SURFICIAL GEOLOGICAL INVESTIGATIONS OF THE GULF OF ST.LAWRENCE

CRUISE REPORT: HUDSON 90-028

PREPARED BY: H.JOSENHANS, L. JOHNSTON, K. JARRETT, D. SMITH, J. ZEVENHUIZEN

TABLE OF CONTENTS

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CRUISE REPORT: HUDSON 90-028

CRUISE DATES: OCTOBER 30 - NOV. 17 1990

CHIEF SCIENTIST: H.W.Josenhans

OBJECTIVES

The cruise was intended to obtain ground truth of seismo-stratigraphic sections in the Gulf of St. Lawrence which had been identified on the regional seismic data collected in 1989 (Baffin 89-008 and Dawson 89-007). The sample sites were chosen to obtain representative samples of the regional seismic units and to define the sedimentary environments proximal and distal to former ice margins. In addition the cruise was intended to fill in some regional seismic gaps and to undertake a detailed survey of paleo-channels west of Cheticamp, Cape Breton. A multidiciplinary group of scientists participated in the on board core subsampling and analysis in order to determine: physical properties, lithologic composition and provenance, pollen composition as an indicator of paleo-climate and O18/C14 as an indicator of paleoceanography and age.
The cruise was divided into two phases with H.W. Josenhans acting as chief scientist for the Gulf of St.Lawrence work from Oct 30- Nov 13 and J.Locat in charge of the Saguenay fiord work from Nov 13-17. One LCF core was collected for J. Syvitski in the St Lawrence estuary.

RESULTS

A persistent succession of intense storms restricted the survey and sampling opportunities. Nevertheless, about 60% of survey objectives were accomplished. Rough seas resulted in loss of much of the seismic program. Accurate GPS navigation and on station 3.5kHz profiling allowed us to pinpoint the piston core locations close to former ice margins as defined by the seismic data. The following list indicates the number and type of samples collected on both phases of the cruise.

CRUISE PERSONEL
AND DUTIES

Chief scientist: Heiner Josenhans
Second scientist: John Zevenhuizen
Geotech program: Kate Moran
Halifax harbour sampling program: Dale Buckley
Bedrock geology: Al Grant
Photography: Heinz Wiele
Navigation/data technician: Larry Johnson
Sampling technician: Fred Jodrey
Airgun technician: Jes Nielsen
Huntec technician: Graham Standen
Sidescan technician: Austin Boyce
Electronic technician: Borden Chapman

Seismic watchkeeping personel

Austin Boyce (watch leader)
Stephan Kress
Nora Feve
Borden Chapman (watch leader)
Maureen Macdonald
Sophie Tran
Jes Nielsen (watch leader)
Graham Standen
Linda Dredge

Core analysis teams

Kate Moran (team leader)
Andre Rochon
Fouad Hamidi
Scott Lehman
Bob Harmes
Kate Jarrett
Bernadette Quemerais
Sylvain Vallieres
Ralph Stea
Bob Mott

ACKNOWLEDGEMENTS

I thank the officers and crew of CSS Hudson for their proficient ship handling and willing support. I personally thank all the scientific staff for their dedicated work on this cruise which will be long remembered for a non stop succession of intense storms which forced repeated changes in program execution. I also congratulate the GEOTOP participants for their impressive capacity for work.

Summary of samples: 90-028-

STATION NUMBER	SAMPLE TYPE
001	IKU
002	CTD
003	WATER SAMPLE
004	IKU
005	CTD
006	BOX CORE/CTD
OO7	LCF CORE
008	WATER SAMPLE
009	CTD
010	LCF CORE
011	LCF CORE
012	CAMERA/CTD
013	LCF CORE-NO RECOVERY
014	CAMERA
015	CAMERA/CTD
016	WATER SAMPLE
017	VAN VEEN GRAB
018	LCF CORE
019	BOX CORE/CTD
020	LCF CORE
021	WATER SAMPLE
022	CAMERA
023	IKU
024	LCF CORE
025	IKU
026	LCF CORE-NO RECOVERY
O27	LCF CORE
028	CAMERA
029	WATER SAMPLE
030	LCF CORE-BROKEN BARREL,SAMPLE FROM CORE CUTTER ONLY
031	CAMERA/CTD
032	BOX CORE
033	WATER SAMPLE
034	LCF CORE- MINIMAL RECOVERY - SECOND ATTEMPT = 037
035	VAN VEEN GRAB
036	CAMERA/CTD

037	LCF CORE- SAME SITE AS 034
038	CORE
	END OF 90-028 PHASE ONE
039	LCF CORE-(J. SYVITSKI)
	BEGIN SAGUENAY SURVEY
040	BOX CORE/CTD
041	LCF CORE
042	WATER SAMPLE
043	LCF CORE
044	LEHEIGH CORE
045	CAMERA/CTD
046	LCF CORE
047	BOX CORE/CTD
048	BOX CORE/CTD
049	LCF CORE
050	WATER SAMPLE
051	BOX CORE
052	LEHEIGH CORE
053	LEHEIGH CORE
054	LEHEIGH CORE
055	LCF CORE
056	BOX CORE
057	LCF CORE-BROKEN BARREL
058	CTD
059	WATER SAMPLE
060	CAMERA
	END OF CRUISE

THE FOLLOWING SECTION ILLUSTRATES :

1) LOCATION OF PISTON CORE, BOX CORE OR IKU GRAB STATIONS ON SEISMIC PROFILE

2) APPARENT PENETRATION AND ACTUAL CORE RECOVERY

The amount of apparent penetration measured from the outside of the core barrel was used to determine the amount of penetration on the seismic record, (based on velocity of 1480m/second).

3) X-RAY DESCRIPTION DOWN CORE (SCALE IN CM)

4) WRITTEN DESCRIPTION OF CORE (SCALE IN CM)

5) SHEAR STRENGTH, VELOCITY AND , MAGNETIC SUSCEPTIBILITY PROFILES DOWN CORE

(NOTE: THE ATTACHED LEGEND PERTAINS TO ALL CORES)

LEGEND

Sandy mud, sand

Silty mud, silt

Silty clay, clay or clayey mud

Mud, undifferentiated

Major deformation

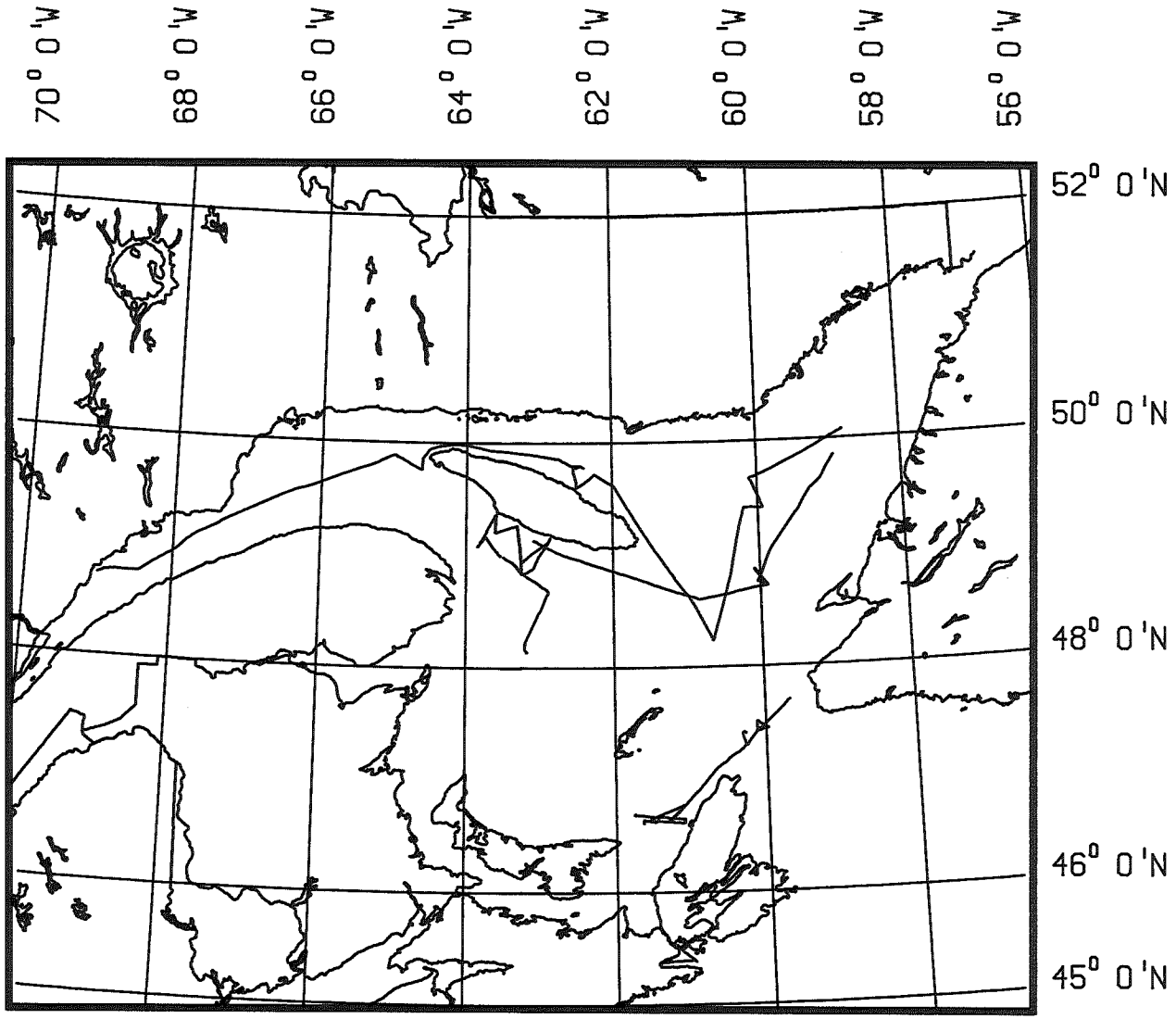
● Pebble clast

O Intraclast (rip-ups, clay balls)

