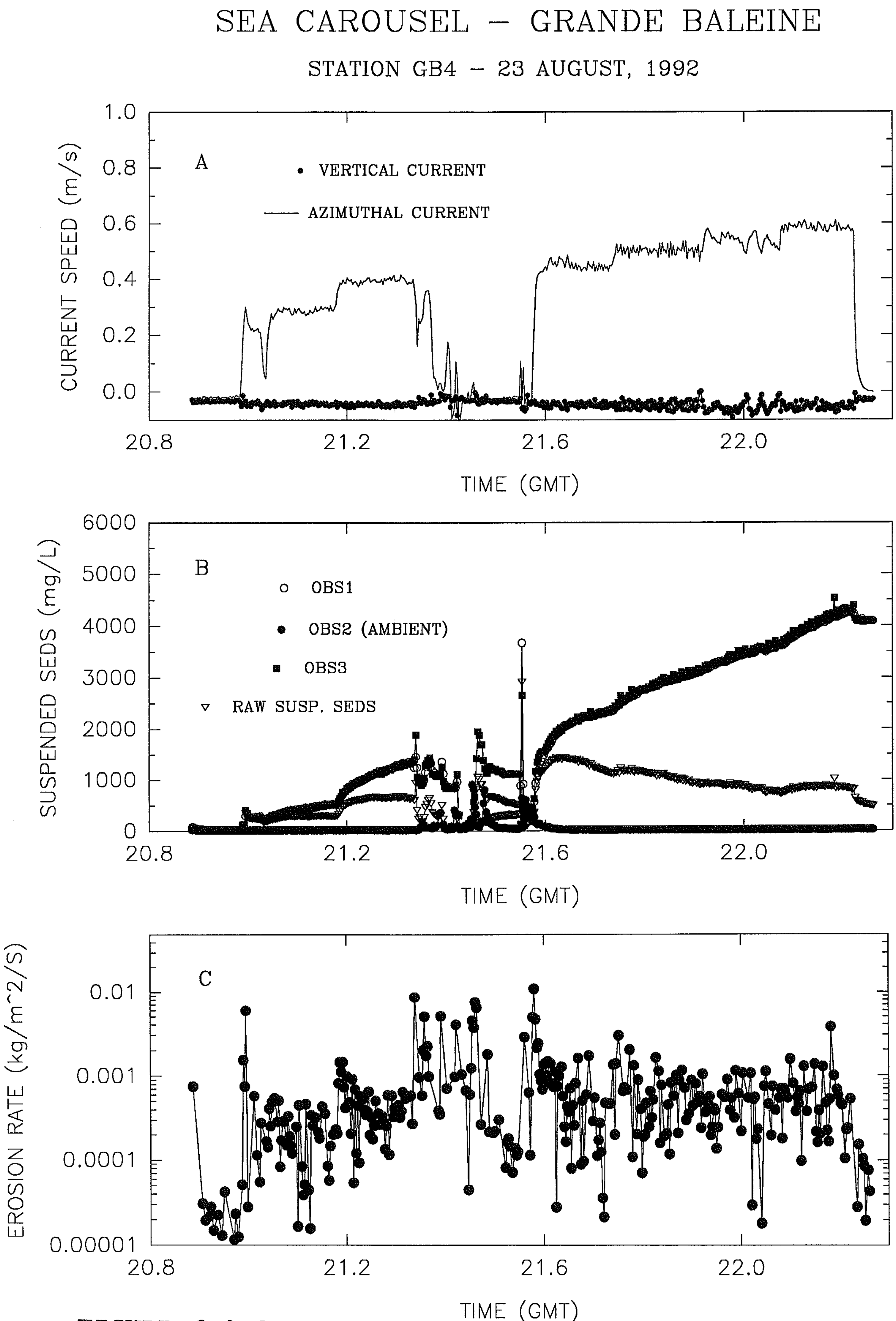
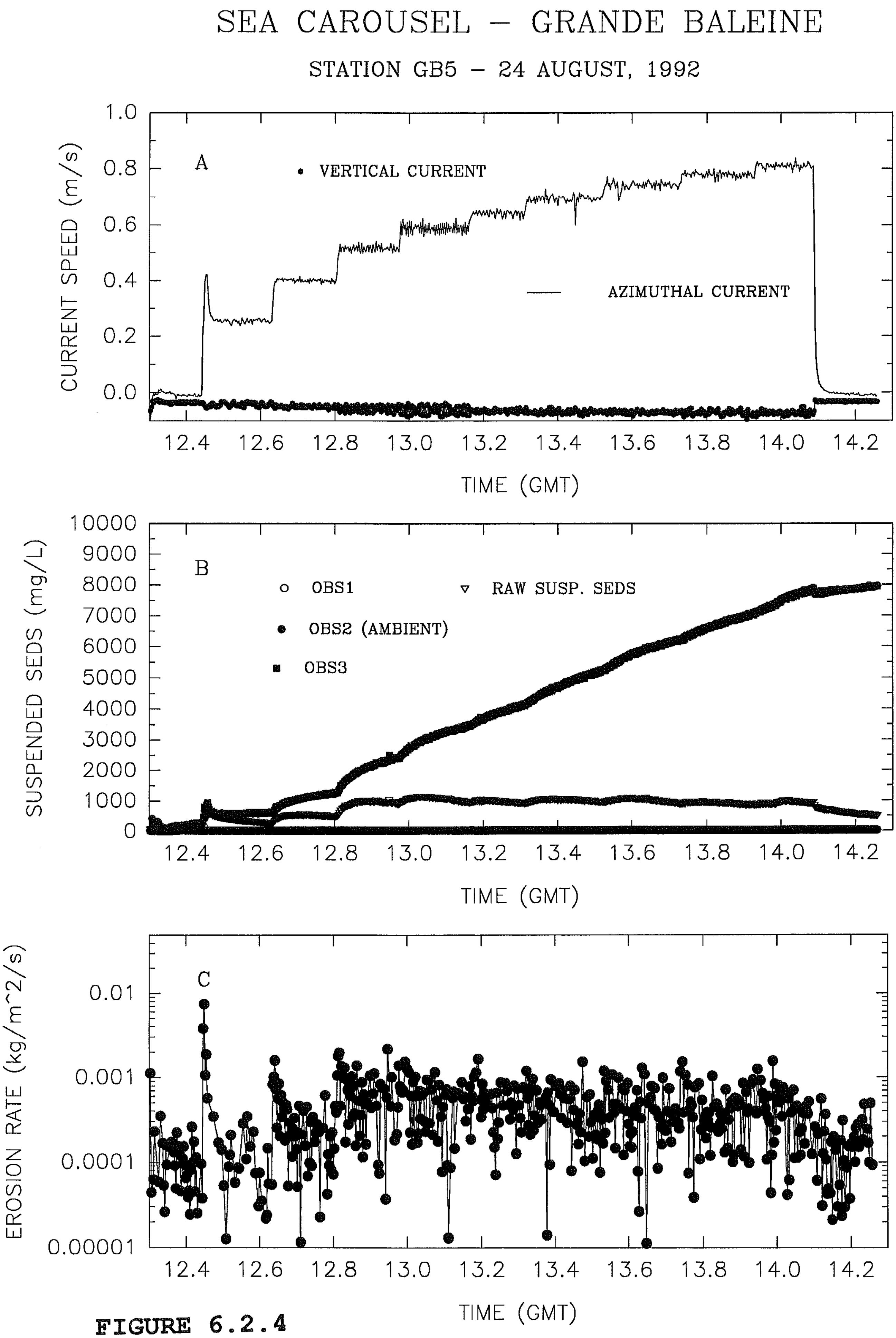

SEA CAROUSEL – GRANDE BALEINE
STATION GB4 – 23 AUGUST, 1992
A
VERTICAL CURRENT
AZIMUTHAL CURRENT
CURRENT SPEED (m/s)
TIME (GMT)
B
OBS1
OBS2 (AMBIENT)
OBS3
RAW SUSP. SEDS
SUSPENDED SEDS (mg/L)
TIME (GMT)
C
EROSION RATE (kg/m^2/S)
TIME (GMT)

FIGURE 6.2.3



SEA CAROUSEL – GRANDE BALEINE
STATION GB5 – 24 AUGUST, 1992
A
VERTICAL CURRENT
AZIMUTHAL CURRENT
CURRENT SPEED (m/s)
1.0
0.8
0.6
0.4
0.2
0.0
12.4
12.6
12.8
13.0
13.2
13.4
13.6
13.8
14.0
14.2
TIME (GMT)
B
OBS1
RAW SUSP. SEDS
OBS2 (AMBIENT)
OBS3
SUSPENDED SEDS (mg/L)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
12.4
12.6
12.8
13.0
13.2
13.4
13.6
13.8
14.0
14.2
TIME (GMT)
C
EROSION RATE (kg/m^2/s)
0.01
0.001
0.0001
0.00001
12.4
12.6
12.8
13.0
13.2
13.4
13.6
13.8
14.0
14.2
TIME (GMT)

FIGURE 6.2.4

SEA CAROUSEL — GRANDE BALEINE

STATION GB6 — 24 AUGUST, 1992

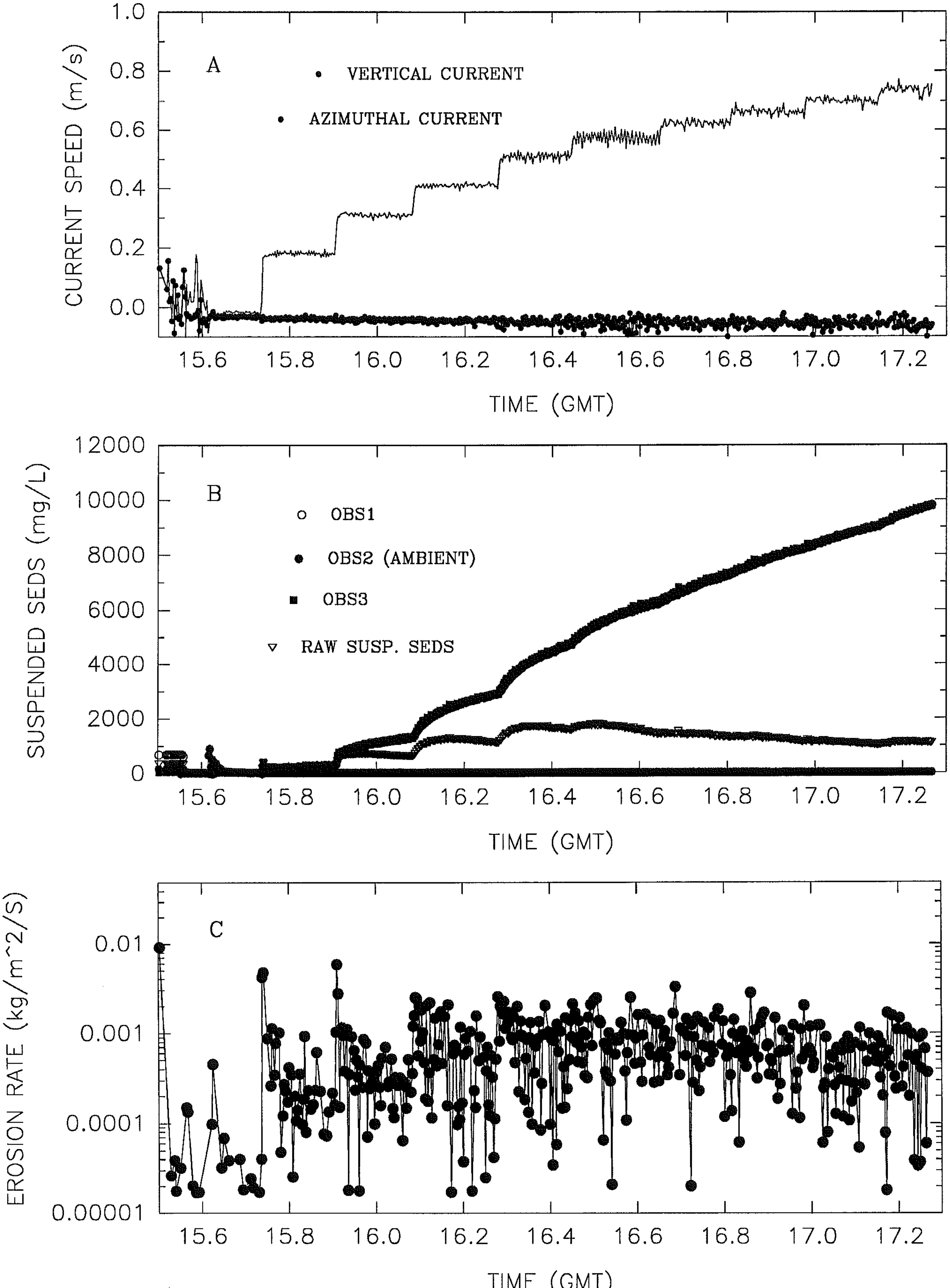


FIGURE 6.2.5

SEA CAROUSEL — GRANDE BALEINE

STATION GB7 — 24 AUGUST, 1992

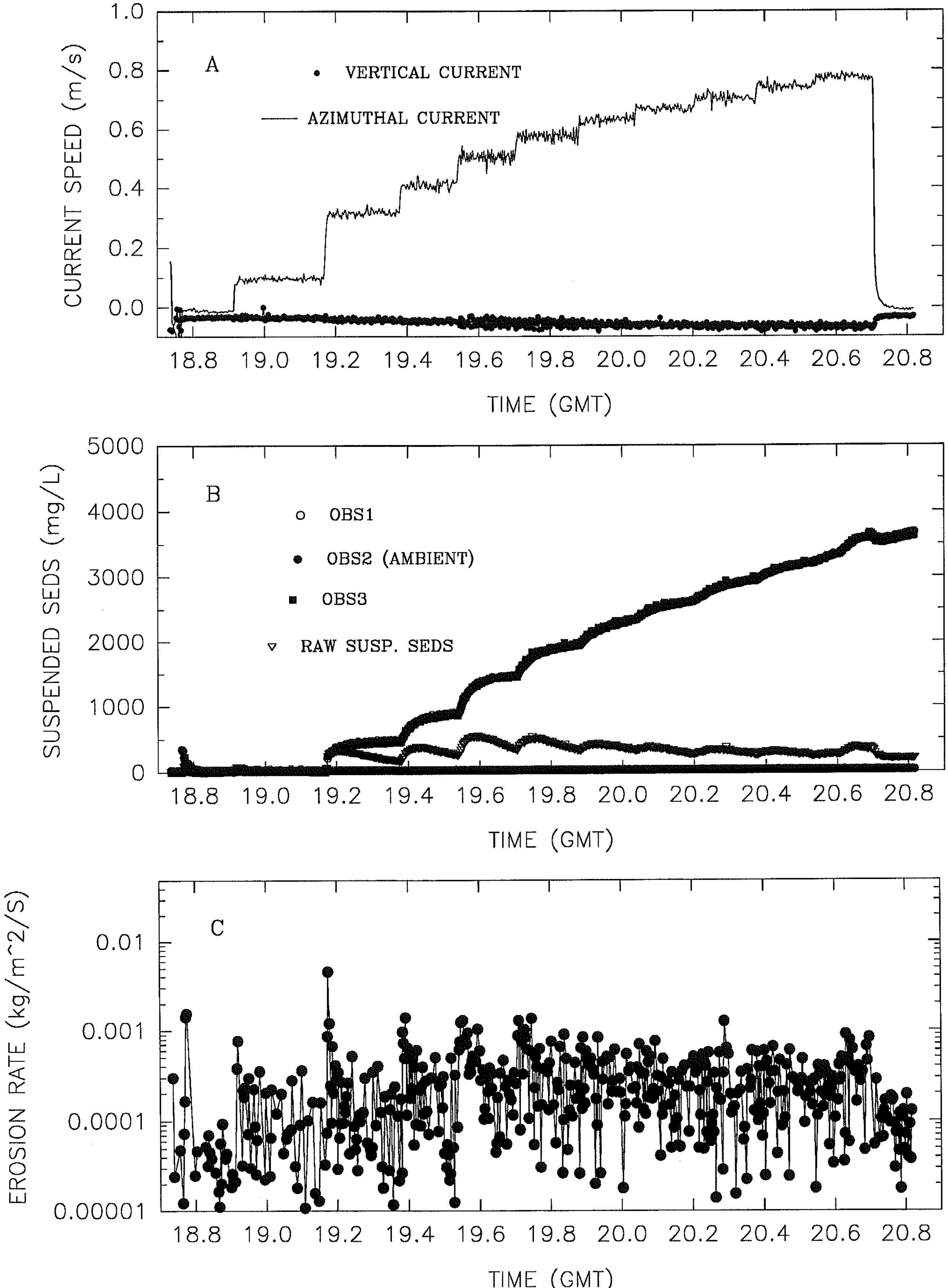


FIGURE 6.2.6

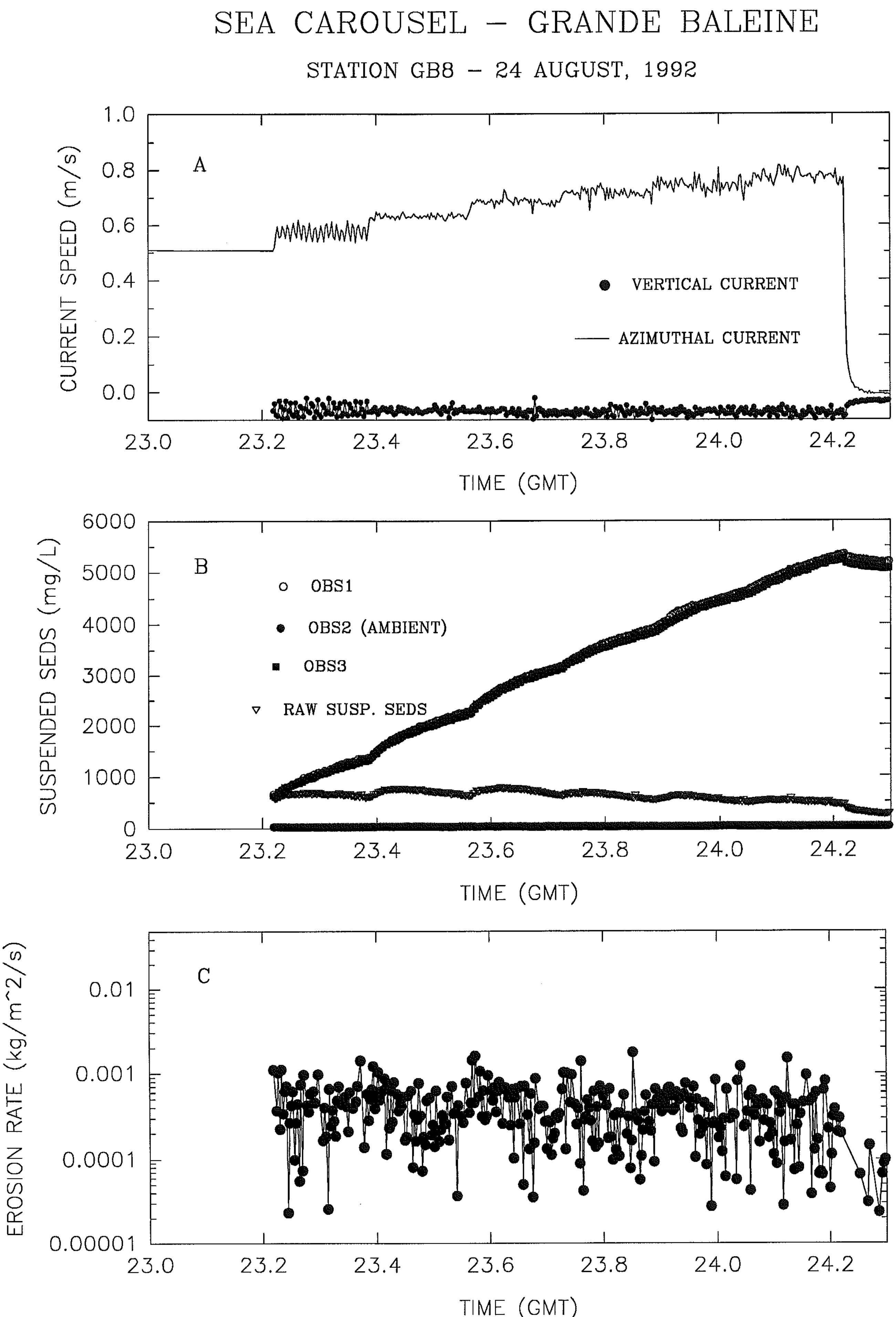

SEA CAROUSEL – GRANDE BALEINE
STATION GB8 – 24 AUGUST, 1992
A
CURRENT SPEED (m/s)
VERTICAL CURRENT
AZIMUTHAL CURRENT
1.0
0.8
0.6
0.4
0.2
0.0
23.0
23.2
23.4
23.6
23.8
24.0
24.2
TIME (GMT)
B
SUSPENDED SEDS (mg/L)
OBS1
OBS2 (AMBIENT)
OBS3
RAW SUSP. SEDS
6000
5000
4000
3000
2000
1000
0
TIME (GMT)
C
EROSION RATE (kg/m^2/s)
0.01
0.001
0.0001
0.00001
TIME (GMT)

FIGURE 6.2.7

SEA CAROUSEL – GRANDE BALEINE

STATION GB9 – 25 AUGUST, 1992

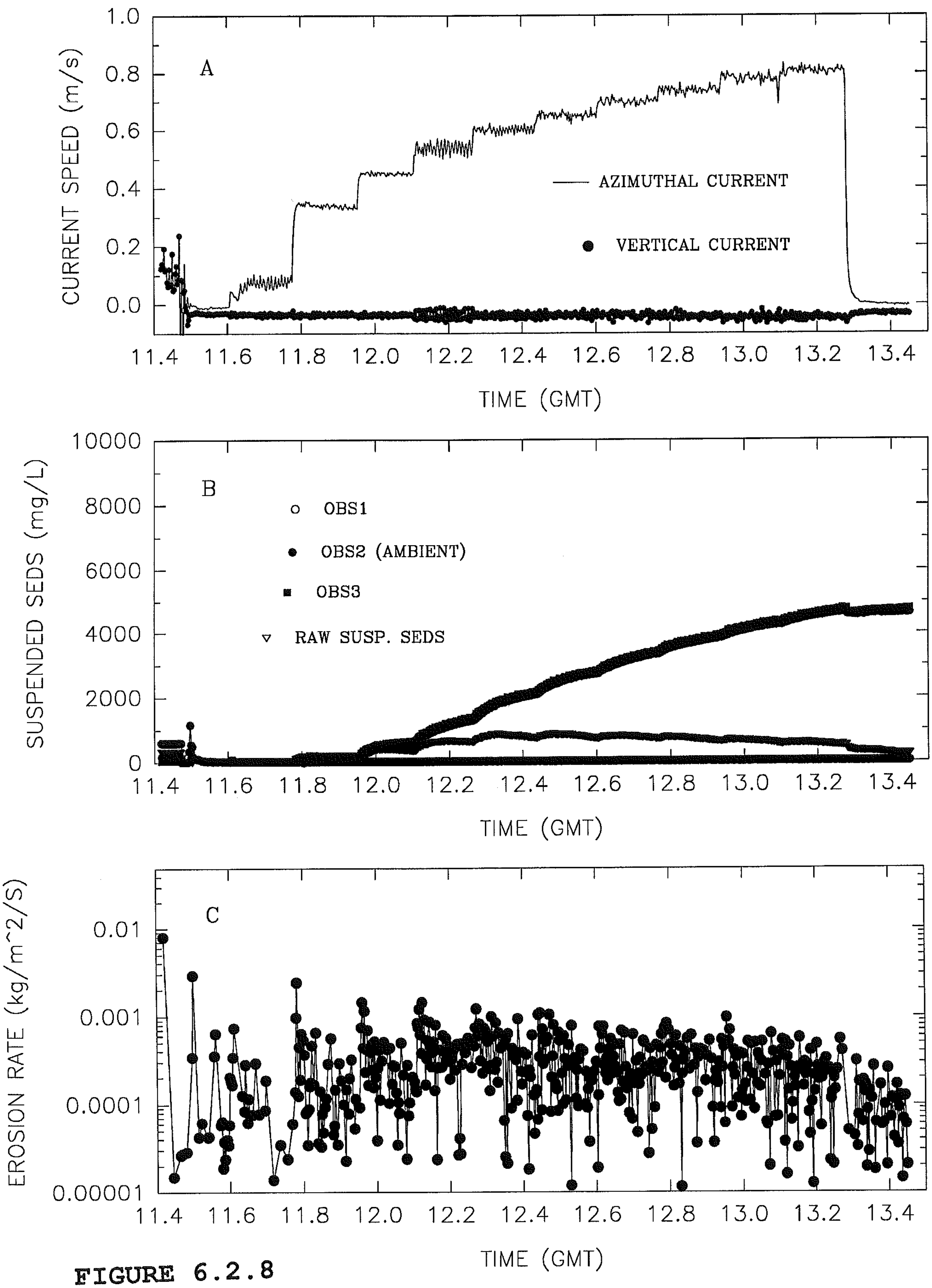


FIGURE 6.2.8

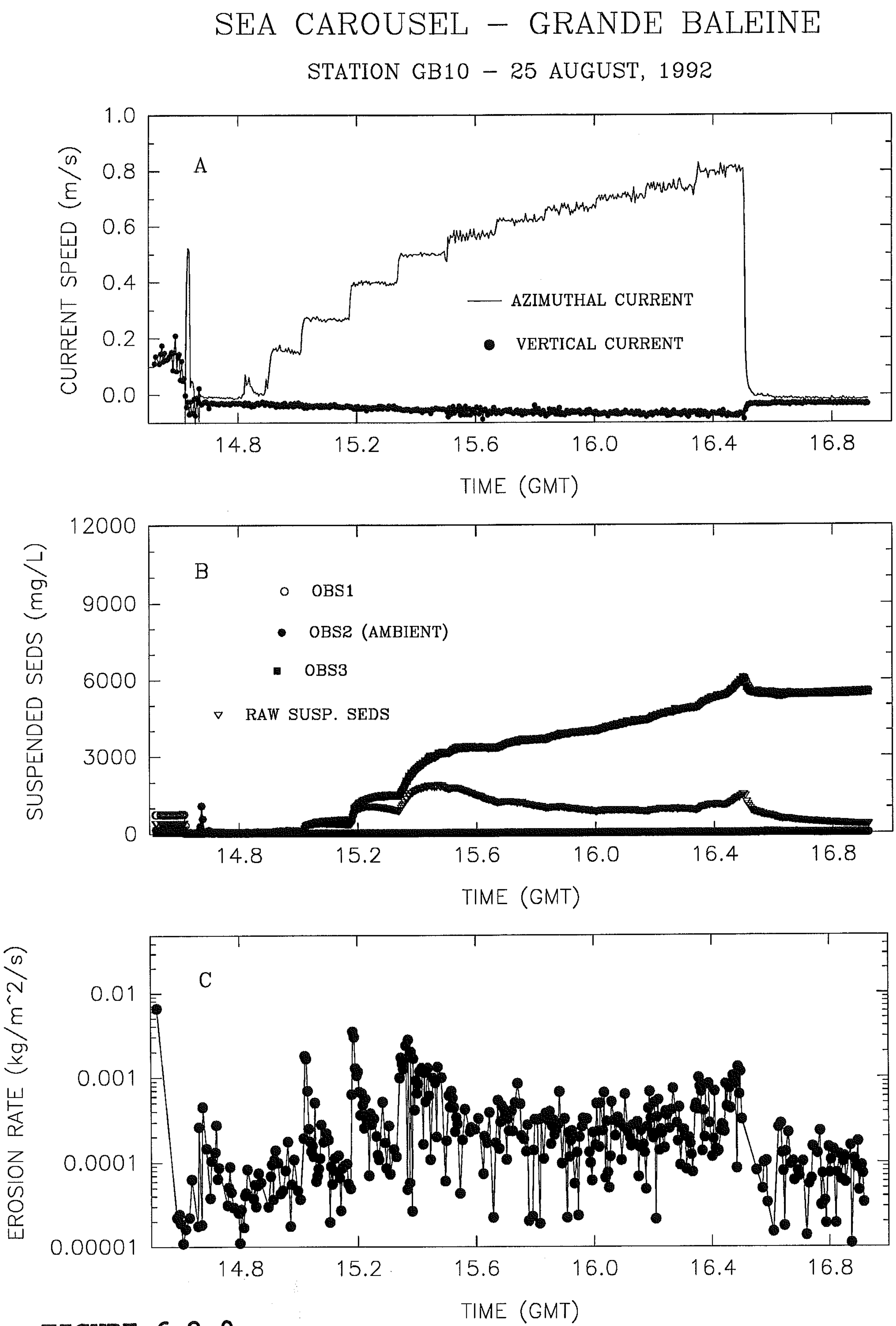

SEA CAROUSEL - GRANDE BALEINE
STATION GB10 - 25 AUGUST, 1992
A
CURRENT SPEED (m/s)
AZIMUTHAL CURRENT
VERTICAL CURRENT
1.0
0.8
0.6
0.4
0.2
0.0
14.8
15.2
15.6
16.0
16.4
16.8
TIME (GMT)
B
SUSPENDED SEDS (mg/L)
OBS1
OBS2 (AMBIENT)
OBS3
RAW SUSP. SEDS
12000
9000
6000
3000
0
TIME (GMT)
C
EROSION RATE (kg/m^2/s)
0.01
0.001
0.0001
0.00001
TIME (GMT)

FIGURE 6.2.9

SEA CAROUSEL – GRANDE BALEINE

STATION GB11 – 25 AUGUST, 1992

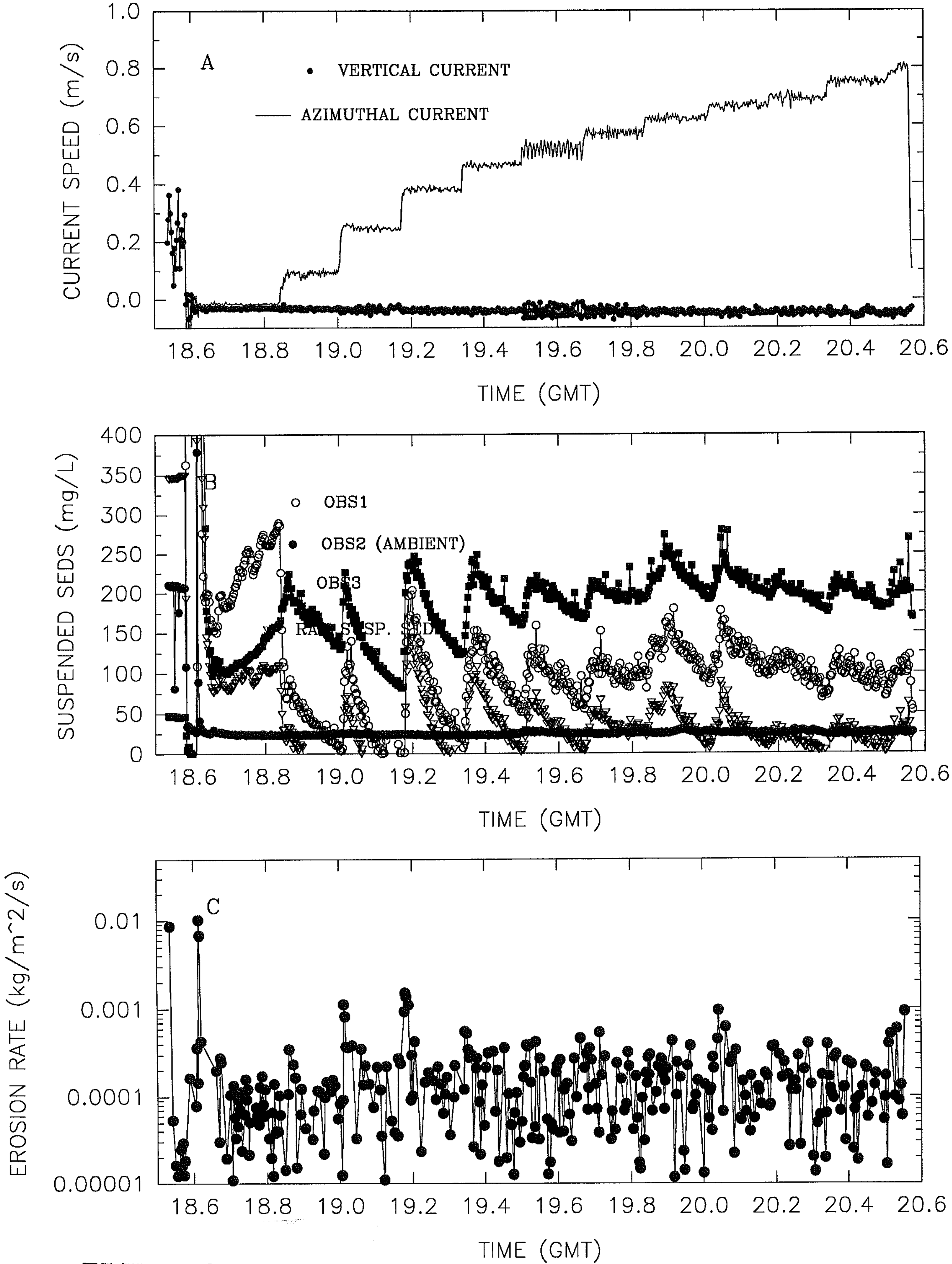


FIGURE 6.2.10

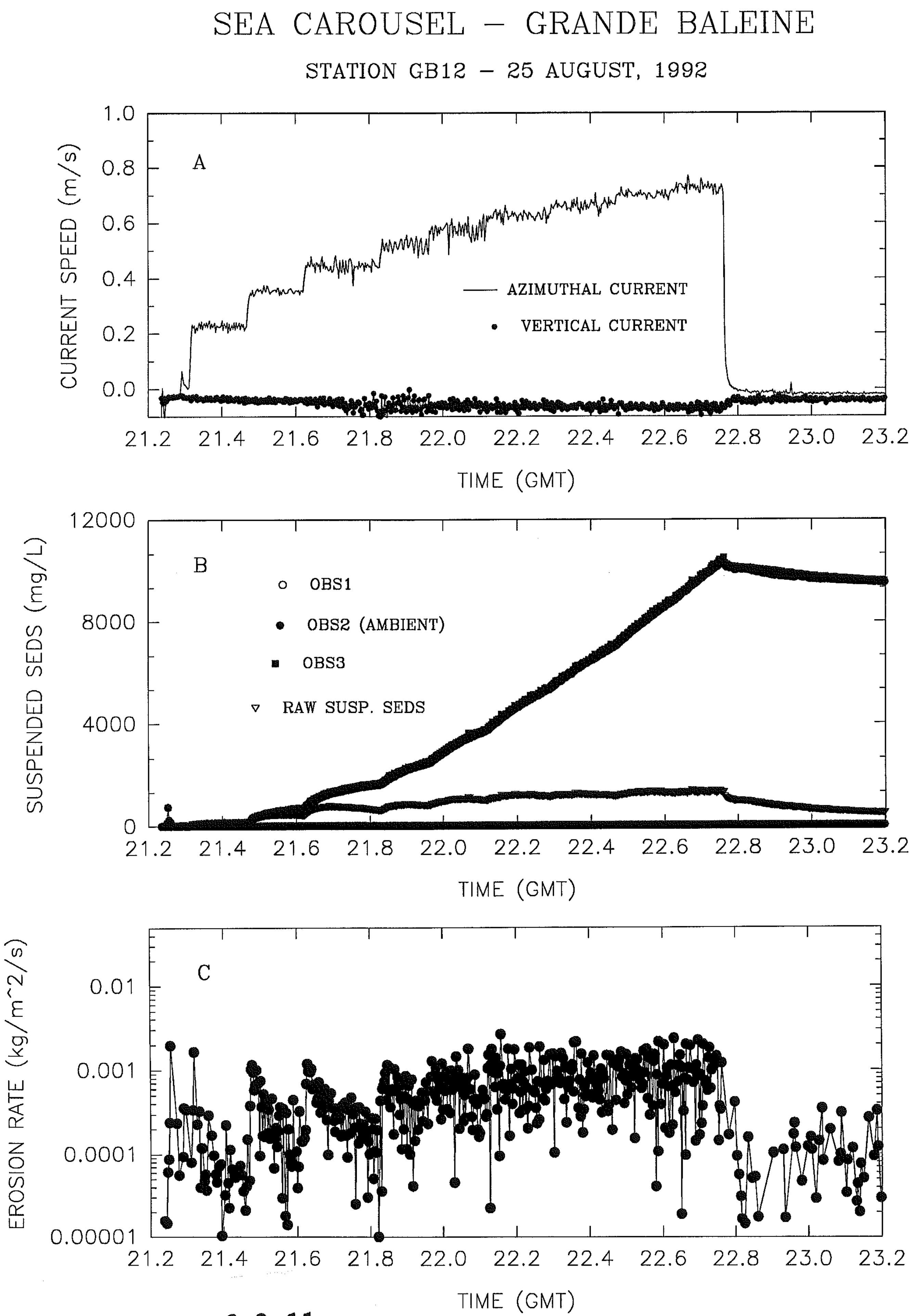

SEA CAROUSEL – GRANDE BALEINE
STATION GB12 – 25 AUGUST, 1992
A
AZIMUTHAL CURRENT
VERTICAL CURRENT
CURRENT SPEED (m/s)
TIME (GMT)
B
OBS1
OBS2 (AMBIENT)
OBS3
RAW SUSP. SEDS
SUSPENDED SEDS (mg/L)
TIME (GMT)
C
EROSION RATE (kg/m^2/s)
TIME (GMT)

FIGURE 6.2.11

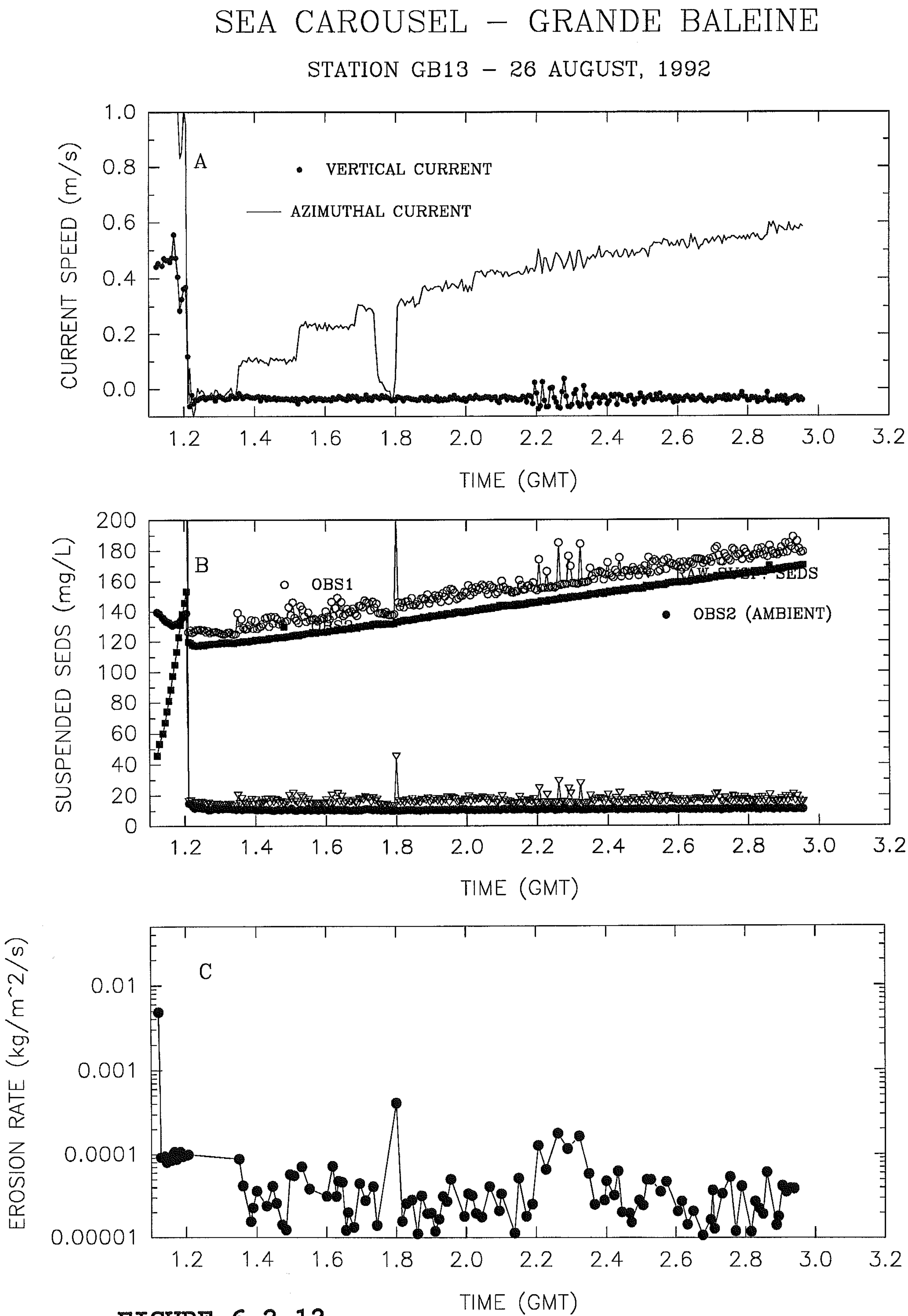

SEA CAROUSEL – GRANDE BALEINE
STATION GB13 – 26 AUGUST, 1992
A
VERTICAL CURRENT
AZIMUTHAL CURRENT
CURRENT SPEED (m/s)
1.0
0.8
0.6
0.4
0.2
0.0
TIME (GMT)
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
3.2
B
OBS1
OBS2 (AMBIENT)
SUSPENDED SEDS (mg/L)
200
180
160
140
120
100
80
60
40
20
0
C
EROSION RATE (kg/m^2/s)
0.01
0.001
0.0001
0.00001