S Shell fragments

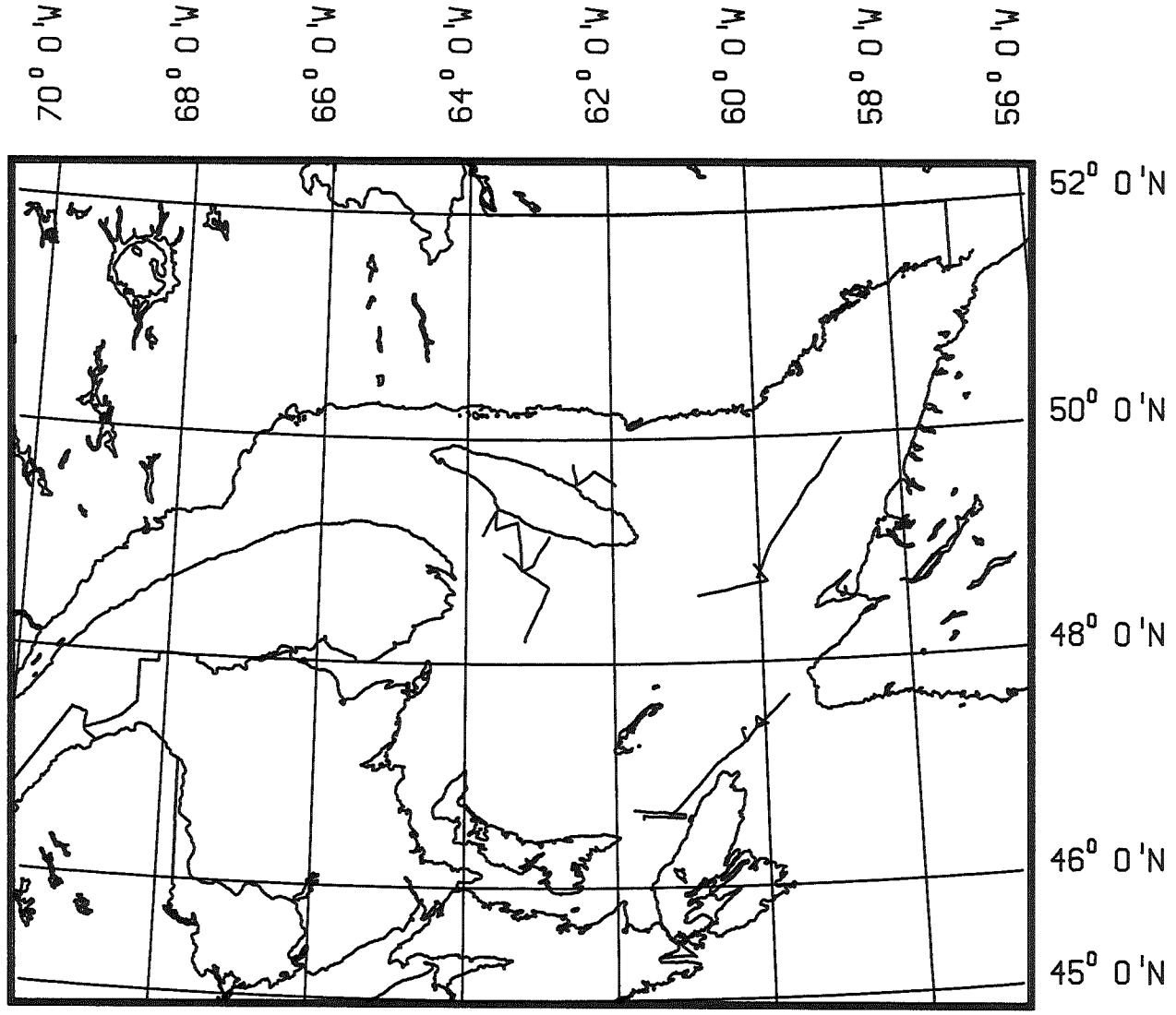
M Mottling

3.5 KHZ TRACKS
90-028



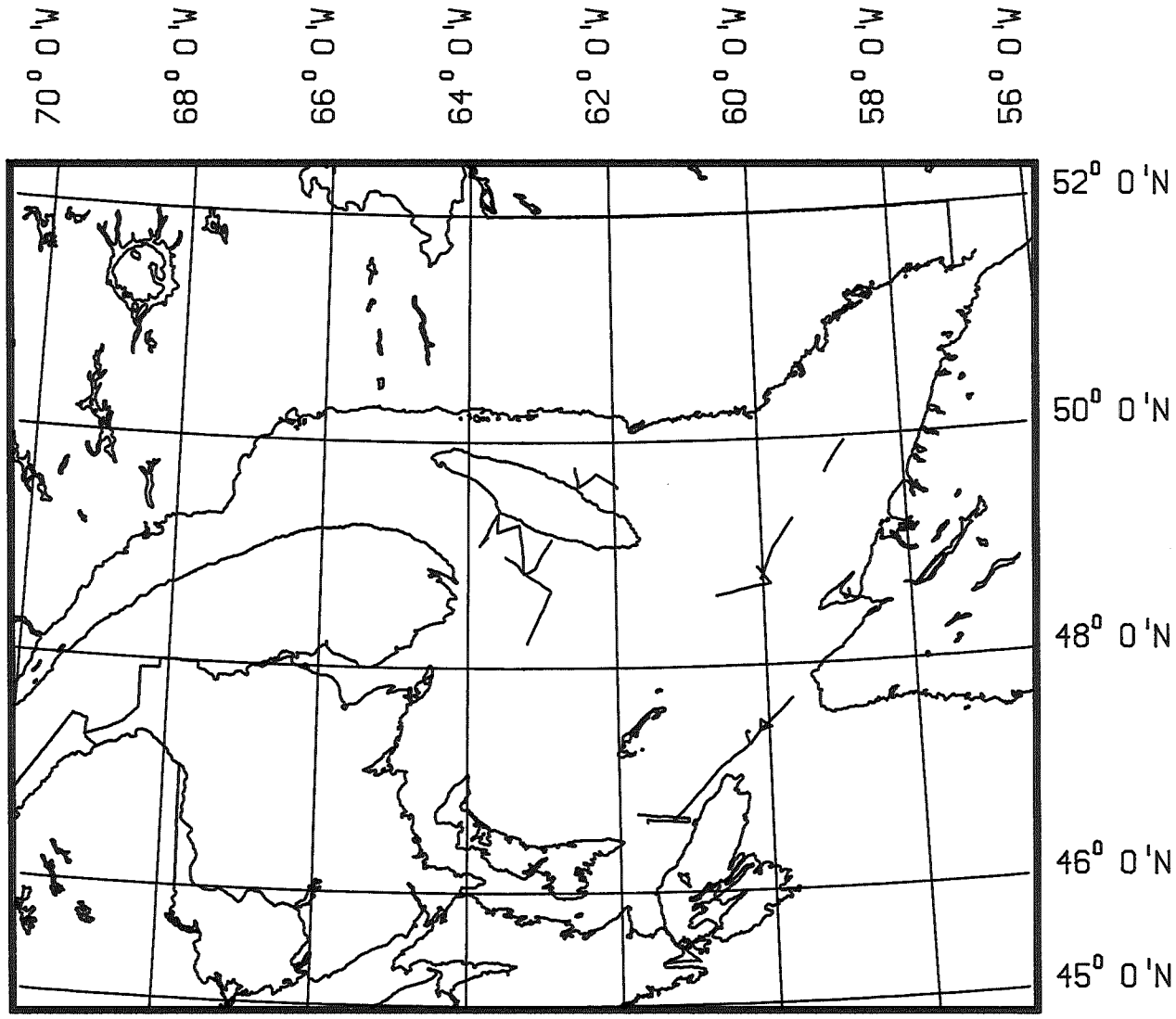
ATLANTIC GEØSCIENCE CENTRE

SLEEVE GUN SEISMICS TRACKS
90-028



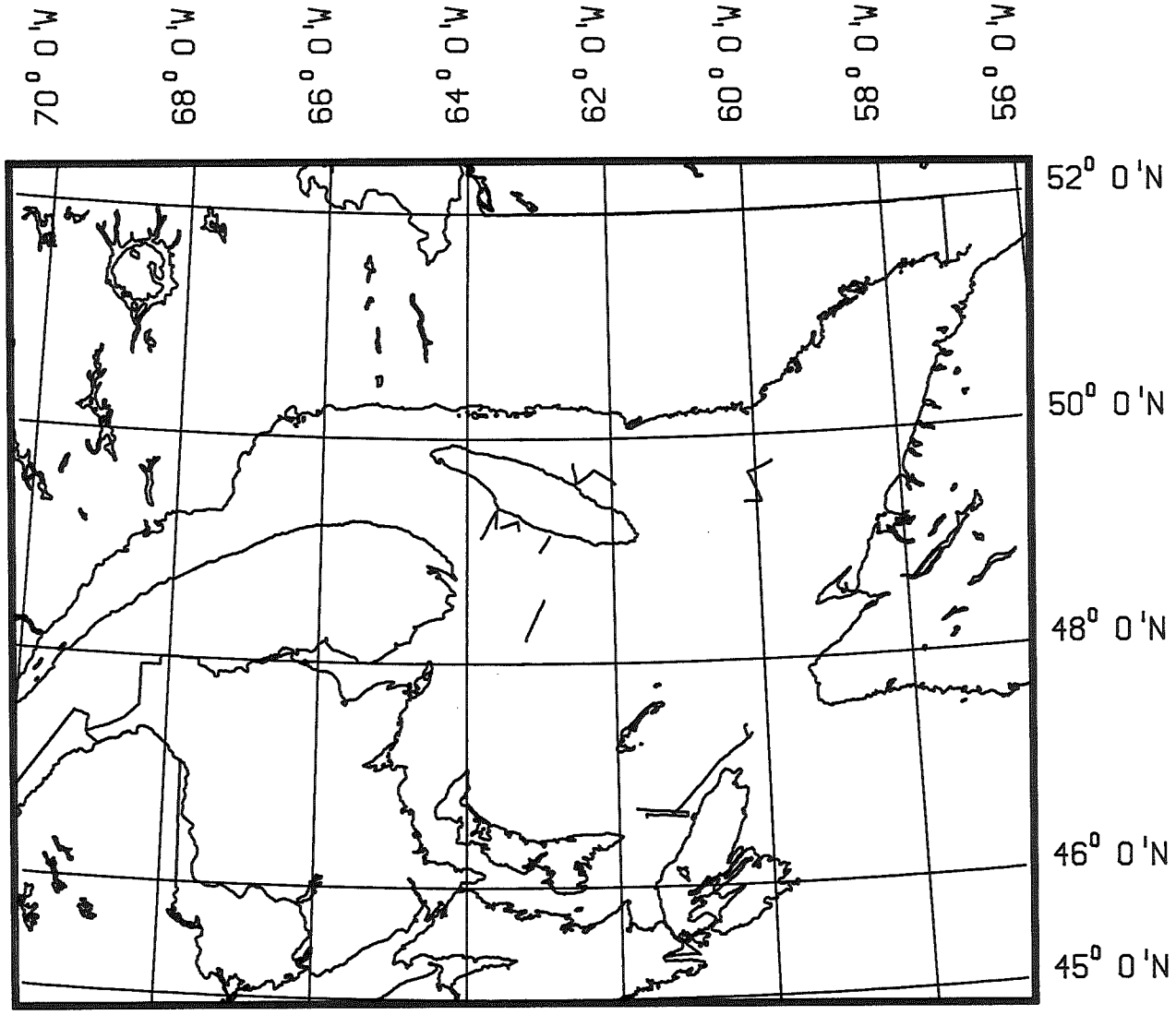
ATLANTIC GEØSCIENCE CENTRE

HUNTEC TRACKS
90-028



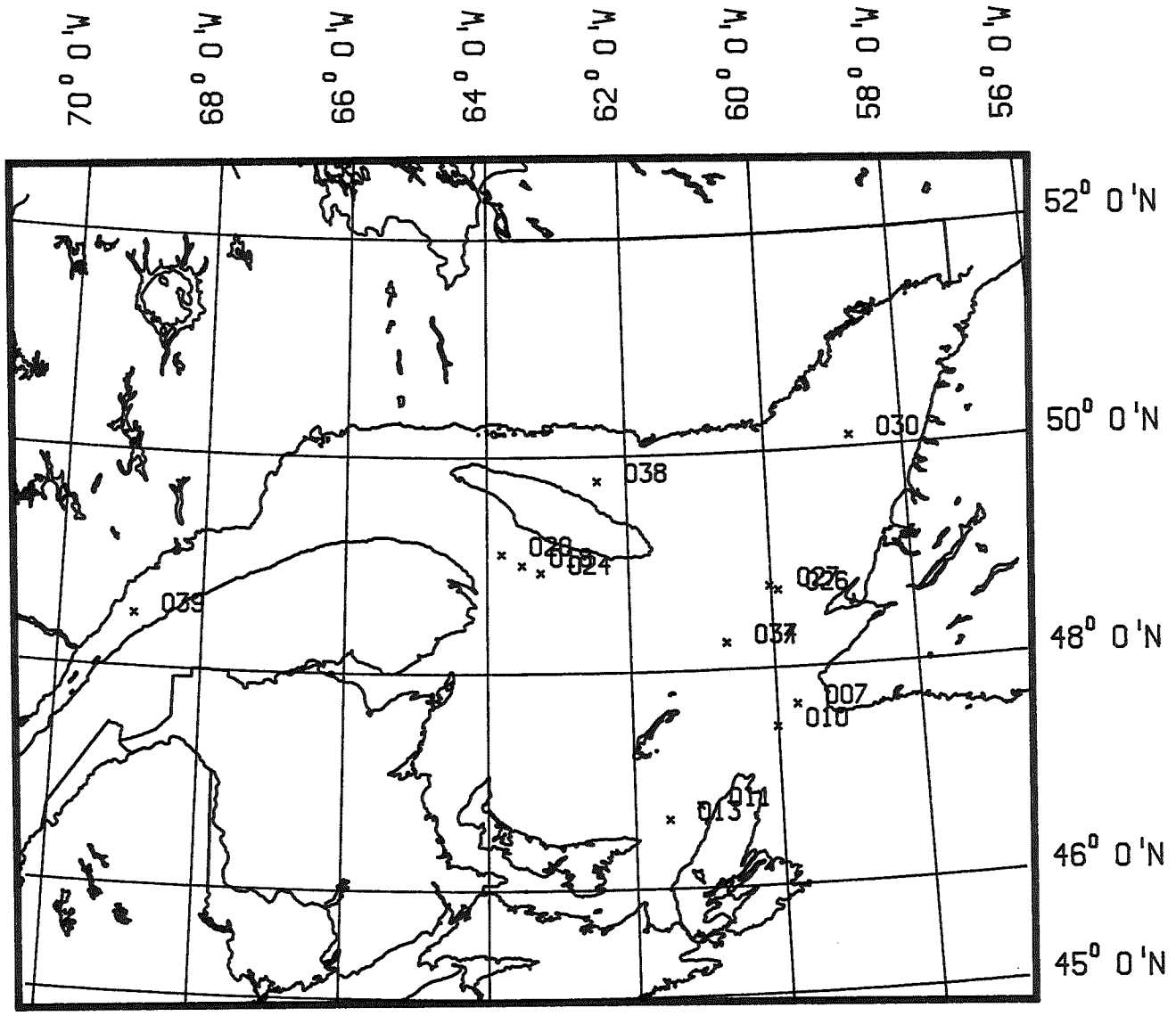
ATLANTIC GEOSCIENCE CENTRE

SIDESCAN TRACKS
90-028

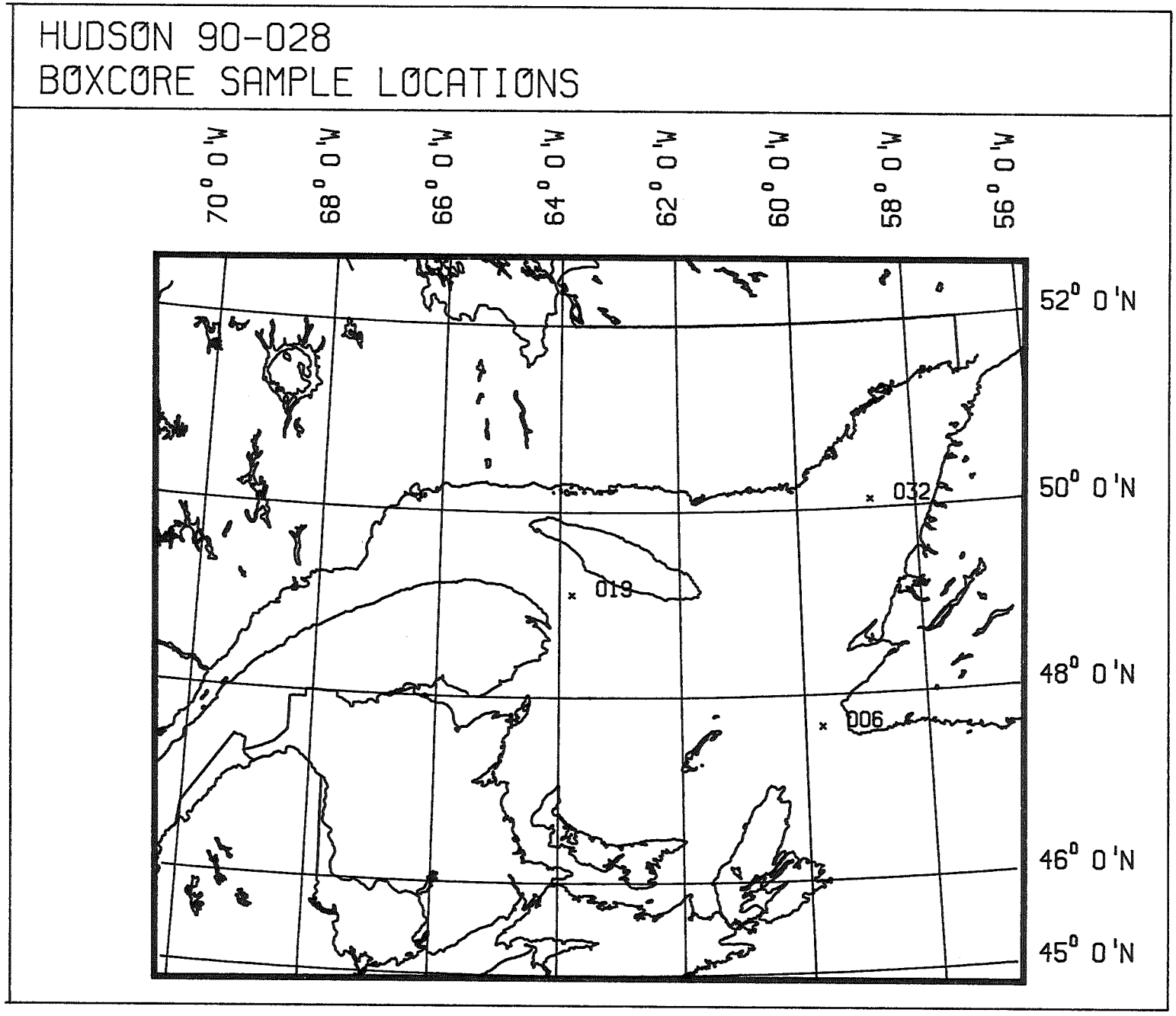


ATLANTIC GEØSCIENCE CENTRE

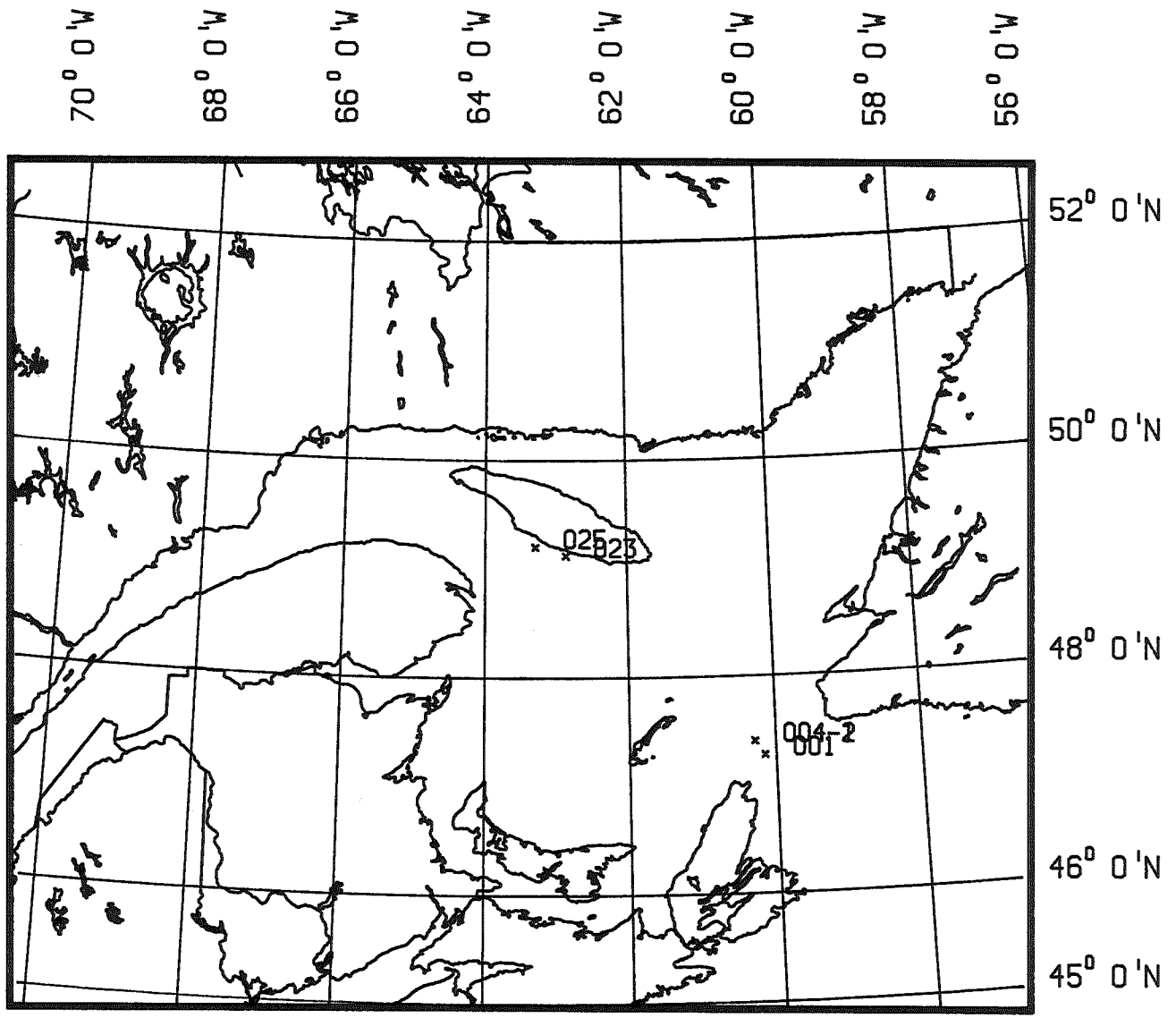
HUDSON 90-028
CORE SAMPLE LOCATIONS



ATLANTIC GEOSCIENCE CENTRE


HUDSØN 90-028
BØXCØRE SAMPLE LØCATIØNS
70° 0'W
68° 0'W
66° 0'W
64° 0'W
62° 0'W
60° 0'W
58° 0'W
56° 0'W
52° 0'N
50° 0'N
48° 0'N
46° 0'N
45° 0'N
032
019
006
ATLANTIC GEØSCIENCE CENTRE