FIGURE 6.2.12

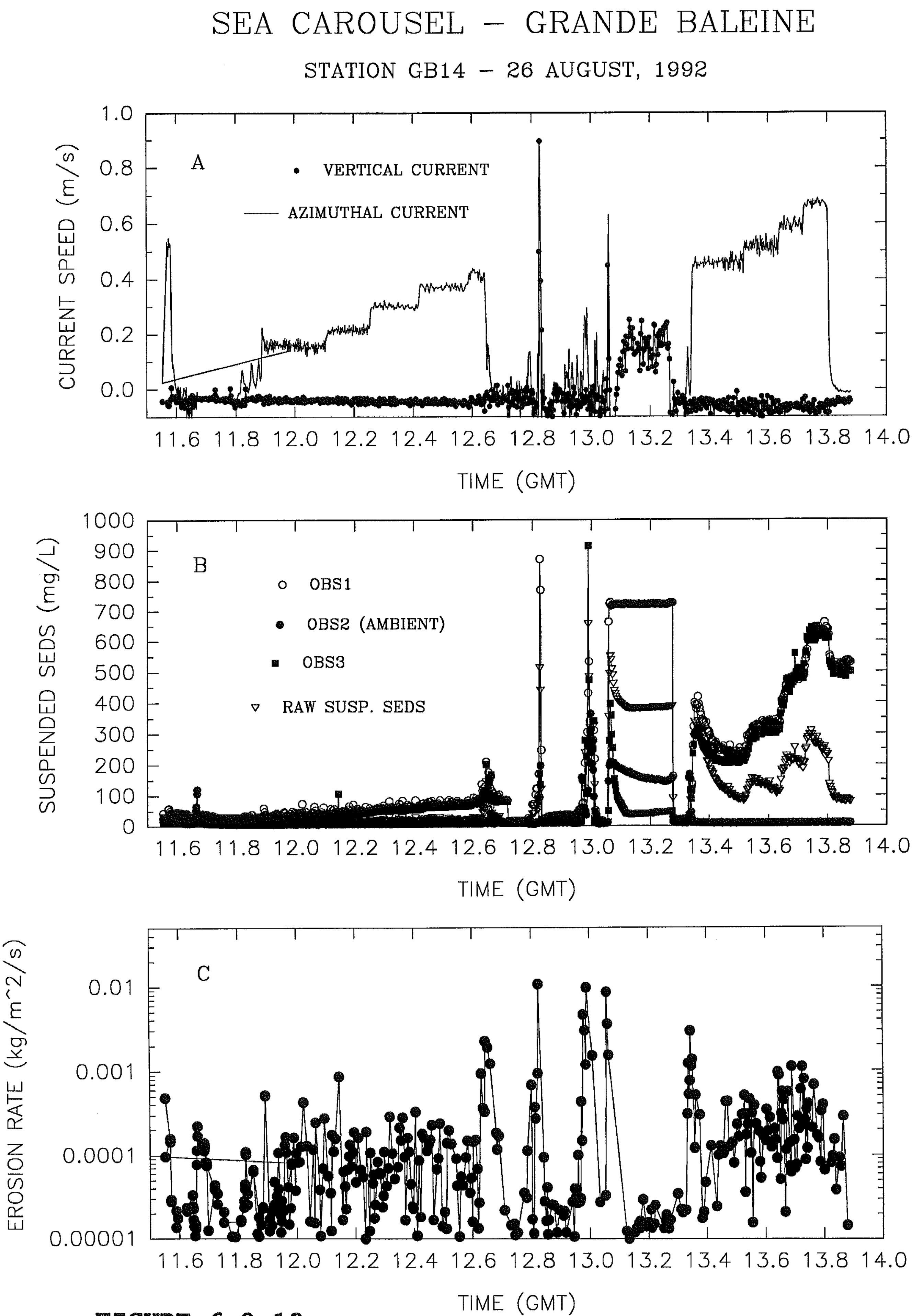

SEA CAROUSEL - GRANDE BALEINE
STATION GB14 - 26 AUGUST, 1992
A
VERTICAL CURRENT
AZIMUTHAL CURRENT
CURRENT SPEED (m/s)
1.0
0.8
0.6
0.4
0.2
0.0
TIME (GMT)
11.6
11.8
12.0
12.2
12.4
12.6
12.8
13.0
13.2
13.4
13.6
13.8
14.0
B
OBS1
OBS2 (AMBIENT)
OBS3
RAW SUSP. SEDS
SUSPENDED SEDS (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
TIME (GMT)
C
EROSION RATE (kg/m^2/s)
0.01
0.001
0.0001
0.00001
TIME (GMT)

FIGURE 6.2.13

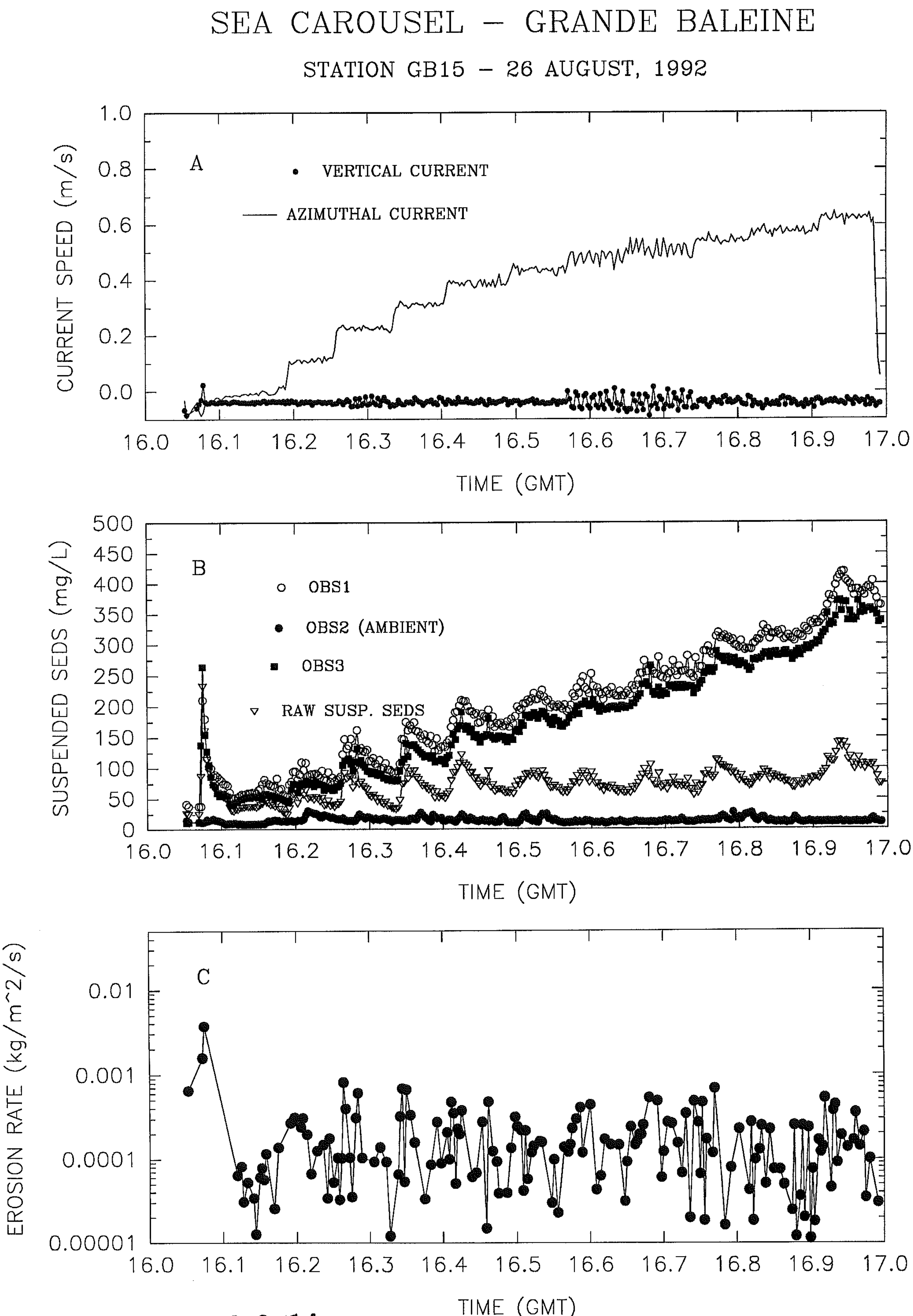

SEA CAROUSEL – GRANDE BALEINE
STATION GB15 – 26 AUGUST, 1992
A
VERTICAL CURRENT
AZIMUTHAL CURRENT
CURRENT SPEED (m/s)
1.0
0.8
0.6
0.4
0.2
0.0
16.0
16.1
16.2
16.3
16.4
16.5
16.6
16.7
16.8
16.9
17.0
TIME (GMT)
B
OBS1
OBS2 (AMBIENT)
OBS3
RAW SUSP. SEDS
SUSPENDED SEDS (mg/L)
500
450
400
350
300
250
200
150
100
50
0
TIME (GMT)
C
EROSION RATE (kg/m^2/s)
0.01
0.001
0.0001
0.00001
TIME (GMT)

FIGURE 6.2.14

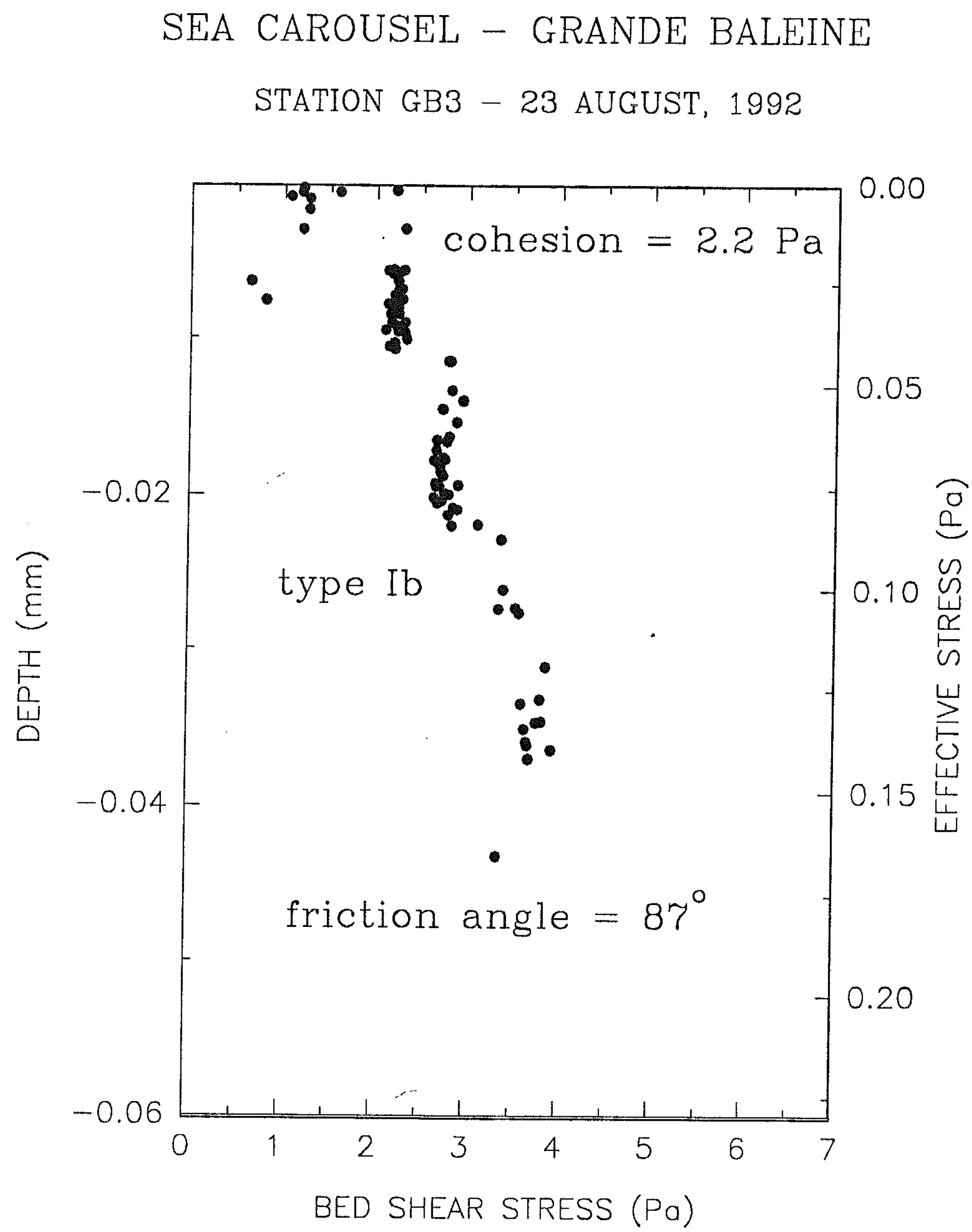

SEA CAROUSEL - GRANDE BALEINE
STATION GB3 - 23 AUGUST, 1992
cohesion = 2.2 Pa
type Ib
friction angle = 87°
DEPTH (mm)
-0.02
-0.04
-0.06
EFFECTIVE STRESS (Pa)
0.00
0.05
0.10
0.15
0.20
0
1
2
3
4
5
6
7
BED SHEAR STRESS (Pa)

FIGURE 6.3.1

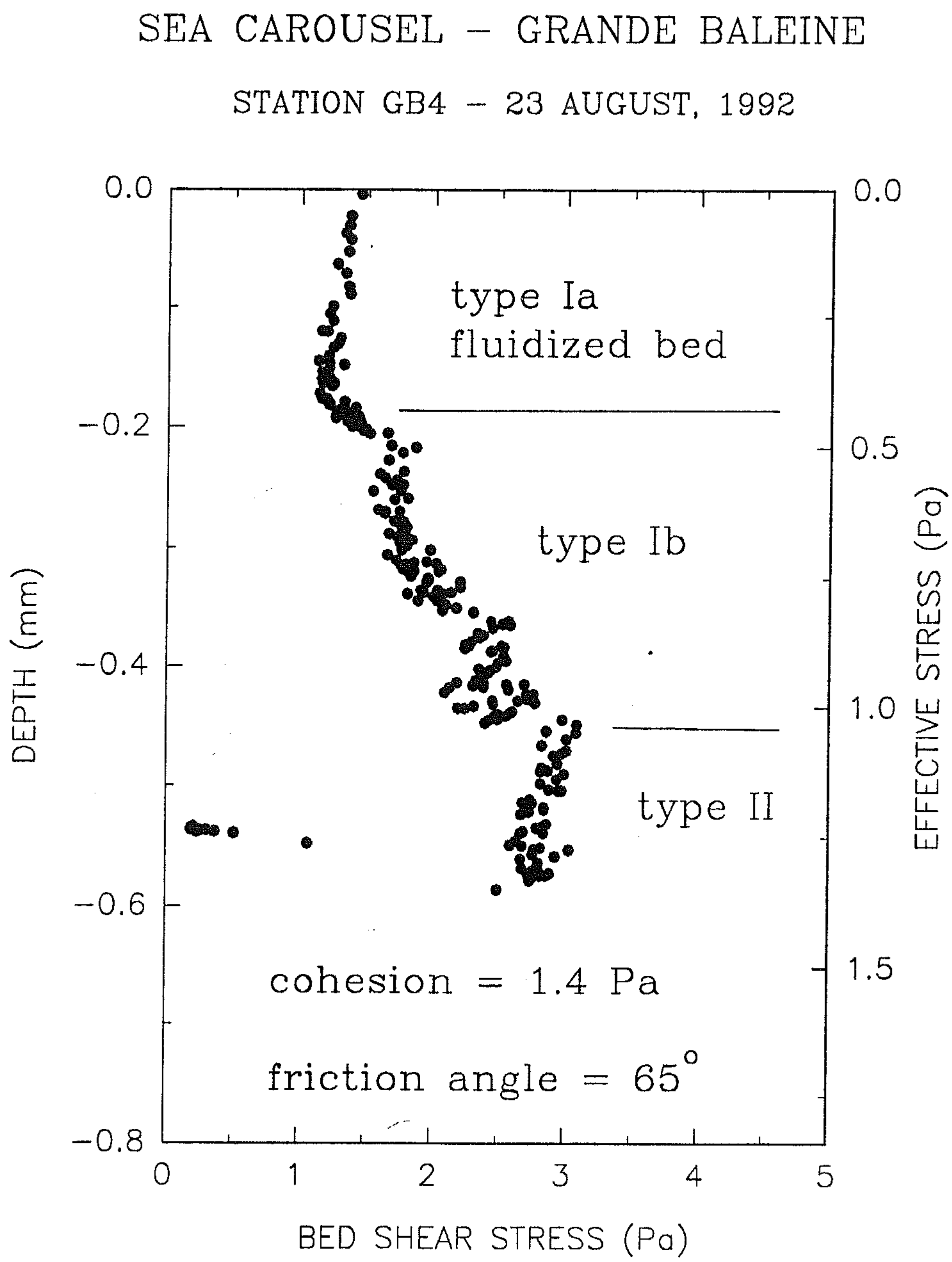

SEA CAROUSEL – GRANDE BALEINE
STATION GB4 – 23 AUGUST, 1992
0.0
–0.2
–0.4
–0.6
–0.8
DEPTH (mm)
0.0
0.5
1.0
1.5
EFFECTIVE STRESS (Pa)
type Ia
fluidized bed
type Ib
type II
cohesion = 1.4 Pa
friction angle = 65°
0
1
2
3
4
5
BED SHEAR STRESS (Pa)

FIGURE 6.3.2

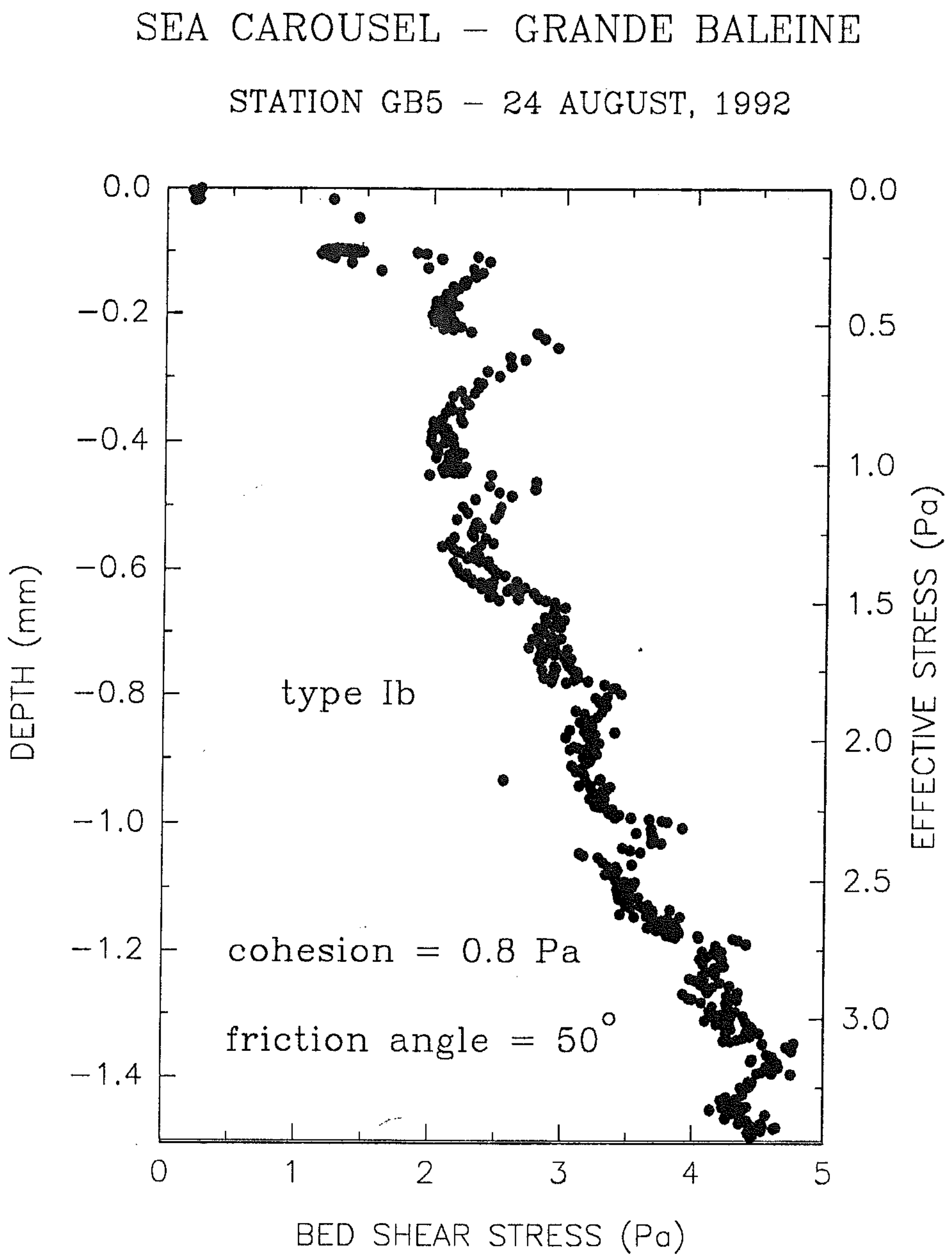

SEA CAROUSEL – GRANDE BALEINE
STATION GB5 – 24 AUGUST, 1992
DEPTH (mm)
EFFECTIVE STRESS (Pa)
BED SHEAR STRESS (Pa)
type Ib
cohesion = 0.8 Pa
friction angle = 50°
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
−1.4
0.5
1.0
1.5
2.0
2.5
3.0
0
1
2
3
4
5

FIGURE 6.3.3

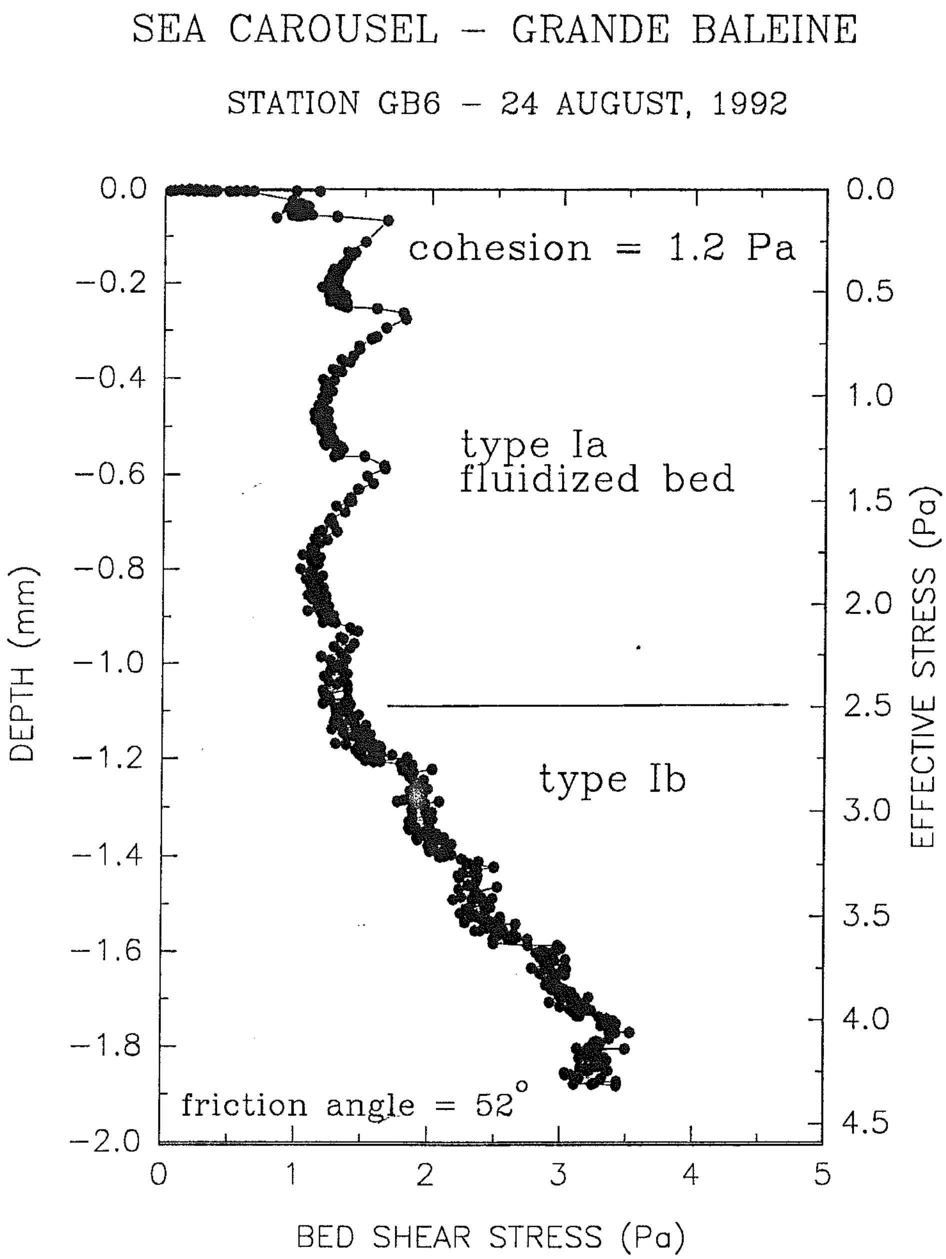
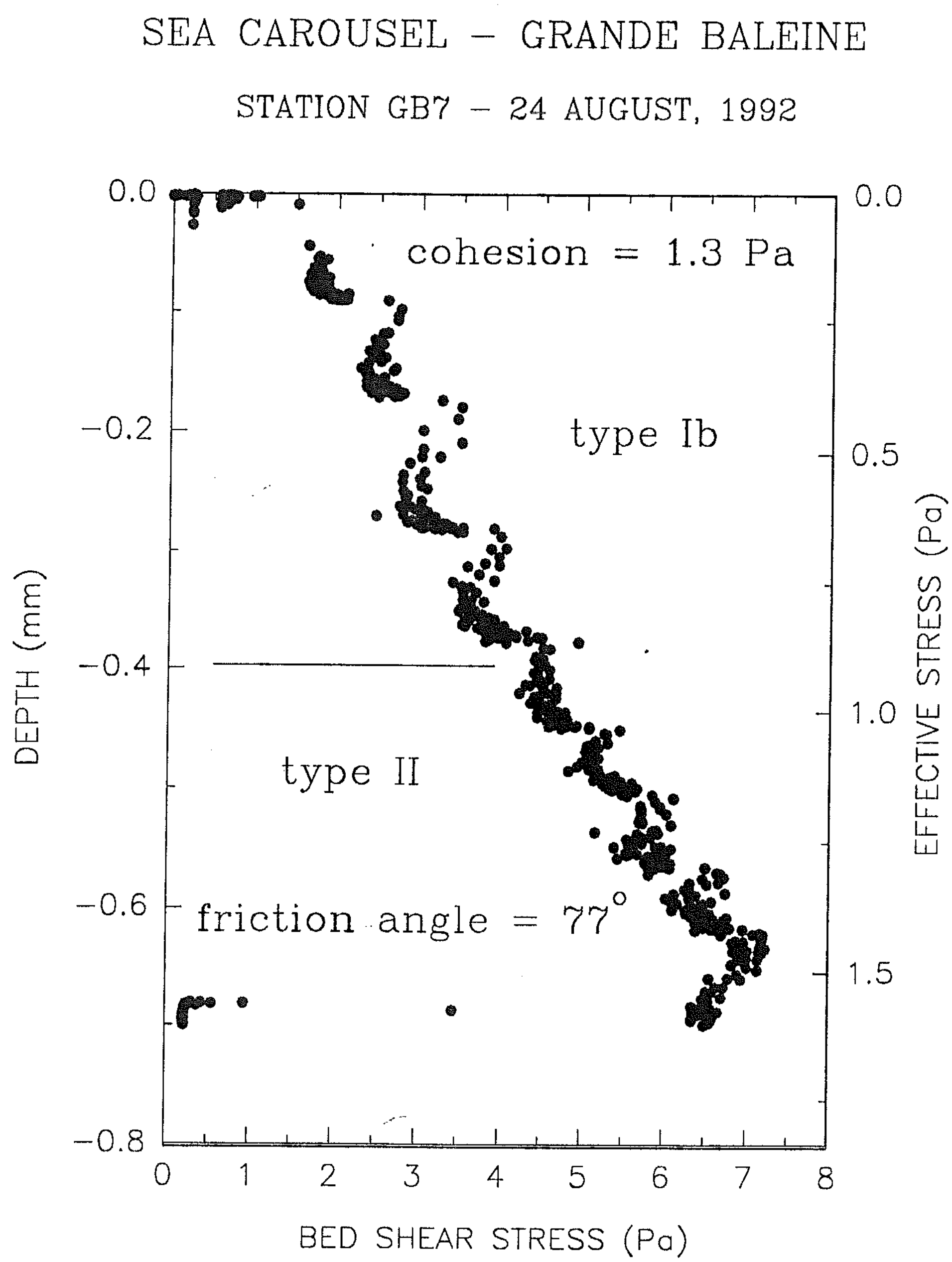
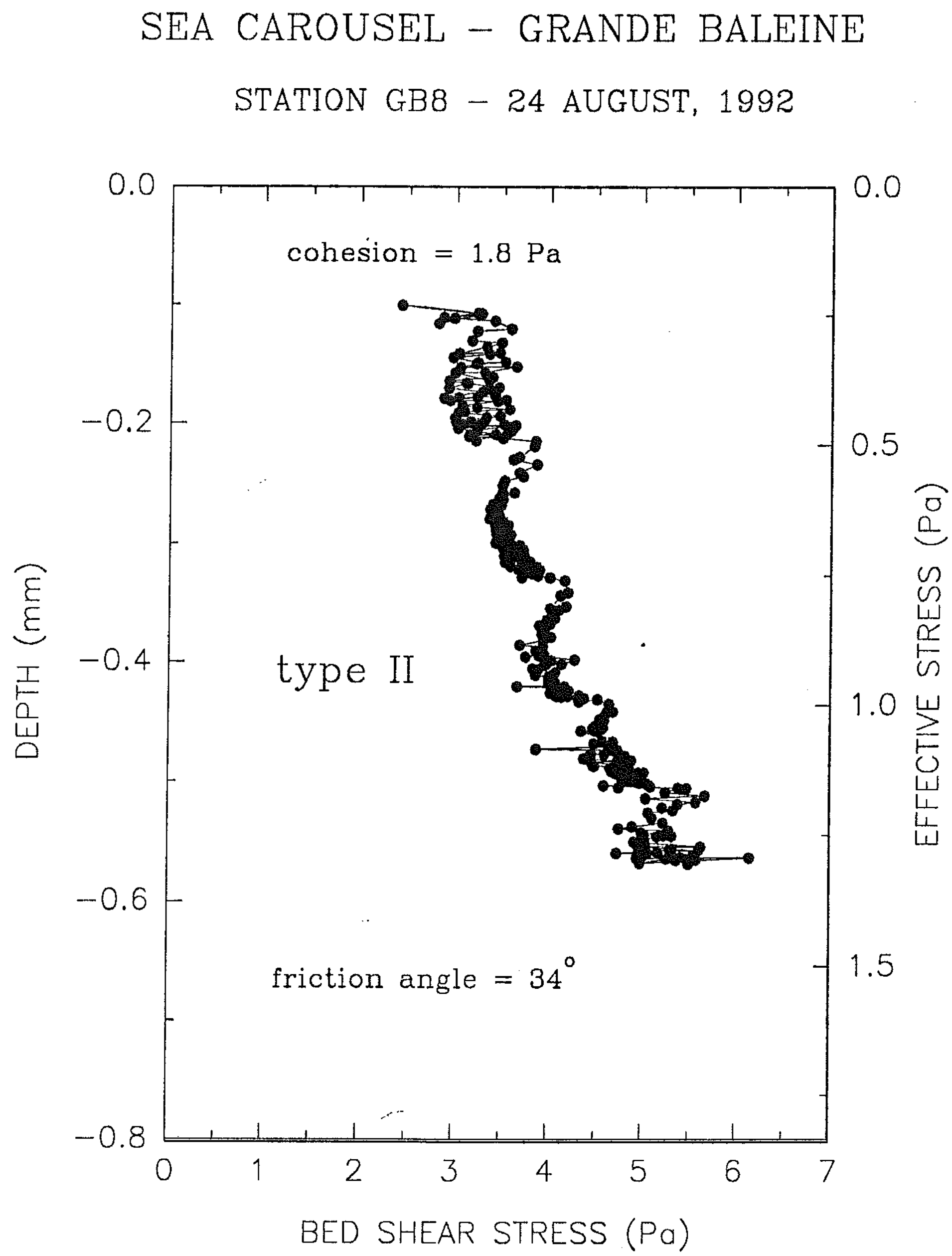

SEA CAROUSEL - GRANDE BALEINE
STATION GB6 - 24 AUGUST, 1992
cohesion = 1.2 Pa
type Ia
fluidized bed
type Ib
friction angle = 52°
DEPTH (mm)
EFFECTIVE STRESS (Pa)
BED SHEAR STRESS (Pa)
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.2
-1.4
-1.6
-1.8
-2.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
0
1
2
3
4
5

FIGURE 6.3.4



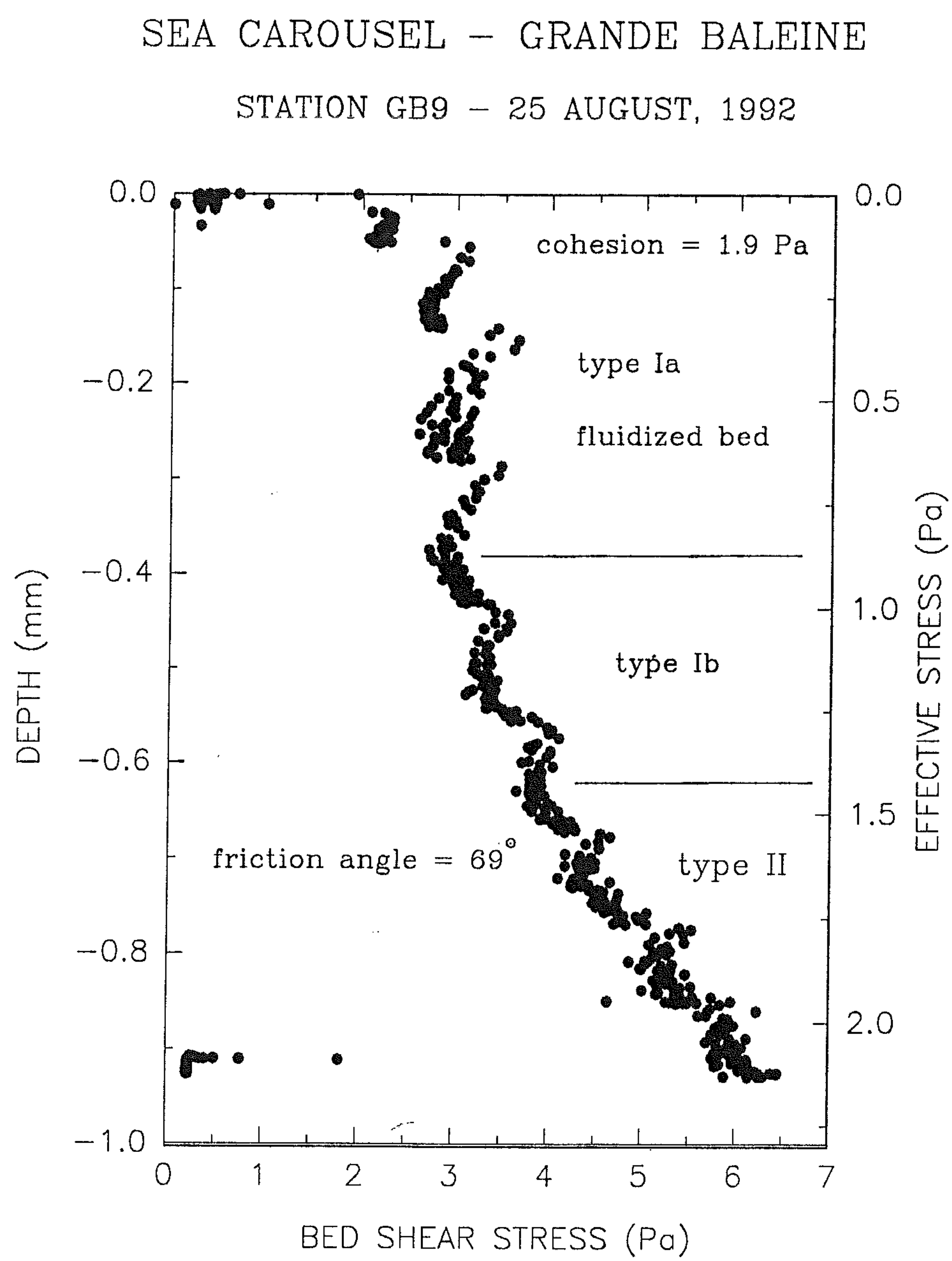
SEA CAROUSEL – GRANDE BALEINE
STATION GB7 – 24 AUGUST, 1992
cohesion = 1.3 Pa
type Ib
type II
friction angle = 77°
DEPTH (mm)
0.0
−0.2
−0.4
−0.6
−0.8
EFFECTIVE STRESS (Pa)
0.0
0.5
1.0
1.5
BED SHEAR STRESS (Pa)
0
1
2
3
4
5
6
7
8

FIGURE 6.3.5



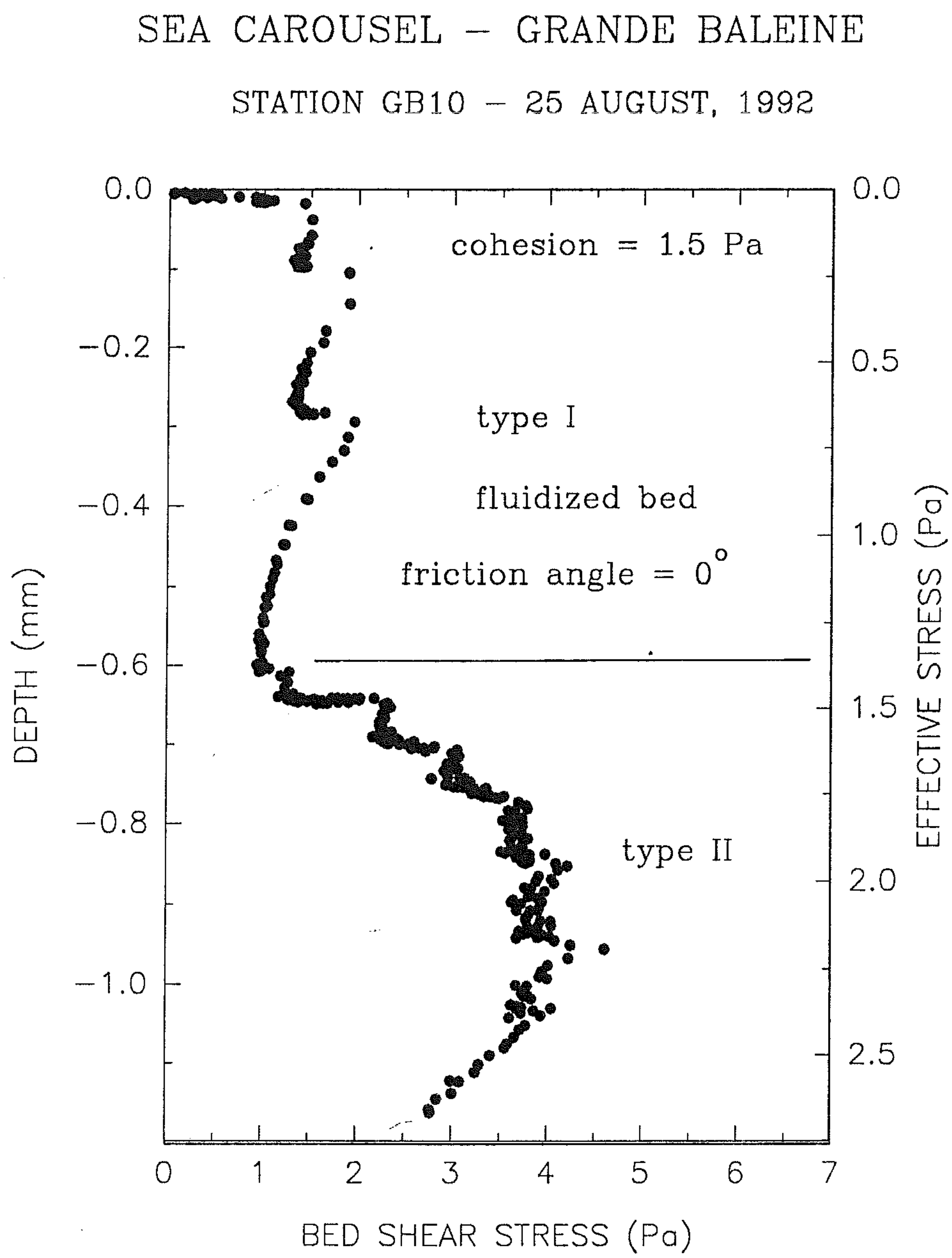
SEA CAROUSEL – GRANDE BALEINE
STATION GB8 – 24 AUGUST, 1992
cohesion = 1.8 Pa
type II
friction angle = 34°
DEPTH (mm)
0.0
−0.2
−0.4
−0.6
−0.8
EFFECTIVE STRESS (Pa)
0.0
0.5
1.0
1.5
BED SHEAR STRESS (Pa)
0
1
2
3
4
5
6
7

FIGURE 6.3.6



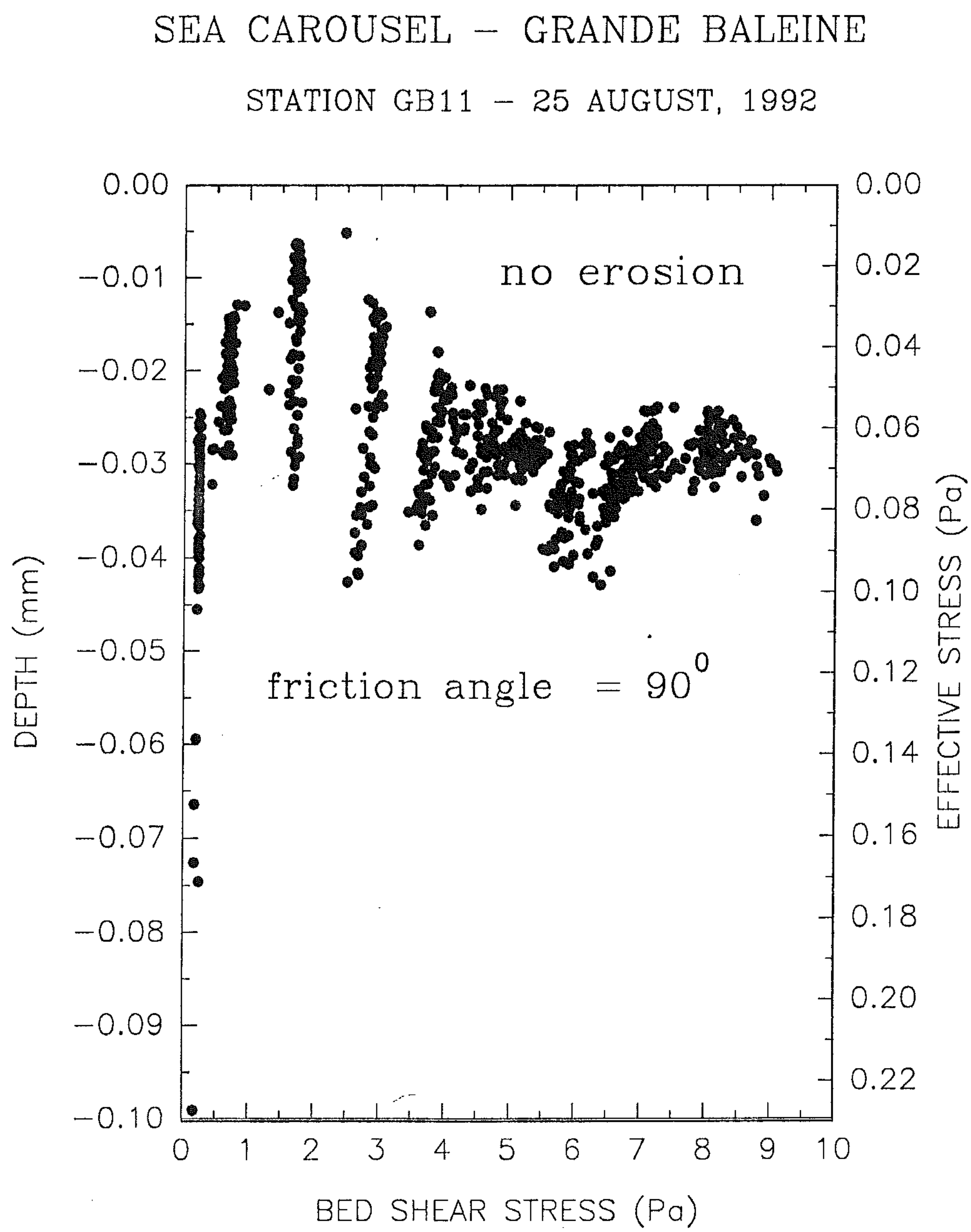
SEA CAROUSEL - GRANDE BALEINE
STATION GB9 - 25 AUGUST, 1992
cohesion = 1.9 Pa
type Ia
fluidized bed
type Ib
type II
friction angle = 69°
DEPTH (mm)
EFFECTIVE STRESS (Pa)
BED SHEAR STRESS (Pa)
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
0.5
1.0
1.5
2.0
0
1
2
3
4
5
6
7