HUDSØN 90-028
IKU GRAB SAMPLE LØCATIØNS



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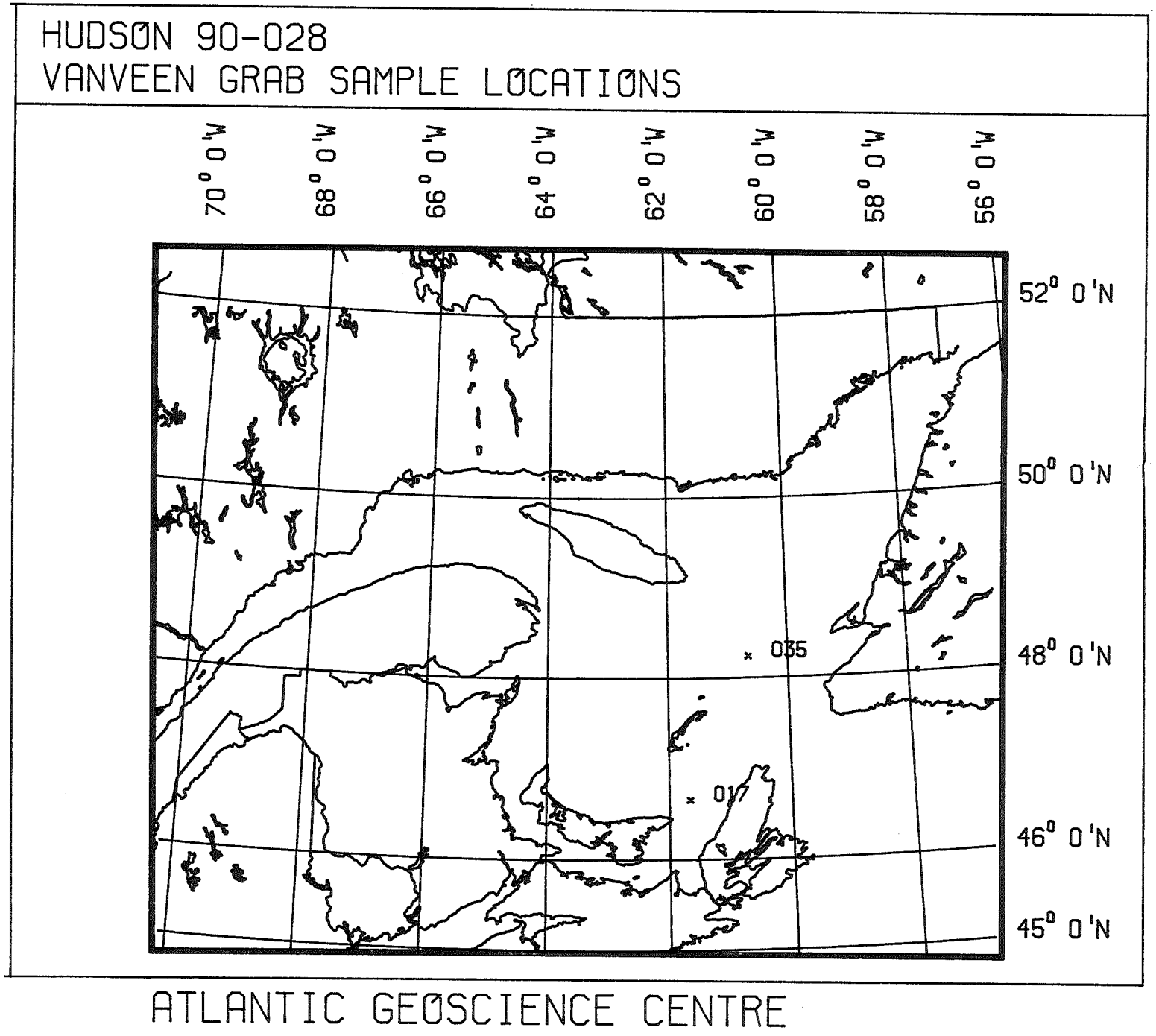
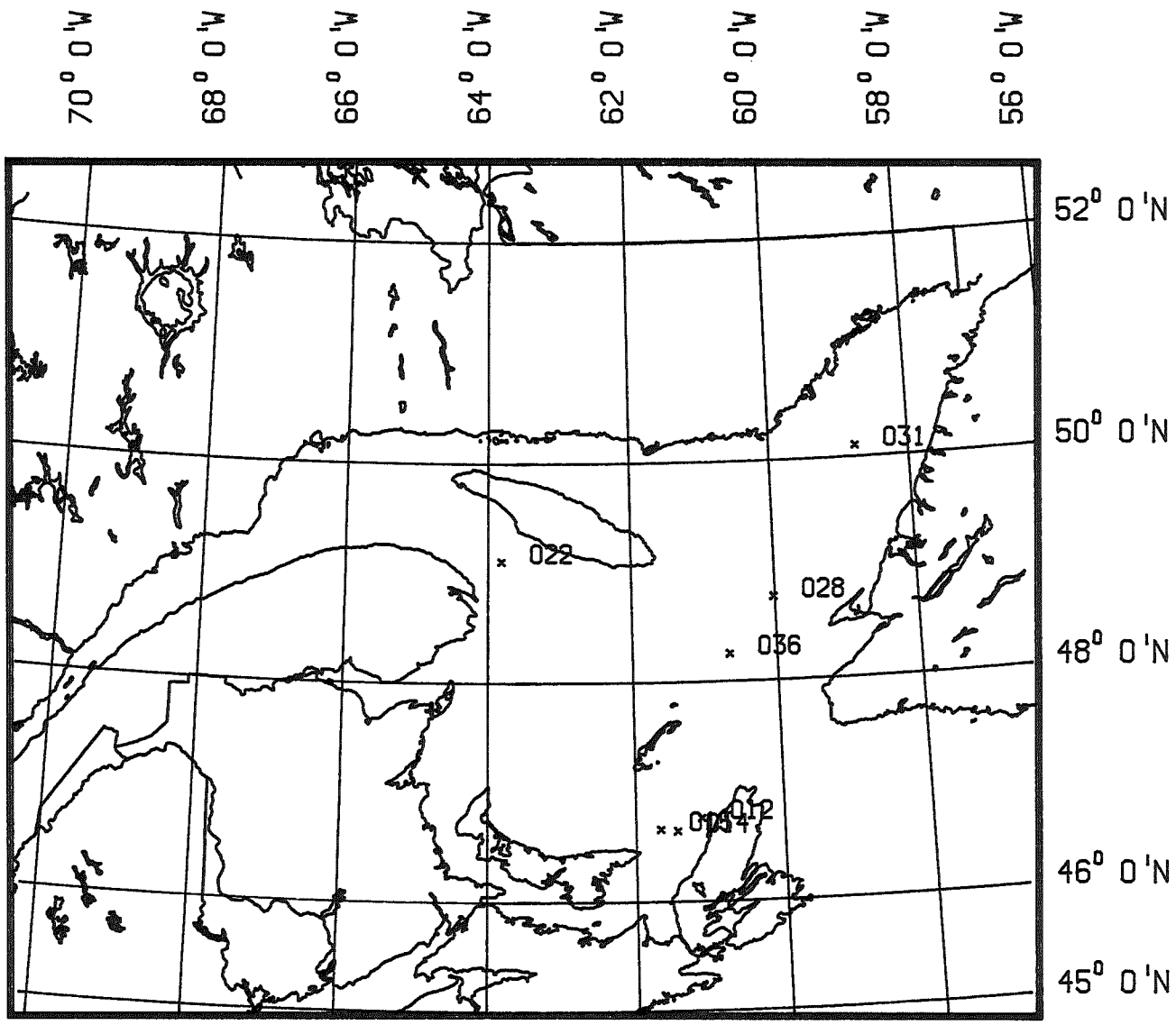

HUDSØN 90-028
VANVEEN GRAB SAMPLE LØCATIØNS
70° 0'W
68° 0'W
66° 0'W
64° 0'W
62° 0'W
60° 0'W
58° 0'W
56° 0'W
52° 0'N
50° 0'N
48° 0'N
46° 0'N
45° 0'N
035
017
ATLANTIC GEØSCIENCE CENTRE

HUDSON 90-028
CAMERA LOCATIONS

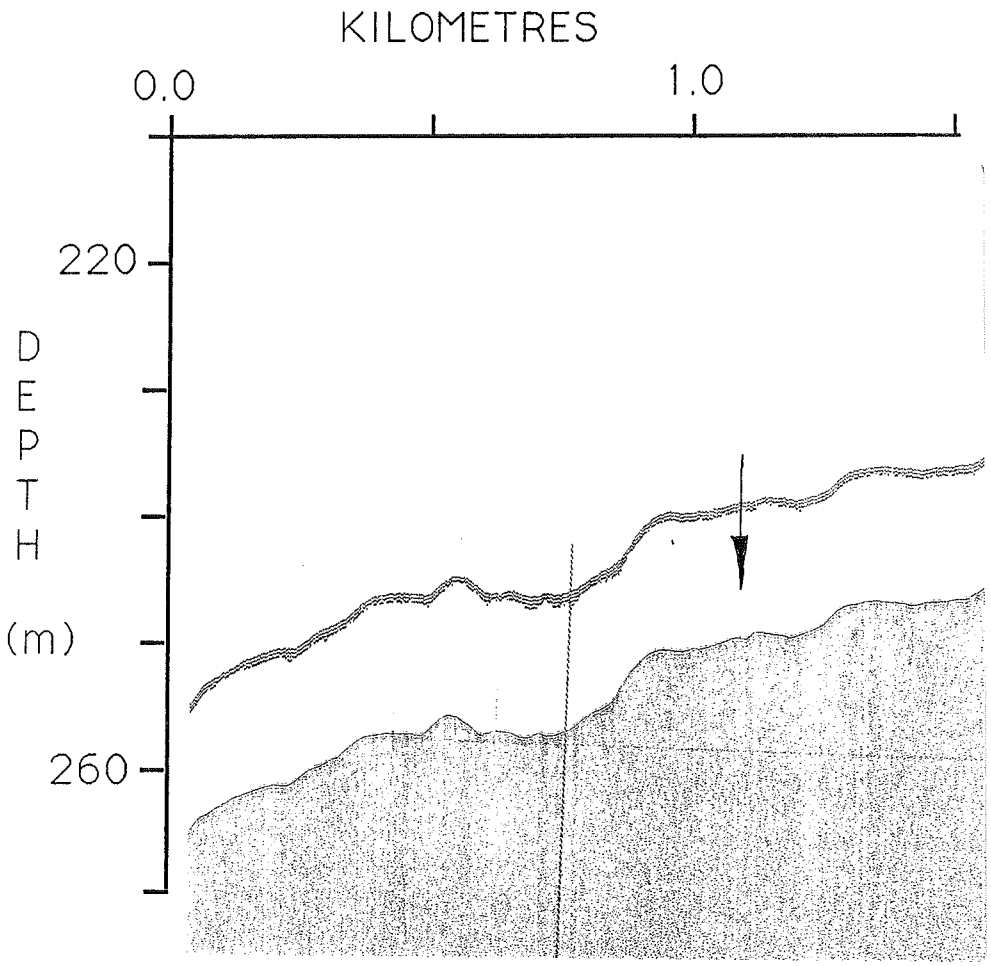


ATLANTIC GEOSCIENCE CENTRE

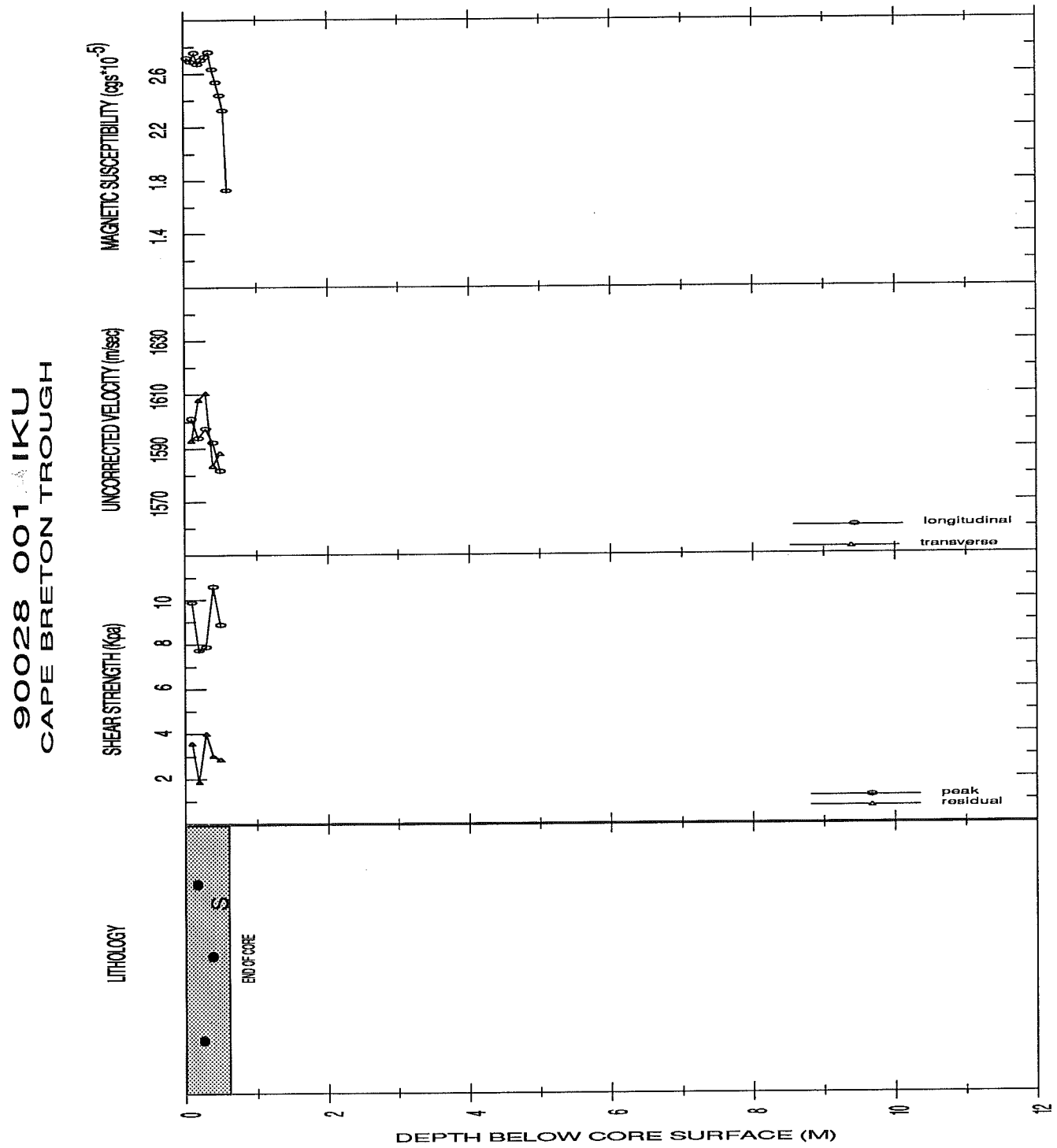
90028 - 001: IKU

Julian day:	306	GMT Time:	18:05
Latitude:	47 16.07 N	Longitude:	60 09.48 W
Depth:	254 m		

Geographic location: Cape Breton Trough

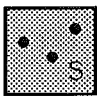


HUNTEC DTS profile
IKU location 90-028-001


90028 001 IKU
CAPE BRETON TROUGH
LITHOLOGY
SHEAR STRENGTH (Kpa)
UNCORRECTED VELOCITY (m/sec)
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
END OF CORE
peak
residual
longitudinal
transverse
DEPTH BELOW CORE SURFACE (M)

90028-001 IKU

0



50
60

Massive red-brown, sandy mud with gravel, occasional pebble-sized sandstone clasts and disarticulated shell fragments. Slightly calcareous.

Box Core description:
Surface pail: Large dark rocks on surface. Bulk (99%) of material is sticky red clayey mud. Some pebbles and a small amount of sand.
Clasts: Rocks include green augen gneiss, syenogranite, black siltstone and red coarse sandstone.

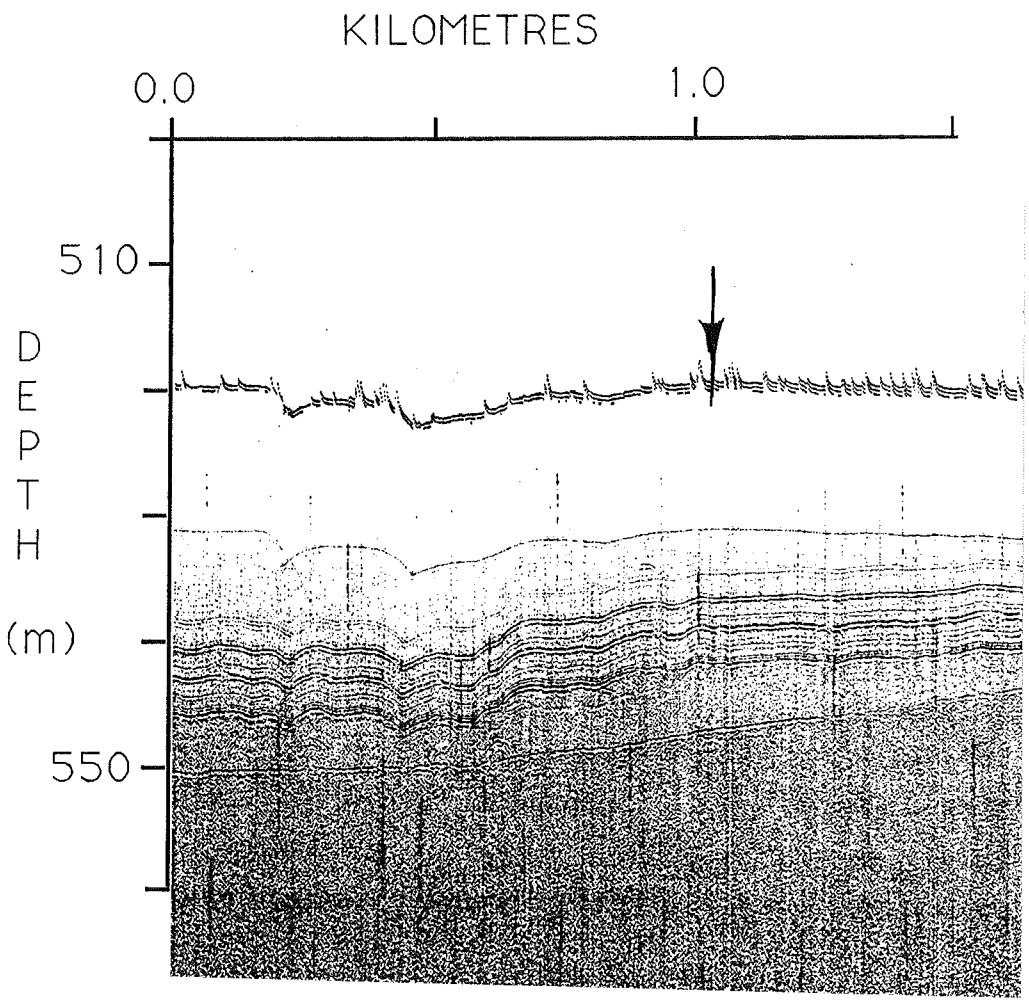
Just below surface: Mostly sticky red gumbo silt-clay with much less pebbles and about the same amount of sand. Pearly shell fragments and barnacle plates.
Clasts: 33%grey sandstone; 30% red sandstone; 7% buff limestone: 21% striated black non-calcareous siltstone, flat-iron shapes; 4% striated red mudstones; 5% quartz-hornblende granitoid metamorphic rocks.

Bottom pail: Mostly fine red gumbo clay with much less pebbles and about the same amount of sand. Shell fragments.
Clasts: There are grey smeared coatings on the pebbles despite the red colour of the matrix-old till? 37% red and grey sandstone; 44% grey and black siltstone, faceted but not striated; 6% red mudstone, striated and flat-iron shapes; 19% quartz-hornblende metamorphics.