FIGURE 6.3.7



SEA CAROUSEL – GRANDE BALEINE
STATION GB10 – 25 AUGUST, 1992
cohesion = 1.5 Pa
type I
fluidized bed
friction angle = 0°
type II
DEPTH (mm)
EFFECTIVE STRESS (Pa)
BED SHEAR STRESS (Pa)
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
0.5
1.0
1.5
2.0
2.5
0 1 2 3 4 5 6 7

FIGURE 6.3.8



SEA CAROUSEL – GRANDE BALEINE
STATION GB11 – 25 AUGUST, 1992
no erosion
friction angle = 90°
DEPTH (mm)
EFFECTIVE STRESS (Pa)
BED SHEAR STRESS (Pa)
0.00
−0.01
−0.02
−0.03
−0.04
−0.05
−0.06
−0.07
−0.08
−0.09
−0.10
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0
1
2
3
4
5
6
7
8
9
10

FIGURE 6.3.9

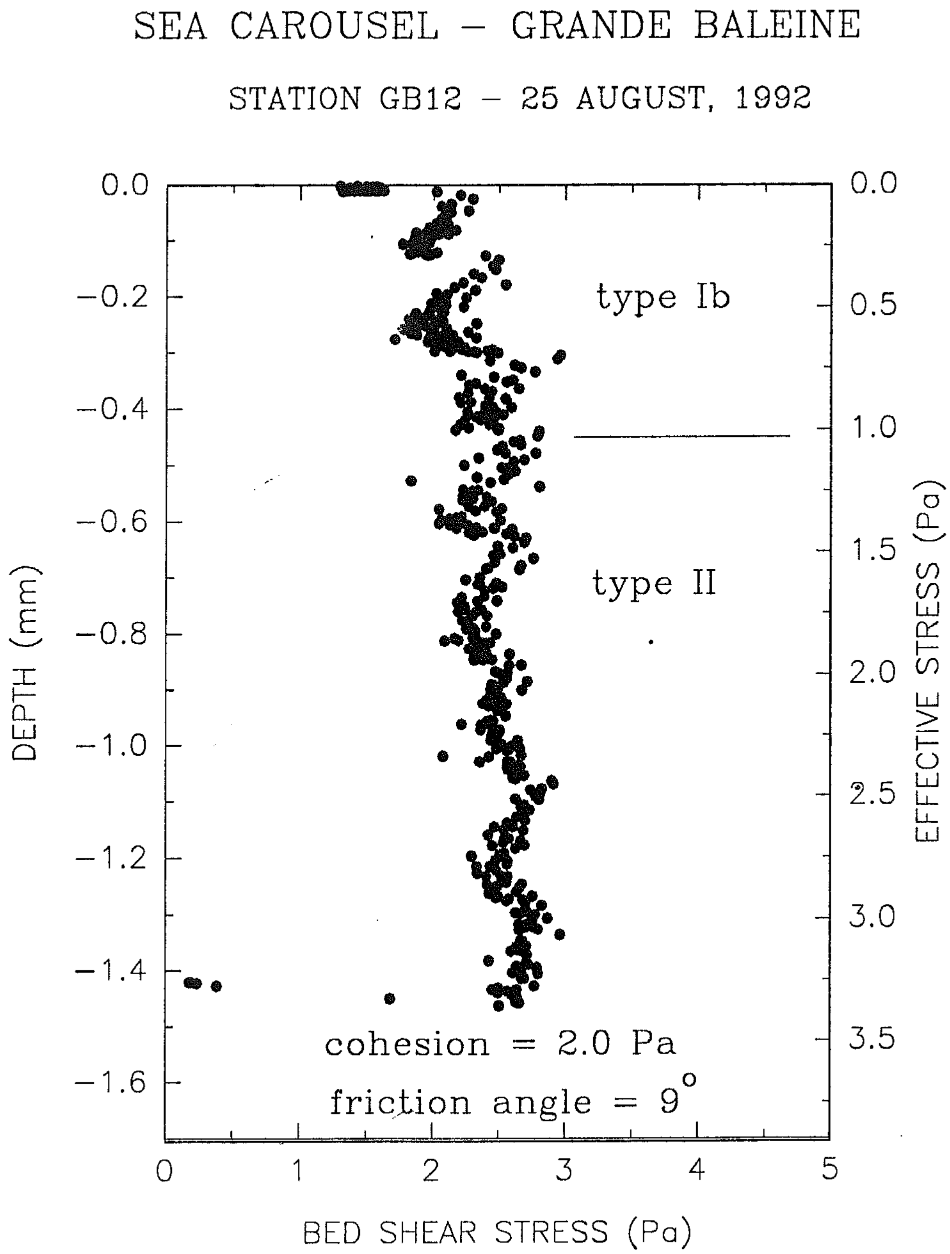

SEA CAROUSEL – GRANDE BALEINE
STATION GB12 – 25 AUGUST, 1992
type Ib
type II
cohesion = 2.0 Pa
friction angle = 9°
DEPTH (mm)
EFFECTIVE STRESS (Pa)
BED SHEAR STRESS (Pa)
0.0
−0.2
−0.4
−0.6
−0.8
−1.0
−1.2
−1.4
−1.6
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
1
2
3
4
5

FIGURE 6.3.10

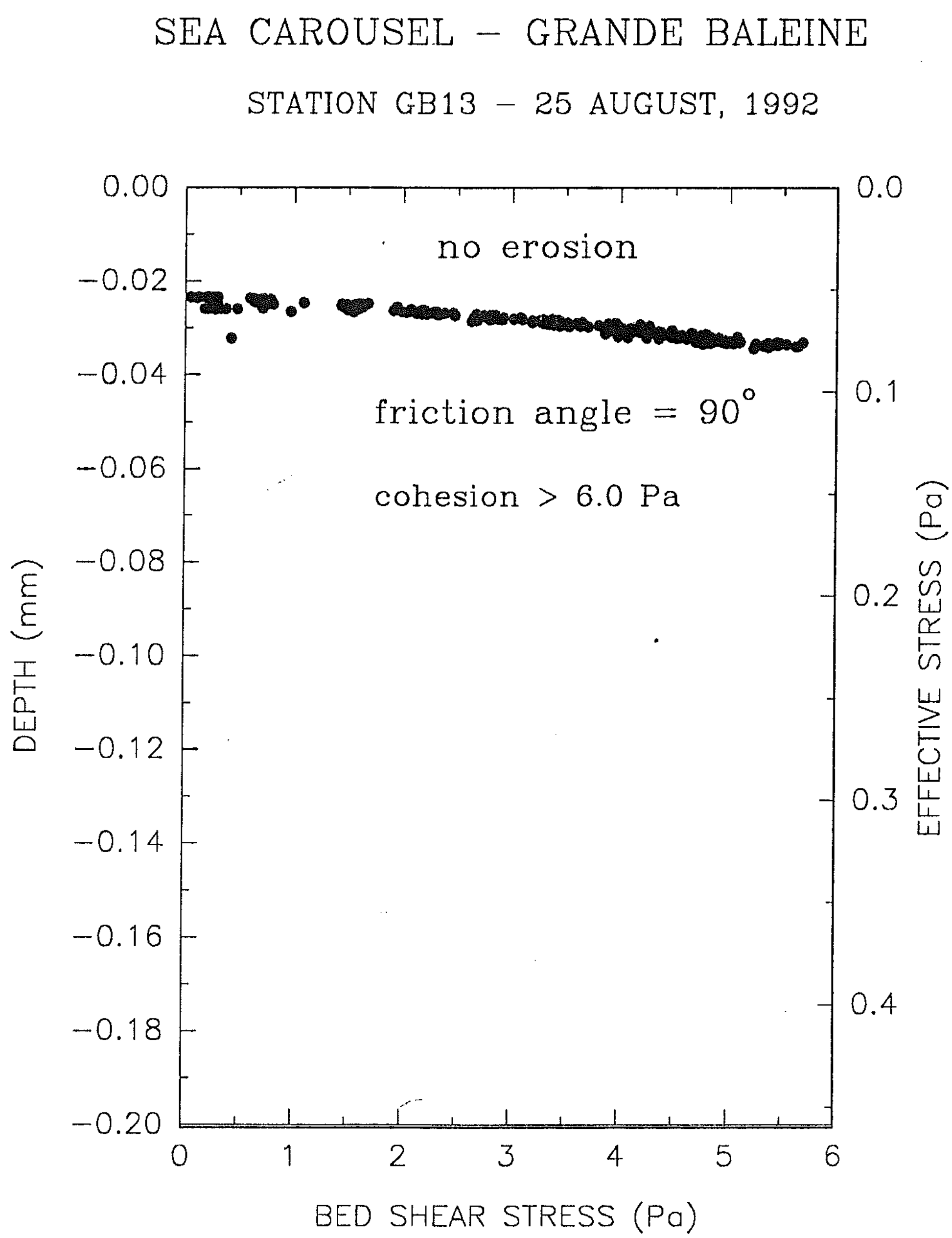

SEA CAROUSEL – GRANDE BALEINE
STATION GB13 – 25 AUGUST, 1992
no erosion
friction angle = 90°
cohesion > 6.0 Pa
DEPTH (mm)
0.00
–0.02
–0.04
–0.06
–0.08
–0.10
–0.12
–0.14
–0.16
–0.18
–0.20
EFFECTIVE STRESS (Pa)
0.0
0.1
0.2
0.3
0.4
BED SHEAR STRESS (Pa)
0
1
2
3
4
5
6

FIGURE 6.3.11

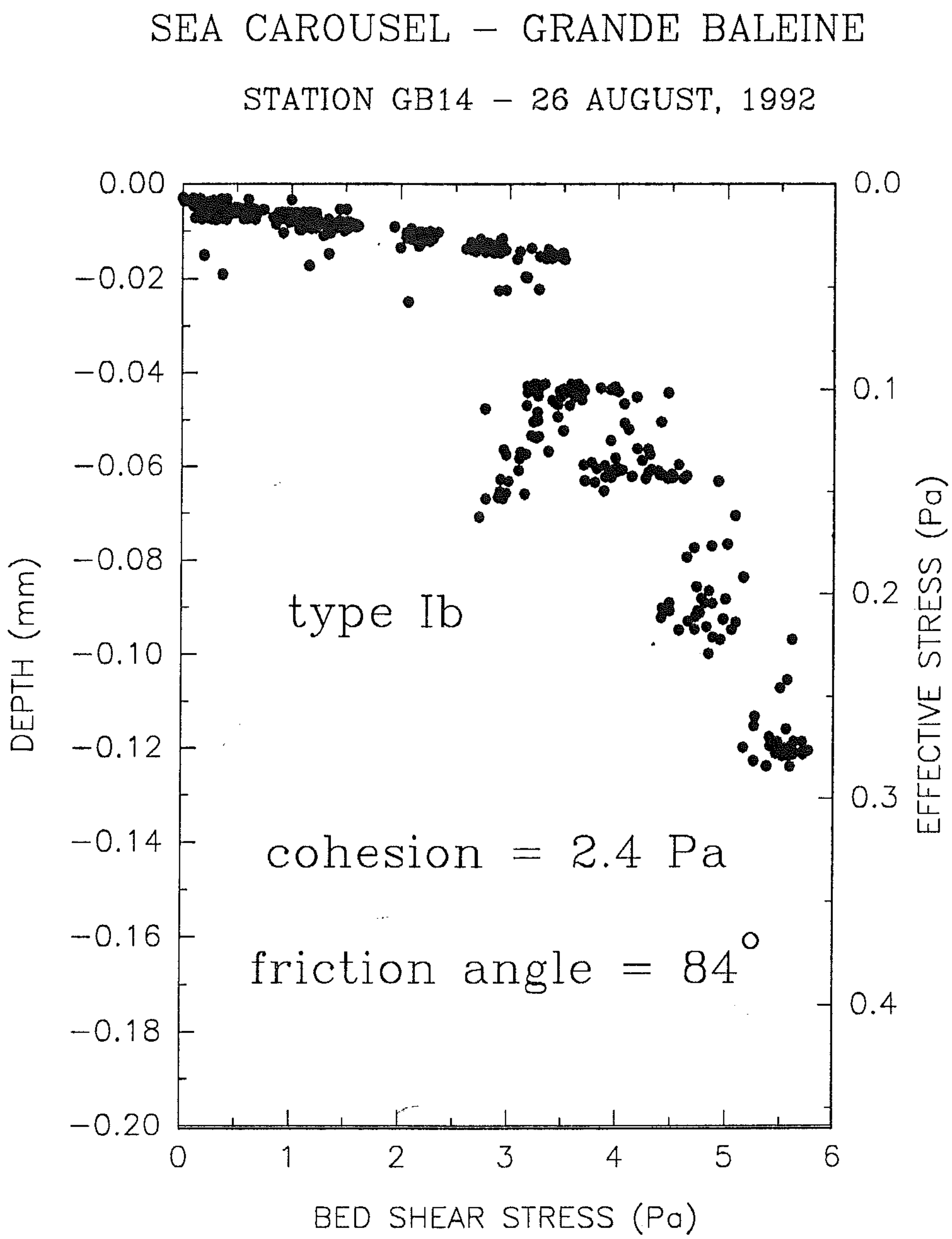

SEA CAROUSEL – GRANDE BALEINE
STATION GB14 – 26 AUGUST, 1992
DEPTH (mm)
0.00
–0.02
–0.04
–0.06
–0.08
–0.10
–0.12
–0.14
–0.16
–0.18
–0.20
EFFECTIVE STRESS (Pa)
0.0
0.1
0.2
0.3
0.4
0
1
2
3
4
5
6
BED SHEAR STRESS (Pa)
type Ib
cohesion = 2.4 Pa
friction angle = 84°

FIGURE 6.3.12

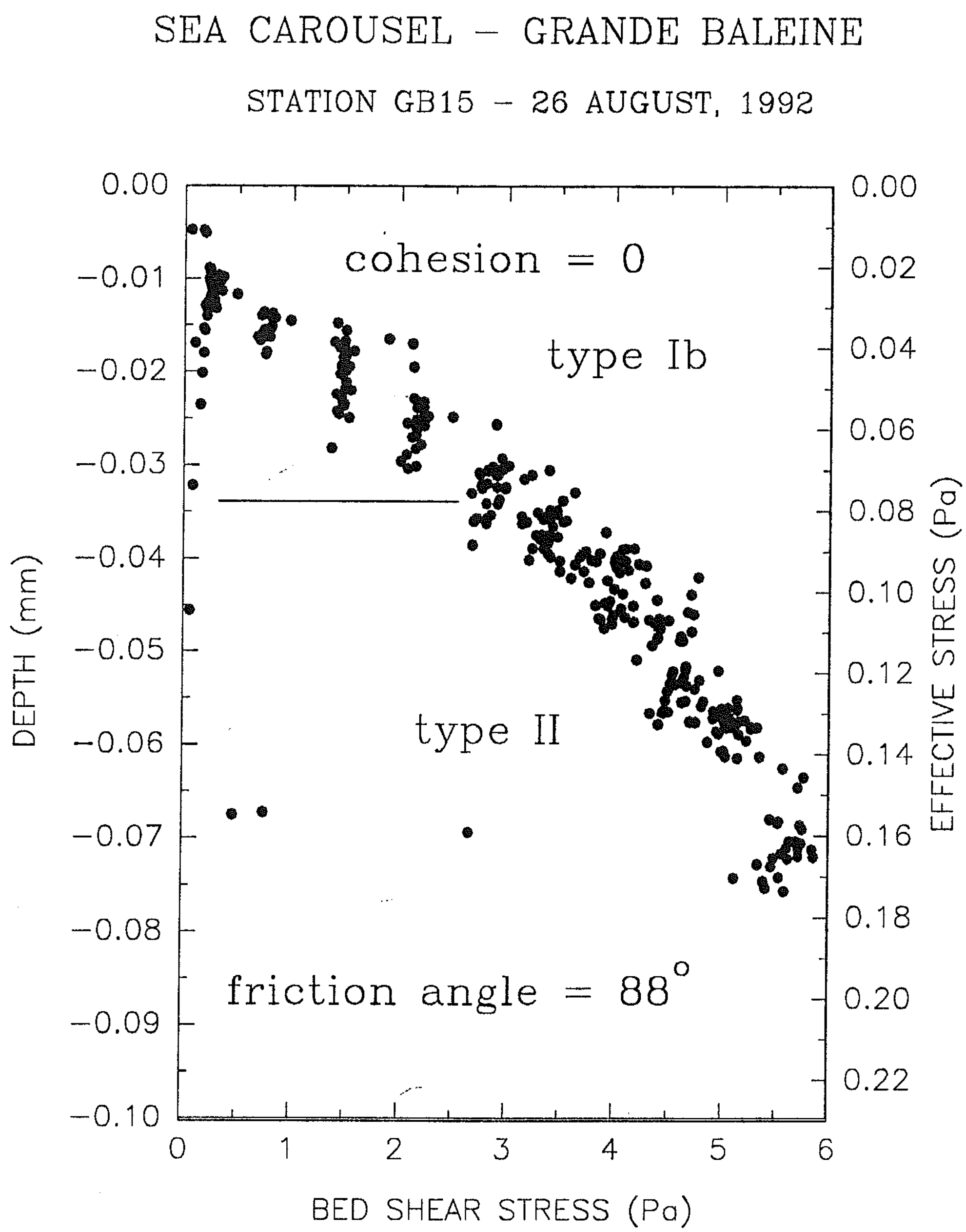
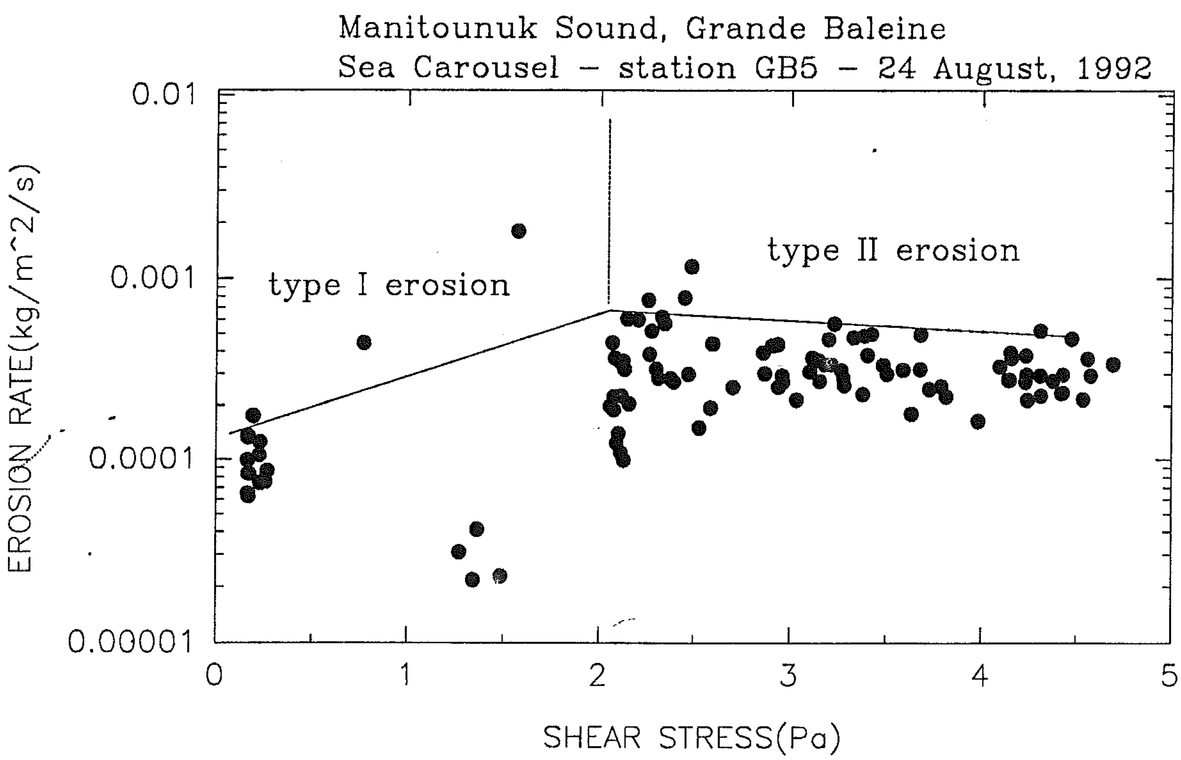
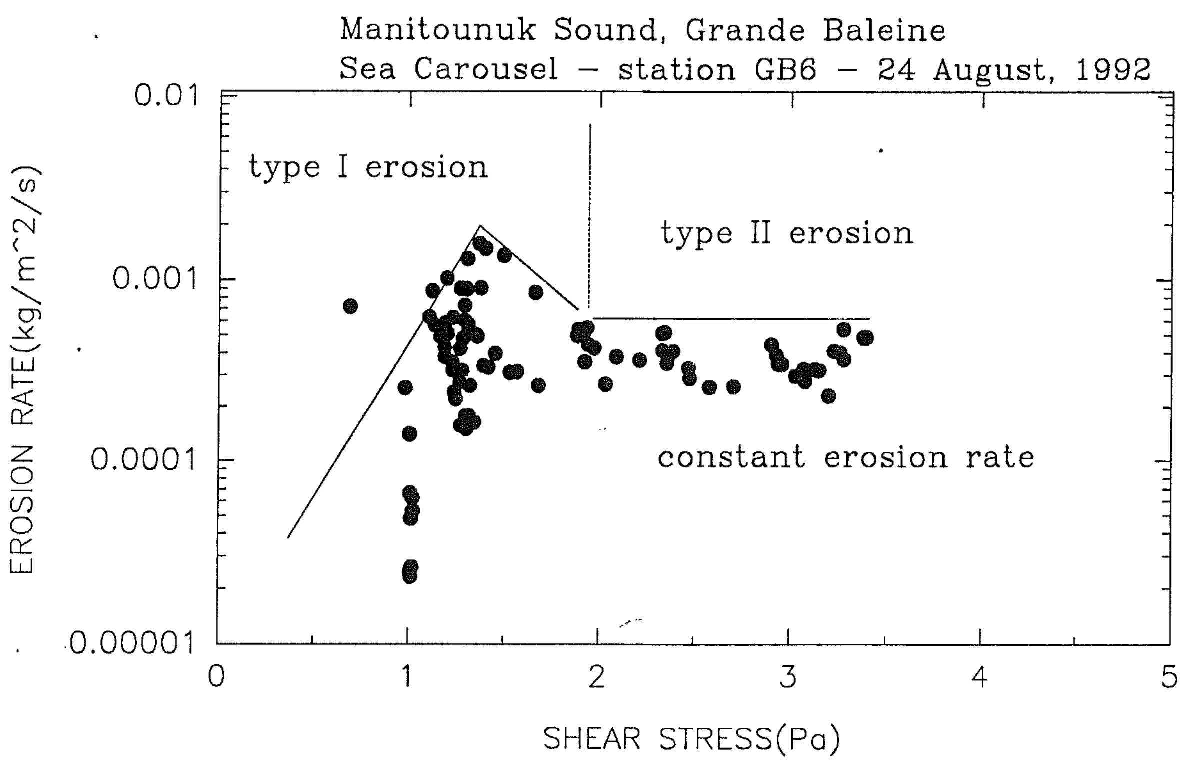

SEA CAROUSEL - GRANDE BALEINE
STATION GB15 - 26 AUGUST, 1992
cohesion = 0
type Ib
type II
friction angle = 88°
DEPTH (mm)
EFFECTIVE STRESS (Pa)
BED SHEAR STRESS (Pa)
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
-0.08
-0.09
-0.10
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0
1
2
3
4
5
6

FIGURE 6.3.13



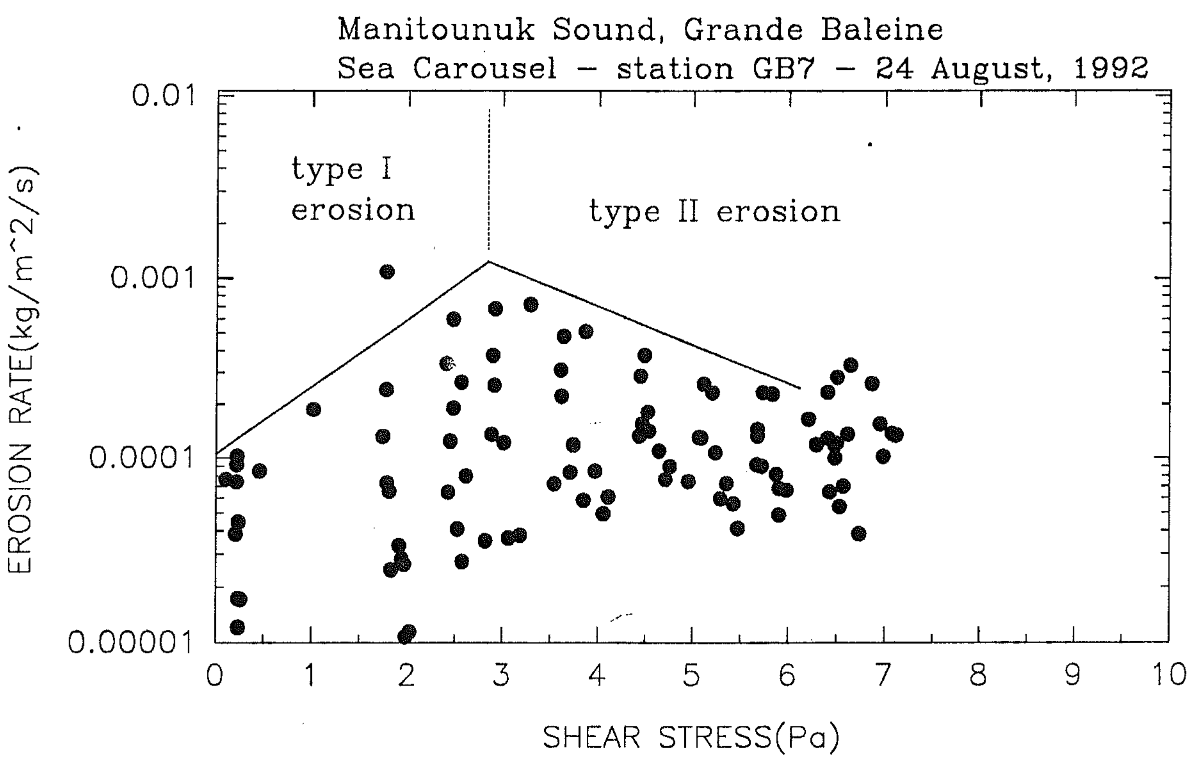
Manitounuk Sound, Grande Baleine
Sea Carousel – station GB5 – 24 August, 1992
0.01
0.001
0.0001
0.00001
EROSION RATE(kg/m^2/s)
type I erosion
type II erosion
0
1
2
3
4
5
SHEAR STRESS(Pa)

FIGURE 6.4.1



Manitounuk Sound, Grande Baleine
Sea Carousel – station GB6 – 24 August, 1992
type I erosion
type II erosion
constant erosion rate
EROSION RATE(kg/m^2/s)
0.01
0.001
0.0001
0.00001
0
1
2
3
4
5
SHEAR STRESS(Pa)

FIGURE 6.4.2



Manitounuk Sound, Grande Baleine
Sea Carousel - station GB7 - 24 August, 1992
type I erosion
type II erosion
EROSION RATE(kg/m^2/s)
0.01
0.001
0.0001
0.00001
0
1
2
3
4
5
6
7
8
9
10
SHEAR STRESS(Pa)

FIGURE 6.4.3

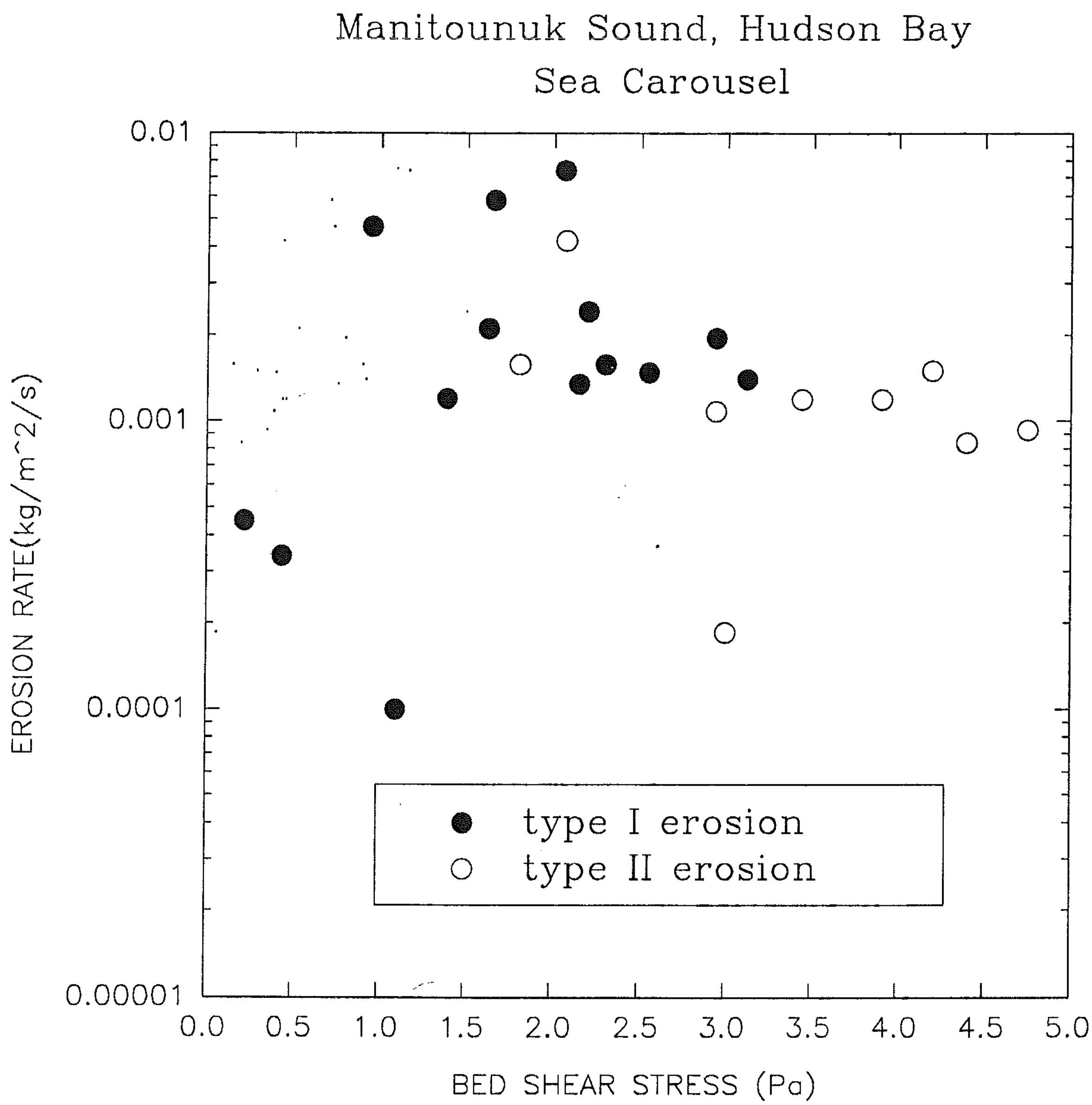
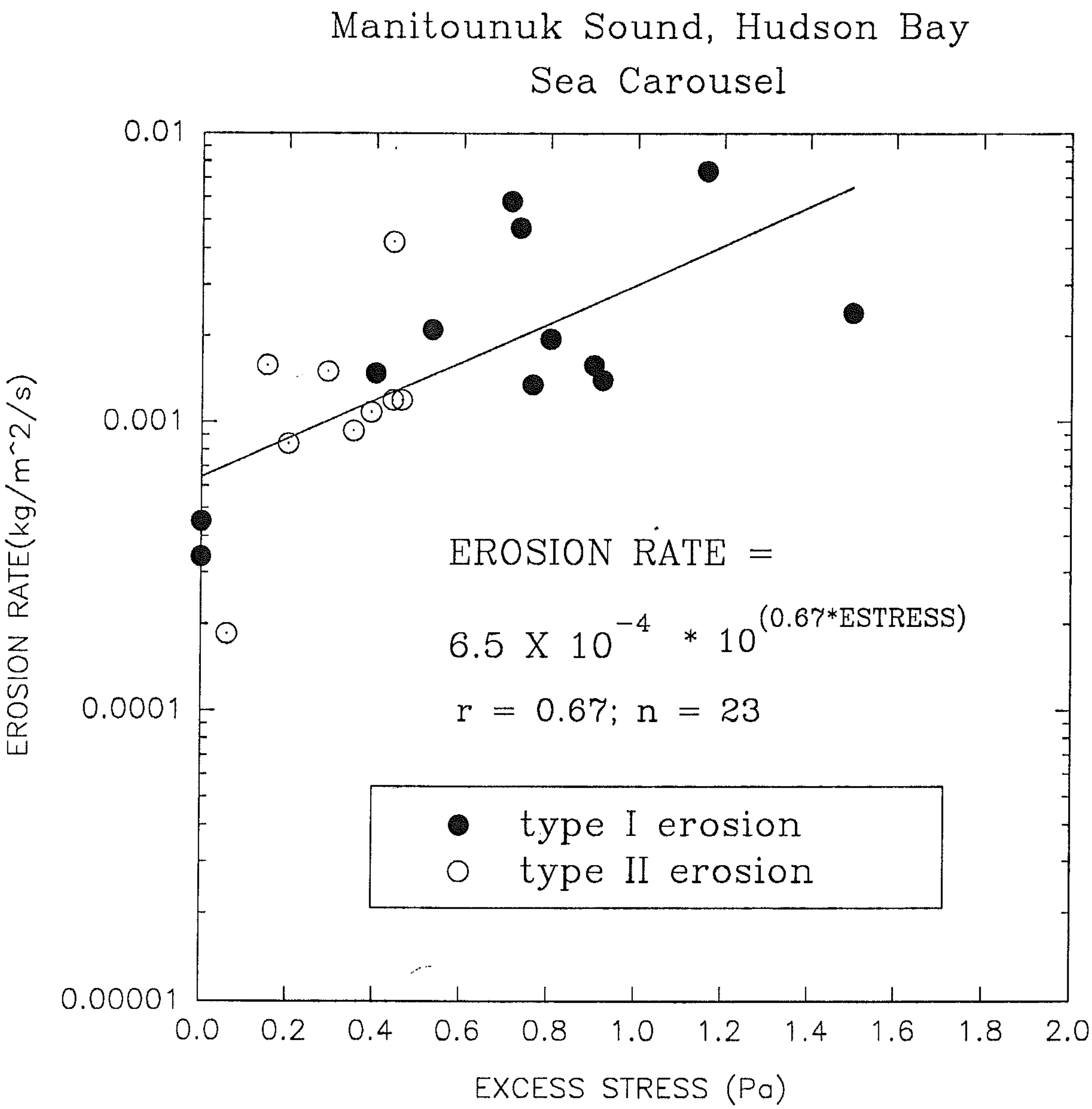
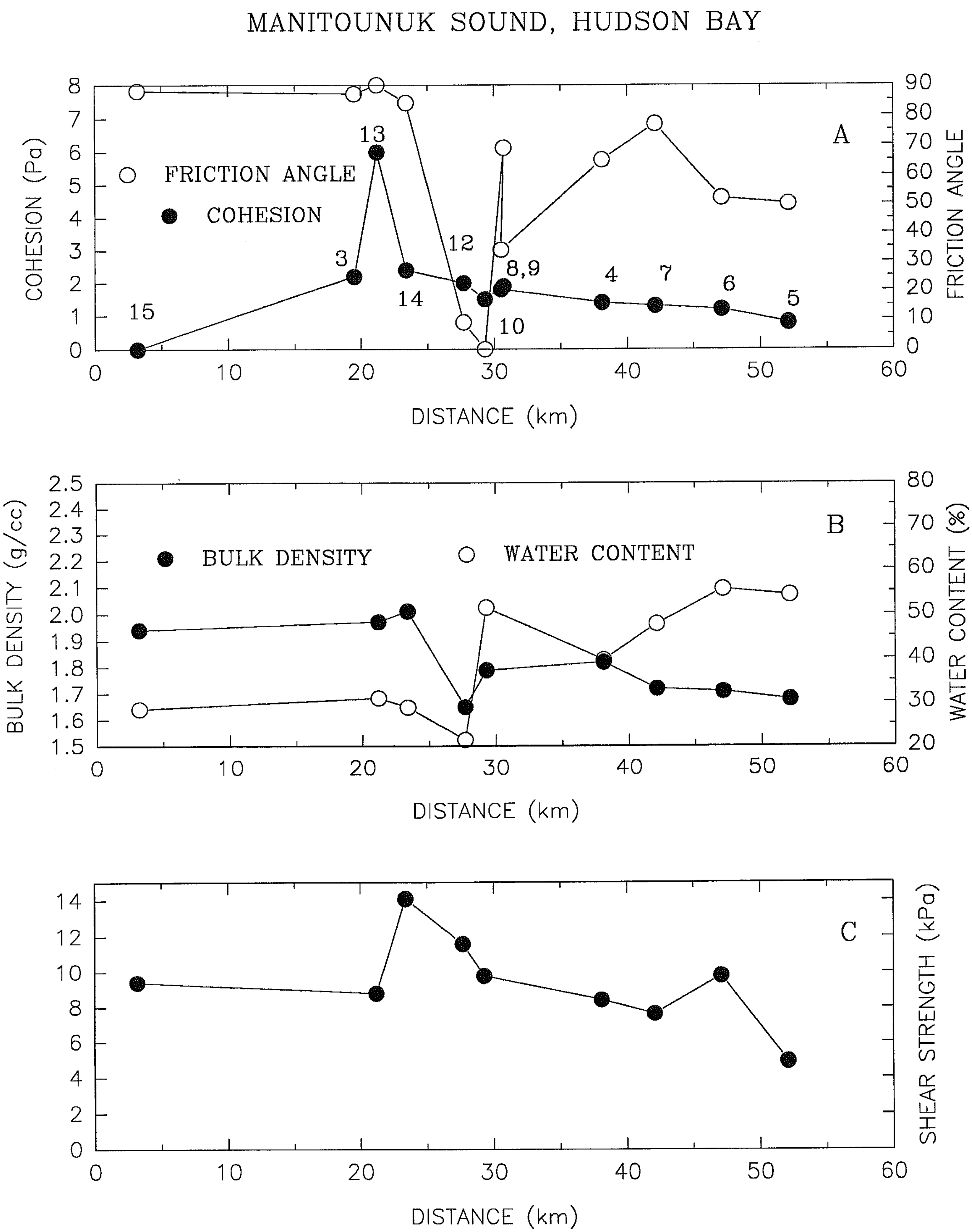

Manitounuk Sound, Hudson Bay
Sea Carousel
0.01
0.001
0.0001
0.00001
EROSION RATE(kg/m^2/s)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
BED SHEAR STRESS (Pa)
type I erosion
type II erosion

FIGURE 6.4.4



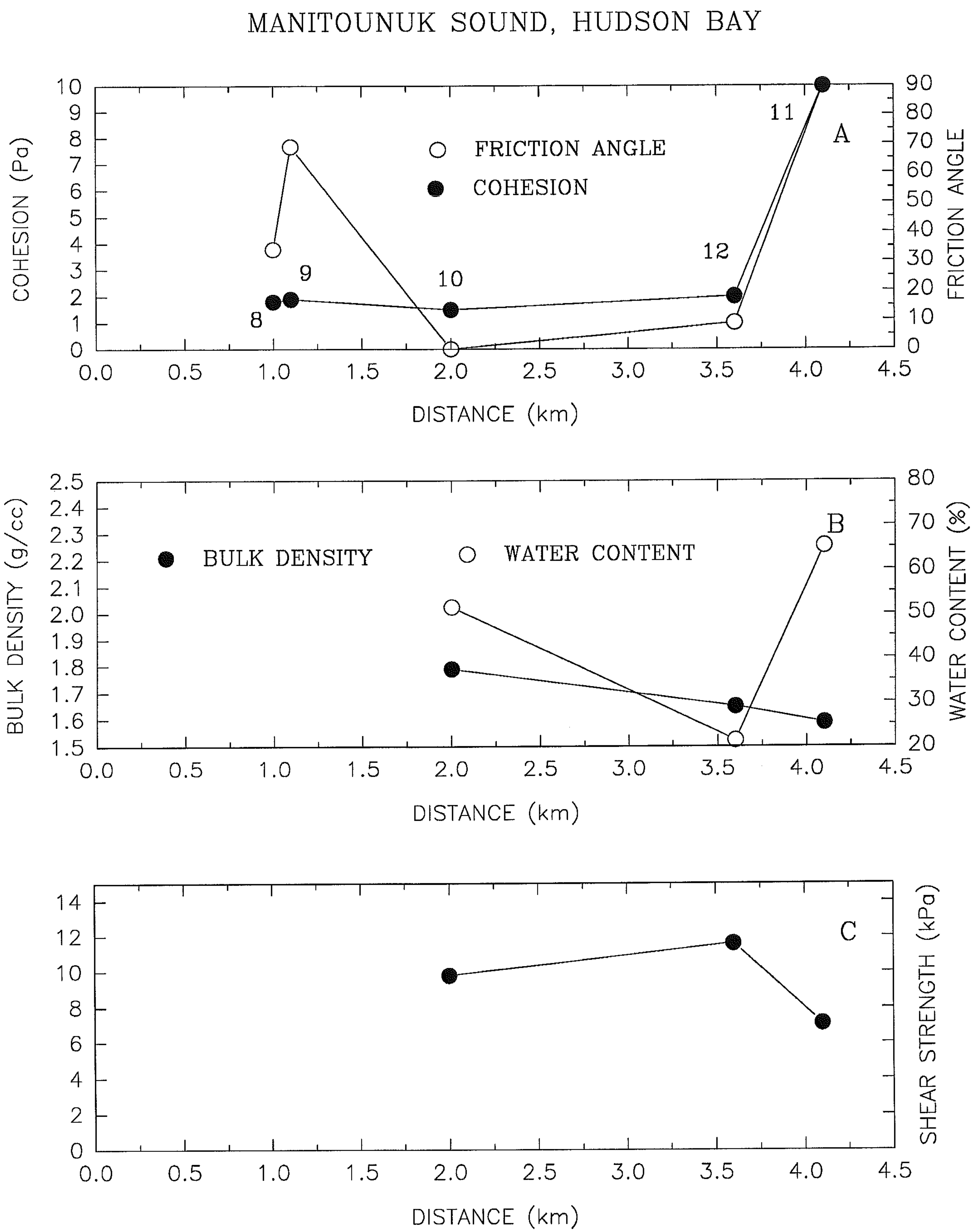
Manitounuk Sound, Hudson Bay
Sea Carousel
0.01
0.001
0.0001
0.00001
EROSION RATE(kg/m^2/s)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
EXCESS STRESS (Pa)
EROSION RATE =
6.5 X 10^-4 * 10^(0.67*ESTRESS)
r = 0.67; n = 23
type I erosion
type II erosion

FIGURE 6.4.5



MANITOUNUK SOUND, HUDSON BAY
COHESION (Pa)
FRICTION ANGLE
A
FRICTION ANGLE
COHESION
15
3
13
14
12
8,9
10
4
7
6
5
DISTANCE (km)
BULK DENSITY (g/cc)
WATER CONTENT (%)
B
BULK DENSITY
WATER CONTENT
DISTANCE (km)
SHEAR STRENGTH (kPa)
C
DISTANCE (km)

FIGURE 7.1.