90028 - 006: Box Core

Julian day:	307	GMT Time:	14:01
Latitude:	47 39.54 N	Longitude:	59 43.31 W
Depth :	521 m	Penetration:	50 cm

Geographic location: Cabot Strait



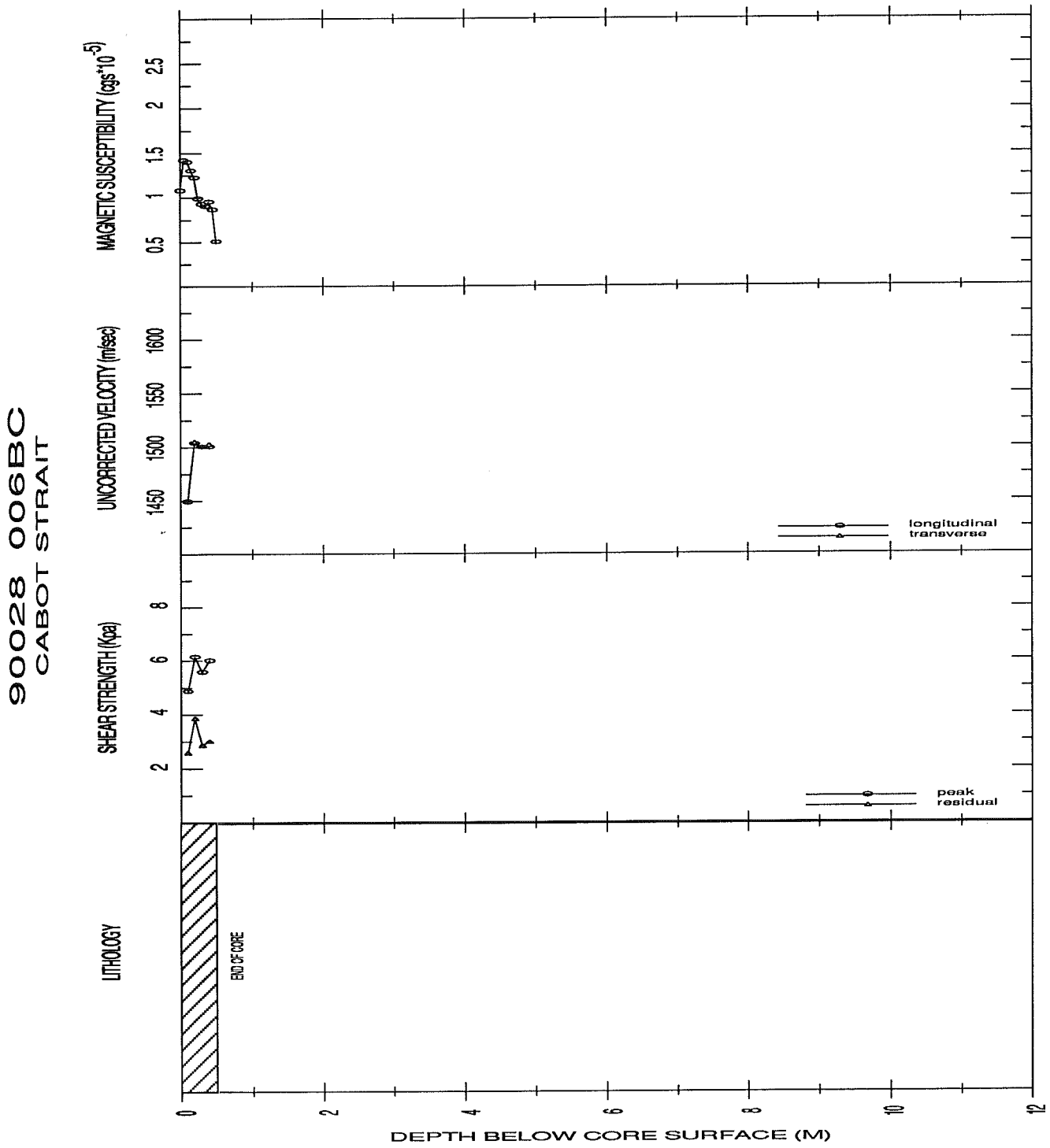
HUNTEC DTS profile
core location 90-028- 006

90028-006c Box Core

0

48

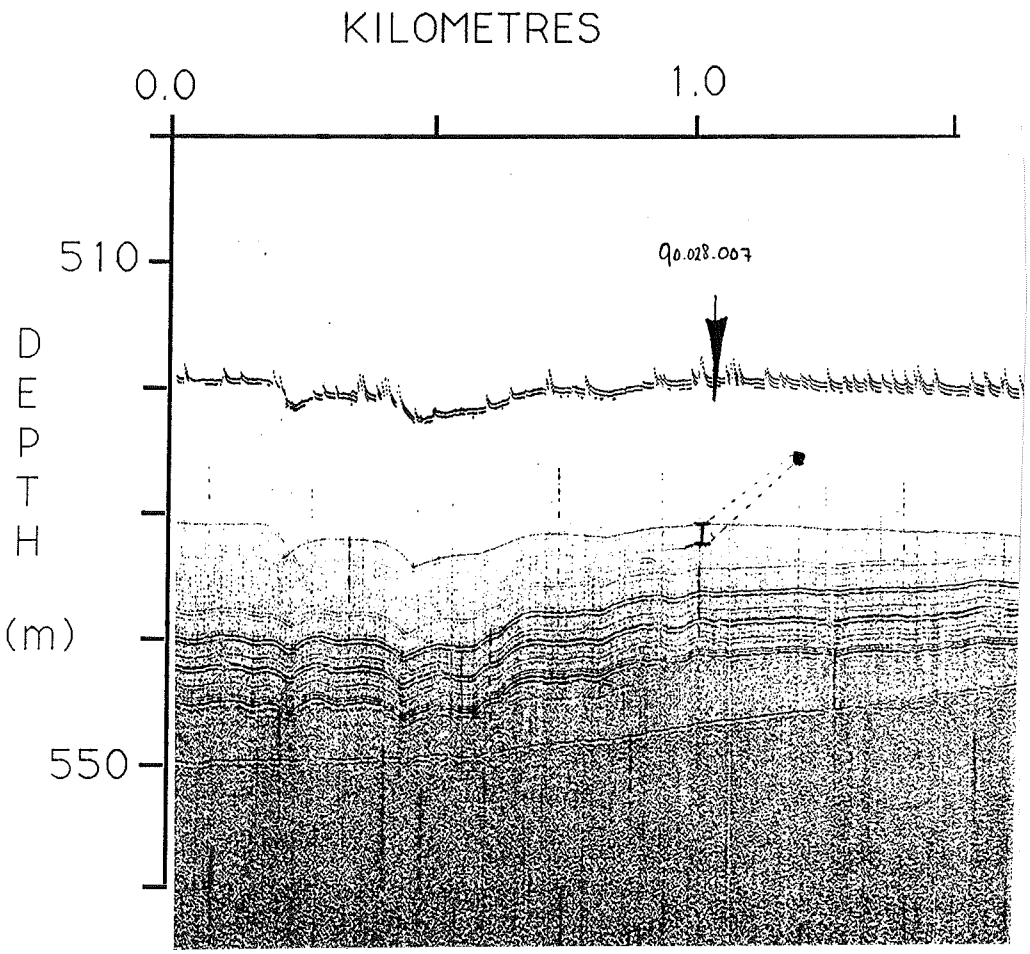
Dark greyish-brown massive silty mud


90028 006BC
CABOT STRAIT
LITHOLOGY
END OF CORE
SHEAR STRENGTH (Kpa)
2
4
6
8
peak
residual
UNCORRECTED VELOCITY (m/sec)
1450
1500
1550
1600
longitudinal
transverse
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
0.5
1
1.5
2
2.5
0
2
4
6
8
10
12
DEPTH BELOW CORE SURFACE (M)

90028 - 007: Trigger Weight Core

Julian day:	307	GMT Time:	15:34
Latitude:	47 39.54 N	Longitude:	59 43.25 W
Depth :	521 m		
App. penetration:	183 cm	TWC length:	65 cm

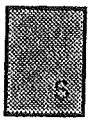
Geographic location: Cabot Strait



HUNTEC DTS profile
core location 90-028- 007

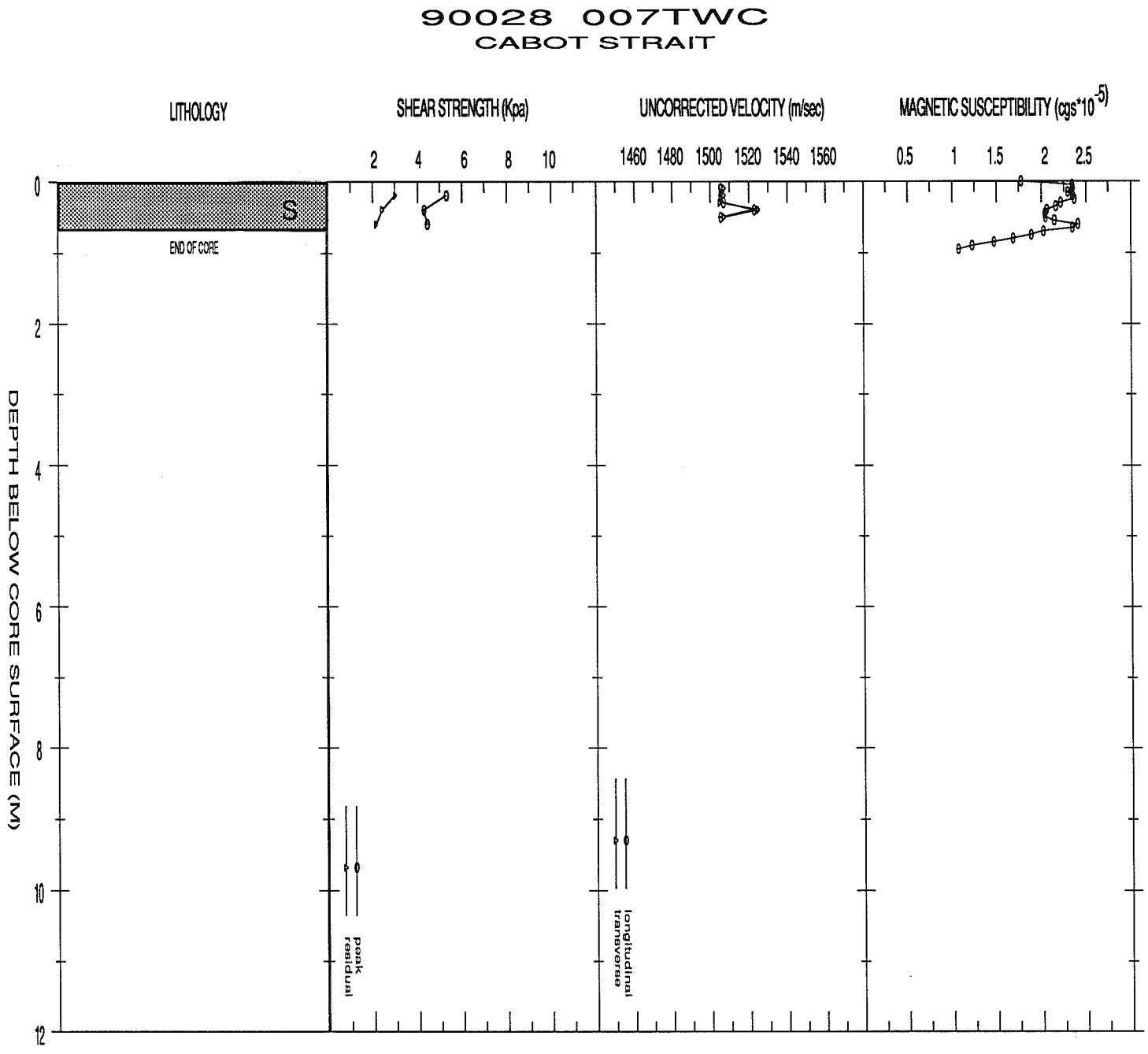
90028-007 TWC

0



65

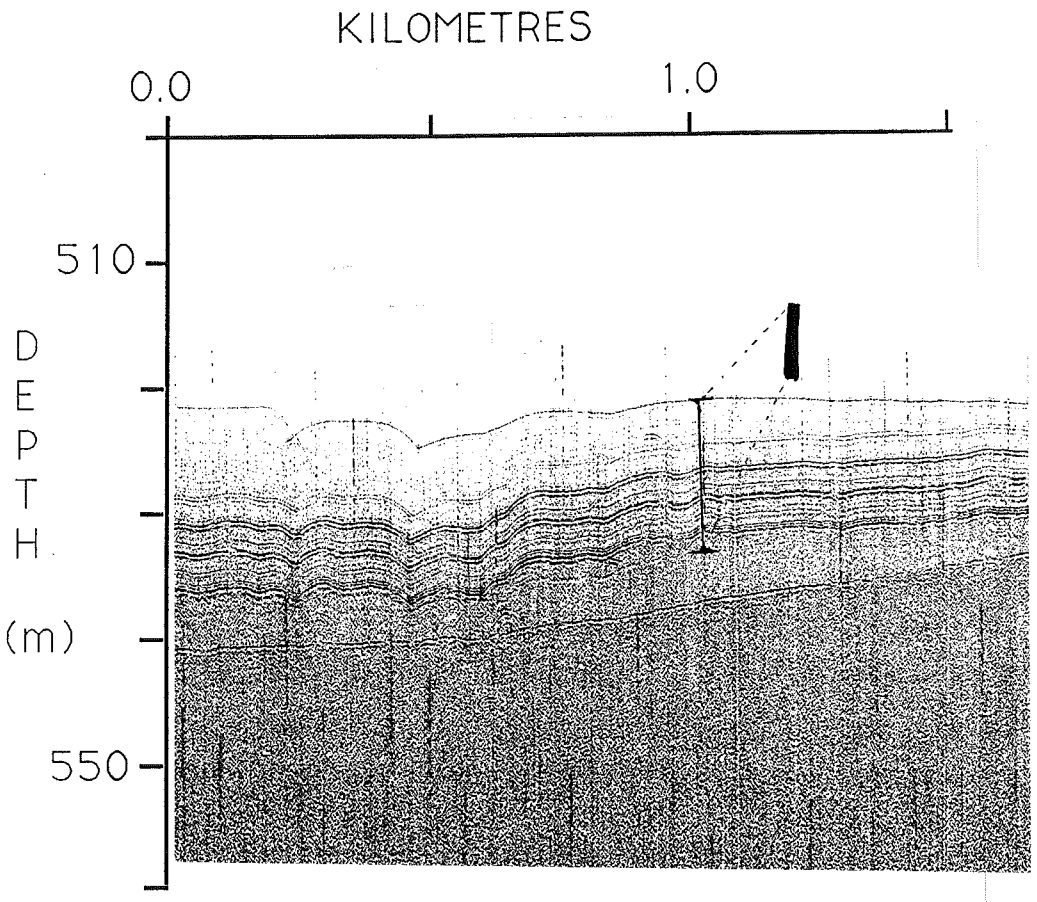
Massive dark grey moderately calcareous mud.


90028 007TWC
CABOT STRAIT
LITHOLOGY
SHEAR STRENGTH (Kpa)
UNCORRECTED VELOCITY (m/sec)
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
2 4 6 8 10
1460 1480 1500 1520 1540 1560
0.5 1 1.5 2 2.5
S
END OF CORE
peak
residual
longitudinal
transverse
DEPTH BELOW CORE SURFACE (M)
0 2 4 6 8 10 12

90028 - 007: L-Piston Core

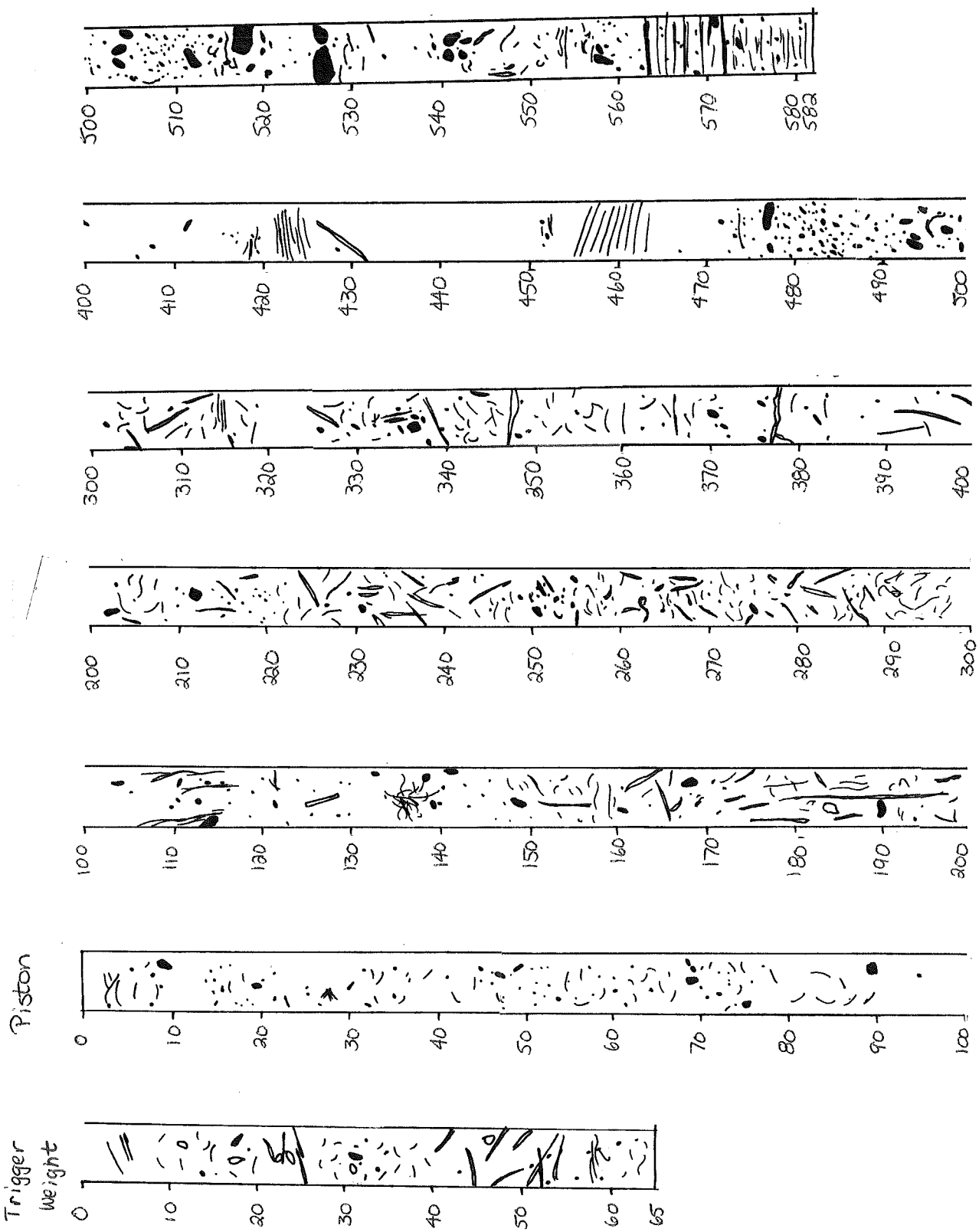
Julian day:	307	GMT Time:	15:34
Latitude:	47 39.54 N	Longitude:	59 43.25 W
Depth :	521 m	Corer length:	1824 cm
App. penetration:	1216 cm	Core recovery:	580 cm

Geographic location: Cabot Strait

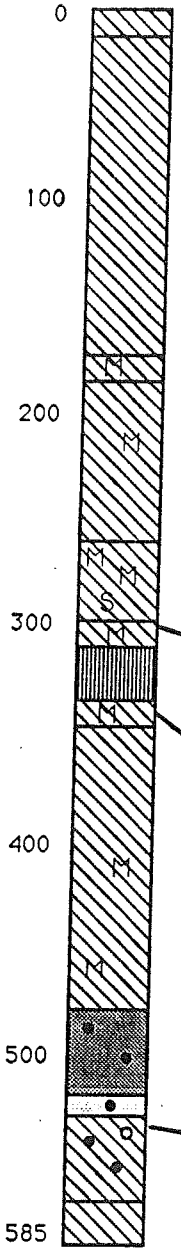


HUNTEC DTS profile
core location 90-028- 007

LCF CORE STATION HU-029-007



90028-007



Silty mud, slightly calcareous

Greyish silty mud, slightly mottled, moderately calcareous

Grey brown silty mud, slightly mottled, non-calcareous

Grey brown silty mud, occasional mottling, non-calcareous

grading to
Brown silty mud, more black sulphide mottling than above,
slightly calcareous

Brown mottled silty mud, slightly calcareous
Convoluted contact, and intrusion of upper brown mud into lower red-grey mud. Load structures.