MANITOUNUK SOUND, HUDSON BAY
COHESION (Pa)
FRICTION ANGLE
FRICTION ANGLE
COHESION
A
8
9
10
11
12
DISTANCE (km)
BULK DENSITY (g/cc)
WATER CONTENT (%)
BULK DENSITY
WATER CONTENT
B
DISTANCE (km)
SHEAR STRENGTH (kPa)
C
DISTANCE (km)

FIGURE 7.2.

Étude de la production primaire dans la baie et le détroit d'Hudson

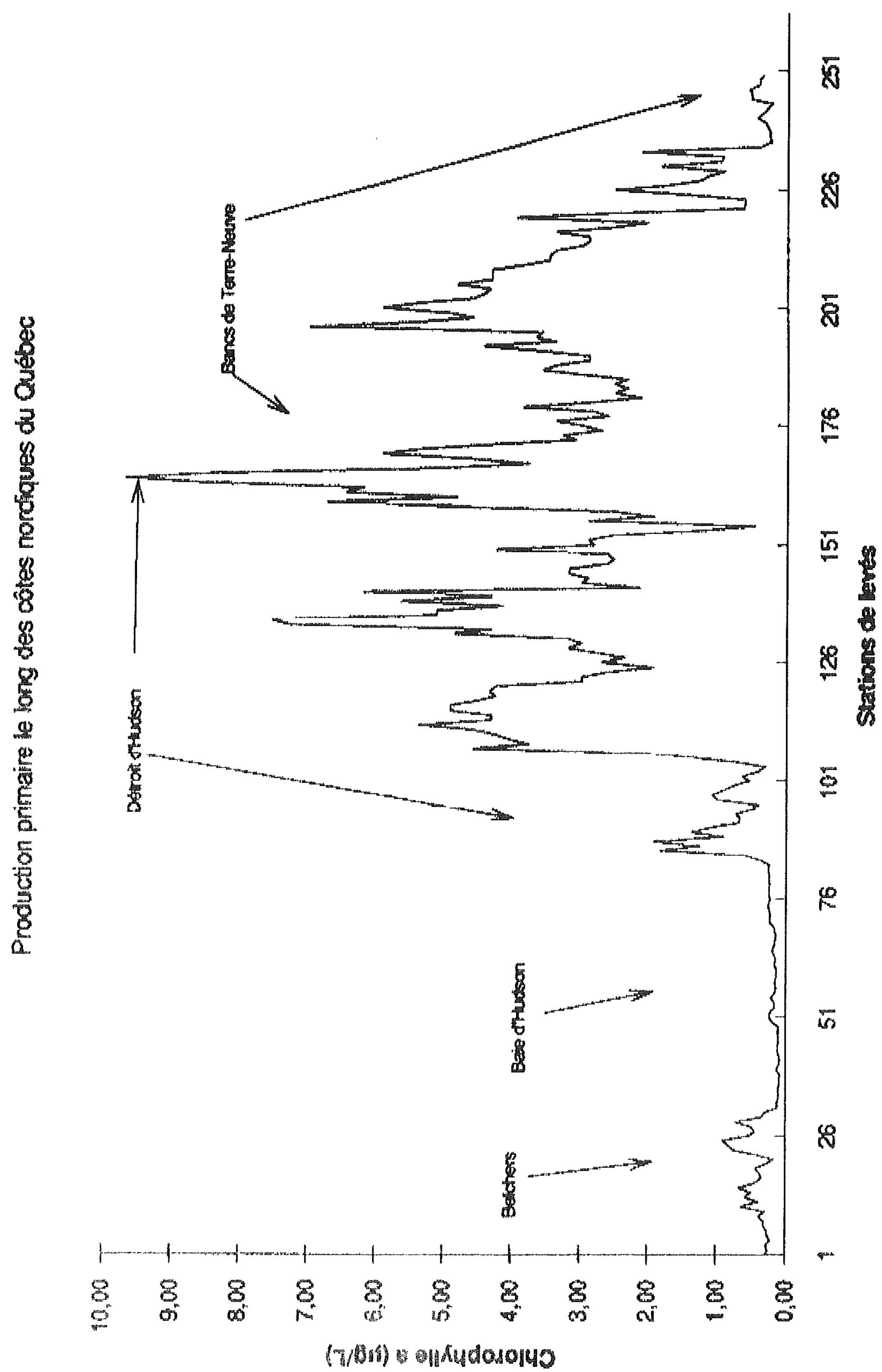
Rapport de mission océanographique de CSSA Consultants Ltée

[illegible] CALENDRIER

[illegible] déroulée du 31 août au [illegible] septembre 1992. CSSA [illegible] Caron et l'équipement de laboratoire a été gracieusement prêté par [illegible] L'échantillonnage a porté exclusivement sur la prise [illegible] de la course du CSS Hudson. A bord, des analyses [illegible] et les phaeopi[illegible] pour un total de 253 [illegible] la position de la station, la profondeur [illegible] [illegible]

- Au coeur de la baie d'Hudson, soit entre les îles Belchers et en aval de Mansel Island, la biomasse est excessivement faible, soit entre 0,08 et 0,25 µg/L.

- Dans le détroit d'Hudson, on observe une biomasse très importante pour cette période de l'année. Trois pics d'abondance ont été mesurés et les valeurs atteignent près de 10 µg/L. L'alternance de valeurs aussi fortes, témoignent d'une production soutenue et occasionnée par des processus locaux. Les valeurs de salinités de ces échantillons sous-tendent cette observation.


Production primaire le long des côtes nordiques du Québec
Chlorophylle a (µg/L)
10,00
9,00
8,00
7,00
6,00
5,00
4,00
3,00
2,00
1,00
0,00
Stations de levés
1
26
51
76
101
126
151
176
201
226
251
Belchers
Baie d'Hudson
Détroit d'Hudson
Bancs de Terre-Neuve

CSSA

Date Julien	Heure GMT	No.	Latitude	Longitude	Prof. m	Temp. °C	Chloro µg/L	Phaeop. µg/L	Sal. ppt
244	15:17	1	55 21.511N	77 42.770W			0,29	7,13	
244	17:35	2	55 20.095N	77 44.032W	35		0,25	6,73	
244	17:40	3	55 20.511N	77 45.187W	50		0,28	6,25	
244	17:51	4	55 18.711N	77 48.475W	55		0,21	5,46	
244	17:54	5	55 18.253N	77 50.411W	56		0,26	2,74	
244	17:57	6	55 17.862N	77 51.216W	60		0,26	3,61	
244	18:29	7	55 13.878N	78 03.093W	72		0,31	3,20	21,3
244	18:40	8	55 13.892N	78 07.841W	100		0,31	7,32	
244	19:00	9	55 14.016N	78 15.392W	65		0,39	7,39	
244	19:32	10	55 14.270N	78 29.351W	155		0,29	5,54	
244	20:10	11	55 14.263N	78 45.577W	135		0,64	3,71	20,1
244	20:30	12	55 14.365N	78 53.484W	120		0,39	5,74	
244	21:05	13	55 14.352N	79 07.838W	110	9	0,58	8,93	
244	21:32	14	55 14.233N	79 19.115W	110	8	0,50	8,01	
244	22:00	15	55 14.190N	79 31.284W	150	8	0,67	0,90	20,3
244	22:30	16	55 14.180N	79 43.273W	75	7	0,44	7,39	
244	23:00	17	55 14.091N	79 54.475W	135	7	0,34	0,83	
244	23:30	18	55 14.243N	80 05.442W	60	7,5	0,37	8,79	
245	00:00	19	55 15.045N	80 15.235W	100	7,5	0,44	15,06	22,2
245	00:30	20	55 21.445N	80 16.520W	105	7	0,27	6,93	
245	01:00	21	55 28.064N	80 17.457W	105	6	0,17	3,41	
245	01:30	22	55 33.420N	80 19.137W	60	6	0,41	0,00	
245	02:00	23	55 39.467N	80 21.421W	95	4,5	0,76	0,00	24,4
245	02:30	24	55 44.905N	80 23.907W	68	4	0,82	0,00	
245	03:00	25	55 51.166N	80 26.878W	82	3	0,90	0,00	
245	03:30	26	55 56.975N	80 30.174W	90	4	0,52	2,47	
245	04:00	27	56 03.247N	80 32.479W	65	5	0,44	4,56	23,3
245	04:30	28	56 09.700N	80 34.378W	75	4,5	0,50	2,17	
245	05:00	29	56 16.221N	80 36.116W	67	4,5	0,73	1,53	
245	05:30	30	56 22.850N	80 38.338W	77	5,5	0,36	3,75	
245	06:00	31	56 29.621N	80 40.391W	90	6	0,30	3,11	23,3
245	11:30	32	57 43.312N	80 58.840W	105	3,5	0,11	1,18	23,3
245	12:26	33	57 55.585N	81 01.893W	105	4,5	0,12	0,37	
245	13:31	34	58 10.190N	81 05.131W	125	4	0,10	0,75	24,3
245	14:30	35	58 23.615N	81 07.999W	150	4	0,10	1,77	
245	15:30	36	58 37.129N	81 12.333W	175	5	0,10	2,97	24,8
245	16:31	37	58 50.784N	81 18.304W	165	5	0,09	3,09	
245	17:30	38	59 03.653N	81 22.673W	135	6	0,09	3,56	24,6
245	18:36	39	59 17.743N	81 27.678W	113	6	0,08	2,46	
245	19:30	40	59 29.679N	81 31.554W	113	6	0,13	2,22	24,8
245	20:35	41	59 39.850N	81 28.646W	125	6	0,09	1,72	
245	21:30	42	59 44.744N	81 15.164W	127	6	0,08	1,14	24,2
245	22:30	43	59 49.813N	80 59.933W	135	6	0,09	2,88	
245	23:30	44	59 54.890N	80 44.765W	135	6,5	0,11	2,04	22,3
246	00:34	45	60 00.606N	80 27.841W	140	6	0,11	2,04	
246	01:04	46	60 03.329N	80 19.889W	145	6	0,09	1,19	23,4

CSSA

Date Julien	Heure GMT	No.	Latitude	Longitude	Prof. m	Temp. °C	Chloro µg/L	Phaeop. µg/L	Sal. ppt
246	01:30	47	60 05.699N	80 12.853W	153	6	0,11	1,12	
246	02:00	48	60 07.757N	80 04.352W	140	6	0,11	1,18	24,3
246	03:30	49	60 07.964N	79 38.010W	147	6	0,11	1,86	
246	18:07	50	59 56.279N	77 52.887W	142	8	0,20	10,91	23,4
246	18:32	51	59 56.941N	78 03.137W	129	8	0,23	12,61	
246	18:52	52	59 57.775N	78 11.407W	124	7	0,23	11,97	
246	19:11	53	59 58.489N	78 19.415W	119	7	0,16	7,64	
246	19:33	54	60 00.006N	78 27.953W	115	7	0,17	8,43	24,2
246	19:51	55	60 01.244N	78 35.698W	110	7	0,21	4,69	
246	20:30	56	60 03.806N	78 51.522W	125	7	0,15	6,16	
246	20:53	57	60 05.408N	79 00.697W	120	7	0,14	4,64	
246	21:12	58	60 06.685N	79 08.438W	135	6	0,16	4,85	
246	21:30	59	60 07.888N	79 15.875W	140	6	0,14	5,35	
246	21:53	60	60 11.867N	79 22.647W	153	6	0,14	3,12	
246	22:15	61	60 15.693N	79 28.441W	150	6,5	0,14	4,64	
246	22:31	62	60 18.617N	79 32.738W	150	7	0,17	6,40	24,4
246	22:51	63	60 22.151N	79 37.973W	150	5,5	0,14	3,90	
246	23:11	64	60 25.838N	79 43.356W	150	5,5	0,18	3,51	
246	23:31	65	60 29.169N	79 48 478W	165	5	0,20	2,10	
246	23:52	66	60 32.810N	79 54.331W	165	5	0,17	3,41	25
247	00:11	67	60 35.962N	79 59.468W	165	5	0,15	3,22	
247	00:30	68	60 39.080N	80 04.905W	160	5	0,14	2,31	
247	00:51	69	60 42.436N	80 10.891W	148	5	0,16	4,85	
247	01:13	70	60 46.285N	80 17.388W	150	5	0,18	4,30	22,8
247	12:32	71	62 31.771N	81 08.875W	195	5	0,24	6,53	25,5
247	13:01	72	62 29.060N	80 57.223W	195	5	0,23	5,66	
247	13:30	73	62 26.085N	80 45.894W	185	5	0,23	5,66	
247	13:57	74	62 23.145N	80 36.262W	185	5	0,25	5,96	
247	15:01	75	62 21.294N	80 28.324W	165	5	0,25	5,86	25,1
247	15:34	76	62 17.436N	80 19.646W	140	4,5	0,23	3,24	
247	16:36	77	62 18.808N	80 15.725W	135	4	0,25	3,42	
247	17:01	78	62 24.233N	80 09.465W	165	4	0,25	5,86	
247	17:22	79	62 28.386N	80 02.643W	200	5	0,24	7,27	24,9
247	17:40	80	62 30.404N	79 55.363W	220	5	0,25	6,63	
247	18:00	81	62 30.978N	79 45.803W	215	5	0,25	5,86	
247	18:20	82	62 31.443N	79 35.472W	195	4	0,25	5,16	
247	18:40	83	62 31.713N	79 26.136W	175	4,5	0,25	6,63	25,6
247	19:02	84	62 28.361N	79 18.722W	153	3,5	0,36	5,46	
247	19:20	85	62 25.048N	79 14.809W	152	3,5	0,58	6,08	
247	19:40	86	62 20.966N	79 11.213W	210	2,5	1,83	9,19	
247	20:04	87	62 16.105N	79 06.344W	145	2,5	1,25	13,05	25,9
247	20:21	88	62 12.737N	79 04.068W	147	2	1,92	0,00	
247	20:42	89	62 08.332N	79 04.901W	145	3	0,90	3,40	
247	21:01	90	62 04.396N	79 05.291W	135	2,5	1,37	11,34	
247	21:20	91	62 00.599N	79 05.787W	130	3	1,11	2,45	26,1
247	22:20	92	61 58.365N	79 03.118W	130	4	0,70	10,16	

CSSA

Date Julien	Heure GMT	No.	Latitude	Longitude	Prof. m	Temp. °C	Chloro µg/L	Phaeop. µg/L	Sal. ppt
247	22:40	93	61 57.627N	78 54.590W	143	4	0,67	4,01	
247	22:57	94	61 56.795N	78 50.086W	155	4	0,73	10,46	
247	23:18	95	61 55.162N	78 47.355W	152	4,5	0,47	7,70	25,5
248	00:02	96	61 55.048N	78 38.338W	127	4,5	0,41	9,74	
248	13:27	97	62 27.166N	78 51.920W	115	2,5	0,99	1,19	25,9
248	13:53	98	62 32.984N	78 51.302W	330	2,5	1,08	5,26	
248	14:12	99	62 37.274N	78 50.786W	334	3	0,90	0,23	
248	14:28	100	62 40.850N	78 50.317W	339	3	0,76	4,93	
248	14:48	101	62 44.363N	78 46.743W	343	3	0,52	8,31	23,7
248	15:11	102	62 45.321N	78 35.370W	347	3,5	0,64	6,69	
248	15:31	103	62 46.423N	78 26.034W	352	3,5	0,41	9,74	
248	15:50	104	62 47.696N	78 16.669W	356	4	0,30	3,97	
248	16:10	105	62 48.715N	78 07.216W	360	3,5	0,73	4,63	22
248	16:24	106	62 49.650N	78 02.476W	365	3	1,34	0,00	
248	16:46	107	62 50.079N	77 59.355W	369	2	2,02	0,00	
248	17:07	108	62 50.625N	77 55.680W	365	0,5	4,57	19,98	
248	17:30	109	62 51.154N	77 51.848W	356	0	3,75	0,00	27,3
248	17:48	110	62 51.560N	77 48.343W	343	0,5	4,04	42,15	
248	18:10	111	62 52.078N	77 44.657W	329	0,5	4,23	0,00	
248	18:30	112	62 52.596N	77 41.312W	320	1	4,57	0,00	
248	18:50	113	62 53.027N	77 37.706W	305	1,5	5,38	0,00	26,9
248	19:11	114	62 53.515N	77 34.342W	298	2	4,30	17,13	
248	19:30	115	62 53.878N	77 31.275W	292	2	4,30	17,13	
248	19:50	116	62 54.298N	77 28.342W	279	2	4,91	0,00	
248	20:11	117	62 54.725N	77 24.905W	274	2	4,91	0,00	26
248	20:32	118	62 55.137N	77 21.549W	268	2	4,52	0,00	
248	20:52	119	62 55.551N	77 18.869W	261	2	4,23	0,00	
248	21:11	120	62 55.951N	77 15.750W	257	2	4,33	0,00	
248	21:32	121	62 56.405N	77 12.567W	250	2	4,23	44,15	24,9
248	21:50	122	62 56.818N	77 09.347W	250	2	2,98	0,00	
248	22:10	123	62 57.295N	77 05.632W	254	2,5	2,98	0,00	
248	22:31	124	62 57.764N	77 01.669W	257	2,5	2,60	0,00	
248	22:50	125	62 57.983N	16 57.929W	270	3	1,92	0,00	26,7
248	23:12	126	62 58.023N	76 53.570W	283	2,5	2,69	0,00	
248	23:30	127	62 57.983N	76 50.022W	298	3	2,31	0,00	
248	23:50	128	62 57.903N	76 46.070W	307	3	2,69	0,00	
249	00:10	129	62 57.846N	76 41.951W	309	2,5	3,18	0,00	25,7
249	00:31	130	62 57.803N	76 37.605W	320	2,5	2,98	0,00	
249	00:45	131	62 57.781N	76 35.181W	325	2	3,18	0,00	
249	20:04	132	62 24.932N	72 17.178W	347	1,5	4,84	0,00	27,3
249	20:31	133	62 21.189N	72 08.099W	347	2	4,30	17,13	
249	20:52	134	62 18.159N	72 01.100W	338	1	7,26	0,00	
249	21:11	135	62 15.484N	71 54.621W	334	1	7,53	0,00	
249	21:28	136	62 13.047N	71 48.896W	338	1,5	5,11	0,00	24,6
249	21:51	137	62 10.802N	71 43.592W	329	2	5,11	0,00	
249	22:02	138	62 11.372N	71 47.171W	329	2,5	4,14	0,00	

CSSA

Date Julien	Heure GMT	No.	Latitude	Longitude	Prof. m	Temp. °C	Chloro µg/L	Phaeop. µg/L	Sal. ppt
249	22:30	139	62 10.225N	71 46.218W	320	2,5	5,65	0,00	
249	22:44	140	62 11.095N	71 50.269W	320	2	4,30	0,00	27,2
249	23:13	141	62 13.223N	72 00.231W	305	2	6,19	0,00	
250	13:32	142	61 12.191N	70 34.278W	177	2	2,12	1,92	26,4
250	13:50	143	61 10.485N	70 34.060W	188	2	2,98	0,00	
250	14:08	144	61 09.116N	70 34.118W	188	2	2,89	0,00	
250	14:27	145	61 09.480N	70 34.053W	188	2	3,18	0,00	
250	14:40	146	61 09.438N	70 34.165W	188	2	3,18	0,00	24,9
250	16:52	147	61 09.614N	70 32.355W	197	2	2,60	0,00	
250	17:10	148	61 11.250N	70 25.916W	150	2,5	2,50	0,00	
250	17:30	149	61 12.862N	70 17.617W	146	2,5	2,60	0,00	
250	17:50	150	61 14.654N	70 08.922W	173	2,5	4,23	0,00	24,2
250	18:03	151	61 15.785N	70 03.704W	201	2,5	2,79	9,18	
250	18:30	152	61 18.027N	69 52.313W	219	2,5	2,89	0,00	
250	18:52	153	61 19.962N	69 19.962W	228	2,5	2,50	0,00	
250	19:09	154	61 21.344N	69 35.417W	228	2,5	1,28	4,33	26,9
250	19:28	155	61 22.871N	69 27.655W	256	3	0,47	7,70	
250	19:50	156	61 24.739N	69 18.549W	314	2,5	2,89	0,00	
250	20:02	157	61 25.640N	69 13.358W	320	2,5	1,92	0,00	
250	21:21	158	61 30.526N	68 41.074W	329	2	2,50	0,00	25,1
250	21:43	159	61 32.850N	68 32.427W	283	2	5,11	0,00	
250	21:59	160	61 34.510N	68 26.237W	292	1	6,72	0,00	
250	22:20	161	61 36.080N	68 17.602W	283	1,5	4,81	0,00	
250	22:40	162	61 37.681N	68 09.676W	265	1	6,46	0,00	27,5
250	23:00	163	61 39.420N	68 00.792W	265	1	6,19	0,00	
250	23:20	164	61 40.963N	67 52.333W	250	1	8,61	0,00	
250	23:40	165	61 42.316N	67 44.335W	241	0,5	9,68	0,00	
251	00:00	166	61 43.581N	67 36.061W	223	0	8,34	0,00	27,9
251	13:30	167	60 58.148N	65 44.838W	735	1	5,11	0,00	27,3
251	13:50	168	60 58.413N	65 34.729W	735	0,5	3,75	0,00	
251	14:10	169	60 58.725N	65 25.492W	814	1	4,57	0,00	
251	14:25	170	60 58.878N	65 18.306W	841	1	5,92	0,00	
251	14:37	171	60 58.966N	65 12.136W	850	1	5,38	0,00	24,8
251	15:09	172	60 58.892N	64 55.434W	750	1	4,30	17,00	
251	15:24	173	60 58.737N	64 48.021W	649	0	3,08	12,25	
251	15:41	174	60 58.524N	64 39.194W	549	0	3,27	3,92	
251	16:21	175	60 57.732N	64 19.545W	448	0	2,69	28,10	25,3
251	16:40	176	60 57.801N	64 10.572W	375	0,5	2,98	0,00	
251	17:01	177	60 57.869N	64 00.288W	378	0,5	3,37	4,97	
251	17:21	178	60 58.028N	63 50.284W	420	1	2,60	45,71	
251	17:42	179	60 58.170N	63 40.623W	444	1	2,79	29,10	26,9
251	18:00	180	60 58.515N	63 32.170W	503	1,5	3,85	0,00	
251	18:23	181	60 58.985N	63 21.482W	552	2	2,79	0,00	
251	18:39	182	60 59.265N	63 14.066W	585	2,5	2,12	12,24	
251	19:00	183	60 59.655N	63 04.528W	616	2,5	2,50	26,09	27,8
251	19:23	184	61 00.004N	62 55.772W	621	2	2,31	24,08	

CSSA

Date Julien	Heure GMT	No.	Latitude	Longitude	Prof. m	Temp. °C	Chloro µg/L	Phaeop. µg/L	Sal. ppt
251	20:28	185	60 56.618N	62 51.117W	623	2	2,50	16,28	
251	20:48	186	60 52.784N	62 46.378W	634	1,5	2,31	33,53	
251	21:12	187	60 48.374N	62 40.852W	634	1	2,98	0,77	27,4
251	21:31	188	60 44.820N	62 36.198W	589	1	3,56	0,00	
251	21:50	189	60 41.151N	62 31.491W	539	1	3,37	0,00	
251	22:11	190	60 37.200N	62 26.460W	457	1,5	2,89	10,20	
251	22:31	191	60 33.375N	62 21.297W	402	2	2,89	10,20	27,6
251	22:51	192	60 29.479N	62 16.510W	356	1,5	3,56	0,00	
251	23:10	193	60 26.042N	62 12.102W	342	1,5	4,43	0,00	
251	23:29	194	60 22.522N	62 07.699W	310	2	3,37	0,00	
251	23:48	195	60 14.857N	62 03.922W	279	2	3,66	8,09	26,4
252	00:08	196	60 14.857N	61 58.227W	256	2	3,56	37,13	
252	11:03	197	58 03.442N	59 41.425W	1015	1,5	6,99	0,00	26,6
252	11:20	198	57 59.883N	59 37.519W	823	2	5,38	0,00	
252	11:41	199	57 56.738N	59 32.818W	969	2	4,57	0,00	
252	12:01	200	57 51.761N	59 29.288W	1024	2	4,91	0,00	
252	12:20	201	57 47.846N	59 23.588W	960	2	5,92	0,00	27,1
252	12:40	202	57 43.364N	59 18.188W	1079	2	5,38	0,00	
252	13:00	203	57 39.054N	59 13.557W	1070	2,5	4,57	0,00	
252	13:20	204	57 34.653N	59 09.581W	1024	3	4,43	5,93	
252	13:40	205	57 30.644N	59 06.012W	1134	3	4,33	0,00	27,5
252	14:00	206	57 26.048N	59 01.890W	1060	2,5	4,81	0,00	
252	14:20	207	57 21.395N	58 57.453W	1243	2,5	4,30	17,13	
252	14:40	208	57 17.631N	58 53.750W	1243	2,5	4,30	17,13	
252	14:55	209	57 13.895N	58 50.060W	1115	2,5	4,30	0,00	26,3
252	15:24	210	57 07.619N	58 43.887W	1134	3	3,85	0,00	
252	15:39	211	57 04.560N	58 40.886W	1170	3	3,46	6,01	
252	15:59	212	57 00.173N	58 36.866W	1134	3	3,46	0,00	
252	16:19	213	56 56.131N	58 32.860W	914	3	3,37	0,00	28,4
252	16:42	214	56 51.380N	58 27.883W	932	3	2,98	0,00	
252	17:00	215	56 47.566N	58 23.819W	993	3	2,89	0,00	
252	17:21	216	56 43.334N	58 19.242W	973	3	2,89	0,00	
252	17:40	217	56 39.564N	58 15.026W	1189	3	3,37	0,00	25,9
252	18:01	218	56 35.401N	58 10.242W	1353	3	2,50	6,08	
252	18:22	219	56 31.146N	58 05.667W	1042	3	2,02	0,00	
252	18:41	220	56 27.279N	58 01.463W	439	2,5	3,95	0,00	
252	19:00	221	56 23.479N	57 57.642W	329	2,5	2,50	0,00	25,9
252	19:19	222	56 19.234N	57 53.430W	347	3	0,64	0,00	
252	19:33	223	56 16.574N	57 50.802W	347	3	0,61	0,00	
252	20:03	224	56 09.913N	57 44.587W	347	3	0,61	0,26	
252	20:20	225	56 06.618N	57 41.667W	329	3	1,49	0,00	24,9
252	20:41	226	56 01.769N	57 37.556W	274	3	2,50	0,00	
252	21:02	227	55 57.284N	57 33.479W	259	3	1,73	8,17	27,7
252	21:20	228	55 53.515N	57 29.821W	246	3	1,25	13,05	
252	21:40	229	55 48.804N	57 26.211W	219	3	1,14	0,00	27,5
252	22:01	230	55 44.935N	57 21.045W	195	3	0,90	3,40	

CSSA

Date Julien	Heure GMT	No.	Latitude	Longitude	Prof. m	Temp. °C	Chloro µg/L	Phaeop. µg/L	Sal. ppt
252	22:20	231	55 41.158N	57 17.047W	223	3	1,83	0,00	
252	22:40	232	55 36.891N	57 12.538W	246	3,5	0,96	0,00	
252	23:00	233	55 33.019N	57 08.307W	237	4	0,93	0,55	27,5
252	23:20	234	55 28.895N	57 03.706W	184	3,5	2,12	0,00	
252	23:40	235	55 25.220N	56 59.458W	201	4	0,40	3,32	
253	00:01	236	55 20.787N	56 54.578W	219	5	0,24	8,01	
253	10:36	237	53 14.645N	55 16.381W	206	6,5	0,26	13,82	26
253	10:59	238	53 09.942N	55 17.134W	173	7	0,25	16,18	
253	11:20	239	53 05.333N	55 17.945W	164	7	0,30	9,49	
253	11:38	240	53 01.418N	55 18.654W	155	7	0,32	17,86	
253	12:00	241	52 56.609N	55 19.244W	201	7	0,44	26,14	24,7
253	12:21	242	52 52.412N	55 19.612W	166	7	0,35	18,38	
253	12:38	243	52 48.854N	55 19.766W	155	7,5	0,29	14,87	
253	12:59	244	52 44.422N	55 20.021W	179	7	0,22	13,10	
253	13:20	245	52 40.228N	55 20.290W	164	7	0,52	18,55	25,6
253	13:42	246	52 35.097N	55 20.763W	142	7	0,52	25,39	
253	14:00	247	52 31.696N	55 21.173W	164	7	0,55	21,28	
253	14:20	248	52 26 583N	55 21.776W	292	7	0,41	17,01	
253	14:40	249	52 22.728N	55 22.238W	186	7	0,41	21,44	25,1
253	15:00	250	52 17.890N	55 22.757W	192	7	0,35	24,56	26,7

RESEARCH VESSEL SEPTENTRION 92-028S

RECORDS/SAMPLES INVENTORY
EQUIPMENT SPECS, VESSEL SPECS, CRUISE SPECS

compiled by

John Zevenhuizen - Jacques Riel
Larry Johnston - Don Locke - Austin Boyce

RV SEPTENTRION 92-028S SURVEY CRUISE

The study area is located in the James Bay - southeastern Hudson Bay region. Regional seismic and sidescan data was collected from Rupert Bay in James Bay to Belanger Island in southeastern Hudson Bay with site specific data collected in the la Grande riviere (figure 1), Grande riviere de la Baleine, Manitounuk Sound and Petite riviere de la Baleine areas (figures 2-5). Site specific data was collected in selected areas from Bear Islands in the southwest to Belanger Island in the northeast. Due to weather constraints line spacing and orientation are variable.

These surveys, aboard Hydro Quebec's vessel the RV Septentrion, were conducted utilizing seismic reflection and subbottom profiling equipment including sidescan sonar and seabed sampling equipment (gravity corer and grab sampler, figure 1,3 and 4).

Scientific Highlights

Seismic and sidescan data collected along the eastern shore of James Bay indicate that the complex seabed morphology is predominantly formed by mounds and ridges of unconsolidated sediments overlying a relatively smooth bedrock surface.

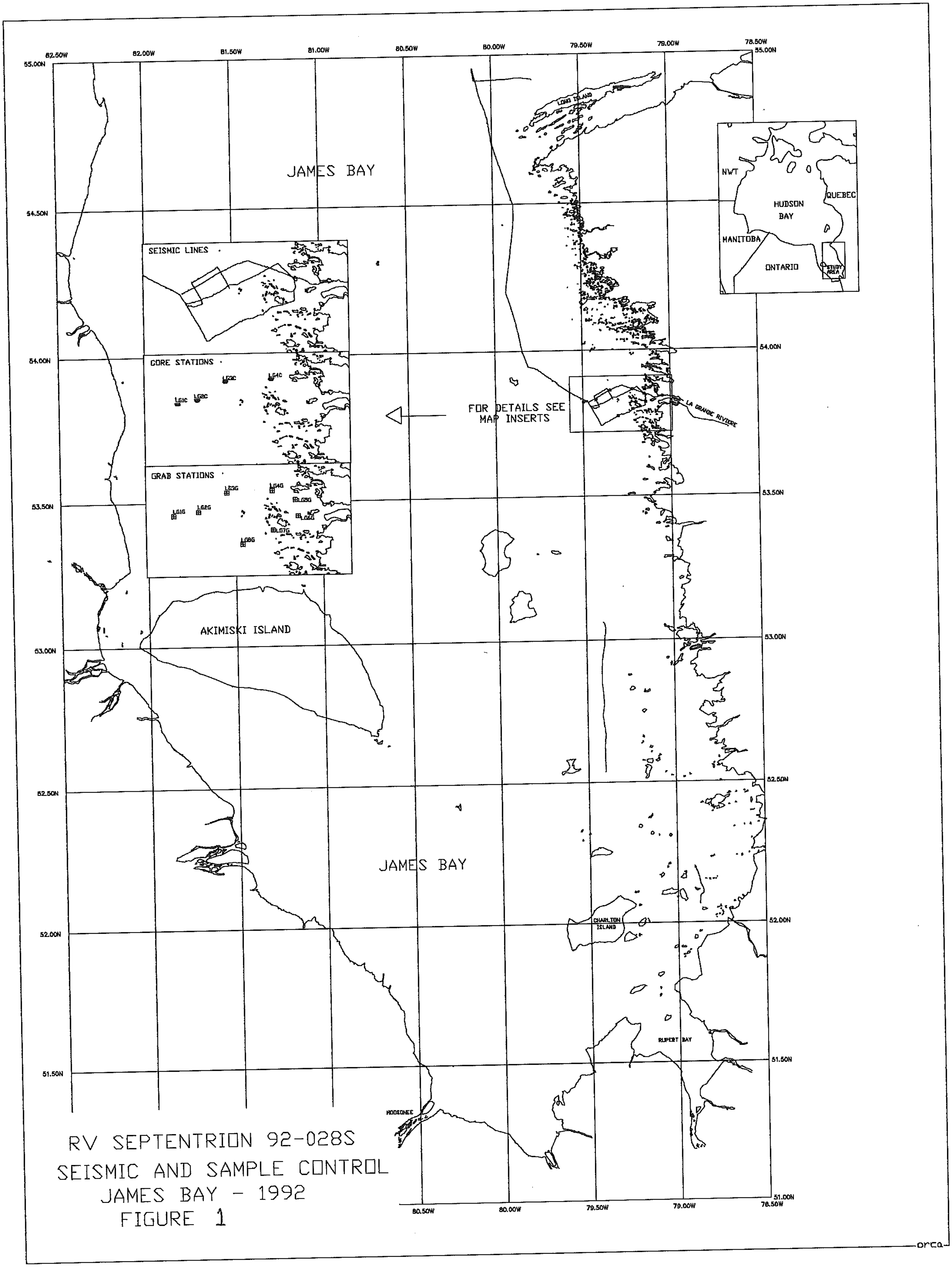
In the estuary of the La Grande River up to 20m of unconsolidated sediment are present. These consist of 1) an acoustically massive, discontinuous unit directly overlying bedrock, blanketed by 2) a thin (2-5m) draped unit with 3) a ponded unit present directly off the river mouth and filling in the basins present in the estuary. This surface unit is locally greater than 20m thick, with internal structure frequently masked by the presence of gas.

In the Manitounuk Sound region the Atlantic Geoscience Centre has been collecting data on an oppertunity basis since 1987 averaging 3-6 days of shiptime per year. Until 1992 only large vessels were utilized by AGC and limited data were collected in the nearshore regions. The combined 1992 CSS Hudson and RV Septentrion surveys completed the regional data grid and collected site specific data in the nearshore areas.

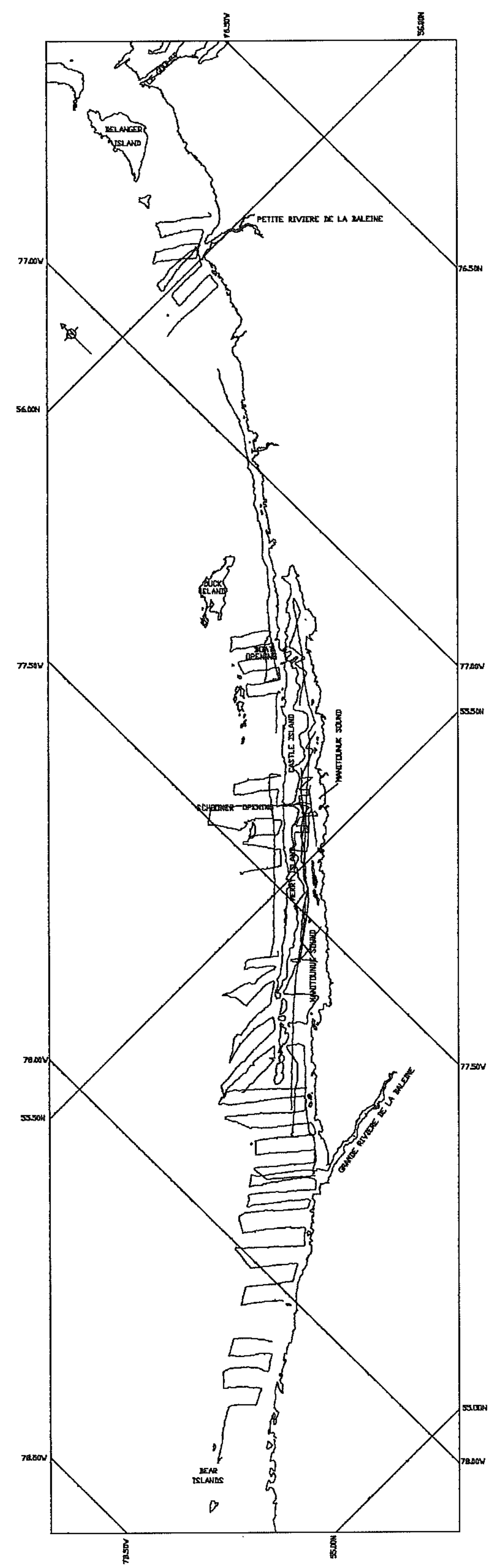
The regional mapping of the character and distribution of seismostratigraphic units can now completed. Based on this data five stratigraphic units can be mapped. The marine geophysical data indicate that in the study area submerged bedrock cuesta ridges, with a similar NE-SW orientation to those that form the bedrock of the coastal areas extend offshore over 40km off Grande riviere de la Baleine and over 20km offshore Petite riviere de la Baleine. The sequential ridges and intervening valleys produce a pronounced NE-SW grain to the seabed morphology and surficial geology. However, the apparent allignment of several coastal physiographic features on the mainland and Manitounuk Islands and the bathymetric contours suggest the presence of some regional E-W structural trends diagonal to and in part offsetting the dominant NE-SW orientation of the cuesta ridges, especially at Schooner Opening. The bedrock morphology and orientation to a large extent influences the distribution of the overlying unconsolidated sediments.

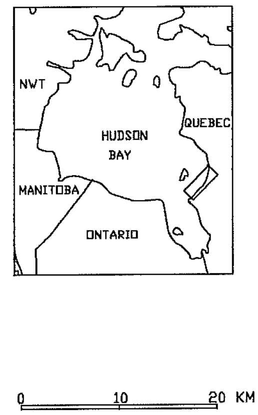
Four seismostratigraphic units overlie the bedrock. Directly overlying the bedrock is an acoustically massive, predominantly unstratified unit. This unit is highly variable, present as a thin discontinuous veneer over much of the region with thick accumulations, some indicating complex internal structure, present on low slope side of the cuesta ridges and NE off Belanger Island. This unit is overlain by an acoustically well stratified, conformably draped unit of fairly uniform thickness (2-5m) in the offshore regions but more complex in the nearshore displaying locallized channels and accumulations of up to 40m in the inner Manitounuk and Nastapoca Sounds. Offshore and off Petite riviere de la Baleine an acoustically nearly transparent, weakly stratified, ponded unit grades into and overlies the conformably draped unit. This unit displays considerable horizontal and vertical variability. In Manitounuk Sound and off the Grande riviere de la Baleine a substantially thicker, contemperaneous unit is present as a constructional wedge of well stratified material. Within this unit 3-4 eposodic (?) sets/pulses of high amplitude reflectors are observed. Approximately 8-10km offshore towards the SW of the Grande riviere de la Baleine estuary this unit grades laterally into the acoustically transparent, weakly stratified, ponded unit. In the Petite riviere the la Baleine region this unit possibly overlies and laterally grades into the upper section of the acoustically tranparent, weakly stratified, ponded unit. The surface distribution of these two latter units represent approximately 70% of the material outcropping in the region. Sidescan sonar data indicate surficial features such as bedrock scarps, sediment failure scarps, slump deposits, ice keel scouring, megaripples and sedimentary furrows in the deeper basins.

Bottom sample data collected off Grande riviere de la Baleine, Manitounuk Sound, and seaward of the Manitounuk Island (figure 3 and 4) were collected to sample only the uppermost (recent) sediments. Most of the grab samples with the exception of those collected in Schooner Opening and near the Paint Islands consisted of a thin oxidized, soupy tan mud layer (0.5-2.0cm) overlying a mottled gray mud. These samples contained few clasts and the macrobenthos consisted predominantly of polycheates. The samples collected in Schooner Opening and near the Paint Islands were predominantly muddy sand to sand with numerous clasts and diverse macrobenthos.



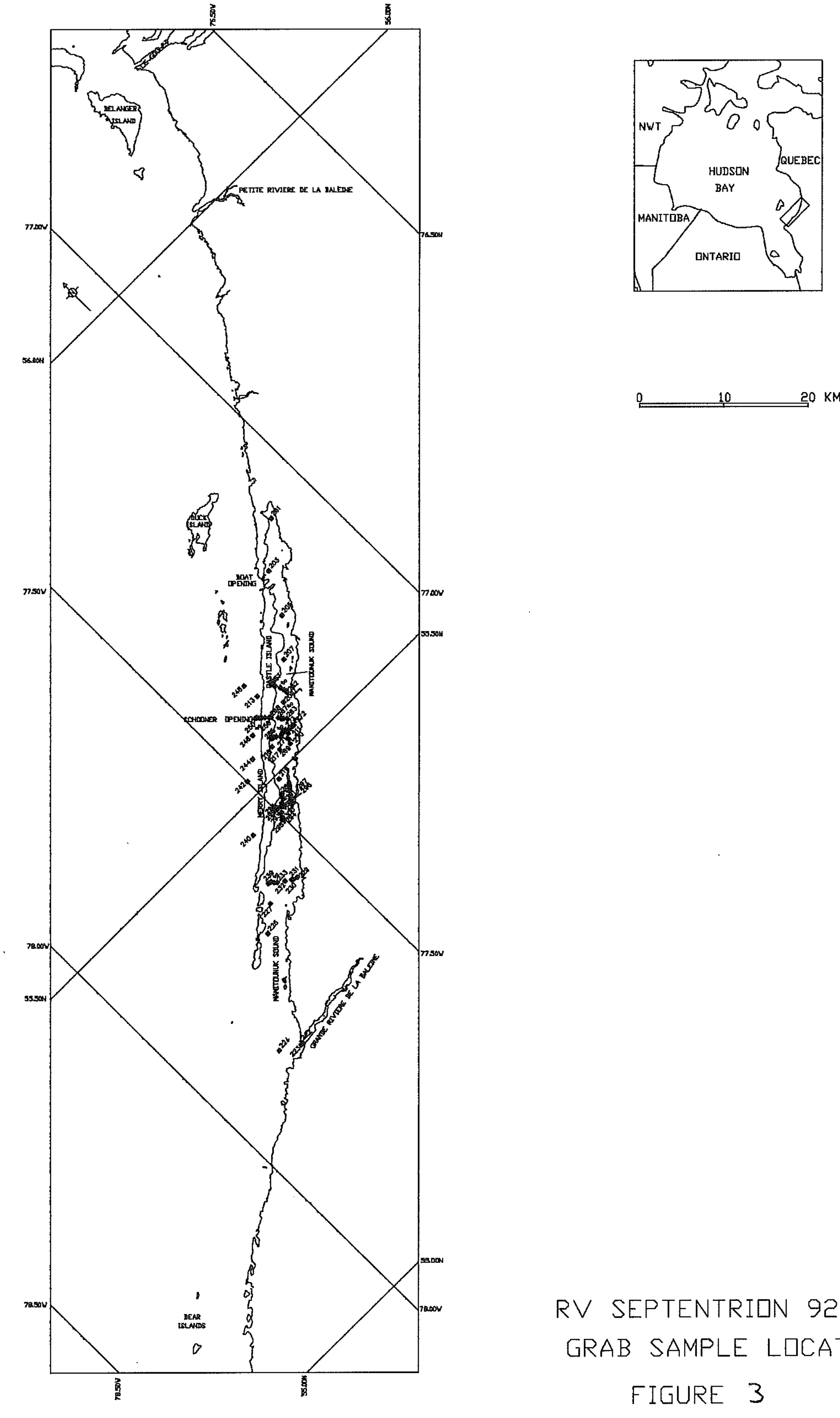
RV SEPTENTRION 92-028S
SEISMIC AND SAMPLE CONTROL
JAMES BAY - 1992
FIGURE 1





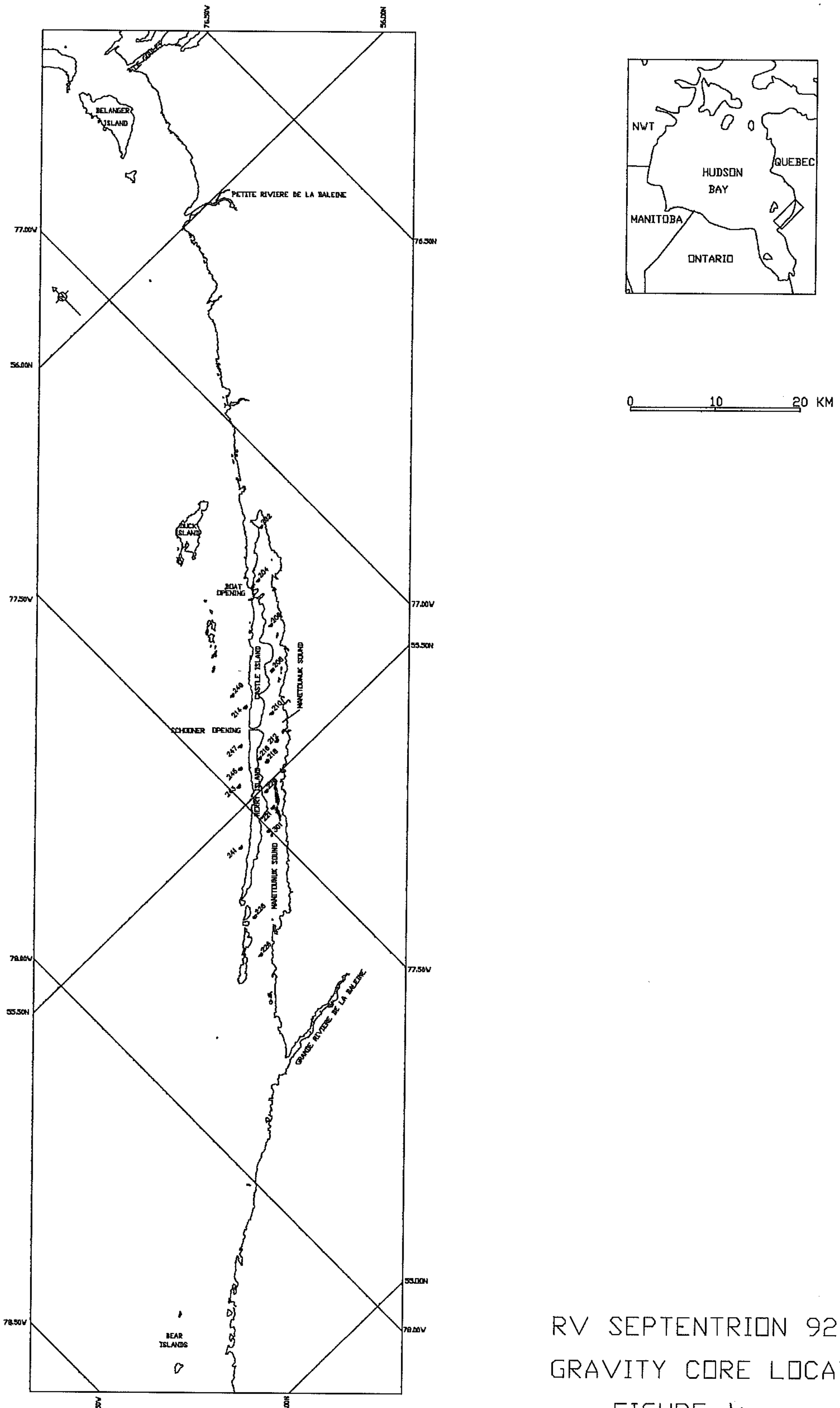
RV SEPTENTRION 92-028S
SEISMIC DATA

FIGURE 2

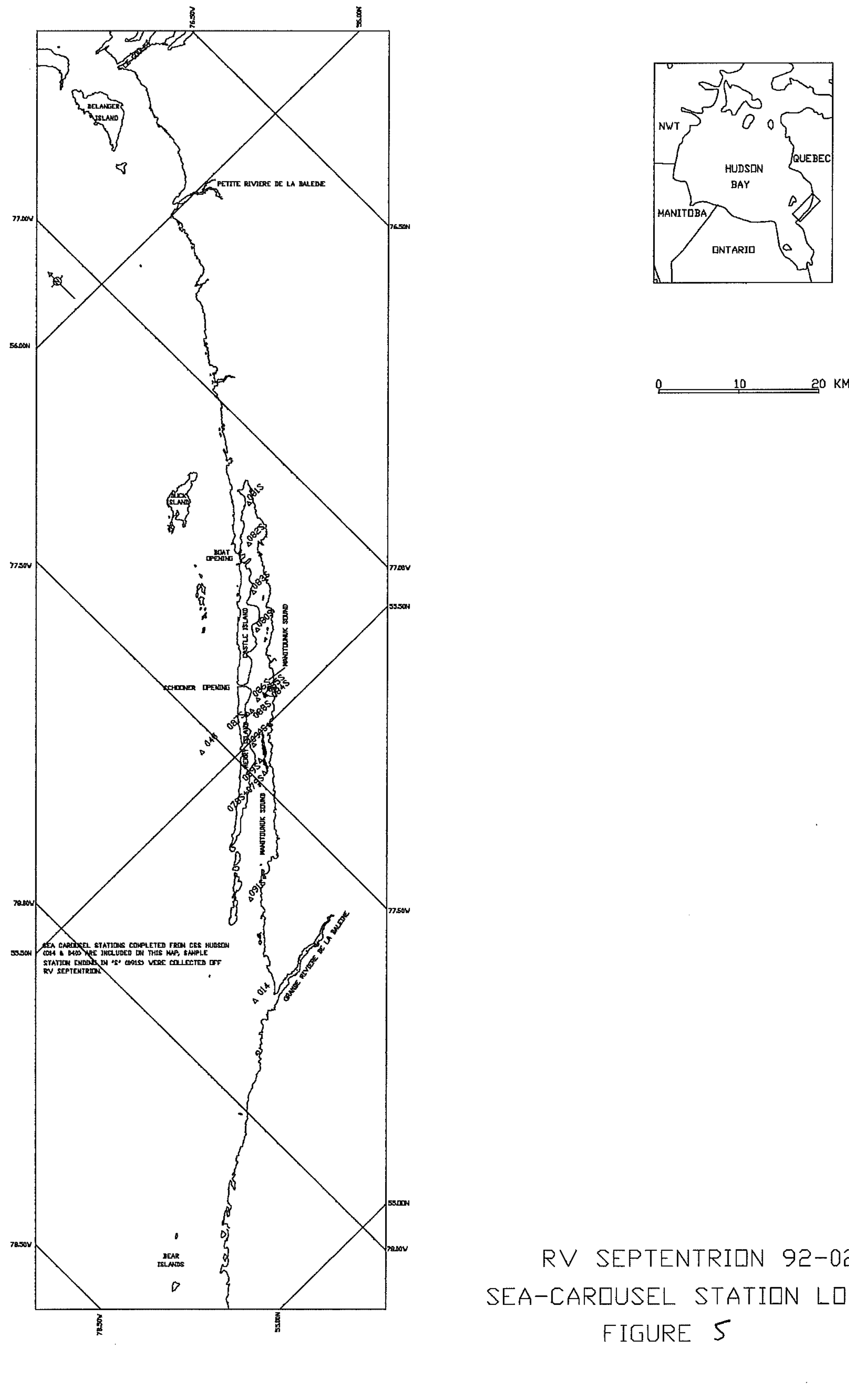


RV SEPTENTRION 92-028S
GRAB SAMPLE LOCATIONS
FIGURE 3

orca



RV SEPTENTRION 92-028S
GRAVITY CORE LOCATIONS
FIGURE 4



RV SEPTENTRION 92-028S
SEA-CAROUSEL STATION LOCATIONS
FIGURE 5

ITINERARY

PHASE 1 - MOBILIZATION AND REGIONAL SEISMIC DATA COLLECTION

July 27-31	Travel to Moosonee and mobilization
August 1	Steam to Rupert Bay and deploy Waverider Bouy
August 2	Deploy Waverider shore station and start James Bay regional seismic data collection Charlton to Weston Island
August 3	Continue regional seismic and sidescan sonar line
from	Weston to South Twin Island
August 4	Rough seas, no data collected, steam to la Grand riviere estuary
August 5	Seismic and sidescan sonar survey la Grande riviere estuary and offshore region
August 6	Grab and core sampling in the la Grande riviere estuary, reprovision and take on fuel at Chissasibi, collect subbottom profiler data in the river
August 7	Grab and core sample collection, seismic and sidescan sonar survey la Grande riviere estuary
and	offshore
August 8	Continue regional seismic and sidescan sonar survey in James Bay, Loon Islands to Bare Island
August 9	Continue regional seismic and sidescan sonar survey in James Bay and into Hudson Bay from Bare Island to CCGS Narwhal 1978 and CSS Hudson 87-028
data to	complete initial regional tie line
August 10-11	Gale force winds 40+ kts from NE at anchor in lee
of	LongIsland

PHASE 2 - GRANDE RIVIERE DE LA BALEINE AND AREA SITE SPECIFIC SURVEY

August 12	Steamed to Bear Island in heavy swell, proceeded with Grand riviere de la Baleine survey with seismic and sidescan sonar survey Bear Island to Walton Point
August 13	Grande riviere de la Baleine seismic and sidescan
sonar	survey off estuary and offshore
August 14	Grand riviere de la Baleine seismic and sidescan survey, mouth of Manitounuk Sound to estuary, rendezvous with CSS Hudson to reprovision and
refuel	
August 15	Manitounuk Sound seismic and sidescan sonar survey, continuous line from mouth to head of sound, start detailed survey inner sound
August 16	Manitounuk Islands offshore seismic and sidescan sonar survey, Gillies to Merry Island
August 17	Manitounuk Sound seismic and sidescan sonar survey, in the outer sound and a nearshore line
from	Manitounuk Sound to Grande riviere de la
Baleine estuary	

August 18	Manitounuk Islands offshore seismic and sidescan sonar survey, off Schooner Opening
August 19	Manitounuk Islands offshore seismic and sidescan sonar survey, Boat Opening to Duck Island
August 20	Petite riviere de la Baleine seismic and sidescan sonar survey, tie into CCGS Narwhal 1988 and CSS Baffin 90-024 regional data and complete nearshore survey
August 21	Manitounuk Sound seismic and sidescan sonar survey in outer and middle sound including Schooner Opening.
August 22	Demobilize seismic gear, start grab and core
sample	collection, transfer personel and seismic
gear to CSS	Hudson

PHASE 3A - MANITOUNUK SOUND - SEA CAROUSEL

August 23-26	Sea Carousel data collection Manitounuk Sound

PHASE 3B - MANITOUNUK SOUND - GRAB AND CORE SAMPLE COLLECTION

August 27	Collect grab and core samples inner and middle Manitounuk Sound
August 28	Collect grab and core samples in the Grande riviere de la Baleine estuary, outer Manitounuk Sound, and Schooner Opening
August 29	Collect grab samples and cores in inner and middle Manitounuk Sound, transfer personel, samples and
gear to	CSS Hudson, completed Phase 4.

SEPTENTRION 92-028S FACTS SHEET

SAMPLE INVENTORY:

VANVEEN GRABS ------	90
GRAVITY CORES ------	23

KILOMETRES RUN:

3.5 KHZ PROFILER --------------	956.8
200 KHZ BATHYMETRY ------------	884.0
BUBBLE PULSER / SEA OTTER SEISMICS ------------	910.2
KLEIN SIDESCAN ----------------	634.3

RESEARCH VESSEL SEPTENTRION

VESSEL SPECS

Home port	Montreal
Number	369289
Call sign	CFB-4979
Gross tonnage	38.0
Net registered	26.76
Builder	Hike Metal Products Wheatley, Ontario
Year	1973
Class	Home Trade 2
Limitations	Not more then 120 miles off shore and not more then 200 miles from port of refuge
Length	18.29 m - 60 ft.
Width	4.36 m - 14 ft. 6 in.
Draught	1.83 m - 6 ft.
Weight	45.5 tons
Fuel capacity	1300 gallons
Water capacity	150 gallon + 3*50 gallon (rubber)
Fuel inlet	2" diameter
Water inlet	1 1/4" diameter
Main engines	2 - V903 Cummins (300 hp each)
Generators	1 - 30 Kw Perkins 1 - 20 Kw Perkins 1 5000 W Honda Portable
Steering	Hydraulic
Propeller	2
Speed	10-12 Knots
Deck crane	HIAB articulated 1/2" + 3/16" stainless cable 1/2" = 100 ft. 3/16" = 600 ft.
Heating	Electric
Galley	1 Electric stove (4 element) 1 Microwave/convection oven 1 Refrigerator (3 cu ft.) 1 Refrigerator (7 cu ft.) 1 Freezer (5 cu ft.)
Shower	1
Toilet	1
Entertainment	TV - VCR
Sleeping bags (with linen)	6

SAFETY EQUIPMENT

1 EPIRB (406 Mhz) (beacon)
6 survival suits
1 liferaft (10 persons)
1 Lifeboat (14 ft.)
1 Zodiac MK1 + 15 Hp Johnson
1 Fire pump
1 CO_2 100 lb. fire suppression for engine room
1 Halon 40 lb fire suppression for generator room
3 Fire extinguishers
2 Liferings
6 Life vests
All survival equipment necessary for the operation

NAVIGATION EQUIPMENT

1 Radar 96 nm - KELVIN HUGHES
1 Radar 18 nm - DECCA
1 Gyro compass - KELVIN HUGHES
1 Magnetic compass
1 Digital Sonar
1 Video Forward Looking Sonar (WESMAR)
3 VHF
2 SSB-HF (Programmable ICOM M-700)
1 Weatherfax - ALDEN
1 GPS Navtrac - TRIMBLE
1 VHF portable
1 Intercom
1 GPS PATHFINDER available

LAB SPECS

- 3 benches are available for equipment:

BENCH	EQUIPMENT MOUNTED
50" * 27"	(EPC9800 thermal recorder + Datasonics BPS530 Bubble Pulser power supply + Datasonics BPR510 Bubble Pulser receiver + Ore Geopulse receiver + NSRF Preamp
	Ore Geopulse 5420A Power supply (mounted under the above bench)

108" * 27"	Ore Model 140 transceiver + Klein Model 401 sidescan recorder + Raytheon 719 sounder + Nec Multisync color monitor + keyboard Olivetti 386 PC (mounted on the deck at the right end of this bench)
33" * 29"	Pathfinder GPS + navigation log + General log + 2 coffee percs + 1 kettle + 1 can of sugar. This small bench was used by the data tech to log navigation and maintain the General log.

-Other

1- 3 inch gland at the top of the after bulkhead of the lab (starboard side), about 5 feet above the deck, to lead cables in/out.

12- 110 volt outlets of which 8 are available for lab equipment.

1- 12 volt supply.

7 windows (lots of natural light)

VESSEL PERFORMANCE

+ side

This vessel proved to be an excellent sea boat for a vessel of its size. Pitching and rolling were not excessive which increased the weather window within which she can operate. 2-300 HP engines give the vessel ample power to tow equipment in strong head winds and still maintain survey speed. Surveying had to be abandoned on several occasions because of record deterioration rather then the inability of the vessel to operate. The combination of twin screws and power, coupled with the Wesmar Forward looking Sonar, give the vessel the manuverability to operate in shallow water (4 m +) and to navigate in areas of uncharted waters.
Lab bench space is adequate for a standard survey (3.5 khz, sounder, seismics and sidescan) and could be improved by the use of racks.

- side

Because all our gear was streamed or mounted on the port side, the port engine/prop caused a lot of noise on the 3.5 khz and streamer. Engine noise was being transferred through the hull and water column to the recievers. Running hours were alternated between the two engines so it was not a

constant problem.
Cupboard or storage space is limited. A plywood box (6'*3'*2') was mounted on the lab roof which proved invaluable for storage of recorder paper, consumables etc.). Personal weather gear was stored in a covered 45 gal drum on deck. Sampling supplies were stored in the generator room.

BIO Reflection Seismics:

Seismic Reflection equipment consisted of two soundsources:

1) Datasonics bubble pulser
2) Huntec Model 4425 Boomer

and two streamers

1) Bubble Pulser eel
2) NSRF 25 ft. eel

Seismic equipment consisted of the two following systems:

1) A Datasonics Bubble Pulser was configured as follows:

   A Datasonics bubble pulser system consisting of a bubble pulser transducer towed on a surfboard off the port side, powered by a (BPS 530) power supply. Signals were recieved on a Datasonics eel, processed through a Datasonics BPR510 seismic receiver and displayed on an EPC 9800 thermal recorder operating at a 1/4 sec sweep at 1/2 sec firing rate. Filter settings on the receiver were 2000 Hz (high pass) and 400 Hz (low pass).

2) A Huntec Sea Otter was configured as follows:

   A Huntec model 4425 boomer mounted on the Sea Otter tow body and powered by an ORE Geopulse model 5420A power supply set at 105 joules output. Seismic signals were recieved by a NSRF LC10 streamer with preamp fed into an ORE Geopulse 5210A receiver with filter settings of HP 700 Hz LP 3.0 kHz and displayed on an EPC 9800 thermal recorder operating at a 1/4 sec sweep at 1/2 sec firing rate. Filter settings were 700 Hz (low pass) to 3000 Hz (high pass).

   Power for these systems was provided by a 5000W Honda portable generator operating on the after deck.

The streamer was towed from a 6" long aluminum boom mounted on a swivel just forward of midship on the port side.

Summary:

The Bubble Pulser was used for days 215 and 216 while the Sea Otter was being repaired. This unit worked well and within its specs but produced lesser quality records (compared to the Sea Otter) due to a very thick bubble pulse.

The Sea Otter towed submerged for the first two weeks caused by the combined weight of the power cable and sampson braid towing rope giving the fish a nose down attitude. This did not affect the records adversely and may possibly have aided the records on poor weather days because the waves had less affect on the fish. On the third week the Sea Otter was towed closer to the stern and towed on the surface sometimes but the fish seemed to get forced into a downward attitude and would then tow about 3 ft. submerged.

The Sea Otter Geopulse power supply was blowing fuses on high voltage off and on for two days at the start of the trip. The Honda generator was putting out 120-121 volts and this was suspected as being the problem but it turned out to be a faulty surge protector in the Geopulse 5420A power supply. Removing the surge protector solved the problem with blowing fuses. The Geopulse power supply should be run off the 220 volt output but the proper plug was not available so it was run off 110v.
A 1000 watt heater was run off the Honda to smooth out the voltage being delivered to the Geopulse power supply.

An NSRF streamer was damaged when it became entangled in the Sea Otter tow body while making a port turn in heavy swell. There was no visible external damage but it stopped working at that point probably due to a broken wire within the phone section. A few hours after the damage a replacement streamer was obtained from AGC personel on CSS Hudson.

<u>3.5 Khz Sub-bottom Profiler</u>

3.5 Khz data was collected using an ORE (Model 140) Transciever.
The single transducer was mounted on an ORE Model 132B over the side swivel mounting bracket with a 2m down boom. This arrangement submerged the transducer approx. 2 ft. into the water. The mounting bracket was initially mounted midship port side because of deck space and to reduce the affects of ship motion.

The tranducer was later moved farther forward, secured on the swivel and boom to eliminate port engine and prop noise. Data were recorded on an EPC 8700 thermal recorder operating at either 1/8 sec sweep with an 1/8 sec firing rate or a 1/4 sec sweep at 1/4 sec firing rate.

Summary:

This single element transducer configuration is in the experimental stage but shows promise of becoming a standard small vessel subbottom profiling system.

The 3.5 system performed very well in reasonable weather conditions, water depths under 50 metres and speeds less than 5 Kts. Beam seas caused breakup in the recovered signals as the swivel of the overside arm could not keep up with ship motion. Two options exist to improve the performance of the 3.5 system.

1) An improvement in the configuration of the transducer cover body (now inclosed in a modified plastic float) to cut down on aeration under the transducer should increase the operating windows.

2) Mount the single transducer in a small towed body to be towed on a short purchase. This arrangement would eliminate the problem with rolling experienced with the overside mounted system and again should increase operating windows. The towed body could possibly consist of a floating streamline body which would give a record during core/grab stations but contain diving planes/fins,etc. to put it below the surface at survey speed.

Engine/prop noise from the port engine (3.5 was mounted on port side) caused very noisy records each time this engine was run. This noise problem was largely overcome by moving the transducer forward and lashing it to the boom installed for the NSRF streamer with a strain relief line going forward. This configuration also seemed to reduce the affects of ship rolling motion.

Bathymetry:

Bathymetry was collected on a RAYTHEON 719 recorder mounted in the lab using a 200 Khz over the side transducer. A calibration (draught corrected) was done at Moosonee, Ont. Chart scale was 15m full scale for the James Bay phase of the cruise and 30m full scale for the Hudson Bay, Grande Baleine phase. Velocity value used = 1456 m/sec.

Julian day and GMT time were manually annotated on the chart at 5 min intervals.

Summary:

For the first several days of the trip, the sounder was not working well at depths > 60m. An extension to the deckcable which had been added for this trip was removed resulting in output power to the transducer being increased. From this point on the sounder worked well in all water depths encountered. Some motor drive problems were encountered which were solved by cleaning the drive gears. Very few spares exist for these recorders.

Klein 100 kHz Sidescan Sonar:

Sidescan data was obtained using a one degree beam, 100 Khz Klein system consisting of a Klein 401 recorder and a Klein 402B-001 sidescan aluminum towfish operating in the 100m to 200m range.
For days 215-229 the towfish was attached to a Kevlar 100 metre towcable running through a block on the Hyab crane and then under the guard rail at the stern. The fish and cable were deployed and RECOVERED by hand and stopped off at various depths.
From day 230-234, a stainless steel 5/32 wire from the HIAB winch was attached to the fish to do the deployment and recovery. The kevlar towcable was deployed and recovered by hand as the towfish was being lowered/raised by the HIAB winch.

Towfish depth was approximately 17m with all cable out and a speed of 4-5 knots. Records displayed ranges of 100-200m. each side at 40-50 lines/cm. paper speed.

Summary:

The system worked well with the following limitations:

1) The length of cable available limited sidescan sonar data to water depths less than 50 metres at 4-5 knot survey speeds This lack of towfish depth increased sea surface clutter on the record
2) The complex seafloor morphology and limited sounding availability made flying the fish extremely difficult especially as the system was deployed/recovered by hand for the first two weeks.
3) No sidescan sonar data was collected in areas of water depths greater than 60m due to depth limitations and during period of heavy swell which made deployment, depth adjustment and recovery an unsafe operation.

The HIAB crane winch wire was attached to the sidescan fish to assist in towfish retrieval this arrangement greatly improved recovery time but unequal tension between towcable and wire caused some data reduction in deep water due to towfish roll/attitude being affected.

For future small boat surveys it is recommended that a lightweight slipringed, electro/hydraulic winch with level-wind and remote control be acquired to facilitate rapid depth adjustment allowing closer altitude adjustment for higher data quality.

Also, a rack mounted 595 Klein system with dual frequency would decrease operations complexity and take up less limited bench space on such a small survey vessel, while increasing the type of sidescan coverage in a survey area rarely visited.

Navigation:

The vessel was navigated by a Trimble Navtrac GPS reciever. This reciever has a 500 waypoint capability with an excellent user interface/display giving an accurate line running capability.
Navigation for the scientific watchkeeper was provided by a Trimble navigation GPS Pathfinder portable position recording system powered off the vessels 12 volt system. Logging intervals were either 30 sec or 10 sec. Navigation, as read off the Pathfinder display, was logged by hand at approximately 3 min intervals to provide backup should the unit fail to record.
The Pathfinder logged data files were downloaded at each days end to an Olivetti 386 PC through an RS232 port using a software package 'PFINDER' supplied by Trimble navigation. The 'PFINDER' software has a track ploting option allowing for a quick check on the recorded file after downloading. The downloaded raw .SSF files were output in ascii format (output option in the 'PFINDER' SOFTWARE) as a DMSddd.DAT file. This DMSddd.DAT file was passed through a custom Fortran program to add Julian day to each fix record, convert lats and longs to degrees and decimal degrees to match the required Multi-parameter format for the BIO database and add a header record of cruise number and number of lat/long pairs to each track section.
After downloading, display and conversion the raw .SSF, ascii DMSddd.DAT and converted Nddd.DAT files were backed up to a Jumbo tape cartridge as well as to 1.44 meg 3 1/2" disks.

Summary:

The Trimble Pathfinder worked without fail for the entire trip. The 'PFINDER' software has several very useful utilities (a number of output formats, tape measure option to quickly calculate kilometers run, lat long displayed at mouse pointer etc.) etc. The system is well documented so a new user can become proficient in its operation in a short time. This unit will track only 4 sats but newer models may track more (6). It would be worth looking in to the newer model to see what improvements have been made.

Computer system:

Computer hardware consisted of a Olivetti 386 PC computer operating at 22 Mh with a 1.44 meg 3 1/2" floppy disk drive, a 1.2 meg 5 1/4" floppy disk drive and a 130Mb hard drive. A 250mb Jumbo tape drive backup unit was used to back up all nav and report files as well as to restore a Dos 5.0 system at the beginning of the trip after the original system was corrupted.

Summary:

In an attempt to get the mouse driver working at the beginning of the trip, the 'command.com' file became corrupted during a re-boot making bootup impossible. Through excellent cooperation with Hydro Quebec a DOS 5.0 system disk and new mouse were flown to Radisson at LG-2 and then taxied to Chisasibi where we were scheduled to stop for fuel and stores. When we arrived the material was waiting for us at the dock. A Dos 5.0 system should be included with the computer supplies for all future trips.

Inventory system:

The field inventory system 'SHIP' was used to handle the storage, editing and report generation of all samples and records collected on this cruise as well as the start/end times of all recorded online parameters. 'Ship' was run on an Olivetti 386 PC. Backups were done to a Jumbo 250 mb tape cartridge drive as well as to 1.44 mb 3 1/2 diskettes. 'Ship' is a Dbase 3 Plus based system written in the Dbase language. Printing capability was provided by a HEWLETT PACKARD Thinkjet printer and a Panasonic 1123-24 pin dot matrix printer.

Summary:

'SHIP' operated well with a couple of minor modifications made to accomodate the data being recorded on this trip. A full report of all data collected is included with this report.

Sampling:

Sea-bed samples were collected using the following:

1) a 8" Van Veen grab sampler
2) a 3-m Benthos gravity corer.

Summary:

Grab sampling went smoothly as did the coring operation but core samples were on average only about 1/2 to 2/3 of penetration. The spring in the valve (core head) is possibly too strong and does not open sufficiently to allow the water to exit as the core enters the liner. The valve was removed later in the survey and sample recovery improved to maximum recovery of 1.45m instead of 1.0m previously.

Core freefall distance was determined by marking the winch wire after taking an initial grab sample at each station.

A sample log was maintained for all sampling operations from which sampling information was entered into the 'SHIP' inventory system.

Because of the workup to be done on these cores at BIO, it was required to keep them at 10 degrees celsius or lower. This was accomplished by immersing the cores in sea water in a 45 gallon drum. The sea water was changed as the drum warmed up but on some occasions the sea water was warmer then the water in the drum. The temp went to about 12 degrees celsius for a period of 12 hours for cores LG-1 and LG-2 but was maintained at 10 degrees celsius or lower for the remainder of the time.

COASTAL VIDEO by Yves Michaud

The Hudson Bay coastline within the area covered by the coastal video can be divided in three portions, according to their locations and exposures. These portions are i) the coastline located outside Manitounuk Sound; ii) the coastline located inside Manitounuk Sound along the cuesta front; and iii) the mainland coast located inside Manitounuk Sound.

i) The coastline located outside Manitounuk Sound extent from Long Island in the south to Guillaume-Delisle Gulf in the north. This coastline is the continuation of the cuesta into Hudson Bay. The shoreline is mainly composed of bedrock outcrops and bouldery to sandy beaches. The general slope dips toward the Belcher Islands at an angle between 5 to 10 degrees. Thus, this coastline, which is exposed to the long Hudson Bay fetch, does not show extensive intertidal flats. Often, coastal sand dunes are developed behind large sandy beaches.

ii) The coastline located inside Manitounuk Sound, but along the cuesta front is essentially a rocky to bouldery shoreline with a few sandy beaches located along consequent valleys dissecting this monoclinal relief. It is mainly composed of block size talus slopes that fall in Manitounuk Sound at a steep angle ($>10^0$). This portion covers the length of the sound on its west shore.

iii) The mainland coast inside Manitounuk Sound is the most interesting shoreline for the purpose of this study. It covers the length of the sound on its east shore. The main characteristic of this coastline is the presence of extensive intertidal flats (up to 1 km wide) all along the sound. The coastline is composed of a series rocky promontories and bays filled with fine sediments. In cross-section, very often bays are either composed of discontinuously frozen marine sediments (Tyrrell Sea sediments), above the maximum water level, followed by a narrow salt marsh, a small sand beach, and a large mud flat, where the salt marsh and the sand beach are truncated by a micro-cliff of *circa* 0.5 - 1 m in height (see Figure 10.12.1), or raised beaches and coastal dunes followed by the actual sand beach and a large sandy to silty tidal flat.

Depositional landforms found along the Hudson Bay coast, show a large input of sediments by the incoming rivers and the longshore current. However, the fact that these landforms are concentrated in protected areas, demonstrate also that the longshore current and waves acting along this coastline, are quite effective in redistributing sediments. Finally, although this is an emerging coast, many erosional features are found in the coastal zone. It is an interesting dilemma that will be look at in the following studies.

ATLANTIC GEOSCIENCE CENTRE
DATA SECTION
-SHIP- REPORTING PACKAGE

TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
001	GRAB	2281623		55 16.83	77 49.70	32	GRANDE BALEINE DELTA,QUEBEC
002	CAMERA	2281646		55 17.06	77 49.57	41	GRANDE BALEINE DELTA,QUEBEC
003	EXCALIBUR	2281731		55 16.79	77 49.47	32	GRANDE BALEINE DELTA,QUEBEC
004	BOXCORE	2281840	2281800	55 17.28	77 49.30	60	GRANDE BALEINE DELTA,QUEBEC
006	CAMERA	2291343		55 17.40	77 48.95	43	GRANDE BALEINE DELTA,QUEBEC
009	CORE	2291653		55 17.37	77 49.45	61	GRANDE BALEINE DELTA,QUEBEC
010	CAMERA	2291811		55 20.02	77 45.76	45	GRANDE BALEINE OFF MAVER ISLANDS, QUEBEC
011	BOXCORE	2291840	2291235	55 20.15	77 46.06	58	GRANDE BALEINE OFF MAVER ISLANDS, QUEBEC
012	CORE	2291903	2291235	55 20.10	77 45.73	49	GRANDE BALEINE DELTA,QUEBEC
013	WATER	2292131		55 16.76	77 49.56	36	GRANDE BALEINE DELTA,QUEBEC
014	CAROUSEL	2301332		55 16.77	77 49.60	42	GRANDE BALEINE DELTA,QUEBEC
015	GRAB	2301614		55 16.80	77 49.61	37	GRANDE BALEINE DELTA,QUEBEC
016	CORE	2301807	2291235	55 20.15	77 45.82	53	GRANDE BALEINE DELTA,QUEBEC
017	BOXCORE	2301932		55 14.35	77 58.91	96	GRANDE BALEINE DELTA,QUEBEC
018	CORE	2301944		55 14.34	77 59.23	96	GRANDE BALEINE DELTA,QUEBEC
019	CAMERA	2311145		55 14.38	77 59.08	95	GRANDE BALEINE DELTA,QUEBEC

ATLANTIC GEOSCIENCE CENTRE	TABLE 1	CRUISE NUMBER = 92-028
DATA SECTION		CHIEF SCIENTIST = CARL AMOS
-SHIP- REPORTING PACKAGE	TOTAL SAMPLE INVENTORY	PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
020	CORE	2311218		55 14.31	77 59.16	96	GRANDE BALEINE DELTA,QUEBEC
021	EXCALIBUR	2311305		55 15.67	77 56.27	79	GRANDE BALEINE DELTA,QUEBEC
022	CAMERA	2311321		55 15.75	77 56.22	70	GRANDE BALEINE DELTA,QUEBEC
023	BOXCORE	2311405		55 15.64	77 56.37	86	GRANDE BALEINE DELTA,QUEBEC
024	CORE	2311419		55 15.62	77 56.25	79	GRANDE BALEINE DELTA,QUEBEC
025	CORE	2311626		55 15.83	77 56.52	77	GRANDE BALEINE DELTA,QUEBEC
026	CORE	2311651		55 15.93	77 56.29	88	GRANDE BALEINE DELTA,QUEBEC
027	BOXCORE	2311916		55 15.79	77 53.45	79	GRANDE BALEINE DELTA,QUEBEC
028	CAMERA	2311943		55 15.91	77 53.43	81	GRANDE BALEINE DELTA,QUEBEC
029	CAMERA	2321152		55 32.22	77 32.55	17	GRANDE BALEINE DELTA,QUEBEC
030	RALPH	2321221		55 32.30	77 32.49	16	GRANDE BALEINE SCHOONER OPENING,QUEBEC
031	SOBS	2321320		55 32.33	77 32.34	17	GRANDE BALEINE SCHOONER OPENING,QUEBEC
032	EXCALIBUR	2321400		55 32.92	77 34.06	123	GRANDE BALEINE DELTA,QUEBEC
033	CORE	2321417		55 32.96	77 34.02	118	GRANDE BALEINE DELTA,QUEBEC
034	CORE	2321436		55 32.93	77 33.85	121	GRANDE BALEINE DELTA,QUEBEC
035	BOXCORE	2321620		55 32.81	77 34.33	138	GRANDE BALEINE DELTA,QUEBEC

ATLANTIC GEOSCIENCE CENTRE	TABLE 1	CRUISE NUMBER = 92-028
DATA SECTION		CHIEF SCIENTIST = CARL AMOS
-SHIP- REPORTING PACKAGE	TOTAL SAMPLE INVENTORY	PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
036	CAMERA	2321647		55 32.67	77 34.35	137	GRANDE BALEINE DELTA,QUEBEC
037	GRAB	2321738		55 31.95	77 32.85	34	GRANDE BALEINE DELTA,QUEBEC
038	GRAB	2321750		55 31.91	77 32.79	36	GRANDE BALEINE DELTA,QUEBEC
039	GRAB	2321809		55 32.06	77 32.75	39	GRANDE BALEINE DELTA,QUEBEC
040	CAROUSEL	2321902		55 31.97	77 32.56	46	GRANDE BALEINE SCHOONER OPENING,QUEBEC
041	WATER	232		55 31.98	77 32.59	42	GRANDE BALEINE DELTA,QUEBEC
042	WATER	2331216		55 31.95	77 32.63	42	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
043	CORE	2331441		55 31.99	77 37.28	160	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
044	CORE	2331613		55 32.04	77 37.26	160	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
045	BOXCORE	2331639		55 32.01	77 37.30	160	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
046	CAMERA	2331706		55 32.01	77 37.32	160	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
047	CORE	2331802		55 29.61	77 43.46	151	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
048	CORE	2331826		55 29.73	77 43.44	151	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
049	BOXCORE	2331855		55 29.75	77 43.44	151	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC

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TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
050	CAMERA	2331927		55 29.67	77 43.44	150	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
051	EXCALIBUR	2341255		55 36.29	77 31.90	97	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC
052	CORE	2341330		55 36.14	77 31.61	106	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC
053	CORE	2341357		55 36.34	77 31.53	94	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC
054	BOXCORE	2341419		55 36.32	77 31.47	95	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC
055	CAMERA	2341610		55 36.43	77 31.65	103	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC
056	CORE	2341659		55 38.34	77 24.52	80	GRANDE BALEINE OFF BOAT OPENING,QUEBEC
057	CAMERA	2341720		55 38.43	77 24.42	90	GRANDE BALEINE OFF BOAT OPENING,QUEBEC
058	CORE	2341737		55 38.39	77 24.57	97	GRANDE BALEINE OFF BOAT OPENING,QUEBEC
059	BOXCORE	2341755		55 38.35	77 24.55	97	GRANDE BALEINE OFF BOAT OPENING,QUEBEC
060	CAMERA	2341810		55 38.35	77 24.52	97	GRANDE BALEINE OFF BOAT OPENING,QUEBEC
061	EXCALIBUR	2351433		55 31 42	77 34.48	78	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC
062	SOBS	2361225		56 00.52	76 56.24	37	PETITE BALEINE QUEBEC

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TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
063	CORE	2361610		55 58.81	77 09.88	166	PETITE BALEINE QUEBEC
064	CORE	2361630		55 58.81	77 09.95	166	PETITE BALEINE QUEBEC
065	BOXCORE	2361653		55 58.71	77 09.96	168	PETITE BALEINE QUEBEC
066	CAMERA	2361723		55 58.74	77 09.83	166	PETITE BALEINE QUEBEC
067	CORE	2361823		56 00.49	76 58.10	166	PETITE BALEINE QUEBEC
068	CORE	2361835		56 00.44	76 58.04	96	PETITE BALEINE QUEBEC
069	BOXCORE	2361856		56 00.42	76 58.10	96	PETITE BALEINE QUEBEC
070	CAMERA	2361939		56 00.57	76 58.09	97	PETITE BALEINE QUEBEC
071	CORE	2371155		55 58.59	77 17.52	110	PETITE BALEINE QUEBEC
072	CORE	2371211		55 58.52	77 17.43	103	PETITE BALEINE QUEBEC
073	BOXCORE	2371230		55 58.59	77 17.45	107	PETITE BALEINE QUEBEC
074	CAMERA	2371249		55 58.55	77 17.41	105	PETITE BALEINE QUEBEC
075	CORE	2371430		56 05.51	76 56.20	182	PETITE BALEINE QUEBEC
076	CAMERA	2371441		56 05.47	76 56.28	183	PETITE BALEINE QUEBEC
077	BOXCORE	2371747		56 05.45	76 56.26	180	PETITE BALEINE QUEBEC
078	CORE	2371804		56 05.51	76 56.18	183	PETITE BALEINE QUEBEC
079	GRAB	2391246		55 21.48	77 43.22	68	MOUTH OF MANITOUNUK, QUEBEC

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TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
080	CORE	2391323		55 21.40	77 43.24	68	MOUTH OF MANITOUNUK, QUEBEC
081	CORE	2391344		55 21.40	77 43.20	68	MOUTH OF MANITOUNUK, QUEBEC
082	BOXCORE	2391405		55 21.46	77 43.20	68	MOUTH OF MANITOUNUK, QUEBEC
083	CAMERA	2391445		55 21.40	77 43.22	69	MOUTH OF MANITOUNUK, QUEBEC
084	RALPH	2391916		55 21.43	77 43.13	68	MOUTH OF MANITOUNUK, QUEBEC
085	WATER	2392056		55 21.42	77 43.13	57	MOUTH OF MANITOUNUK, QUEBEC
086	SOBS	2401252		55 21.51	77 42.94	64	MOUTH OF MANITOUNUK, QUEBEC
087	EXCALIBUR	2401311		55 21.61	77 42.52	51	MOUTH OF MANITOUNUK, QUEBEC
088	RALPH	2401339		55 21.39	77 43.14	56	MOUTH OF MANITOUNUK, QUEBEC
089	CORE	2401613		55 24.85	78 00.44	160	MOUTH OF MANITOUNUK, QUEBEC
090	CORE	2401630		55 24.80	78 00.41	163	MOUTH OF MANITOUNUK, QUEBEC
091	BOXCORE	2401651		55 24.76	78 00.45	163	MOUTH OF MANITOUNUK, QUEBEC
092	CAMERA	2401734		55 24.86	78 00.41	163	MOUTH OF MANITOUNUK, QUEBEC

TABLE 1

TOTAL SAMPLE INVENTORY

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
093	WATER	2401807		55 24.92	78 08.44	163	MOUTH OF MANITOUNUK, QUEBEC
094	CORE	2411202		55 32.64	78 44.76	160	SOUTH OF KUUGAAPIK RIVER,QUEBEC
095	CORE	2411219		55 32.87	78 44.81	175	OFFSHORE BELCHER ISLANDS QUEBEC
096	BOXCORE	2411237		55 32.70	78 44.80	176	OFFSHORE BELCHER ISLANDS QUEBEC
097	CAMERA	2411310		55 32.69	78 44.83	175	OFFSHORE BELCHER ISLANDS QUEBEC
098	WATER	2411337		55 32.70	78 44.75	175	OFFSHORE BELCHER ISLANDS QUEBEC
099	CORE	2411600		55 26.94	78 21.37	133	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
100	CORE	2411623		55 26.94	78 21.34	133	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
101	BOXCORE	2411639		55 26.94	78 21.28	133	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
102	CAMERA	2411700		55 26.98	78 21.30	131	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
103	WATER	2411723		55 27.03	78 21.51	130	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
104	CORE	2411854		55 35.65	77 59.16	145	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC

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TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
105	CORE	2411910		55 35.67	77 59.36	136	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
106	BOXCORE	2411932		55 35.76	77 59.38	136	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
107	CAMERA	2411944		55 35.79	77 59.41	138	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
108	CAMERA	2421505		55 16.82	77 52.63	87	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC
109	WATER	2421526		55 16.77	77 52.61	85	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC
110	GRAB	2421542		55 16.77	77 52.65	83	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC
111	GRAB	2421609		55 17.69	77 55.88	73	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC
112	GRAB	2421633		55 18.35	77 59.07	70	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC
113	GRAB	2421715		55 19.93	78 05.47	116	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC
114	GRAB	2421737		55 20.77	78 08.76	105	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
115	GRAB	2422209		55 21.71	78 12.45	141	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC

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TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
116	GRAB	2422237		55 22.25	78 15.33	165	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
117	GRAB	2422302		55 23.11	78 18.37	181	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
118	GRAB	2422333		55 23.86	78 21.58	186	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
119	GRAB	243		55 24.70	78 24.96	158	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
120	GRAB	2430028		55 25.56	78 27.99	116	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
121	GRAB	2430056		55 26.37	78 31.55	114	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
122	GRAB	2430126		55 27.10	78 34.51	136	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
123	CAMERA	2430139		55 27.24	78 35.44	94	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
124	WATER	2430155		55 27.21	78 35.38	94	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
125	WATER	2430330		55 18.14	78 48.00	109	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
127	GRAB	2430408		55 17.95	78 47.87	94	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
128	GRAB	2430439		55 16.40	78 46.56	108	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
129	GRAB	2430507		55 14.68	78 45.11	108	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC

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TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92-028
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PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
130	GRAB	2430542		55 12.79	78 43.40	140	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
131	GRAB	2430613		55 09.96	78 41.04	125	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
132	GRAB	2430648		55 09.28	78 40.41	120	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
133	GRAB	2430718		55 07.48	78 38.64	130	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
134	GRAB	2430746		55 05.59	78 37.21	115	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
135	GRAB	2430809		55 04.42	78 36.35	42	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
136	CAMERA	2430820		55 04.31	78 36.21	45	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
137	WATER	2431132		55 04.09	78 36.13	42	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
138	WATER	2431237		55 38.82	78 18.95	140	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
139	CAMERA	2431253		55 38.64	78 19.07	133	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
140	GRAB	2431318		55 38.42	78 19.08	135	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
141	GRAB	2431405		55 37.94	78 15.95	97	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
142	GRAB	2431433		55 36.67	78 13.27	96	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC

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TABLE 1

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
143	GRAB	2431526		55 35.22	78 10.66	128	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
144	GRAB	2431646		55 33.99	78 07.81	147	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
145	GRAB	2431727		55 32.66	78 05.67	145	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
146	GRAB	2431851		55 29.51	77 59.05	140	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
147	CAMERA	2431907		55 29.44	77 59.16	140	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
148	WATER	2431923		55 29.47	77 59.10	147	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC

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TABLE2

GRAB SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
001	VAN VEEN	2281623	55 16.83 77 49.70	32	03	4	GRANDE BALEINE DELTA,QUEBEC	BOTH 1ST AND 2ND ATTEMPTS FAILED DUE TO WEDGED CATCH PIN; BROWN 2.5YR 4/2 SOUPY THIN VENEER WITH FEW BROKEN POLYCHETES TAKEN BY BARB ARDILLES; REPRESENTATIVE SAMPLE BAGGED FOR AGC; FORAM SAMPLE FROZEN FOR INSTAAR;
037	VAN VEEN	2321738	55 31.95 77 32.85	34	01	01	GRANDE BALEINE DELTA,QUEBEC	RECOVERED 1 LARGE BOULDER AND 1 SMALL ERATIC;
038	VAN VEEN	2321750	55 31.91 77 32.79	36	01	01	GRANDE BALEINE DELTA,QUEBEC	SAND WASHED OUT UPON RECOVERY; REMAINING MATERIAL BAGGED;
039	VAN VEEN	2321809	55 32.06 77 32.75	39	02	02	GRANDE BALEINE DELTA,QUEBEC	FIRST ATTEMPT RECOVERED 4 SMALL PEBBLES-BAGGED; ON SECOND ATTEMPT RECOVERED SAND- BAGGED; WATER DEPTH 44.0M;
079	VAN VEEN	2391246	55 21.40 77 43.22	68	01	02	MOUTH OF MANITOUNUK, QUEBEC	ON THE BOTTOM AT 1246; SURFICIAL VENEER <1/2CM THICK UNDERLAIN BY 5Y5/1 BIOTURBA TED CLAY; VENEER 2.5Y4/2; SURFACE CONTAI NED LARGE POLYCHEATES, TUBES, STARFISH, SMALL MOLLUSCS; SUSPECT ICE SCOUR REASON FOR SUCH SMALL MOLLUSCS;
110	VAN VEEN	2421542	55 16.77 77 52.65	83	01	02	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC	SOUPY BROWN SURFICIAL VENEER 2.5YR4/2 UNDERLAIN BY GRAY BIOTURBATED 5Y5/1 CLAY
111	VAN VEEN	2421609	55 17.69 77 55.80	73	01	02	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC	SOUPY BROWN SURFICIAL VENEER (1CM) UNDERLAIN BY BIOTURBATED GRAY CLAY
112	VAN VEEN	2421633	55 18.35 77 59.07	70	01	02	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC	SOUPY BROWN SURFICIAL VENEER (~1CM) UNDERLAIN BY GRAY BIOTURBATED CLAY
113	VAN VEEN	2421715	55 19.93 78 05.47	116	01	02	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC	SOUPY BROWN SURFICIAL CLAY VENEER UNDERLAIN BY GRAY BIOTURBATED CLAY;
114	VAN VEEN	2421737	55 20.77 78 08.76	105	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	BIOLOGICAL AND REPRESENTATIVE SAMPLE TAKEN; SOUPY BROWN SURFICIAL VENEER~1CM UNDERLAIN BY GRAY BIOTURBATED CLAY

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TABLE2

GRAB SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
115	VAN VEEN	2422209	55 21.71 78 12.45	141	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	BIOLOGICAL AND REPRESENTATIVE SAMPLE TAKEN; THIN BROWN SURFACE LAYER OVER STEEL GRAY CLAYEY TO SLIGHTLY SILTY SEDIMENTS;
116	VAN VEEN	2422237	55 22.25 78 15.33	165	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; BROWN SURFACE LAYER; STEEL GRAY CLAYEY SEDIMENTS ONLY TRACE OF SILT -NO BIOLOGICAL SPECIMENS NOTED;
117	VAN VEEN	2422302	55 23.11 78 18.37	181	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; VERY THIN BROWN SURFACE LAYER OVER LIGHT MEDIUM GRAY CLAYEY SEDIMENTS WITH ONLY A TRACE OF SILTY GRITTY SEDIMENTS;
118	VAN VEEN	2422333	55 23.86 78 21.58	186	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN SURFACE LAYER UNDRELAIN BY MED-GRAY CLAYEY SED SLIGHTLY GRITTY;
119	VAN VEEN	243	55 24.70 78 24.96	158	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN SURFACE LAYER UNDERLAIN BY MED GRAY CLAYEY AND SILTY SEDS - SOME SAND GRAINS NO BIOLOGICAL SPECIMENS OBSERVED;
120	VAN VEEN	2430028	55 25.56 78 27.99	116	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN SURFACE LAYER OVER MED GRAY CLAYEY SEDS
121	VAN VEEN	2430056	55 26.37 78 31.55	114	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN SURFACE LAYER OVER MED GRAY CLAYEY SEDS
122	VAN VEEN	2430126	55 27.10 78 34.51	136	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; BROWN SURFACE OVER MED GRAY CLAY;
127	VAN VEEN	2430408	55 17.95 78 47.87	94	01	02	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN LAYER OVER MED GRAY CLAY
128	VAN VEEN	2430439	55 16.40 78 46.56	108	01	02	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN LAYER OVER GRAY CLAY;
129	VAN VEEN	2430507	55 14.68 78 45.11	108	01	02	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN LAYER OVER MED GRAY CLAY;

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TABLE2

GRAB SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
130	VAN VEEN	2430542	55 12.79 78 43.40	140	01	02	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE; BROWN OOZE OVER A MED GRAY CLAY;
131	VAN VEEN	2430613	55 09.96 78 41.04	125	01	02	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN LAYER OVER MED GRAY CLAY;
132	VAN VEEN	2430648	55 09.28 78 40.41	120	01	02	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN LAYER TAKEN OVER MED GRAY CLAY;
133	VAN VEEN	2430718	55 07.48 78 38.64	130	01	02	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; MED BROWN TOP LAYER OVER MED GRAY CLAY;
134	VAN VEEN	2430746	55 05.59 78 37.21	115	01	02	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN; THIN BROWN LAYER OVER MED GRAYM CLAY;
135	VAN VEEN	2430809	55 04.42 78 36.35	42	01	02	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	REPRESENTATIVE SAMPLE TAKEN;
140	VAN VEEN	2431318	55 38.42 78 19.08	135	01	02	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	SOUPY BROWN 2.5Y4/2 PEBBLY, GRAVELLY, SANDY SURFACE LAYER ~ 4 CM THICK UNDER-LAIN BY GRAY 5Y4/2 GRAVELLY SANDY CLAY
141	VAN VEEN	2431405	55 37.94 78 15.95	97	01	02	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	2CM SOUPY BROWN 2.5Y4/2 SURFICIAL VENEER UNDERLAIN BY GRAY 5Y4/2 CLAY SLIGHTLY BIOTURBATED;
142	VAN VEEN	2431433	55 36.67 78 13.27	96	01	02	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	SOUPY BROWN 2.5Y4/2 SURFICIAL LAYER ~2CM THICK UNDERLAIN BY GRAY 5Y4/2 CLAY SLIGHTLY BIOTURBATED;
143	VAN VEEN	2431526	55 35.22 78 10.66	120	01	02	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	114 CABLE OUT; SOUPY BROWN 2.5Y4/2 SURFACE LAYER ~2CM UNDERLAIN BY GRAY 5Y4/2 CLAY; SHELL FRAGMENTS ON THE SURFACE;
144	VAN VEEN	2431646	55 33.99 78 07.81	147	01	02	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	SOUPY BROWN 2.5Y4/2 SURFICIAL VENEER~1CM THICK UNDERLAIN BY GRAY 5Y4/2 CLAY
145	VAN VEEN	2431727	55 32.66 78 05.67	145	01	02	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	SOUPY BROWN 2.5Y4/2 SURFICIAL VENEER ~2CM THICK UNDERLAIN BY GRAY 5Y4/2 CLAY

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TABLE2

GRAB SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
146	VAN VEEN	2431851	55 29.51 77 59.05	140	01	02	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	SOUPY BROWN 2.5Y4/2 SURFICIAL VENEER UNDERLAIN BY GRAY 5Y4/2 CLAY

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TABLE 3

CORE SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
009	GRAVITY	2291653	55 17.37 77 49.45	61	1515			03	GRANDE BALEINE DELTA,QUEBEC	MIDDLE BARREL BENT AT COUPLING; CUTTER BAGGED; UPPER 0-20CM BAGGED AS STRETCHED AND EXTRUDED FROM THE BARREL;
012	LEHIGH	2291903	55 20.10 77 45.73	49	305	300	60	01	GRANDE BALEINE DELTA,QUEBEC	1ST ATTEMPT TO CORE BARREL FULL BUT LOST CORE CUTTER AND SEDIMENT; 2ND ATTEMPT CORE NOT FULL; DISTURBED TOP DEWATERED A ND PLACED PAPER IN TOP TO KEEP IN PLACE; NOT RECOMMENDED FOR GEOCHEM AS INTENDED;
016	GRAVITY	2301007	55 20.15 77 45.82	53	1010	1010		02	GRANDE BALEINE DELTA,QUEBEC	
018	LEHIGH	2301944	55 14.34 77 59.23	96	0150	0200	0000	01	GRANDE BALEINE DELTA,QUEBEC	SEDIMENT WENT OVER TOP OF LEHIGH CORE HEAD; UPON RETREIVAL CORE CATCHER FELL OUT ON DECK AS DID REMAINING DISTURBED SEDIMENT; TURFED OVER THE SIDE;
020	GRAVITY	2311218	55 14.31 77 59.16	96	153			01	GRANDE BALEINE DELTA,QUEBEC	
024	LEHIGH	2311419	55 15.62 77 56.25	79	153			01	GRANDE BALEINE DELTA,QUEBEC	DUE TO DAMAGE LEHIGH CORE MAY BE TRASHED
025	GRAVITY	2311626	55 15.83 77 56.52	77	610	610		02	GRANDE BALEINE DELTA,QUEBEC	E/D; D/C; C/B;B/A;
026	GRAVITY	2311651	55 15.93 77 56.29	88	153	153		01	GRANDE BALEINE DELTA,QUEBEC	
033	GRAVITY	2321417	55 32.96 77 34.02	118	153	153		01	GRANDE BALEINE DELTA,QUEBEC	
034	GRAVITY	2321436	55 32.93 77 33.85	121	610	610	392	02	GRANDE BALEINE DELTA,QUEBEC	
043	GRAVITY	2331441	55 31.99 77 37.28	160	153	153		01	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC	
044	GRAVITY	2331613	55 32.04 77 37.26	160	610	610	427	02	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC	D/C 0-122; C/B 122-277; A/B 277-427CM; THIN SURFICIAL VENEER UNDERLAIN BY SILTY BIOTURBATED CLAY; CORE CATCHER BAGGED;

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TABLE 3

CORE SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
047	GRAVITY	2331802	55 29.61 77 43.46	151	153	153		01	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC	
048	GRAVITY	2331826	55 29.73 77 43.44	151	610	610		02	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC	
052	GRAVITY	2341330	55 36.14 77 31.61	106	153	153		01	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC	
053	GRAVITY	2341357	55 36.34 77 31.53	94	610	610	176	02	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC	BOTH BARRELS SLIGHTLY BENT; C/B 0-87CM; A/B 87-176 CM;CATCHER BAGGED
056	LEHIGH	2341659	55 38.34 77 24.52	80	153	153		01	GRANDE BALEINE OFF BOAT OPENING,QUEBEC	GEOCHEM CORE FOR AGC;
058	GRAVITY	2341737	55 38.39 77 24.57	97	305	305+		01	GRANDE BALEINE OFF BOAT OPENING,QUEBEC	UPPER 20 CM BAGGED;
063	GRAVITY	2361610	55 58.81 77 09.88	166	153	153		01	PETITE BALEINE QUEBEC	
064	GRAVITY	2361630	55 58.81 77 09.95	166	610	610		02	PETITE BALEINE QUEBEC	
067	GRAVITY	2361823	56 00.49 76 58.18	166	153	153	153	01	PETITE BALEINE QUEBEC	FOR CHEM AT AGC
068	BENTHOS GRAVIT	2361835	56 00.44 76 58.04	96	610	610	610+	02	PETITE BALEINE QUEBEC	CORE HEAD CHANGED TO 1800LBS. IN WATER 1838; ON BOTTOM 1840;
071	LEHIGH	2371155	55 58.59 77 17.52	110	153	153		01	PETITE BALEINE QUEBEC	
072	BENTHOS GRAVIT	2371211	55 58.52 77 17.43	103	610	610		02	PETITE BALEINE QUEBEC	IN THE WATER AT 1211; ON THE BOTTOM AT 1214;
075	GRAVITY	2371430	56 05.51 76 56.28	182	153	153		01	PETITE BALEINE QUEBEC	

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TABLE 3

CORE SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
078	BENTHOS GRAVIT	2371804	56 05.51 76 56.18	183	0915	0915		03	PETITE BALEINE QUEBEC	IN THE WATER AT 1804; ON THE BOTTOM AT 1808; TROUBLE RECOVERING CORE FROM BARRE LS - HAD TO CUT ONE SECTION WITH A SAW; PIECE C-C' 8 CM IN LENGTH;
080	LEHIGH	2391323	55 21.48 77 43.24	68	305	214		01	MOUTH OF MANITOUNUK, QUEBEC	IN THE WATER AT 1323; ON BOTTOM AT 1324;
081	BENTHOS GRAVIT	2391344	55 21.48 77 43.20	68	610	610	348	02	MOUTH OF MANITOUNUK, QUEBEC	IN THE WATER AT 1344; ON BOTTOM AT 1345; THIN VENEER, SEQUENCE OF BIOTURBATED CLAYS TERMINATING IN A SEQUENCE OF RYTHMITES AS ENCOUNTERED IN CORE 048; D/C 0-51CM; C/B 51-205CM; A/B 205-348CM.
089	GRAVITY	2401613	55 24.85 78 08.44	160	153	FULL		01	MOUTH OF MANITOUNUK, QUEBEC	IN THE WATER 1613; ON THE BOTTOM 1617; APPARENT PENETRATION TO THE SECOND WEIGHT ON THE CORE HEAD;
090	BENTHOS GRAVIT	2401630	55 24.80 78 08.41	163	610	FULL		02	MOUTH OF MANITOUNUK, QUEBEC	D/C 0-29CM; C-C1 29-35CM; B/C35- A/B ;
094	LEHIGH	2411202	55 32.64 78 44.76	160	153			01	SOUTH OF KUUGAAPIK RIVER,QUEBEC	IN THE WATER AT 1202; ON THE BOTTOM AT 1205;
095	BENTHOS GRAVIT	2411219	55 32.87 78 44.81	175	610	FULL	377	02	OFFSHORE BELCHER ISLANDS QUEBEC	IN THE WATER AT 1219; ON BOTTOM AT 1222; D/C 0-77; C/B 77-228; A/B 2228-377CM;
099	LEHIGH	2411608	55 26.94 78 21.37	133	305	305		01	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC	IN THE WATER AT 1608; ON BOTTOM AT 1610; ~9 FT OF RECOVERY RESULTING IN LAYING OF CORE ON ITS SIDE TO BE CUT AS COULD NOT STAND IN STORAGE AREA;
100	BENTHOS GRAVIT	2411623	55 26.94 78 21.34	133	610	455		02	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC	IN THE WATER AT 1623; ON BOTTOM AT 1626; D/C 0-75; C-C1 75-78; C/B 78-230;A/B 230 - TD; CORE CONTAINS GLACIAL MARINE RYTHMITES OVERLAIN BY POSTGLACIAL GRAY CLAY;
104	LEHIGH	2411854	55 35.65 77 59.16	145	305	214		01	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC	IN THE WATER AT 1854; ON BOTTOM AT 1857;

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TABLE 3

CORE SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
105	BENTHOS GRAVIT	2411910	55 35.67 77 59.36	136	610	FULL		01	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC	IN THE WATER AT 1910; ON BOTTOM AT 1913; NO CATCHER;

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TABLE 4

CAMERA STATIONS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF CAMERA	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	FRAMES SHOT	DIST OFF. BOTT	STEREO	COLOR1 COLOR2	ASA1 ASA2	FSTOP1 FSTOP2	FOCUS1 FOCUS2	FILM1 FILM2	GEOGRAPHIC LOCATION
002		2281646	55 17.06 77 49.57	41	00	000	N	COLOR	400	5.6	152	EKT-400	GRANDE BALEINE DELTA,QUEBEC
006	UMEL	2291343	55 17.48 77 48.95	43		000	N	COLOR	400	5.6	152	EKT-400	GRANDE BALEINE DELTA,QUEBEC
019	UMEL	2311145	55 14.38 77 59.08	95		000	N	COLOR	400	5.6	152	EKT-400	GRANDE BALEINE DELTA,QUEBEC
022	UMEL	2311321	55 15.75 77 56.22	70		000	N	COLOR	400	5.6	152	EKT-400	GRANDE BALEINE DELTA,QUEBEC
028	UMEL	2311943	55 15.91 77 53.43	81		000	N	COLOR	400	5.6	152	EKT-400	GRANDE BALEINE DELTA,QUEBEC
029	NIKON F4	2321152	55 32.22 77 32.55	17	15	150	N	B-W	200	8.0		EKTACHROME	GRANDE BALEINE DELTA,QUEBEC
036	NIKON F4	2321647	55 32.67 77 34.35	137	12	150	N	COLOR	200	8.0	105	EKTACHROME	GRANDE BALEINE DELTA,QUEBEC
046	NIKON F4	2331706	55 32.01 77 37.32	160	12	150	N	COLOR	200	8.0	105	EKTACHROME	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
050	ICE HOLE	2331927	55 29.67 77 43.44	150	1	152	N	COLOR	400	5.6	152	EKT-400	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC
055	NIKON F4	2341610	55 36.43 77 31.65	103	12	150	N	COLOR	200	8.0	105	EKTACHROME	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC
057	NIKON F4	2341720	55 38.43 77 24.42	90	12	150	N	COLOR	200	8.0	105	EKTACHROME	GRANDE BALEINE OFF BOAT OPENING,QUEBEC
060	NIKON F4	2341810	55 38.35 77 24.52	97	12	150	N	COLOR	200	8.0	105	EKTACHROME	GRANDE BALEINE OFF BOAT OPENING,QUEBEC
066	NIKON F4	2361723	55 58.74 77 09.83	166	12	150	N	COLOR	200	8.0	105	EKTACHROME	PETITE BALEINE QUEBEC
070	NIKON F4	2361939	56 00.57 76 58.89	97		150	N	COLOR	200	8.0	105	EKTACHROME	PETITE BALEINE QUEBEC
074	NIKON F4	2371249	55 58.55 77 17.41	105		150	N	COLOR	200	8.0	105	EKTACHROME	PETITE BALEINE QUEBEC

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TABLE 4

CAMERA STATIONS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF CAMERA	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	FRAMES SHOT	DIST OFF. BOTT	STEREO	COLOR1 COLOR2	ASA1 ASA2	FSTOP1 FSTOP2	FOCUS1 FOCUS2	FILM1 FILM2	GEOGRAPHIC LOCATION
076	NIKON F4	2371441	56 05.47 76 56.28	183		150	N	COLOR	200	8.0	105	EKTACHROME	PETITE BALEINE QUEBEC
083	NIKON F4	2391445	55 21.40 77 43.22	69	12	150	N	COLOR	200	8.0	105	EKTACHROME	MOUTH OF MANITOUNUK, QUEBEC
092	NIKON F4	2401734	55 24.86 78 08.41	163		150	N	COLOR	200	8.0	105	EKTACHROME	MOUTH OF MANITOUNUK, QUEBEC
097	NIKON F4	2411310	55 32.69 78 44.83	175		150	N	COLOR	200	8.0	105	EKTACHROME	OFFSHORE BELCHER ISLANDS QUEBEC
102	NIKON F4	2411700	55 26.98 78 21.38	131		150	N	COLOR	200	8.0	105	EKTACHROME	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
107	NIKON F4	2411944	55 35.79 77 59.41	138		150	N	COLOR	200	8.0	105	EKTACHROME	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC
108	NIKON F4	2421505	55 16.82 77 52.63	87		150	N	COLOR	200	8.0	105	EKTACHROME	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC
123	NIKON F4	2430139	55 27.24 78 35.44	94		150	N	COLOR	200	8.0	105	EKTACHROME	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC
136	NIKON F4	2430820	55 04.31 78 36.21	45		150	N	COLOR	200	8.0	105	EKTACHROME	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC
139	NIKON F4	2431253	55 38.64 78 19.07	133	10	150	N	COLOR	200	8.0	105	EKTACHROME	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
147	NIKON F4	2431907	55 29.44 77 59.16	140		150	N	COLOR	200	8.0	105	EKTACHROME	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC
010	UMEL	2291811	55 20.02 77 45.76	45		000	N	COLOR	400	5.6	152	EKT-400	GRANDE BALEINE OFF MAUER ISLANDS, QUEBEC

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TABLE 5

BOXCORE SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF BOXCORE	JULIAN DAY/TIME	LATITUDE LONGTITUDE	DEPTH (MTRS)	NO OF ATMTS	NO OF SUBS	NO OF CORES	PHOTOS TAKEN	GEOGRAPHIC LOCATION	NOTES
004	BOXCORE	2281048	55 17.28 77 49.38	60	01	05	05	Y	GRANDE BALEINE DELTA,QUEBEC	THIN SURFICIAL VENEER; 2.5YR4/2; BRITTLE STARS AND AMPHIPOD NOTED; BELOW 2CM GRY 5Y4/1 HEAVILY BIOTURBATED COHESIVE CLAY TO BOTTOM; A=ARCHIVE AGC; C= GEOCHEM AGC; B= STRAT/ DESCRIP/SUBSAMPLE FOR GRAIN SIZE; REMAIN ING SURFACE 0-10CM REMOVED FOR WASHING BY INLAND WATERS,DFO FOR AGE DETERMINATI ON AND FAUNA;
011	BOXCORE	2291040	55 20.15 77 46.06	58	01	06	4	N	GRANDE BALEINE OFF MAVER ISLANDS, QUEBEC	THIN 5 CM VENEER 5YR4/2 SILTY CLAY UNDER LAIN BY A COHESIVE OLIVE GRAY 5Y4/2 HEAV ILY BIOTURBATED SILTY CLAY/GLACIAL MUD; LARGE OPEN WORM BURROWS NOTED WITH LIVE POLYCHAETES DOWN TO 25 CM;
017	BOXCORE	2301932	55 14.35 77 58.91	96	01	5	4	N	GRANDE BALEINE DELTA,QUEBEC	A=AGC ARCHIVE; C=CHEMISTRY;B= BARB ARTILLES; D= LOCKHART; REMAINING SAMPLE WASHED BY LOCKHART; BRITTLE STAR AT SURF ACE; THIN BROWN VENEER WITH FEW POLCHAET TUBES; UNDERLAIN BY 5Y5/1 BIOTURB CLAY
023	BOXCORE	2311405	55 15.64 77 56.37	86	01	05	05	N	GRANDE BALEINE DELTA,QUEBEC	
027	BOXCORE	2311916	55 15.79 77 53.45	79	01	05	05	N	GRANDE BALEINE DELTA,QUEBEC	
035	BOXCORE	2321620	55 32.81 77 34.33	138	01	07	05	N	GRANDE BALEINE DELTA,QUEBEC	THIN VENEER OF 2.5YR4/2 SILTY CLAY; UNDERLAIN BY 5Y4/1 BIOTURBATED CLAY AS OBERSERVED DOWNCORE AT STN 034; SURFACE HAS FEW SMALL BIVALVES; A=AGC;B=STRAT;C= BUCKLEY; D= ARDILLES; E=LOCKHART; SMALL SAMPLE TAKEN FOR ANDREWS; BUCKET SAMPLE FOR LOCKHART;
045	BOXCORE	2331639	55 32.01 77 37.38	160	01	05	04	N	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC	A=AGC; B=STRAT.; C=GEOCHEM; D=BARB ARTIL LES; LOCKHART BAGGED REMAINING SURFACE VENEER;
049	BOXCORE	2331055	55 29.75 77 43.44	151	01	05	04	N	GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC	

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TABLE 5

BOXCORE SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF BOXCORE	JULIAN DAY/TIME	LATITUDE LONGITUDE	DEPTH (MTRS)	NO OF ATMTS	NO OF SUBS	NO OF CORES	PHOTOS TAKEN	GEOGRAPHIC LOCATION	NOTES
054	BOXCORE	2341419	55 36.32 77 31.47	95	01	05	03	Y	GRANDE BALEINE OFF SCHOONER OPENING,QUEBEC	LARGE CRINOID AT SURFACE WITH SHRIMP,AND LARGE BOULDER WITH CORAL GROWTH; BOULDER GRANITE; A=AGC; C=BUCKLEY; D=ARDILLES; LOCKHART BUCKET REMAINING MATERIAL;
059	BOXCORE	2341755	55 38.35 77 24.55	97	01	5	4	Y	GRANDE BALEINE OFF BOAT OPENING,QUEBEC	A=AGC; B=STRAT;C=BUCKLEY;D=ARDILLES;
065	BOXCORE	2361653	55 58.71 77 09.96	168	01	07		Y	PETITE BALEINE QUEBEC	A=AGC;B=STRAT;C=GEOCHEM;D=ARDILLES; E=LOCKHART; 10YR4/3 SILTY CLAY SURFICIAL VENEER UNDERLAIN BY 5Y4/2 BIOTURBATED CLAY; POLYCHAETE TUBES;
069	BOXCORE	2361856	56 00.42 76 58.10	96	01	06	04	N	PETITE BALEINE QUEBEC	A=AGC;B=STRAT;C=GEOCHEM;D=ARTILLES; BUCKET FOR LOCKHART; CARBONATE CLASTS IN UNDERLYING BIOTURBATED GRAY 5Y4/2 CLAY; SURFICIAL VENEER COLOR CHANGE TO 2.5YR4/2;
073	BOXCORE	2371230	55 58.59 77 17.45	107	01	05	04	N	PETITE BALEINE QUEBEC	2.5Y4/2 SURFICIAL CLAY VENEER UNDERLAIN BY 5Y4/2 BIOTURBATED CLAY; FEW SHRIMP AT SURFACE;
077	BOXCORE	2371747	56 05.45 76 56.26	180	01	05	04	N	PETITE BALEINE QUEBEC	2.5Y4/2 SURFICIAL CLAY VENEER (1-2CM) THICK UNDERLAIN BY 5Y5/1 BIOTURBATED CLAY; LARGE POLYCHAETE BURROW OPENING AT SURFACE, SMALL MOLLUSCS AND FEW SHRIMP;
082	BOXCORE	2391405	55 21.46 77 43.20	68	01	06	05	N	MOUTH OF MANITOUNUK, QUEBEC	2.5Y4/2 SURFICIAL VENEER UNDERLAIN BY 5Y 5/1 BIOTURBATED CLAY; LARGE POLCHEATES, TUBES, SHRIMP, BLOOD WORMS;
091	BOXCORE	2401651	55 24.76 78 08.45	163	01	06	04	Y	MOUTH OF MANITOUNUK, QUEBEC	A=AGC;B=STRAT;C=CHEM;D=ARTILLES; "B" SPLIT 10YR4/4 SURFICIAL VENEER 0-5CM UNDERLAIN BY THIN TRANSITION ZONE THEN BIOTURBATED CLAY 5Y4/2; TO 51CM; FEW SHRIMP AT SURFACE SMALL BIVALVES;
096	BOXCORE	2411237	55 32.70 78 44.80	176	01	06	05	Y	OFFSHORE BELCHER ISLANDS QUEBEC	2.5Y4/2 SURFICIAL SLI. SILTY CLAY UNDER-LAIN BY GRAY 5Y5/1 BIOTURBATED CLAY; FEW SMALL SHRIMP,AN ANEMONE AND STARFISH; A=AGC;C=GEOCHEM; B=STRAT; D=ARTILLES; BUCKET FOR BIOLOGY LOCKHART; SURFACE SAMPLE FOR ANDREWS-INSTAAR;

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TABLE 5

BOXCORE SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	TYPE OF BOXCORE	JULIAN DAY/TIME	LATITUDE LONGITUDE	DEPTH (MTRS)	NO OF ATMTS	NO OF SUBS	NO OF CORES	PHOTOS TAKEN	GEOGRAPHIC LOCATION	NOTES
101	BOXCORE	2411639	55 26.94 78 21.20	133	01	05	04	Y	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC	2.5Y4/2 THIN SURFICIAL SLI. SILTY CLAY UNDERLAIN BY GRAY 5Y5/1 BIOTURBATED CLAY FEW SHRIMP AT SURFACE; A=AGC; B=STRAT; C=GEOCHEM; D=ARTILLES;
106	BOXCORE	2411932	55 35.76 77 59.30	136	01	05	04	Y	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC	IN WATER AT 1932; ON BOTTOM 1935; 2.5Y4/2 SURFICIAL VENEER UNDRELAIN BY GRAY 5Y5/1 BIOTURBATED CLAY; THIN POLYCHAETE TUBE ON SURFACE, FEW SMALL SHRIMP; A=AGC; B=STRAT; C=GEOCHEM; D=ARTILLES;

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TABLE 6

WATER SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	JULIAN DAY/TIME	LATITUDE LONGITUDE	DEPTH (MTRS)	BOTTLE VOLUMN	SAMPLE DEPTHS (1-10)	GEOGRAPHIC LOCATION	NOTES
041	WATER	232	55 31.98 77 32.59	42	1.2		GRANDE BALEINE DELTA,QUEBEC	
042	WATER	2331216	55 31.95 77 32.63	42	1.2		GRANDE BALEINE OFF MANITOUNUK ISLANDS,QUEBEC	
093	WATER	2401007	55 24.92 78 08.44	163	1.2	0 50 100	MOUTH OF MANITOUNUK, QUEBEC	BOTTLE FOR 163 METER WATER DEPTH DID NOT TRIP- 3 SAMPLES ONLY;
085	WATER	2392056	55 21.42 77 43.13	57	1.2		MOUTH OF MANITOUNUK, QUEBEC	ANCHOR STATION FROM 239/2056 TO 240/1053
098	WATER	2411337	55 32.70 78 44.75	175	1.2	0 50 100 150	OFFSHORE BELCHER ISLANDS QUEBEC	
103	WATER	2411723	55 27.03 78 21.51	130	1.2	0 25 50 100	OFFSHORE GRANDE BALEINE BELCHER IS. QUEBEC	
109	WATER	2421526	55 16.77 77 52.61	85	1.2	9 34 59 84	GRAB TRANSECT #2, GRANDE BALEINE QUEBEC	TEMP 10, 3, 1, 0 AT 9, 34, 59, 84 RESPECTIVELY;
124	WATER	2430155	55 27.21 78 35.38	94	1.2	3 33 63 93	GRAB TRANSECT #2, GRAND BALEINE, QUEBEC	SURFACE 100C; UPPER MID 10C; LOWER MID 00C; BOTTOM 10C;
125	WATER	2430330	55 18.14 78 48.00	109	1.2	1 49 79 109	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	SURFACE 6.60C; UPPER MID 20C; LOWER MID .20C; BOTTOM .10C;
137	WATER	2431132	55 04.09 78 36.13	42	1.2	0 5 25	GRAB TRANSECT #1, GRAND BALEINE, QUEBEC	SURFACE 00C; MID 6.5 0C; BOTTOM 2.50C;
138	WATER	2431237	55 38.82 78 18.95	140	1.2	1 20 36 80 130	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	TEMPERATURE AND SALINITY AT DEPTH; TEMPS 90C 1; 50C AT 20; 10C AT 36; 10C AT 80; 0.50C AT 130M;

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TABLE 6

WATER SAMPLES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	SAMPLE TYPE	JULIAN DAY/TIME	LATITUDE LONGITUDE	DEPTH (MTRS)	BOTTLE VOLUMN	SAMPLE DEPTHS (1-10)	GEOGRAPHIC LOCATION	NOTES
148	WATER	2431923	55 29.47 77 59.10	147	1.2	1 20 40 60 80 100 120 140	GRAB TRANSECT #3, GRAND BALEINE, QUEBEC	TEMP'S: 1M 100C; 20M 60C; 40M 10C; 60M 10C; 80M 00C; 100M 00C; 120M 00C; 140M 00C;
013	WATER	2292131	55 16.76 77 49.56	36	1.2		GRANDE BALEINE DELTA,QUEBEC	

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TABLE 7

EXCALIBUR STATIONS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

SAMPLE NUMBER	DAY/TIME (UTC)	LATITUDE LONGITUDE DEPTH (M)	(TIME) -IN WATER- -ZERO CHECK- -ON BOTTOM- -OF PULLOUT-	SAMP RATE PER/SEC	DEPTH TO LOG (M)	TILL VALVE OPEN (MIN)	WATER SAMP INT (MIN)	(RECOVERED) SAMP VOL GAS VOL (CC)	TIP DIAM (MM)	TIP POROSITY (MICRONS)	(BOTTLE) INIT PRES FINAL PRES (KPA)	PROBE LEN (CM)
003	2201731	55 16.79 77 49.47 32										
021	2311305	55 15.67 77 56.27 79	2356 0001 0024 1150	12	30	120	360	40.3 20	4.76	70	100 2750	60
032	2321400	55 32.92 77 34.06 123	1354 1400									
051	2341255	55 36.29 77 31.90 97	1255 1305									
061	2351433	55 31 42 77 34.40 70	1433 1437									
087	2401311	55 21.61 77 42.52 51	1311									

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TABLE 8

SEISMIC RECORDS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR DAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
1	2280150	2281110	NSRF 15'	1	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
2	2282000	2290520	NSRF 15'	2, 3	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
3	2290200	2290830	NSRF 15'	3, 4	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
4	2290550	2290830	NSRF 15'	4, 5	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
5	2302240	2311040	NSRF 15'	6, 7, 8	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
6	2310030	2311030	NSRF 15'	7, 8, 9	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
7	2312100	2320900	NSRF 15'	10, 11, 12	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
8	2312040	2320910	NSRF 15'	10, 11, 12, 13	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
9	2332000	2341125	NSRF 15'	14, 15, 16, 17, 18	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
10	2332030	2340000	NSRF 15'	14, 15	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
11	2340010	2341100	NSRF 15'	15, 16, 17, 18	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
12	2341100	2351105	NSRF 15'	18, 19, 20, 21, 22	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
13	2350130	2351113	NSRF 15'	19, 20, 21, 22	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
14	2360425	2361111	NSRF 15'	23, 24, 25, 26	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
15	2362100	2371119	NSRF 15'	27, 28, 29, 30, 31	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
16	2362100	2371100	NSRF 15'	27, 28, 29, 30, 31	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
17	2372105	2380055	NSRF 15'	32, 33	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN

ATLANTIC GEOSCIENCE CENTRE
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TABLE 8

SEISMIC RECORDS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
18	2372120	2380800	NSRF 15'	32, 33, 34, 35, 36	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
19	2380105	2380805	NSRF 15'	33, 34, 35, 36, 37	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN
20	2390300	2390815	NSRF 15'	39, 40, 41	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4800	AGC SEISMICS SLEEVE GUN 40 CU IN
21	2390030	2390815	NSRF 15'	38, 39, 40, 41	SINGLE	GREAT WHALE REGION, HUDSON BAY	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN
22	2390040	2390230	NSRF 15'	38,	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4800	AGC SEISMICS SLEEVE GUN 40 CU IN
23	2402346	2411100	NSRF 15'	42, 43, 44, 45	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4800	AGC SEISMICS SLEEVE GUN 40 CU IN
24	2402325	2411115	NSRF 15'	42, 43, 44, 45	SINGLE	GREAT WHALE REGION, HUDSON BAY	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN
25	2412155	2421100	NSRF 15'	46, 47, 48, 49	SINGLE	GREAT WHALE REGION, HUDSON BAY	LSR 1811	AGC SEISMICS SLEEVE GUN 40 CU IN
26	2412200	2420450	NSRF 15'	46, 47	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	AGC SEISMICS SLEEVE GUN 40 CU IN

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TABLE 9

HUNTEC RECORDS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	HUNTEC SYSTEM
1	2200150	2201110	EXTERNAL	1	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
12	2331955	2341030	EXTERNAL	14, 15, 16, 17, 18	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
13	2341040	2351105	EXTERNAL	18, 19, 20, 21, 22	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
16	2362025	2371100	EXTERNAL	27, 28, 29, 30, 31	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
17	2360500	2361026	EXTERNAL	23, 24, 25, 26	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
20	2372100	2380808	EXTERNAL	32, 33, 34, 35, 36, 37	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
22	2390040	2390930	EXTERNAL	38, 39, 40, 41	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
23	2402330	2411115	EXTERNAL	42, 43, 44, 45	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
25	2412150	2420345	EXTERNAL	46, 47	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
26	2420350	2421105	EXTERNAL	47, 48, 49	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
3	2282005	2290830	EXTERNAL	2, 3, 4, 5	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
5	2302155	2311102	EXTERNAL	6	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
8	2311855	2320900	EXTERNAL	10, 11, 12, 13	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
10	2331955	2340330	INTERNAL	14, 15, 16	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
11	2340340	2341120	INTERNAL	17, 18	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
14	2350055	2351105	INTERNAL	19, 20, 21, 22	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
15	2360500	2361105	INTERNAL	23, 24, 25, 26	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)

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TABLE 9

HUNTEC RECORDS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	HUNTEC SYSTEM
18	2362100	2371100	INTERNAL	27, 28, 29, 30, 31	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
19	2372100	2380730	INTERNAL	32, 33, 34, 35, 36, 37	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
2	2280210	2281100	INTERNAL	1	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
21	2390030	2390930	INTERNAL	38, 39, 40, 41	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
24	2402330	2410930	INTERNAL	42, 43, 44	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
27	2412150	2421100	INTERNAL	46, 47, 48, 49	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
4	2282005	2290830	INTERNAL	2, 3, 4, 5	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
6	2310550	2311100	INTERNAL	7, 8, 9	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
7	2302155	2310545	INTERNAL	10, 11, 12	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)
9	2312020	2320425	INTERNAL	10, 11, 12	SINGLE	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HUNTEC DTS (AGC 1)

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TABLE 10

SIDESCAN RECORDS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SIDESCAN SYSTEM
1	2270135	2271508		SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
2	2280250	2280615	1	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
3	2280440	2281105	1, 2	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
4	2282312	2290339	2, 3	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
5	2290340	2290830	4, 5	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
6	2301708	2310245	6, 7	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
7	2370307	2370900	29, 30, 31	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
8	2370905	2371110	31	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
9	2372110	2380650	32, 33, 34, 35, 36	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
10	2380700	2380805	36, 37	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
11	2390039	2390935	38, 39, 40, 41	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
12	2402325	2410105	42	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
13	2410105	2410355	42, 43	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
14	2410400	2410900	43, 44	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
15	2412150	2420123	46	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)
16	2420130	2420856	47, 48, 49	SINGLE	GREAT WHALE REGION, HUDSON BAY	KLEIN 595	KLEIN 595 (100-500)

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TABLE 11

3.5 KHZ RECORDS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	LINE NUMBERS	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
1	2221420	2240000		HUDSON STRAIT	EPC 4100	HULL MOUNTED
10	2320330	2320910	12, 13	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
11	2321045	2322305	14, 15	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
12	2332310	2341130	15, 16, 17, 18	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
13	2341156	2342310		GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
14	2342315	2351105	19, 20, 21, 22	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
15	2351235	2360155		GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
16	2360200	2361210	23, 24, 25, 26	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
17	2361210	2362151	27	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
18	2362155	2371105	27, 28, 29, 30, 31	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
19	2371110	2372100		GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
2	2272227	2280125		GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
20	2372100	2380805	32, 33, 34, 35, 36, 37	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
21	2380810	2381655		GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
22	2390030	2390345	38, 39	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
23	2390400	2390930	40, 41	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
24	2390940	2410435	41, 42, 43	GREAT WHALE REGION, HUDSON BAY	EPC4100	HULL MOUNTED

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TABLE 11

3.5 KHZ RECORDS

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR DAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	LINE NUMBERS	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
25	2410439	2420120	43, 44, 45, 46	GREAT WHALE REGION, HUDSON BAY	EPC4100	HULL MOUNTED
26	2420130	2430101		GREAT WHALE REGION, HUDSON BAY	EPC4100	HULL MOUNTED
3	2280130	2281110	1	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
4	2281435	2290315	2, 3, 4	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
5	2290320	2290830	5	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
6	2291105	2291545		GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
7	2291545	2310227		GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
8	2310240	2311105	7	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED
9	2311110	2320320	10, 11	GREAT WHALE REGION, HUDSON BAY	EPC 4100	HULL MOUNTED

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TABLE 12

SEISMICS/SIDESCAN/HUNTEC COMBINED VHS TAPES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

TAPE NUMBERS	START DAY/TIME	STOP DAY/TIME	GEOGRAPHIC LOCATION	CHANNEL INFORMATION	
1	2280150	2280443	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
2	2280442	2280729	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
3	2280730	2281021	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
4	2281021	2282204	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
5	2282205	2290059	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
6	2290100	2290353	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
7	2290353	2290654	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
8	2290655	2302340	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
9	2302341	2310226	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
10	2310227	2310520	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
11	2310521	2310813	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
12	2310813	2311105	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
13	2312042	2312345	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
14	2312346	2320239	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
15	2320240	2320533	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
16	2320531	2320830	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
17	2320827	2332310	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR

ATLANTIC GEOSCIENCE CENTRE
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TABLE 12

SEISMICS/SIDESCAN/HUNTEC COMBINED VHS TAPES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR AAL

TAPE NUMBERS	START DAY/TIME	STOP DAY/TIME	GEOGRAPHIC LOCATION	CHANNEL INFORMATION	
18	2332311	2340214	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
19	2340214	2340509	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
20	2340510	2340737	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
21	2340737	2341030	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
22	2341030	2342200	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
23	2350002	2350425	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
24	2350426	2350720	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
25	2350720	2350946	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
26	2350946	2360600	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
27	2360600	2360856	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
28	2360857	2362130	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
29	2362150	2370051	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
30	2370051	2370356	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
31	2370357	2370655	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
32	2370655	2371000	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
33	2371000	2372159	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
34	2372158	2380110	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR

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TABLE 12

SEISMICS/SIDESCAN/HUNTEC COMBINED VHS TAPES

CRUISE NUMBER = 92-028
CHIEF SCIENTIST = CARL AMOS
PROJECT NUMBER = GR BAL

TAPE NUMBERS	START DAY/TIME	STOP DAY/TIME	GEOGRAPHIC LOCATION	CHANNEL INFORMATION	
35	2300112	2380426	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
36	2380426	2380741	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
37	2380741	2380316	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
38	2380316	2390610	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
39	2390610	2390900	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
40	2390900	2410138	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
41	2410138	2410431	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
42	2410432	2410726	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
43	2410728	2411030	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
44	2411032	2420014	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
45	2420015	2420210	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
46	2420211	2420415	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
47	2420415	2420714	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
48	2420903	2421113	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR
49	2420711	2420902	GREAT WHALE REGION, HUDSON BAY	CHAN 1-HSRF RAW, CHAN 2-SONAR TRIGGER CHAN 6-DTS EXT , CHAN 7 KLEIN 100 KHZ	CHAN 4-DTS INT , CHAN 5 DTS TRIG/SYNC CHAN 8-KLEIN SONAR

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TABLE 13

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 920205
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
LG1G	GRAB	2191254		53 49.47N	79 29.81W	46.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG1C	CORE	2191321		53 49.56N	79 28.93W	46.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG2G	GRAB	2191420		53 49.85N	79 25.57W	40.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG2C	CORE	2191444		53 49.904	79 25.538	40.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG3G	GRAB	2201206		53 51.779	79 20.666	40.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG3C	CORE	2201222		53 51.770	79 20.708	40.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG4G	GRAB	2201316		53 51.976	79 12.874	33.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG4C	CORE	2201318		53 51.973	79 12.830	40.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG5G	GRAB	2201406		53 50.992	79 08.955	30.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG6G	GRAB	2201428		53 49.341	79 08.473	13.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG7G	GRAB	2201531		53 47.931	79 12.822	17.0	JAMES BAY LA GRANDE RIVER ESTUARY
LG8G	GRAB	2201624		53 46.501	79 18.041	30.5	JAMES BAY LA GRANDE RIVER ESTUARY
201	GRAB	2401145		55 42.40N	77 05.18W	10	HEAD OF MANITOUNUK SOUND

TABLE 13

TOTAL SAMPLE INVENTORY

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
202	CORE	2401200		55 42.40N	77 05.98W	10.0	HEAD OF MANITOUNUK SOUND
203	GRAB	2401215		55 40.03N	77 10.58W	19.0	BOAT OPENING IN MANITOUNUK SOUND
204	CORE	2401230	2281930	55 40.03N	77 10.58W	19.0	BOAT OPENING IN MANITOUNUK SOUND
205	GRAB	2401245	2281738	55 37.31N	77 13.20W	18.0	NORTH END OF CASTLE ISLAND, MANITOUNUK SOUND
206	CORE	2401300	2281738	55 37.31N	77 13.20W	18.0	NORTH END OF CASTLE ISLAND, MANITOUNUK SOUND
207	GRAB	2401315	2281700	55 35.13N	77 16.72W	25.0	SOUTH END OF CASTLE ISLAND, MANITOUNUK SOUND
208	CORE	2401330	2281700	55 35.13N	77 16.72W	25.0	SOUTH END OF CASTLE ISLAND, MANITOUNUK SOUND
209	GRAB	2401345		55 33.12N	77 20.30W	29.0	SCHOONER OPENING, MANITOUNUK SOUND
210	CORE	2401400		55 33.12N	77 20.30W	29.0	SCHOONER OPENING. MANITOUNUK SOUND
211	GRAB	2401415	2341658	55 31.59N	77 22.14W	12.5	CENTRAL MANITOUNUK SOUND
212	CORE	2401430	2341658	55 31.59N	77 22.14W	12.5	CENTRAL MANITOUNUK SOUND

ATLANTIC GEOSCIENCE CENTRE
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TABLE 13

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
213	GRAB	2401445	2311702	55 34.63N	77 22.02W	58.0	OFF SCHOONER OPENING (NORTH)
214	CORE	2401500	2311702	55 34.63N	77 22.02W	58.0	OFF SCHOONER OPENING (NORTH)
215	GRAB	2401515		55 31.55N	77 24.99W	23.0	MERRY ISLAND, MANITOUNUK SOUND
216	CORE	2401530		55 31.55N	77 24.99W	23.0	MERRY ISLAND, MANITOUNUK SOUND
217	GRAB	2401545	2281545	55 31.05N	77 24.60W	42.0	MERRY ISLAND, MANITOUNUK SOUND
218	CORE	2401600	2281545	55 31.05N	77 24.60W	42.0	MERRY ISLAND, MANITOUNUK SOUND
219	GRAB	2401615		55 29.60N	77 27.10W	42.0	MERRY ISLAND, MANITOUNUK SOUND TERRI (GB14)
220	CORE	2401630		55 29.60N	77 27.10W	42.0	MERRY ISLAND, MANITOUNUK SOUND
221	CORE	2401700		55 28.60N	77 27.90W	23.0	MERRY ISLAND, MANITOUNUK SOUND
222	GRAB	2411140		55 15.99N	77 47.20W	9.0	GRANDE RIVIERE DE LA BALEINE
223	GRAB	2411148		55 15.96N	77 47.46W	5.0	GRANDE RIVIERE DE LA BALEINE
224	GRAB	2411216		55 16.73N	77 49.77W	42.0	GRANDE RIVIERE DE LA BALEINE ESTUARY
225	GRAB	2411305		55 22.863	77 40.947	24.0	OUTER MANITOUNUK SOUND
226	CORE	2411314		55 22.190	77 40.952	24.0	OUTER MANITOUNUK SOUND

TABLE 13

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
227	GRAB	2411338		55 24.165	77 30.250	67.0	OUTER MANITOUNUK SOUND
228	CORE	2411350		55 24.283	77 30.322	71.0	OUTER MANITOUNUK SOUND
229	GRAB	2411432		55 24.150	77 33.803	12.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
230	GRAB	2411441		55 24.237	77 34.325	22.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
231	GRAB	2411447		55 24.310	77 34.500	35.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
232	GRAB	2411455		55 24.548	77 35.145	43.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
233	GRAB	2411503		55 24.849	77 35.898	54.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
234	GRAB	2411511		55 24.995	77 36.167	63.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
235	GRAB	2411519		55 25.152	77 36.322	75.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
236	GRAB	2411528		55 25.178	77 36.470	64.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
237	GRAB	2411537		55 25.177	77 36.550	50.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1

TABLE 13

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92020S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
238	GRAB	2411545		55 25.202	77 36.633	40.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
239	GRAB	2411553		55 25.235	77 36.730	33.0	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1
240	GRAB	2411801	2312020	55 28.232	77 33.963	33.0	OFFSHORE MANITOUNUK ISLANDS
241	CORE	2411811	2312020	55 28.222	77 33.858	50.0	OFFSHORE MANITOUNUK ISLANDS
242	GRAB	2411843	2311935	55 31.050	77 29.917	71.0	OFFSHORE MANITOUNUK ISLANDS
243	CORE	2411858	2311935	55 31.188	77 29.018	83.0	OFFSHORE MANITOUNUK ISLANDS
244	GRAB	2411912	2311920	55 31.860	77 27.646	70.5	OFFSHORE MANITOUNUK ISLANDS
245	CORE	2411922	2311920	55 31.947	77 27.465	68.0	OFFSHORE MANITOUNUK ISLANDS
246	GRAB	2411941	2311900	55 32.990	77 25.667	65.0	OFFSHORE MANITOUNUK ISLANDS
247	CORE	2411950	2311900	55 33.020	77 25.625	68.5	OFFSHORE MANITOUNUK ISLANDS
248	GRAB	2412018		55 35.740	77 22.217	92.0	OFFSHORE MANITOUNUK ISLANDS
249	CORE	2412028	2311830	55 35.772	77 22.122	94.0	OFFSHORE MANITOUNUK ISLANDS, N. OF SCHOONER OPENNG

TABLE 13

TOTAL SAMPLE INVENTORY

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
250	GRAB	2412051		55 33.700	77 24.077	50.0	SCHOONER OPENING ON THE OFFSHORE SIDE. TRANSECT 2
251	GRAB	2412101		55 33.662	77 23.918	38.0	SCHOONER OPENING ON THE OFFSHORE SIDE. TRANSECT 2
252	GRAB	2412107		55 33.630	77 23.843	28.0	SCHOONER OPENING ON THE OFFSHORE SIDE. TRANSECT 2
253	GRAB	2412107		55 33.500	77 23.622	18.5	SCHOONER OPENING ON THE OFFSHORE SIDE. TRANSECT 2
254	GRAB	2412118		55 33.407	77 23.418	18.0	OUTSIDE ENTRAN- CE TO SCHOONER OPENING. TRANSECT 2
255	GRAB	2412123		55 33.275	77 23.162	11.5	SCHOONER OPENING, MID CHANNEL. TRANSECT 2
256	GRAB	2412128		55 33.072	77 22.827	19.0	SCHOONER OPENING AT MANITOUNUK SND. TRANSECT 2
257	GRAB	2421143		55 34.537	77 19.925	10.0	MIDDLE MANITOUNUK SND. TRANSECT 3
258	GRAB	2421151		55 34.302	77 19.675	20.0	MIDDLE MANITOUNUK SND. TRANSECT 3
259	GRAB	2421158		55 33.975	77 19.357	31.0	MIDDLE MANITOUNUK SND. TRANSECT 3
260	GRAB	2421207		55 33.673	77 19.263	32.0	MIDDLE MANITOUNUK SND. TRANSECT 3

TABLE 13

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
261	GRAB	2421213		55 33.540	77 19.143	20.0	MIDDLE MANITOUNUK SND. TRANSECT 3
262	GRAB	2421219		55 33.433	77 19.202	10.0	MIDDLE MANITOUNUK SND. TRANSECT 3
263	GRAB	2421243		55 32.180	77 21.403	10.0	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)
264	GRAB	2421253		55 32.352	77 21.663	25.5	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)
265	GRAB	2421300		55 32.400	77 21.808	32.0	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)
266	GRAB	2421306		55 32.438	77 21.900	42.0	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)
267	GRAB	2421325		55 32.622	77 22.055	36.0	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)
268	GRAB	2421333		55 33.000	77 22.618	30.5	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)
269	GRAB	2421356		55 30.845	77 23.232	11.5	RIVIERE KUUGAPIK
270	GRAB	2421403		55 31.127	77 22.957	11.0	RIVIERE KUUGAPIK
271	GRAB	2421410		55 31.423	77 22.553	12.0	RIVIERE KUUGAPIK
272	GRAB	2421417		55 31.605	77 21.475	7.0	MIDDLE OF MANITOUNUK SND TRANSECT 4

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TABLE 13

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
273	GRAB	2421423		55 31.537	77 21.415	5.0	MIDDLE OF MANITOUNUK SND TRANSECT 4
274	GRAB	2421428		55 31.552	77 21.580	10.0	MIDDLE OF MANITOUNUK SND TRANSECT 4
275	GRAB	2421437		55 31.727	77 22.430	10.5	MIDDLE OF MANITOUNUK SND TRANSECT 4
276	GRAB	2421443		55 31.770	77 22.710	14.5	MIDDLE OF MANITOUNUK SND TRANSECT 4
277	GRAB	2421449		55 31.727	77 22.802	20.5	MIDDLE OF MANITOUNUK SND TRANSECT 4
278	GRAB	2421455		55 31.708	77 23.050	25.0	MIDDLE OF MANITOUNUK SND TRANSECT 4
279	GRAB	2421501		55 31.660	77 23.217	30.0	MIDDLE OF MANITOUNUK SND TRANSECT 4
280	GRAB	2421508		55 31.622	77 23.420	35.0	MIDDLE OF MANITOUNUK SND TRANSECT 4
281	GRAB	2421517		55 31.835	77 23.783	41.0	MIDDLE OF MANITOUNUK SND TRANSECT 4
282	GRAB	2421524		55 31.935	77 24.082	34.0	MIDDLE OF MANITOUNUK SND TRANSECT 4AL
283	GRAB	2421531		55 31.925	77 24.268	30.5	MIDDLE OF MANITOUNUK SND TRANSECT 4
284	GRAB	2421538		55 31.973	77 24.405	24.0	MIDDLE OF MANITOUNUK SND TRANSECT 4
285	GRAB	2421545		55 31.977	77 24.370	21.0	MIDDLE OF MANITOUNUK SND TRANSECT 4

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TABLE 13

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
286	GRAB	2421641		55 28.837	77 28.093	40.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
287	GRAB	2421655		55 28.702	77 28.312	41.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
288	GRAB	2421659		55 28.705	77 28.353	35.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
289	GRAB	2421702		55 28.643	77 28.365	31.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
290	GRAB	2421705		55 28.605	77 28.387	28.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
291	GRAB	2421712		55 28.417	77 28.898	27.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
292	GRAB	2421716		55 28.203	77 29.143	35.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
293	GRAB	2421724		55 27.973	77 29.600	23.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
294	GRAB	2421731		55 27.603	77 30.068	14.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5
295	GRAB	2421737		55 27.577	77 30.275	14.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5

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TABLE 13

TOTAL SAMPLE INVENTORY

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	SAMPLE DAY/TIME	SEISMIC DAY/TIME	LATITUDE	LONGITUDE	DEPTH (M)	GEOGRAPHIC LOCATION
296	GRAB	2421748		55 28.242	77 28.893	26.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANS 5A
297	GRAB	2421755		55 28.273	77 28.947	31.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANS 5A
298	GRAB	2421807		55 28.298	77 29.332	42.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANS 5A
299	GRAB	2421814		55 28.317	77 29.830	50.0	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANS 5A
300	GRAB	2421822		55 27.693	77 30.007	17.0	PAINT ISLANDS, MANITOUNUK SOUND
301	CORE	2421830		55 27.688	77 30.133	17.0	PAINT ISLANDS, MANITOUNUK SOUND

TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 92020S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
LG1G	VAN VEEN	2191254	53 49.47N 79 29.81W	46.0	1	1	JAMES BAY LA GRANDE RIVER ESTUARY	LIGHT GRAY MUD OVERLAIN BY 2-4MM TAN LAYER, NO SURFACE MACROBENTHOS, NO PEBBLES, SOME POLYCHEATES IN SAMPLE. SAMPLE VERY HOMOGENOUS. SAMPLER WAS FULL. SAMPLE STORED IN 1 (1 LITRE) FLIP TOP BAG. 1 SURFACE LAYER SUBSAMPLE STORED IN A 40 DRAM VIAL.
LG2G	VAN VEEN	2191420	53 49.85N 79 25.57W	40.0	1	1	JAMES BAY LA GRANDE RIVER ESTUARY	4-6 CM OF TAN SILTY SAND WITH SHELL FRAGMENTS OVERLYING LIGHT GRAY MUD WITH GRAVEL AND PEBBLES. 1 CLAST 8CM COVERED WITH PINK (MANGANESE ?) COATING. SAMPLE STORED IN 3 (1 LITRE) FLIP BAGS LABELED LG2G (1), (2), (3) 1 SURFACE LAYER SUBSAMPLE STORED IN A 40 DRAM VIAL.
LG3G	VAN VEEN	2201206	53 51.779 79 20.666	40.0	1	1	JAMES BAY LA GRANDE RIVER ESTUARY	VERY THIN TAN SOUPY SURFACE LAYER 1 MM OVER LIGHT GRAY MUD CONTAINING BLACK MOTTLING. NO PEBBLES OR SHELLS. GRAB WAS FULL TO THE TOP. NO VISIBLE MACROBENTHOS. 1 40 DRAM VIAL OF SURFACE SAMPLE. SAMPLE STORED IN TWO 1-LITRE FLIP BAGS LABELLED LG3G (1) AND (2). + 1 40 DRAM PUSH CORE FROM SURFACE TO BASE OF SAMPLER. PUSH CORE WAS WAXED. SAMPLE STORED IN SEA WATER COLD STORAGE.
LG4G	VAN VEEN	2201316	53 51.976 79 12.874	33.0	1	1	JAMES BAY LA GRANDE RIVER ESTUARY	APPROXIMATELY A 1 CM TAN LAYER OVERLYING BLACK MOTTLED GRAY MUD, NO PEBBLES, NO MACROBENTHOS. SAMPLE STORED IN 2 1-LITRE FLIP BAGS LABELLED LG4G (1) AND (2). 1 40 DRAM VIAL OF SURFACE SAMPLE. 1 40 DRAM PUSH CORE FROM SURFACE TO BASE OF SAMPLER. PUSH CORE WAS WAXED. PUSH CORE WAS STORED IN SEA WATER COLD STORAGE.
LG5G	VAN VEEN	2201406	53 50.992 79 08.955	30.0	1	1	JAMES BAY LA GRANDE RIVER ESTUARY	1 CM TAN LAYER (LESS SOUPY THEN PREVIOUS GRABS (LG3G, LG4G) WHILE UNDERLYING GRAY MUD HAS SAME CONSISTENCY AS PREVIOUS. NO PEBBLES, BUT CONTAINS WORMS AND WORM TUBES. GRAB FULL. SAMPLE STORED IN 2 1-LITRE FLIP BAGS LABELLED LG5G (1), (2). 1 40 DRAM VIAL OF SURFACE SAMPLE. 1 40 DRAM PUSH CORE FROM SURFACE TO BASE OF SAMPLER. PUSH CORE WAS WAXED AND STORED IN SEA WATER COLD STORAGE IN A 45 GAL DRUM.

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TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
LG6G	VAN VEEN	2201420	53 49.341 79 08.473	13.0	1	1	JAMES BAY LA GRANDE RIVER ESTUARY	GRAY MUD, NO BLACK MOTTLING. SLIGHT OCHRE COLOURED IN STREAKS ABOUT 7 CM DOWN. SURFACE 1 CM SLIGHTLY SANDY MUD, SLIGHTLY MORE COHESIVE AND STIFFER THEN PREVIOUS SAMPLES. GRAB WAS FULL. SAMPLE STORED IN 2 1-LITRE FLIP BAGS LABELLED LG6G (1), (2). 1 40 DRAM VIAL OF SURFACE SAMPLE. 1 40 DRAM PUSH CORE FROM SURFACE TO BASE OF SAMPLER. PUSH CORE WAS WAXED AND STORED IN SEA WATER COLD STORAGE.
LG8G	VAN VEEN	2201624	53 46.501 79 18.041	30.5	1	1	JAMES BAY LA GRANDE RIVER ESTUARY	1 CM TAN MUD OVER VERY LIGHT GRAY MUD. NO MACROBENTHOS, NO PEBBLES. SAMPLER WAS FULL. SAMPLE STORED IN 2 1-LITRE FLIP BAGS LABELLED LG8G (1), (2). 1 40 DRAM VIAL OF SURFACE SAMPLE. 1 40 DRAM PUSH CORE FROM SURFACE TO BASE OF SAMPLER. PUSH CORE WAS WAXED AND STORED IN SEA WATER COLD STORAGE IN A 45 GAL DRUM.
LG7G	VAN VEEN	2201531	53 47.931 79 12.022	17.0	1	1	JAMES BAY LA GRANDE RIVER ESTUARY	1 CM LAYER OVERLYING 10 CM LIGHT GRAY MUD. 10 CM LAYER OVERLYING A BLACK LAYER OF MUD AT BOTTOM OF SAMPLER. ALL HOMOGENOUS MUD, NO PEBBLES OR MACROBENTHOS. SAMPLE STORED IN 2 1-LITRE FLIP BAGS. 1 40 DRAM VIAL OF SURFACE SAMPLE. 1 40 DRAM PUSH CORE FROM SURFACE TO BASE OF SAMPLER. PUSH CORE WAS WAXED AND STORED IN SEA WATER COLD STORAGE.
201	VAN VEEN	2401145	55 42.40N 77 05.18W	10	1	1	HEAD OF MANITOUNUK SOUND	1 SURFACE SAMPLE IN A 40 DRAM VIAL. SAMPLE STORED IN 3 BAGS LABELLED 201 (A) 201 (B) AND 201 (C). A= BIO B= YVES MICHAUD C= FOR SIEVING BROWN SOUPY SURFACE LAYER OVER GRAY SILT AND CLAY.
203	VAN VEEN	2401215	55 40.03N 77 10.50W	19.0	1	1	BOAT OPENING IN MANITOUNUK SOUND	SURFACE SAMPLE IN A 40 DRAM VIAL. 2-3 CM BROWN SILT AND SAND SURFACE LAYER OVERLYING GRAY SILT AND CLAY. SAMPLE STORED IN 3 BAGS LABELLED 203 (A) 203 (B) AND 203 (C) A= BIO B= YVES MICHAUD C= FOR SIEVING

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GRAB SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
205	VAN VEEN	2401245	55 37.31N 77 13.20W	18.0	1	1	NORTH END OF CASTLE ISLAND, MANITOUNUK SOUND	SURFACE SAMPLE STORED IN A 40 DRAM VIAL. BROWN 2-4 CM SAND AND SILT SURFACE LAYER. GRAY TO BOTTOM- SILT, CLAY AND SAND. WORM TUBES. SAMPLE BAGGED IN 3 BAGS LABELLED 205 (A) 205 (B) AND 205 (C). A= BIO B= YVES MICHAUD C= FOR SIEVING
207	VAN VEEN	2401315	55 35.13N 77 16.72W	25.0	1	1	SOUTH END OF CASTLE ISLAND, MANITOUNUK SOUND	SURFACE SAMPLE IN A 40 DRAM VIAL. 4-5 CM BROWN SURFACE LAYER COMPOSED OF MEDIUM SAND, SHELLS AND PEBBLES OVER-LYING A GRAY CLAY. SAMPLE STORED IN 3 BAGS LABELLED 207 (A) 207 (B) AND 207 (C). A= BIO B= YVES MICHAUD C= FOR SIEVING
209	VAN VEEN	2401345	55 33.12N 77 20.30W	29.0	1	1	SCHOONER OPENING, MANITOUNUK SOUND	SURFACE SAMPLE IN A 40 DRAM VIAL. BROWN SILT AND SAND SURFACE LAYER OVER STICKY GRAY SILTS AND CLAY. CONTAINS SOME PEBBLES. SAMPLE STORED IN 3 BAGS LABELLED 209 (A) 209 (B) AND 209 (C). A= BIO B= YVES MICHAUD C= FOR SIEVING
211	VAN VEEN	2401415	55 31.59N 77 22.14W	12.5	1	1	CENTRAL MANITOUNUK SOUND	SURFACE SAMPLE IN A 40 DRAM VIAL. 2-3 CM BROWN SILTY-SAND SURFACE LAYER OVER GRAY SILT-CLAY AND PEBBLES. SAMPLE STORED IN 3 BAGS LABELLED 211(A), 211(B) AND 211(C). A= BIO B= YVES MICHAUD C= FOR SIEVING
213	VAN VEEN	2401445	55 34.63N 77 22.02W	58.0	1	1	OFF SCHOONER OPENING (NORTH)	SURFACE SAMPLE IN A 40 DRAM VIAL. 2-4 CM OF BROWN FINE SAND OVER GRAY TO BROWN SILT AND SAND. LOTS OF WORMS. SAMPLE STORED IN 3 BAGS LABELLED 213(A), 213(B) AND 213(C). A= BIO B= YVES MICHAUD C= FOR SIEVING

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TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
215	VAN VEEN	2401515	55 31.55N 77 24.99W	23.0	1	1	MERRY ISLAND, MANITOUNUK SOUND	SURFACE SAMPLE IN A 40 DRAM VIAL. 4-5 CM BROWN SILTS-SAND SURFACE LAYER OVER GRAY SILTS AND CLAY. ORGANIC DEBRIS , CLAMS + OURSIN. SAMPLE STORED IN 3 BAGS LABELLED 215(A), 215(B) AND 215(C). A= BIO B= YVES MICHAUD C= FOR SIEVING
217	VAN VEEN	2401545	55 31.05N 77 24.60W	42.0	1	1	MERRY ISLAND, MANITOUNUK SOUND	SURFACE SAMPLE IN A 40 DRAM VIAL. 3-5 CM BROWN SILTS-SAND SURFACE LAYER OVER GRAY SILT AND CLAY. QUITE COHESIVE. WORMS AND ORGANIC DEBRIS. SAMPLE STORED IN 3 BAGS LABELLED 217(A), 217(B) AND 217(C). A= BIO B= YVES MICHAUD C= FOR SIEVING
219	VAN VEEN	2401615	55 29.68N 77 27.10W	42.0	1	1	MERRY ISLAND, MANITOUNUK SOUND TERRI (GB14)	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM BROWN MEDIUM TO COARSE SAND SURFACE LAYER OVER GRAY SILTS -FINE SAND + ORGANICS. WORMS, CLAMS AND SOME SHELL HASH. H2 SULFIDE AT BASE OF SAMPLE. 1 ROCK FRAGMENT, 6 CM LONG * 4 CM WIDE. SAMPLE STORED IN 3 BAGS LABELLED 219(A), 219(B) AND 219(C). ROCK STORED IN A BAG. A= BIO B= YVES MICHAUD C= FOR SIEVING
222	VAN VEEN	2411140	55 15.99N 77 47.20W	9.0	1		GRANDE RIVIERE DE LA BALEINE	SAMPLE WAS ALL SAND. 2 BULK SAMPLES BAGGED AS 202(A) AND 202(B). A= BIO B= FOR SIEVING
223	VAN VEEN	2411148	55 15.96N 77 47.46W	5.0	1		GRANDE RIVIERE DE LA BALEINE	SAMPLE WAS ALL SAND. 2 BULK SAMPLES BAGGED AS 203(A) AND 203(B). A= BIO B= FOR SIEVING
224	VAN VEEN	2411216	55 16.73N 77 49.77W	42.0	1	1	GRANDE RIVIERE DE LA BALEINE ESTUARY	SURAFCE SAMPLE IN A 40 DRAM VIAL. FINE TO COARSE SAND WITH SHELL HASH. WORMS, WORM TUBES ON SURFACE. LOST SOME SAMPLE BECAUSE OF A ROCK IN THE JAWS. 2 BULK SAMPLES BAGGED AS 224(A) AND 224(B). A= BIO B= FOR SIEVING

TABLE 14

GRAB SAMPLES

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
225	VAN VEEN	2411305	55 22.063 77 40.947	24.0	1	1	OUTER MANITOUNUK SOUND	SURFACE SAMPLE IN A 40 DRAM VIAL. HOMOGENOUS GRAY MUD, NO TAN SURFACE LAYER. VERY SLIGHT BLACK MOTTLING, FEW PEBBLES. NO MACROBENTHOS. 2 BULK SAMPLES BAGGED AS 225(A) AND 225(B). A= BIO B= FOR SIEVING
227	VAN VEEN	2411338	55 24.165 77 38.250	67.0	1	1	OUTER MANITOUNUK SOUND	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN LAYER OVER GRAY MUD. SLIGHTLY SILTY, NO BLACK MOTTLING. 2 BULK SAMPLES BAGGED AS 227(A) AND 227(B).
229	VAN VEEN	2411432	55 24.150 77 33.003	12.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 1 CM TAN LAYER OVER GRAY MUD WITH A LITTLE COARSE SAND. WORMS AND WORM TUBES PRESENT. 2 BULK SAMPLES BAGGED AS 229(A) AND 229(B). A= BIO B= FOR SIEVING
230	VAN VEEN	2411441	55 24.237 77 34.325	22.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN LAYER OVER GRAY MUD. SAMPLER FULL. SOME WORMS. 2 BULK SAMPLES BAGGED AS 230(A) AND 230(B). A= BIO B= FOR SIEVING
231	VAN VEEN	2411447	55 24.310 77 34.500	35.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN LAYER OVER GRAY MUD. SOME WORMS SAMPLER WAS FULL. 2 BULK SAMPLES BAGGED AS 231(A) AND 231(B). A= BIO B= FOR SIEVING
232	VAN VEEN	2411455	55 24.548 77 35.145	43.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN LAYER OVER GRAY MUD. SAMPLER FULL. 2 BULK SAMPLES BAGGED AS 232(A) AND 232(B). A= BIO B= FOR SIEVING

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GRAB SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO. OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
233	VAN VEEN	2411503	55 24.849 77 35.898	54.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	2 CM TAN SURFACE LAYER OVER GRAY MUD. A FEW SHELLS. SAMPLER WAS FULL. 2 BULK SAMPLES BAGGED AS 233(A) AND 233(B). A= BIO B= FOR SIEVING
234	VAN VEEN	2411511	55 24.995 77 36.167	63.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. SLIGHTLY PEBBLEY 2 CM TAN LAYER OVER GRAY MUD. SOME WORMS AND WORM TUBES. 2 BILK SAMPLES BAGGED AS 234(A) AND 234(B). A= BIO B= FOR SIEVING
235	VAN VEEN	2411519	55 25.152 77 36.322	75.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN LAYER OVER GRAY MUD. QUITE COHESIVE. 2 BULK SAMPLES BAGGED AS 235(A) AND 235(B). A= BIO B= FOR SIEVING
236	VAN VEEN	2411528	55 25.178 77 36.470	64.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN LAYER OVER GRAY MUD. WORMS 2 BULK SAMPLES BAGGED AS 236(A) AND 236(B). A= BIO B= FOR SIEVING
237	VAN VEEN	2411537	55 25.177 77 36.550	50.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN LAYER OVER GRAY SANDY MUD. 2 BULK SAMPLES BAGGED AS 237(A) AND 237(B). A= BIO B = FOR SIEVING
238	VAN VEEN	2411545	55 25.202 77 36.633	40.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 1 ROCK SAMPLE BAGGED AS 238 ROCK. 2 CM TAN LAYER OVER GRAY MUD WITH SOME GRAVEL AND 1 COBBLE. 2 BULK SAMPLES BAGGED AS 238(A) AND 238(B). A= BIO B= FOR SIEVING
239	VAN VEEN	2411553	55 25.235 77 36.730	33.0	1	1	OUTER MANITOUNUK SOUND, GRAB TRANSECT 1	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN LAYER OVER GRAY MUD. 1 COBBLE BAGGED. 2 BULK SAMPLES BAGGED AS 239(A) AND 239(B). A= BIO B= FOR SIEVING

TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 92020S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
240	VAN VEEN	2411801	55 28.232 77 33.963	33.0	1	1	OFFSHORE MANITOUNUK ISLANDS	SURFACE SAMPLE IN A 40 DRAM VIAL. VERY THIN TAN LAYER OVER GRAY MUD. SAMPLER FULL. 2 BULK SAMPLES BAGGED AS 240(A) AND 240(B). A= BIO B= FOR SIEVING
242	VAN VEEN	2411843	55 31.050 77 29.917	71.0	1	1	OFFSHORE MANITOUNUK ISLANDS	SURFACE SAMPLE IN A 40 DRAM VIAL. 1 CM TAN LAYER OVER GRAY MUD. NO VISIBLE MACROBENTHOS. SAMPLER FULL. 2 BULK SAMPLES BAGGED AS 242(A) AND 242(B). A= BIO B= FOR SIEVING
244	VAN VEEN	2411912	55 31.860 77 27.646	70.5	1	1	OFFSHORE MANITOUNUK ISLANDS	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN LAYER OVER GRAY MUD. SOME BLACK MOTTLING. QUITE STIFF. 2 BULK SAMPLES BAGGED AS 244(A) AND 244(B). A= BIO B= FOR SIEVING
246	VAN VEEN	2411941	55 32.990 77 25.667	65.0	1	1	OFFSHORE MANITOUNUK ISLANDS	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN SOUPY MUD OVER 5-6 CM GRAY SOUPY MUD OVER 7-9 CM OF STIFF COHESIVE GRAY MUD. WORMS AND WORM TUBES. SAMPLER FULL. 2 BULK SAMPLES BAGGED AS 246(A) AND 246(B). A= BIO B= FOR SIEVING
248	VAN VEEN	2412018	55 35.740 77 22.217	92.0	1	1	OFFSHORE MANITOUNUK ISLANDS	SURFACE SAMPLE IN A 40 DRAM VIAL. 1 CM TAN LAYER OVER GRAY MUD. WORMS. SAMPLER FULL. 2 BULK SAMPLES BAGGED AS 248(A) AND 248(B). A= BIO B= FOR SIEVING
250	VAN VEEN	2412051	55 33.700 77 24.077	50.0	1	1	SCHOONER OPENING ON THE OFFSHORE SIDE. TRANSECT 2	SURAFCE SAMPLE IN A 40 DRAM VIAL. 1 CM LAYER OVER GRAY SANDY-SILT TO SILTY -SAND. COBBLES AND PEBBLES. BRITTLE STAR AND WORM TUBES. SAMPLER FULL. 2 BULK SAMPLES BAGGED AS 250(A) AND 250(B). A= BIO B= FOR SIEVING

TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
251	VAN VEEN	2412101	55 33.662 77 23.918	38.0	1		SCHOONER OPENING ON THE OFFSHORE SIDE. TRANSECT 2	SAND AND COBBLES. SAMPLER PARTLY OPEN BY A COBBLE IN THE JAWS, 1/3 FULL. 2 BULK SAMPLES BAGGED AS 251(A) AND 251(B). NO SURFACE SAMPLE. A= BIO B= FOR SIEVING
252	VAN VEEN	2412107	55 33.630 77 23.843	20.0	1		SCHOONER OPENING ON THE OFFSHORE SIDE. TRANSECT 2	MEDIUM TO COARSE SAND, SMALL PEBBLES. 1 WORM TUBE. SAMPLER 1/2 FULL. 2 BULK SAMPLES BAGGED AS 252(A) AND 252(B). A= BIO B= FOR SIEVING
253	VAN VEEN	2412107	55 33.500 77 23.622	18.5	1		SCHOONER OPENING ON THE OFFSHORE SIDE. TRANSECT 2	MEDIUM TO COARSE SAND WITH PEBBLES. SOME SHELL HASH AND 1 SMALL FISH. 2 BULK SAMPLES BAGGED AS 253(A) AND 253(B). A= BIO B= FOR SIEVING
254	VAN VEEN	2412118	55 33.407 77 23.410	10.0	1		OUTSIDE ENTRAN-CE TO SCHOONER OPENING. TRANSECT 2	BRITTLE STARS, MUSSELS AND SEA URCHINS ON COARSE SAND AND PEBBLES. NO SURFACE SAMPLE. 1 BULK SAMPLE FOR BIO BAGGED AS 254(A).
255	VAN VEEN	2412123	55 33.275 77 23.162	11.5	1	1	SCHOONER OPENING, MID CHANNEL. TRANSECT 2	ROCK IN THE JAWS. A FEW COBBLES, MUSSEL BED, STARFISH, WORMS. 1 BULK SAMPLE OF JUST COBBLES FOR BIO BAGGED AS 255(A).
256	VAN VEEN	2412128	55 33.072 77 22.827	19.0	1		SCHOONER OPENING AT MANITOUNUK SND. TRANSECT 2	ROCK IN THE JAWS. COBBLES WITH SAND WITH MUSSEL SHELLS AND SEA URCHINS ATTACHED TO COBBLES. 1 BULK SAMPLE FOR BIO BAGGED AS 256(A). NO SURFACE SAMPLE.
257	VAN VEEN	2421143	55 34.537 77 19.925	10.0	1	1	MIDDLE MANITOUNUK SND. TRANSECT 3	SURFACE SAMPLE IN A 40 DRAM VIAL. DARK GRAY MEDIUM SAND WITH A STRONG H2S SMELL. WORM TUBES AND SHELLS. 2 BULK SAMPLES BAGGED AS 257 (A) AND 257(B). A= BIO B= FOR SIEVING
258	VAN VEEN	2421151	55 34.302 77 19.675	20.0	1	1	MIDDLE MANITOUNUK SND. TRANSECT 3	2 CM TAN LAYER (FINE SAND) OVER GRAY MUD. LAYER OF COARSE SAND AND SHELL HASH SEPERATES THE 2 LAYERS. SURFACE SAMPLE IN A 40 DRAM VIAL. 2 BULK SAMPLES BAGGED AS 258(A) AND 258(B). A= BIO B= FOR SIEVING

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TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
259	VAN VEEN	2421158	55 33.975 77 19.357	31.0	1	1	MIDDLE MANITOUNUK SND. TRANSECT 3	1-2 CM FINE SAND LAYER OVER THIN REDDISH BROWN SAND LAYER > 1 CM OVER GRAY MUD. WORM TUBES AND SMALL CLAM ON THE SURFACE + 1 SMALL CRAB. SURFACE SAMPLE IN A 40 DRAM VIAL. 2 BULK SAMPLES BAGGED AS 259(A) AND 259(B). 1 BASALT SAMPLE BAGGED.
260	VAN VEEN	2421207	55 33.673 77 19.263	32.0	1	1	MIDDLE MANITOUNUK SND. TRANSECT 3	SURFACE SAMPLE IN A 40 DRAM VIAL. SANDY VERY THIN TAN LAYER OVER MOTTLED GRAY MUD. LOTS OF WORMS. 2 BULK SAMPLES BAGGED AS 260(A) AND 260(B). A= BIO B= FOR SIEVING
261	VAN VEEN	2421213	55 33.540 77 19.143	20.0	1	1	MIDDLE MANITOUNUK SND. TRANSECT 3	SURFACE TAN LAYER 1 1/2 CM THICK CONTAINING LOTS OF BLACK SAND, WORMS AND WORM TUBES OVER GRAY SILTY SAND. 2 BULK SAMPLES BAGGED AS 261(A) AND 261(B). A= BIO B= FOR SIEVING
262	VAN VEEN	2421219	55 33.433 77 19.202	10.0	1	1	MIDDLE MANITOUNUK SND. TRANSECT 3	SURAFCE SAMPLE IN A 40 DRAM VIAL. LIGHT BROWN LAYER OVER GRAY MUD. WORMS. 2 BULK SAMPLES BAGGED AS 262(A) AND 262(B). A= BIO B= FOR SIEVING
263	VAN VEEN	2421243	55 32.180 77 21.403	10.0	1	1	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)	SURFACE SAMPLE IN A 40 DRAM VIAL. GRAY, BLACK MOTTLED SILTY FINE SAND WITH BIVALVES AND WORMS. 2 BULK SAMPLES BAGGED AS 263(A) AND 263(B).
264	VAN VEEN	2421253	55 32.352 77 21.663	25.5	1	1	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)	SURFACE SAMPLE IN A 40 DRAM VIAL. 1 CM TAN LAYER OVER GRAY FINE TO COARSE SAND WITH SILT. SHELL HASH AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 264(A) AND 264(B). A= BIO B= FOR SIEVING
265	VAN VEEN	2421300	55 32.400 77 21.808	32.0	1	1	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN LAYER GRADING TO REDDISH BROWN SILTY SAND OVER GRAY MUD MOTTLED WITH BLACK. WORM TUBES. 2 BULK SAMPLES BAGGED AS 265(A) AND 265(B). A= BIO B= FOR SIEVING

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
266	VAN VEEN	2421306	55 32.438 77 21.900	42.0	1	1	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN LAYER OVER GRAY MUD WITH BLACK MOTTLING. LOTS OF WORMS AND SHELL HASH. 2 BULK SAMPLES BAGGED AS 266(A) AND 266(B). A= BIO B= FOR SIEVING
267	VAN VEEN	2421325	55 32.622 77 22.055	36.0	1	1	MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN LAYER OVER GRAY MUD WITH BLACK MOTTLING. WORMS. 2 BULK SAMPLES BAGGED AS 267(A) AND 267(B). A= BIO B= FOR SIEVING
268	VAN VEEN	2421333	55 33.000 77 22.618	30.5	1		MIDDLE MANITOUNUK SND. SCHOONER TRANS 2 (CONT)	COBBLES, GRAVEL AND SOME COARSE SAND. NO SURFACE SAMPLE. 1 BULK SAMPLE BAGGED AS 268(A) FOR BIO.
269	VAN VEEN	2421356	55 30.845 77 23.232	11.5	1	1	RIVIERE KUUGAPIK	SURFACE SAMPLE IN A 40 DRAM VIAL. 1 CM FINE TO MEDIUM TAN SAND OVER GRAY MUD. 1 COBBLE (12 CM) WITH SEA CUCUMBER TYPE GROWTH. WORMS. 2 BULK SAMPLES BAGGED AS 269(A) AND 269(B). 1 ROCK BAGGED. A= BIO B= FOR SIEVING
270	VAN VEEN	2421403	55 31.127 77 22.957	11.0	1	1	RIVIERE KUUGAPIK	SURFACE SAMPLE IN A 40 DRAM VIAL. 1 CM TAN LAYER OVER GRAY MUD. WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 270(A) AND 270(B). A= BIO B= FOR SIEVING
271	VAN VEEN	2421410	55 31.423 77 22.553	12.0	1	1	RIVIERE KUUGAPIK	SURFACE SAMPLE IN A 40 DRAM VIAL. 1 CM TAN LAYER OVER GRAY MUD, SPARSE COARSE SAND. SOME 3-4 CM COBBLES. WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 271(A) AND 271(B). A= BIO B= FOR SIEVING

TABLE 14

GRAB SAMPLES

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
272	VAN VEEN	2421417	55 31.605 77 21.475	7.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. LITTLE OR NO TAN LAYER. GRAY MUD. LOTS OF WORMS, WORM TUBES AND CLAMS. 2 BULK SAMPLES BAGGED AS 272(A) AND 272(B). A= BIO B= FOR SIEVING
273	VAN VEEN	2421423	55 31.537 77 21.415	5.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. TAN LAYER (SILTY SAND) OVER GRAY MUD. LOTS OF WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 273(A) AND 273(B). A= BIO B= FOR SIEVING
274	VAN VEEN	2421428	55 31.552 77 21.588	10.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. 1.5 CM TAN LAYER OVER GRAY MUD. WORMS AND WORM TUBES. GRAY MUD IS MORE COHESIVE TOWARDS BASE. 2 BULK SAMPLES BAGGED AS 274(A) AND 274(B). A= BIO B= FOR SIEVING
275	VAN VEEN	2421437	55 31.727 77 22.438	10.5	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. 1.5 CM TAN LAYER OVER GRAY MUD. SHELL HASH IN THE GRAY LAYER. SOME COARSER GRAINS IN GRAY MUD. WORMS AND WORM TUBES 1 LARGE 20 CM ROUNDED COBBLE. 2 BULK SAMPLES BAGGED AS 275(A) AND 275(B). 1 ROCK SAMPLE. A= BIO B= FOR SIEVING
276	VAN VEEN	2421443	55 31.770 77 22.710	14.5	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. 1.5 CM TAN LAYER OVER GRAY MUD. WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 276(A) AND 276(B). A= BIO B= FOR SIEVING
277	VAN VEEN	2421449	55 31.727 77 22.802	20.5	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM SLIGHTLY COARSE GRAINED TAN LAYER OVER GRAY MUD. WORMS, WORM TUBES AND CLAMS. 2 BULK SAMPLES BAGGED AS 277(A) AND 277(B). A= BIO B= FOR SIEVING

TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
278	VAN VEEN	2421455	55 31.700 77 23.050	25.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	2 CM SURFACE LAYER OF TAN MUD WITH PEBBLES OVER GRAY MUD (BLACK MOTTLING). WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 278(A) AND 278(B). A= BIO B= FOR SIEVING SURFACE SAMPLE IN A BAG.
279	VAN VEEN	2421501	55 31.660 77 23.217	30.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	3 CM TAN SURFACE LAYER GRADING TO REDDISH BROWN AT BASE (SOME COARSE MATERIAL) OVER GRAY MUD WITH BLACK MOTTLING. CLAMS, WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 279(A) AND 279(B). A= BIO B= FOR SIEVING SURFACE SAMPLE IN A 40 DRAM VIAL.
280	VAN VEEN	2421508	55 31.622 77 23.420	35.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. 2 CM TAN SURFACE LAYER GRADING TO REDDISH BROWN AT BASE (SOME COARSE MATERIAL) OVER GRAY MUD WITH BLACK MOTTLING. CLAMS, WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 280(A) AND 280(B). A= BIO B= FOR SIEVING
281	VAN VEEN	2421517	55 31.835 77 23.783	41.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN LAYER CONTAINING A FEW COARSE GRAINS OVER GRAY MUD WITH BLACK MOTTLING. WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 281(A) AND 281(B). A= BIO B= FOR SIEVING
282	VAN VEEN	2421524	55 31.935 77 24.082	34.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4AL	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN MUD GRADING TO COARSE REDDISH BROWN OVER GRAY MUD WITH BLACK MOTTLING. WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 282(A) AND 282(B). A= BIO B= FOR SIEVING
283	VAN VEEN	2421531	55 31.925 77 24.268	30.5	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN MUD GRADING TO COARSER REDDISH BROWN OVER GRAY MUD WITH BLACK MOTTLING. WORMS AND WORM TUBES. 2 BULK SAMPLES BAGGED AS 283(A) AND 283(B). A= BIO B= FOR SIEVING

TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 920285
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
284	VAN VEEN	2421538	55 31.973 77 24.405	24.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	SURFACE SAMPLE IN A 40 DRAM VIAL. 1-2 CM TAN LAYER (MUD) GRADING TO COARSE REDDISH BROWN OVER GRAY MUD WITH BLACK MOTTLING. A FEW WORM TUBES. 2 BULK SAMPLES BAGGED AS 284(A) AND 284(B). A= BIO B= FOR SIEVING
285	VAN VEEN	2421545	55 31.977 77 24.370	21.0	1	1	MIDDLE OF MANITOUNUK SND TRANSECT 4	NO DESCRIPTION FOR THIS SAMPLE. SURFACE SAMPLE IN A 40 DRAM VIAL. 2 BULK SAMPLES BAGGED AS 285(A) AND 285(B). A= BIO B= FOR SIEVING
286	VAN VEEN	2421641	55 28.837 77 28.093	48.0	1		MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	NO SURFACE SAMPLE. VERY COARSE COBBLY LAG OVER GRAY MUD WITH BLACK MOTTLING. NO MACROBENTHOS OBSERVED. 2 BULK SAMPLES BAGGED AS 286(A) AND 286(B). A= BIO B= FOR SIEVING
287	VAN VEEN	2421655	55 28.702 77 28.312	41.0	1		MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	NO SURFACE SAMPLE. MUDDY COARSE SAND WITH COBBLES. SMALL BRITTLE STARS AND SHELLS. 2 BULK SAMPLES BAGGED AS 287(A) AND 287(B). A= BIO B= FOR SIEVING
288	VAN VEEN	2421659	55 28.705 77 28.353	35.0	1		MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	NO SAMPLE, PROBABLY EXPOSED BEDROCK.
289	VAN VEEN	2421702	55 28.643 77 28.365	31.0	1		MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	VERY ROCKY BOTTOM. SAMPLER CONTAINED 1 BOULDER, RETAINED AS 289(A).
290	VAN VEEN	2421705	55 28.605 77 28.387	28.0	1		MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	TAN COLOURED MUDDY SAND AND COBBLES. NO MACROBENTHOS. 1 BULK SAMPLE BAGGED AS 290(A).

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
291	VAN VEEN	2421712	55 28.417 77 28.898	27.0	1		MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	COBBLES ONLY. SAMPLER JAWS KEPT OPEN BY A COBBLE. MOST OF SAMPLE WASHED OUT. 1 BULK SAMPLE BAGGED AS 291(A).
292	VAN VEEN	2421716	55 28.203 77 29.143	35.0	1		MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	TAN COLOURED COARSE SAND WITH COBBLES. 1 BULK SAMPLE BAGGED AS 292(A).
293	VAN VEEN	2421724	55 27.973 77 29.680	23.0	1	1	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	SURFACE SAMPLE STORED IN A TWIST BAG. 2 CM TAN LAYER OVER GRAY MUD WITH BLACK MOTTLING. SOME COBBLES IN THE GRAY MATERIAL, POSSIBLY ICE RAFTED. 2 BULK SAMPLES BAGGED AS 293(A) AND 293(B). A= BIO B= FOR SIEVING
294	VAN VEEN	2421731	55 27.603 77 30.068	14.0	1	1	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	SURFACE SAMPLE STORED IN A TWIST BAG. 2 CM TAN COLOURED MUD OVER GRAY MUD WITH A FEW BLACK PEBBLES AND BLACK MOTTLING. MINOR AMOUNTS OF SAND THROUGHOUT THE SAMPLE. 2 BULK SAMPLES BAGGED AS 294(A) AND 294(B). A= BIO B= FOR SIEVING
295	VAN VEEN	2421737	55 27.577 77 30.275	14.0	1	1	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANSECT 5	SURFACE SAMPLE STORED IN A TWIST BAG. 1 CM LAYER OF TAN MUD OVER GRAY SANDY MUD WITH BLACK MOTTLING. SHELL HASH AND GASTROPOD SHELL OBSERVED. 2 BULK SAMPLES BAGGED AS 295(A) AND 295(B). A= BIO B= FOR SIEVING
296	VAN VEEN	2421748	55 28.242 77 28.893	26.0	1	1	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANS 5A	SURFACE SAMPLE STORED IN A TWIST BAG. 3 CM TAN COLOURED MUDDY SAND LAYER WITH COBBLES OVER GRAY MUD WITH BLACK MOTTLING. NO MACROBENTHOS OBSERVED. 2 BULK SAMPLES BAGGED AS 296(A) AND 296(B). A= BIO B= FOR SIEVING
297	VAN VEEN	2421755	55 28.273 77 28.947	31.0	1	1	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANS 5A	SURFACE SAMPLE STORED IN A TWIST BAG. 5 CM MUDDY SAND TAN COLOURED LAYER WITH COBBLES AND SHELL HASH, OVERLYING GRAY MUD WITH BLACK MOTTLING. NO OTHER MACROBENTHOS OBSERVED. 1 BULK SAMPLE BAGGED AS 297(A). A = BIO

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TABLE 14

GRAB SAMPLES

CRUISE NUMBER = 920205
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	TYPE OF SAMPLER	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (M)	NO.OF TRIES	NO. OF SUBSAMPLES	GEOGRAPHIC LOCATION	GRAB SAMPLE NOTES
298	VAN VEEN	2421007	55 28.298 77 29.332	42.0	1	1	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANS 5A	SURFACE SAMPLE STORED IN A TWIST BAG. 3 CM MUDDY SAND TAN COLOURED LAYER WITH COBBLES AND WORM TUBES, OVERLYING GRAY MUD WITH BLACK MOTTLING. 2 BULK SAMPLES BAGGED AS 298(A) AND 298(B). A= BIO B= FOR SIEVING.
299	VAN VEEN	2421014	55 28.317 77 29.830	50.0	1	1	MIDDLE OF MANITOUNUK SND TO OUTER MAN SND, TRANS 5A	SURFACE SAMPLE STORED IN A TWIST BAG. 2 CM MUDDY FINE SAND TAN COLOURED LAYER WITH SHELL HASH, WORM TUBES AND SMALL CLAMS OVERLYING GRAY MUD. 2 BULK SAMPLES BAGGED AS 299(A) AND 299(B). A= BIO B= FOR SIEVING
300	VAN VEEN	2421022	55 27.693 77 30.007	17.0	1	1	PAINT ISLANDS, MANITOUNUK SOUND	SURFACE SAMPLE STORED IN A TWIST BAG. 1.5 CM TAN COLOURED MUD OVERLYING GRAY MUD WITH BLACK MOTTLING. WORM TUBES. 2 BULK SAMPLES BAGGED AS 300(A) AND 300(B). A= BIO B= FOR SIEVING

TABLE 15

CORE SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
LG1C	BENTHOS GRAVIT	2191321	53 49.56N 79 28.93W	46.0	230	230	137	2	JAMES BAY LA GRANDE RIVER ESTUARY	PENETRATED TO ABOVE THE SHACKLE ON THE SWIVEL. USED A 300 POUND HEAD. SEDIMENTS ON THE BARREL WERE HOMOGENIOUS LIGHT GRAY MUD. 2 SECTIONS LABELLED A-B, B-C. BOTH SECTIONS WAXED (DOUBLE DIP) AND STORED IN A 45 GAL DRUM FILLED WITH SEA WATER. SECTION A-B= 72 CM., B-C= 65 CM.
LG3C	BENTHOS GRAVIT	2201222	53 51.770 79 20.700	40.0	230	230	102	2	JAMES BAY LA GRANDE RIVER ESTUARY	THE CUTTER WAS BLACK MOTTLED GRAY MUD. TOP TAN LAYER APPROX. 1 CM THICK. 2 SECTIONS LABELLED A-B, B-C. CUTTER/CATCHER SAMPLE BAGGED. THE 2 SECTIONS WERE WAXED (DOUBLE DIP) AND STORED IN SEA WATER. SECTION A-B= 54.5 CM., B-C= 48.0 CM. CORER HAD MUD ON THE FLUKES.
LG4C	BENTHOS GRAVIT	2201318	53 51.973 79 12.030	40.0	230	230	106	2	JAMES BAY LA GRANDE RIVER ESTUARY	CUTTER CONTAINED BLACK MOTTLED SOUPY GRAY MUD. TOP 1 CM TAN COLORED MUD. 2 SECTIONS LABELLED A-B, B-C. CUTTER/CATCHER SAMPLED BAGGED. BOTH SECTIONS WERE WAXED AND STORED IN SEA WATER IN A 45 GAL DRUM. SECTION A-B= 55 CM., B-C= 51 CM. CORER HAD MUD ON THE FLUKES.
LG2C	BENTHOS GRAVIT	2191444	53 49.904 79 25.530	40.0	230	230	91	2	JAMES BAY LA GRANDE RIVER ESTUARY	CUTTER CONTAINED BLACK MOTTLED GRAY MUD. WEIGHT WAS REDUCED TO 150 LBS FOR THIS AND FOLLOWING CORES. SECTIONS LABELLED A-B, B-C. BOTH SECTIONS WAXED (DOUBLE DIP) AND STORED IN A 45 GAL. DRUM FILLED WITH SEA WATER. CORER HAD MUD ON THE FLUKES. SECTION A-B= 46 CM, B-C= 45CM.
202	BENTHOS GRAVIT	2401200	55 42.40N 77 05.98W	10.0	210	210	140	2	HEAD OF MANITOUNUK SOUND	CORE CUT IN 2 SECTIONS A-B, B-C FOR STORAGE IN A 45 GAL DRUM OF SEA WATER (FOR COOLING). BURIED TO THE WEIGHTS. CUTTER SAMPLE BAGGED. BOTH CORE SECTIONS WAXED.
204	BENTHOS GRAVIT	2401230	55 40.03N 77 10.58W	19.0	210	210	100	1	BOAT OPENING IN MANITOUNUK SOUND	BURIED TO THE FLUKES. NO CATCHER SAMPLE. STORED IN A 45 GAL DRUM OF SEA WATER FOR COOLING. CORE WAS WAXED.

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TABLE 15

CORE SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
206	BENTHOS GRAVIT	2401300	55 37.31N 77 13.20W	18.0	210	210	90	1	NORTH END OF CASTLE ISLAND, MANITOUNUK SOUND	BURIED TO THE FLUKES. CATCHER SAMPLE BAGGED. CATCHER SAMPLE A VERY COHESIVE GRAY MUD. STORED IN A 45 GAL DRUM OF SEA WATER FOR COOLING. CORE WAS WAXED.
208	BENTHOS GRAVIT	2401330	55 35.13N 77 16.72W	25.0	210	210	85	1	SOUTH END OF CASTLE ISLAND, MANITOUNUK SOUND	BURIED TO THE FLUKES. NO CATCHER SAMPLE. STORED IN A 45 GAL DRUM OF SEA WATER FOR COOLING. CORE WAS WAXED.
210	BENTHOS GRAVIT	2401400	55 33.12N 77 20.30W	29.0	210	210	170	2	SCHOONER OPENING. MANITOUNUK SOUND	BURIED TO THE FLUKES. NO CATCHER SAMPLE. CUT IN TWO SECTIONS A-B, B-C FOR STORAGE IN A 45 GAL DRUM OF SEA WATER FOR COOLING. CORE SECTIONS WAXED.
212	BENTHOS GRAVIT	2401430	55 31.59N 77 22.14W	12.5	210	200	150	2	CENTRAL MANITOUNUK SOUND	BURIED TO THE WEIGHTS. NO CATCHER SAMPLE CORE CUT INTO 2 SECTIONS A-B, B-C FOR STORAGE IN A 45 GAL DRUM OF SEA WATER FOR COOLING. CORE SECTIONS WAXED.
214	BENTHOS GRAVIT	2401500	55 34.63N 77 22.02W	58.0	210	220	147	1	OFF SCHOONER OPENING (NORTH)	BURIED TO THE FLIKES. NO CATCHER SAMPLE. LEFT AS 1 SECTION BECAUSE OF IMMEDIATE RETURN TO THE HUDSON. CORE SECTION WAS WAXED.
216	BENTHOS GRAVIT	2401530	55 31.55N 77 24.99W	23.0	210	210	178	1	MERRY ISLAND, MANITOUNUK SOUND	BURIED TO THE FLUKES. NO CATCHER SAMPLE. STORED IN A 45 GAL DRUM OF SEA WATER FOR COOLING. CORE WAS WAXED.
218	BENTHOS GRAVIT	2401600	55 31.05N 77 24.60W	42.0	210	220	143	2	MERRY ISLAND, MANITOUNUK SOUND	CORE CUT IN TWO FOR STORAGE IN A 45 GAL DRUM OF SEA WATER FOR COOLING. BURIED TO THE FLUKES. NO CATCHER SAMPLE. CORE SECTIONS WAXED.
220	BENTHOS GRAVIT	2401630	55 29.68N 77 27.10W	42.0	210	210	150	1	MERRY ISLAND, MANITOUNUK SOUND	BURIED TO THE FLUKES. CATCHER SAMPLE BAGGED. STORED IN A 45 GAL DRUM OF SEA WATER FOR COOLING. CORE WAS WAXED.
221	BENTHOS GRAVIT	2401700	55 28.60N 77 27.90W	23.0	210	210	55	1	MERRY ISLAND, MANITOUNUK SOUND	DID NOT PENETRATE VERY FAR. STONES AND SAND AT THE TOP AT 'B', COHESIVE MATERIAL AT THE BOTTOM 'A'.

TABLE 15

CORE SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA DAL

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
226	BENTHOS GRAVIT	2411314	55 22.190 77 40.952	24.0	230	190	135	2	OUTER MANITOUNUK SOUND	NO CUTTER/CATCHER SAMPLE. NO SURFACE TAN LAYER APPARENT, APPEARED HOMOGENOUS GRAY THROUGHOUT. CORE CUT INTO 2 SECTION LABELLED A-B, B-C FOR COLD WATER STORAGE. A-B = 67.5 CM. CORE SECTIONS WERE WAXED. B-C = 67.5 CM
228	BENTHOS GRAVIT	2411350	55 24.283 77 38.322	71.0	230	170	150	2	OUTER MANITOUNUK SOUND	NO CUTTER/CATCHER SAMPLE. 3 CM TAN LAYER OVER GRAY MUD, MOTTLING OBSERVED IN TOP SECTION BUT NOT IN THE BOTTOM 30 CM (THROUGH LINER). STORED IN A 45 GAL DRUM OF SEA WATER FOR COOLING. CORE WAS WAXED.
241	BENTHOS GRAVIT	2411811	55 28.222 77 33.858	50.0	230	170	148	2	OFFSHORE MANITOUNUK ISLANDS	2-3 CM TAN SURFACE LAYER ON TOP OVER GRAY MUD. NO CUTTER/CATCHER SAMPLE. CORE CUT IN 2 SECTIONS FOR COLD WATER STORAGE. ENDS WAXED. A-B = 74 CM B-C = 74 CM
243	BENTHOS GRAVIT	2411858	55 31.188 77 29.018	83.0	230	170	123	2	OFFSHORE MANITOUNUK ISLANDS	VERY THIN TAN LAYER OVER GRAY MUD. NO CUTTER/CATCHER SAMPLE. CORE CUT IN 2 SECTIONS FOR COLD WATER STORAGE. CORE SECTIONS WERE WAXED. A-B = 61.5 CM B-C = 61.5 CM
245	BENTHOS GRAVIT	2411922	55 31.947 77 27.465	68.0	230	190	142	2	OFFSHORE MANITOUNUK ISLANDS	1 CM TAN SURFACE LAYER OVER GRAY MUD. NO CUTTER/CATCHER SAMPLE. CORE CUT IN 2 SECTIONS FOR COLD WATER STORAGE. CORE SECTIONS WERE WAXED. A-B = 71 CM B-C = 71 CM
247	BENTHOS GRAVIT	2411950	55 33.020 77 25.625	68.5	230	190	61.5	1	OFFSHORE MANITOUNUK ISLANDS	NO TAN LAYER OBSERVED ON THE SURFACE. POSSIBLY TOO MUCH FREE FALL ON THIS ONE, MAY HAVE GONE IN ON AN ANGLE. NO CUTTER/CATCHER SAMPLE. SECTION LABELLED A-B. WAXED AND STORED IN A 45 GAL DRUM FOR COOLING.
249	BENTHOS GRAVIT	2412028	55 35.772 77 22.122	94.0	230	190	145	2	OFFSHORE MANITOUNUK ISLANDS, N. OF SCHOONER OPENNG	2 CM TAN LAYER OVER GRAY MUD. CORE CUT IN 2 FOR COLD WATER STORAGE. A-B = 72.5 CM B-C = 72.5 CM NO CUTTER/CATCHER SAMPLE. CORE WAS WAXED.

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TABLE 15

CORE SAMPLES

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

SAMPLE NUMBER	SAMPLE TYPE	DAY/TIME (GMT)	LATITUDE LONGITUDE	DEPTH (MTRS)	CORER LENGTH (CM)	APP. PENN (CM)	CORE LENGTH (CM)	NO OF SECT	GEOGRAPHIC LOCATION	NOTES
301	BENTHOS GRAVIT	2421830	55 27.608 77 30.133	17.0	230	190		1	PAINT ISLANDS, MANITOUNUK SOUND	SECTION LABELLED A-B. SECTION WAXED AND STORED IN A 45 GAL DRUM FOR COOLING.

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TABLE 16

BATHYMETRY RECORDS

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	FREQUENCY	LINE NUMBERS	PARAMETER	GEOGRAPHIC LOCATION	RECORDER	NOTES
001	2151810	2152044	200 KHZ	JB1	RAYTHEON 719	JAMES BAY, RUPERT BAY	RAY 719	
002	2161143	2161745	200 KHZ	JB2	RAYTHEON 719	JAMES BAY, WESTON IS TO SOUTH TWINS IS.	RAY 719	
003	2181310	2181913	200 KHZ	LG1, LG2, LG3, LG4	RAYTHEON 719	JAMES BAY, LA GRANDE RIVER ESTUARY	RAY 719	
004	2192121	2192243	200 KHZ	LG7	RAYTHEON 719	JAMES BAY, LA GRANDE RIVER ESTUARY	RAY 719	
005	2201157	2202043	200 KHZ	LG8,LG9,JB3,JB4 + SITE SURVEYS	RAYTHEON 719	JAMES BAY+ LA GRANDE RIVER ESTUARY	RAY 719	
006	2211300	2211500	200 KHZ	JB4, JB5	RAYTHEON 719	JAMES BAY	RAY 719	
007	2211510	2212040	200 KHZ	JB5	RAYTHEON 719	JAMES BAY	RAY 719	
008	2221200	2221515	200 KHZ	JB5	RAYTHEON 719	JAMES BAY	RAY 719	
009	2251642	2252025	200 KHZ	GB1 TO GB10 INCLUSIVE	RAYTHEON 719	GRANDE RIVIERE GRANDE BALEINE	RAY 719	
010	2261216	2261815	200 KHZ	GB11 TO GB16 INCLUSIVE	RAYTHEON 719	GRANDE RIVIERE GRANDE BALEINE	RAY 719	
011	2261822	2262219	200 KHZ	GB16 TO GB23 INCLUSIVE	RAYTHEON 719	GRANDE RIVIERE GRANDE BALEINE	RAY 719	
012	2271134	2271814	200 KHZ	GB24 TO GB30 INCLUSIVE	RAYTHEON 719	GRANDE RIVIERE GRANDE BALEINE	RAY 719	
013	2271825	2271934	200 KHZ	GB30 TO GB32 INCLUSIVE	RAYTHEON 719	GRANDE RIVIERE GRANDE BALEINE	RAY 719	
014	2281229	2282030	200 KHZ	MAN1 TO MAN7	RAYTHEON 719	MANITOUNUK SOUND	RAY 719	
015	2291146	2291306	200 KHZ	OL1 TO IL3 INCLUSIVE	RAYTHEON 719	OFF SHORE LINES MANITOUNUK ISLANDS	RAY 719	
017	2301217	2301811	200 KHZ	MAN8 TO MAN15	RAYTHEON 719	MANITOUNUK SOUND	RAY 719	
018	2301820	2301857	200 KHZ	MAN15	RAYTHEON 719	MANITOUNUK SOUND	RAY 719	
019	2301959	2302056	200 KHZ	MAN16	RAYTHEON 719	MANITOUNUK SOUND	RAY 719	
020	2311234	2312036	200 KHZ	OL10 TO OL16 INCLUSIVE	RAYTHEON 719	OFF SHORE LINES MANITOUNUK ISLANDS	RAY 719	

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TABLE 16

BATHYMETRY RECORDS

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	FREQUENCY	LINE NUMBERS	PARAMETER	GEOGRAPHIC LOCATION	RECORDER	NOTES
021	2321154	2321916	200 KHZ	OL17 TO OL23 INCLUSIVE	RAYTHEON 719	OFF SHORE LINES MANITOUNUK ISLANDS	RAY 719	
022	2331234	2331445	200 KHZ	PB1 TO PB4	RAYTHEON 719	PETITE BALEINE	RAY 719	
023	2331452	2332022	200 KHZ	PB4 TO PB11	RAYTHEON 719	PETITE BALEINE	RAY 719	
024	2341217	2342000	200 KHZ	MAN17 TO MAN39	RAYTHEON 719	MANITOUNUK SOUND	RAY 719	
025	2342002	2342052	200 KHZ	MAN39	RAYTHEON 719	MANITOUNUK SOUND	RAY 719	
026	2351451	2351546	200 KHZ	SITE SURVEY FOR	RAYTHEON 719	MANITOUNUK SOUND	RAY 719	

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TABLE 17

SEISMIC RECORDS

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
001	2151018	2152027	DATASONICS	JB1	SINGLE	JAMES BAY, RUPERT BAY.	EPC 9800	AGC SEISMICS BUBBLE PULSER
002	2161149	2161842	DATASONICS	JB2	SINGLE	JAMES BAY, WESTON IS TO SOUTH TWINS IS.	EPC 9800	AGC SEISMICS BUBBLE PULSER
003	2181320	2181913	NSRF 25 FT	LG1, LG2, LG3, LG4	SINGLE	JAMES BAY, LA GRANDE RIVER ESTUARY.	EPC 9800	AGC SEISMICS SEA OTTER
004	2201657	2202043	NSRF 25 FT	JB4, JB5	SINGLE	JAMES BAY	EPC 9800	AGC SEISMICS SEA OTTER
005	2211310	2212040	NSRF 25 FT	JB4, JB5	SINGLE	JAMES BAY	EPC 9800	AGC SEISMICS SEA OTTER
006	2221208	2222005	NSRF 25 FT	JB5, HB1	SINGLE	JAMES BAY	EPC 9800	AGC SEISMICS SEA OTTER
007	2251642	2252025	NSRF 25 FT	GB1 TO GB10 INCLUSIVE	SINGLE	GRANDE RIVIERE GRANDE BALEINE	EPC 9800	AGC SEISMICS SEA OTTER
008	2261231	2262219	NSRF 25 FT	GB11 TO GB23 INCLUSIVE	SINGLE	GRANDE RIVIERE GRANDE BALEINE	EPC 9800	AGC SEISMICS SEA OTTER
009	2271143	2271934	NSRF 25 FT	GB24 TO GB32 INCLUSIVE	SINGLE	GRANDE RIVIERE GRANDE BALEINE	EPC 9800	AGC SEISMICS SEA OTTER
010	2281230	2281943	NSRF 25 FT	MAN1 TO MAN4 INCLUSIVE	SINGLE	MANITOUNUK SOUND	EPC 9800	AGC SEISMICS SEA OTTER
011	2281946	2282038	NSRF 25 FT	MAN4 TO MAN7 INCLUSIVE	SINGLE	MANITOUNUK SOUND	EPC 9800	AGC SEISMICS SEA OTTER
012	2291146	2291942	NSRF 25 FT	OL1 TO OL9 INCLUSIVE	SINGLE	OFF SHORE LINES MANITOUNUK ISLANDS	EPC 9800	AGC SEISMICS SEA OTTER
013	2301218	2302056	NSRF 25 FT	MAN8 TO MAN16 INCLUSIVE	SINGLE	MANITOUNUK SOUND	EPC 9800	AGC SEISMICS SEA OTTER
014	2311235	2312036	NSRF 25 FT	OL10 TO OL16 INCLUSIVE	SINGLE	OFF SHORE LINES MANITOUNUK ISLANDS	EPC 9800	AGC SEISMICS SEA OTTER
015	2321157	2321916	NSRF 25 FT	OL17 TO OL23 INCLUSIVE	SINGLE	OFF SHORE LINES MANITOUNUK ISLANDS	EPC 9800	AGC SEISMICS SEA OTTER
016	2331235	2332022	NSRF 25 FT	PB1 TO PB11	SINGLE	PETITE BALEINE	EPC 9800	AGC SEISMICS SEA OTTER
017	2341220	2341435	NSRF 25 FT	MAN17 TO MAN27 INCLUSIVE	SINGLE	MANITOUNUK SOUND	EPC 9800	AGC SEISMICS SEA OTTER

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TABLE 17

SEISMIC RECORDS

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	HYDROPHONE	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SYSTEM / SOUND SOURCE
018	2341440	2341757	NSRF 25 FT	MAN27 TO MAN36 INCLUSIVE	SINGLE	MANITOUNUK SOUND	EPC 9800	AGC SEISMICS SEA OTTER

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TABLE 18

SIDESCAN RECORDS

CRUISE NUMBER = 92028S
CHIEF SCIENTIST = J. ZEVENHUIZEN
PROJECT NUMBER = GRA BAL

ROLL NUMBERS	START DAY/TIME	STOP DAY/TIME	LINE NUMBERS	RECORD TYPE	GEOGRAPHIC LOCATION	RECORDER	SIDESCAN SYSTEM
001	2151825	2152030	JB1	SINGLE	JAMES BAY,RUPERT BAY	KLEIN 401	KLEIN 401 (100 KHZ)
002	2161155	2161737	JB2	SINGLE	JAMES BAY,WESTON IS. TO SOUTH TWINS IS.	KLEIN 401	KLEIN 401 (100 KHZ)
003	2181330	2181913	LG1, LG2, LG3, LG4.	SINGLE	JAMES BAY, LA GRANDE RIVER ESTUARY.	KLEIN 401	KLEIN 401 (100 KHZ)
004	2201715	2202042	LG9, JB3, JB4	SINGLE	LA GRANDE RIVER ESTUARY + JAMES BAY	KLEIN 401	KLEIN 401 (100 KHZ)
005	2211322	2212040	JB4, JB5	SINGLE	JAMES BAY	KLEIN 401	KLEIN 401 (100 KHZ)
006	2221230	2221515	JB5, HB1	SINGLE	JAMES BAY, HUDSON BAY	KLEIN 401	KLEIN 401 (100 KHZ)
007	2251655	2252025	GB1 TO GB10 INCLUSIVE	SINGLE	GRANDE RIVIERE GRANDE BALEINE	KLEIN 401	KLEIN 401 (100 KHZ)
008	2261236	2262219	GB11 TO GB23 INCLUSIVE	SINGLE	GRANDE RIVIERE GRANDE BALEINE	KLEIN 401	KLEIN 401 (100 KHZ)
009	2271144	2271934	GB24 TO GB32 INCLUSIVE	SINGLE	GRANDE RIVIERE GRANDE BALEINE	KLEIN 401	KLEIN 401 (100 KHZ)
010	2291558	2291942	OL6 TO OL9 INCLUSIVE	SINGLE	OFF SHORE LINES MANITOUNUK ISLANDS	KLEIN 401	KLEIN 401 (100 KHZ)
011	2301240	2301524	MAN8 TO MAN11 INCLUSIVE	SINGLE	MANITOUNUK SOUND	KLEIN 401	KLEIN 401 (100 KHZ)
012	2301649	2301900	MAN12 TO MAN15 INCLUSIVE	SINGLE	MANITOUNUK SOUND	KLEIN 401	KLEIN 401 (100 KHZ)
013	2321235	2321916	OL17 TO OL23 INCLUSIVE	SINGLE	OFF SHORE LINES MANITOUNUK ISLANDS	KLEIN 401	KLEIN 401 (100 KHZ)
014	2331245	2331542	PB1 TO PB5 ONCLUSIVE	SINGLE	PETITE BALEINE	KLEIN 401	KLEIN 401 (100 KHZ)
015	2331640	2332022	PB6 TO PB11	SINGLE	PETITE BALEINE	KLEIN 401	KLEIN 401 (100 KHZ)
016	2341210	2341758	MAN17 TO MAN36 INCLUSIVE	SINGLE	MANITOUNUK SOUND	KLEIN 401	KLEIN 401 (100 KHZ)
017	2341802	2342052	MAN37 TO MAN39 INCLUSIVE	SINGLE	MANITOUNUK SOUND	KLEIN 401	KLEIN 401 (100 KHZ)

TABLE 19

LINE NUMBER START/STOPS

LINE NUMBER	START DAY/TIME	STOP DAY/TIME
JB1	215/1810	215/2040
JB2	216/1143	216/1842
LG1	218/1310	218/1500
LG2	218/1500	218/1630
LG3	218/1630	218/1705
LG4	218/1705	218/1913
LG5	218/1942	218/2018
LG6	218/2044	218/2110
LG7	219/2115	219/2240
LG8	220/1446	220/1620
LG9	220/1654	220/1745
JB3	220/1745	220/1900
JB4	220/1900	221/1425
JB5	221/1425	222/1722
HB1	222/1752	222/2005
GB1	225/1642	225/1725
GB2	225/1725	225/1742
GB3	225/1742	225/1752
GB4	225/1752	225/1822
GB5	225/1822	225/1834
GB6	225/1834	225/1903
GB7	225/1903	225/1913
GB8	225/1913	225/1947
GB9	225/1947	225/1958
GB10	225/1958	225/2025
GB11	226/1200	226/1330
GB12	226/1330	226/1431
GB13	226/1431	226/1531

TABLE 19

LINE NUMBER START/STOPS

LINE NUMBER	START DAY/TIME	STOP DAY/TIME
GB14	226/1531	226/1628
GB15	226/1628	226/1746
GB16	226/1746	226/1855
GB17	226/1855	226/1950
GB18	226/1950	226/2010
GB19	226/2010	226/2042
GB20	226/2042	226/2055
GB21	226/2055	226/2134
GB22	226/2134	226/2149
GB23	226/2149	226/2219
GB24	227/1134	227/1240
GB25	227/1240	227/1355
GB26	227/1355	227/1454
GB27	227/1454	227/1606
GB28	227/1606	227/1702
GB29	227/1702	227/1755
GB30	227/1755	227/1836
GB31	227/1836	227/1853
GB32	227/1853	227/1934
MAN1	228/1229	228/1850
MAN2	228/1850	228/1903
MAN3	228/1903	228/1933
MAN4	228/1933	228/1948
MAN5	228/1948	228/1957
MAN6	228/1957	228/2009
MAN7	228/2009	228/2038
OL1	229/1150	229/1225
OL2	229/1225	229/1247
OL3	229/1247	229/1404
OL4	229/1404	229/1445
OL5	229/1445	229/1553
OL6	229/1553	229/1639
OL7	229/1639	229/1759
OL8	229/1759	229/1859
OL9	229/1859	229/1942
MAN8	230/1216	230/1300
MAN9	230/1300	230/1313
MAN10	230/1313	230/1328
MAN11	230/1328	230/1524
MAN12	230/1649	230/1701
MAN13	230/1701	230/1724
MAN14	230/1724	230/1754
MAN15	230/1754	230/1857
MAN16	230/1857	230/2056
OL10	231/1237	231/1313

TABLE 19

LINE NUMBER START/STOPS

LINE NUMBER	START DAY/TIME	STOP DAY/TIME
OL11	231/1313	231/1353
OL12	231/1420	231/1449
OL13	231/1449	231/1656
OL14	231/1656	231/1737
OL15	231/1737	231/1809
OL16	231/1818	231/2036
OL17	232/1156	232/1225
OL18	232/1225	232/1255
OL19	232/1255	232/1328
OL20	232/1328	232/1402
OL21	232/1402	232/1508
OL22	232/1508	232/1559
OL23	232/1559	232/1916
PB1	233/1237	233/1329
PB2	233/1329	233/1402
PB3	233/1402	233/1424
PB4	233/1424	233/1507
PB5	233/1507	233/1542
PB6	233/1640	233/1727
PB7	233/1727	233/1802
PB8	233/1802	233/1816
PB9	233/1816	233/1855
PB10	233/1855	233/1932
PB11	233/1932	233/2022
MAN17	234/1220	234/1309
MAN18	234/1309	234/1318
MAN19	234/1318	234/1329
MAN20	234/1329	234/1337
MAN21	234/1337	234/1342
MAN22	234/1342	234/1350
MAN23	234/1350	234/1356
MAN24	234/1356	234/1409
MAN25	234/1409	234/1421
MAN26	234/1421	234/1432
MAN27	234/1432	234/1440
MAN28	234/1440	234/1449
MAN29	234/1449	234/1500
MAN30	234/1500	234/1507
MAN31	234/1507	234/1526
MAN32	234/1526	234/1531
MAN33	234/1531	234/1542
MAN34	234/1640	234/1707
MAN35	234/1707	234/1736
MAN36	234/1736	234/1757
MAN37	234/1906	234/1938
MAN38	234/1938	234/1948
MAN39	234/1948	234/2052

TABLE 20

LINE NUMBER PARAMETER OCCURANCE

LINE NUMBER	KLEIN 401 SIDESCAN	3.5 KHZ PROFILER	DATASONICS BUBBLE PULSER	200 KHZ BATHYMETRY
JB1	X	X	X	X
JB2	X	X	X	X
LG1	X	X	X	X
LG2	X	X	X	X
LG3	X	X	X	X
LG4	X	X	X	X
LG5		X		
LG6		X		
LG7		X		X
LG8		X		X
LG9	X	X	X	X
JB3	X	X	X	X
JB4	X	X	X	X
JB5	X	X	X	X
HB1		X	X	
GB1	X	X	X	X
GB2	X	X	X	X
GB3	X	X	X	X
GB4	X	X	X	X
GB5	X	X	X	X
GB6	X	X	X	X
GB7	X	X	X	X
GB8	X	X	X	X
GB9	X	X	X	X
GB10	X	X	X	X
GB11	X	X	X	X
GB12	X	X	X	X
GB13	X	X	X	X
GB14	X	X	X	X
GB15	X	X	X	X
GB16	X	X	X	X
GB17	X	X	X	X
GB18	X	X	X	X
GB19	X	X	X	X
GB20	X	X	X	X

TABLE 20

LINE NUMBER PARAMETER OCCURANCE

LINE NUMBER	KLEIN 401 SIDESCAN	3.5 KHZ PROFILER	GEOPULSE SEA OTTER	200 KHZ BATHYMETRY
GB21	X	X	X	X
GB22	X	X	X	X
GB23	X	X	X	X
GB24	X	X	X	X
GB25	X	X	X	X
GB26	X	X	X	X
GB27	X	X	X	X
GB28	X	X	X	X
GB29	X	X	X	X
GB30	X	X	X	X
GB31	X	X	X	X
GB32	X	X	X	X
MAN1		X	X	X
MAN2		X	X	X
MAN3		X	X	X
MAN4		X	X	X
MAN5		X	X	X
MAN6		X	X	X
MAN7		X	X	X
OL1		X	X	X
OL2		X	X	X
OL3		X	X	X
OL4		X	X	X
OL5		X	X	X
OL6	X	X	X	X
OL7	X	X	X	X
OL8	X	X	X	X
OL9	X	X	X	X
MAN8	X	X	X	X
MAN9	X	X	X	X
MAN10	X	X	X	X
MAN11	X	X	X	X
MAN12	X	X	X	X
MAN13	X	X	X	X
MAN14	X	X	X	X
MAN15	X	X	X	X
MAN16		X	X	X
OL10		X	X	X
OL11		X	X	X
OL12		X	X	X
OL13		X	X	X
OL14		X	X	X
OL15		X	X	X
OL16		X	X	X
OL17		X	X	X

TABLE 20

LINE NUMBER PARAMETER OCCURANCE

LINE NUMBER	KLEIN 401 SIDESCAN	3.5 KHZ PROFILER	GEOPULSE SEA OTTER	200 KHZ BATHYMETRY
OL18	x	X	X	X
OL19	x	X	X	X
OL20	x	X	X	X
OL21	x	X	X	X
OL22	x	X	X	X
OL23	x	X	X	X
PB1	x	X	X	X
PB2	x	X	X	X
PB3	x	X	X	X
PB4	x	X	X	X
PB5	x	X	X	X
PB6	x	X	X	X
PB7	x	X	X	X
PB8	x	X	X	X
PB9	x	X	X	X
PB10	x	X	X	X
PB11	x	X	X	X
MAN17	X	X	X	X
MAN18	X	X	X	X
MAN19	X	X	X	X
MAN20	X	X	X	X
MAN21	X	X	X	X
MAN22	X	X	X	X
MAN23	X	X	X	X
MAN24	X	X	X	X
MAN25	X	X	X	X
MAN26	X	X	X	X
MAN27	X	X	X	X
MAN28	X	X	X	X
MAN29	X	X	X	X
MAN30	X	X	X	X
MAN31	X	X	X	X
MAN32	X	X	X	X
MAN33	X	X	X	X
MAN34	X	X	X	X
MAN35	X	X	X	X
MAN36	X	X	X	X
MAN37	X	X		X
MAN38	X	X		X
MAN39	X	X		X

TABLE 21

PARAMETER START/STOP TIMES

200 KHZ BATHYMETRY

215/1810	215/2040
216/1143	216/1740
218/1310	218/1913
219/2117	219/2240
220/1157	220/1201
220/1305	220/1312
220/1354	220/1406
220/1420	220/1425
220/1446	220/1530
220/1535	220/1620
220/1654	220/2043
221/1304	221/2040
222/1200	222/1515
225/1642	225/2025
226/1228	226/2219
227/1134	227/1934
228/1229	228/1730
228/1853	228/2038
229/1146	229/1942
230/1217	230/1524
230/1646	230/1857
230/1956	230/2056
231/1234	231/2036
232/1154	232/1916
233/1234	233/1542
233/1640	233/2022
234/1217	234/1542
234/1640	234/1757
234/1906	234/2052

SEISMICS-SEA OTTER

215/1820	215/2030
216/1149	216/1842
218/1320	218/1913
220/1657	220/2043
221/1318	221/2040
222/1208	222/2005
225/1642	225/2025
226/1231	226/2219
227/1143	227/1934
228/1230	228/2038
229/1146	229/1942
230/1218	230/1524
230/1646	230/1857
230/1956	230/2056
231/1235	231/1353
231/1418	231/2036
232/1157	232/1916
233/1235	233/1542
233/1640	233/2022
234/1220	234/1542
234/1640	234/1757

TABLE 21

PARAMETER START/STOP TIMES

3.5 KHZ PROFILER

215/1810	215/1924
215/1950	215/2030
216/1145	216/1842
218/1320	218/2018
218/2044	218/2110
219/2115	219/2240
220/1157	220/1312
220/1354	220/1406
220/1420	220/1425
220/1446	220/1530
220/1535	220/1620
220/1654	220/2043
221/1304	221/2040
222/1200	222/2005
225/1642	225/2025
226/1216	226/2219
227/1134	227/1934
228/1229	228/2038
229/1146	229/1942
230/1220	230/1524
230/1646	230/1857
230/1956	230/2056
231/1236	231/1353
231/1407	231/2036
232/1155	232/1916
233/1234	233/1542
233/1640	233/2022
234/1217	234/1542
234/1640	234/1757
234/1908	234/2052

KLEIN 401 SIDESCAN

215/1826	215/1841
215/1950	215/2030
216/1155	216/1737
218/1330	218/1913
220/1711	220/2043
221/1322	221/2040
222/1230	222/1515
225/1655	225/2025
226/1236	226/2218
227/1144	227/1934
229/1558	229/1942
230/1240	230/1524
230/1646	230/1857
232/1235	232/1916
233/1245	233/1542
233/1640	233/2022
234/1218	234/1542
234/1640	234/1757
234/1641	234/2052