Reddish grey silty mud, slightly calcareous

Massive brown silty mud, some mottling, moderately calcareous

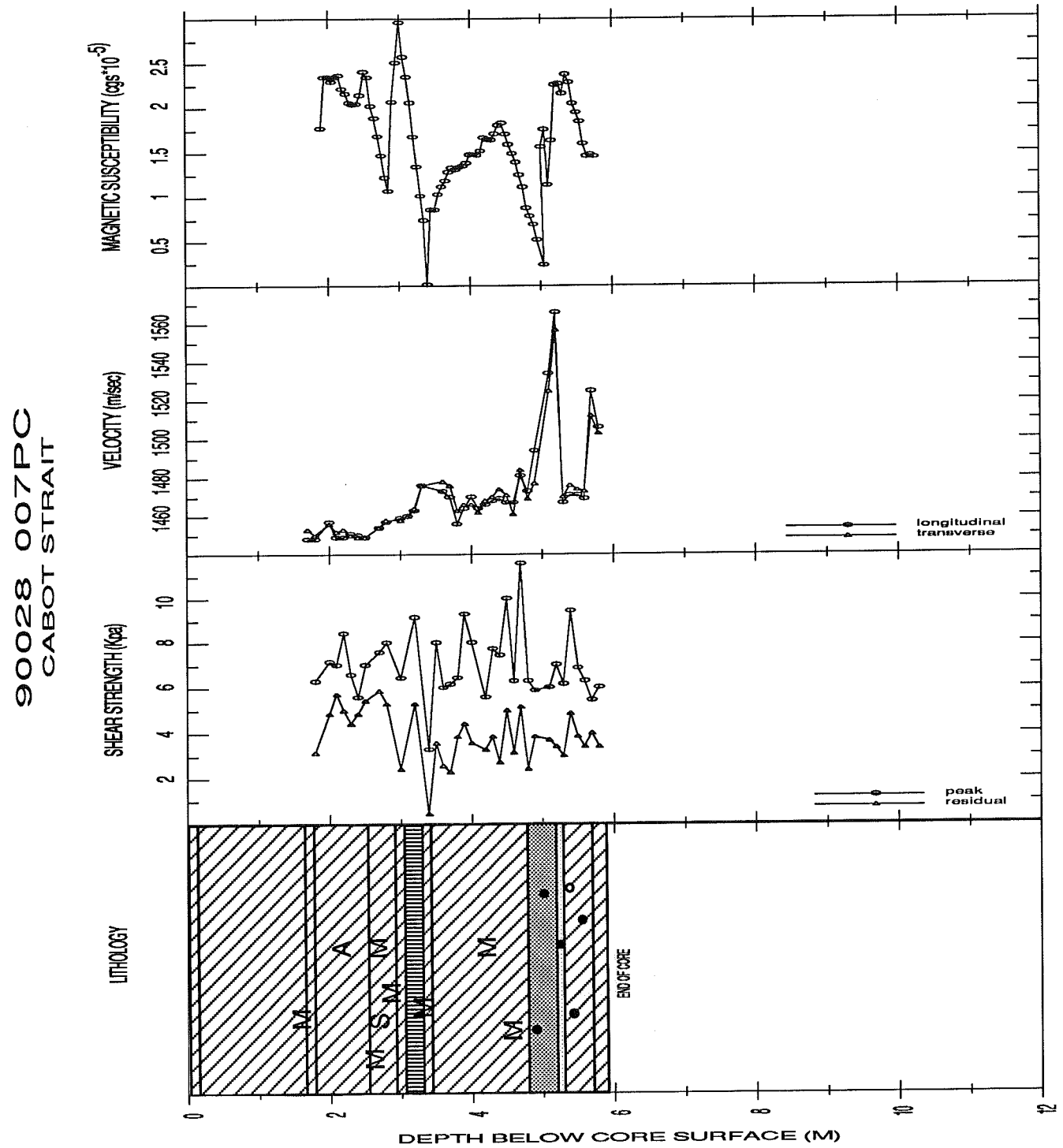
Dark reddish brown silty mud with gritty sand and pebbles,moderately clacareous

Massive reddish sandy silt, some pebbles, moderately calc

Intraformational clasts and rip-ups

Dark brown silty mud, some pebbles, moderately calcareous

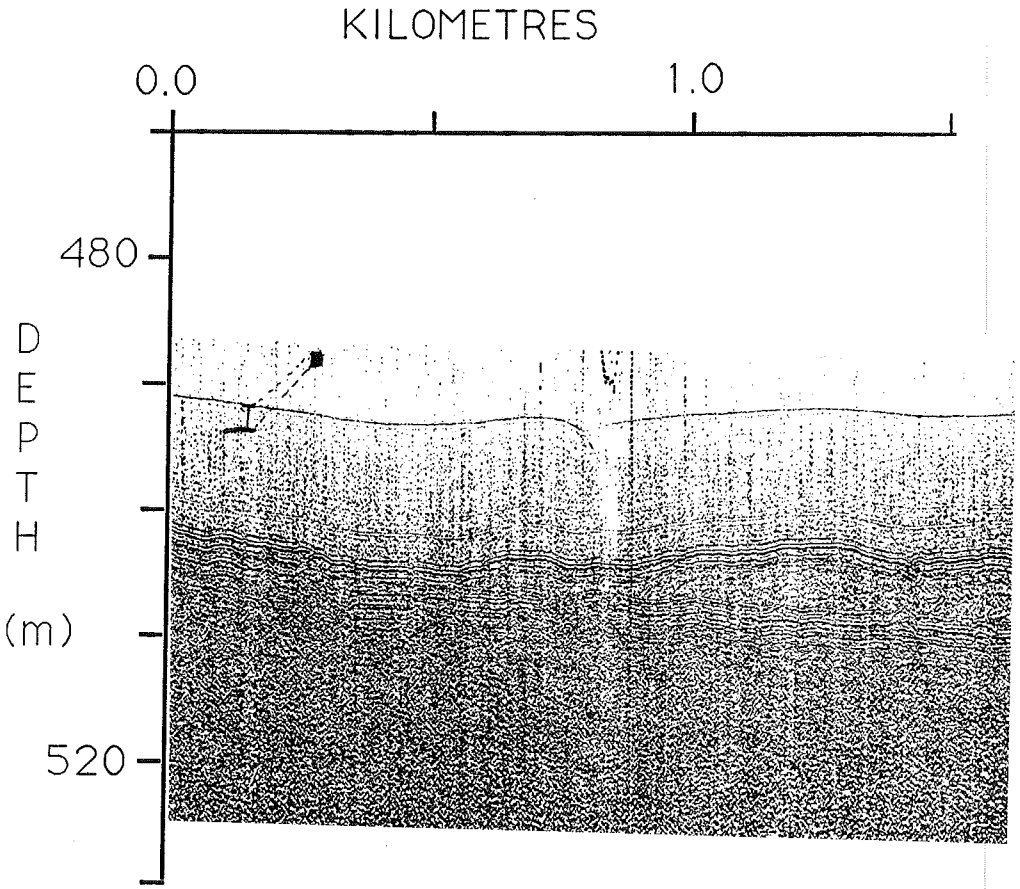
Dark reddish brown silty mud, moderately calcareous


90028 007PC
CABOT STRAIT
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
0.5
1
1.5
2
2.5
VELOCITY (m/sec)
1460
1480
1500
1520
1540
1560
longitudinal
transverse
SHEAR STRENGTH (Kpa)
2
4
6
8
10
peak
residual
LITHOLOGY
M
A
M
M
M
M
END OF CORE
0
2
4
6
8
10
12
DEPTH BELOW CORE SURFACE (M)

90028 - 010: Trigger Weight Core

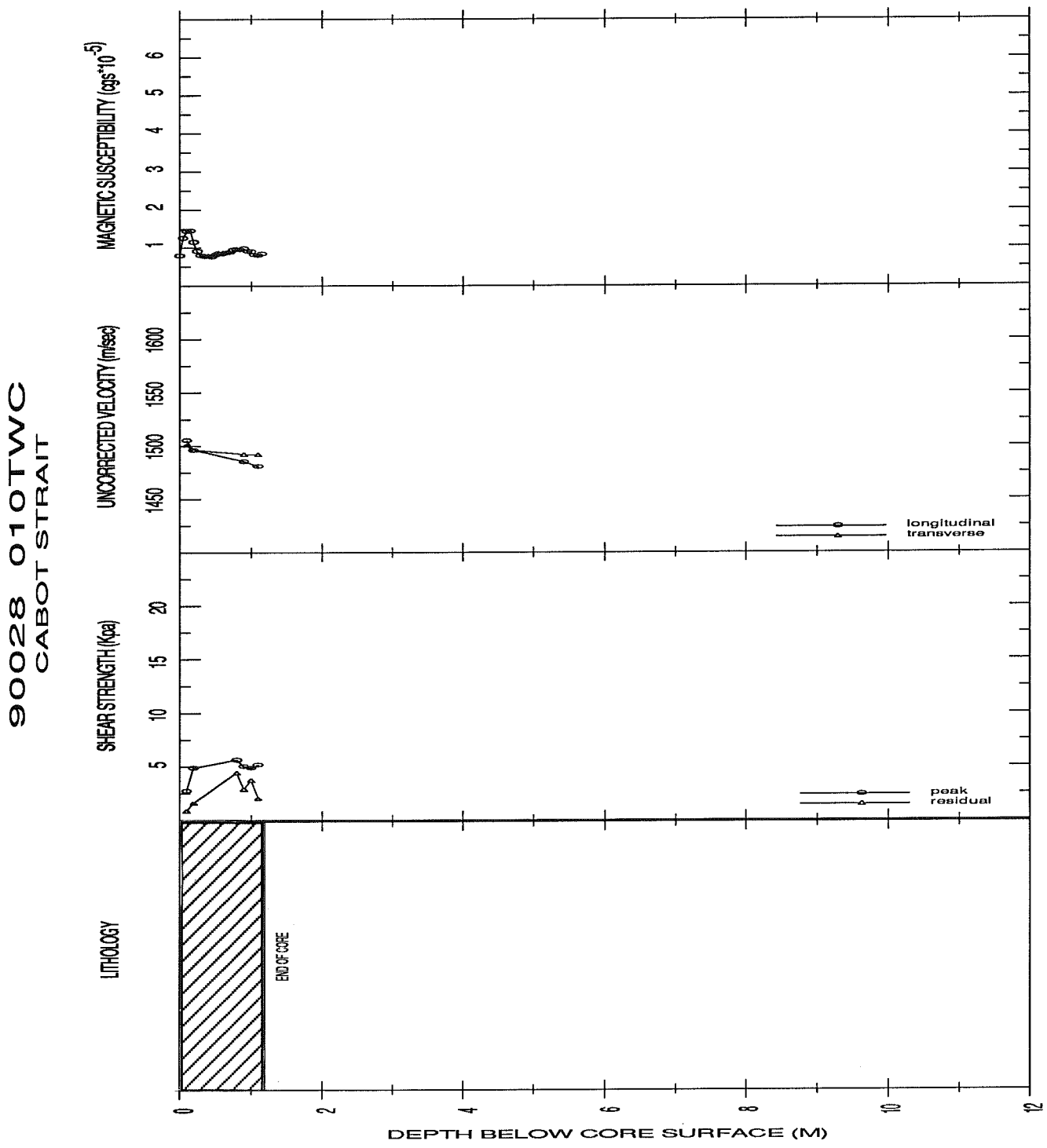
Julian day:	307	GMT Time:	20:46
Latitude:	47 27.57 N	Longitude:	60 00.52 W
Depth :	491 m		
App. penetration:	183 cm	TWC length:	109 cm

Geographic location: Cabot Strait



HUNTEC DTS profile
core location 90-028-010

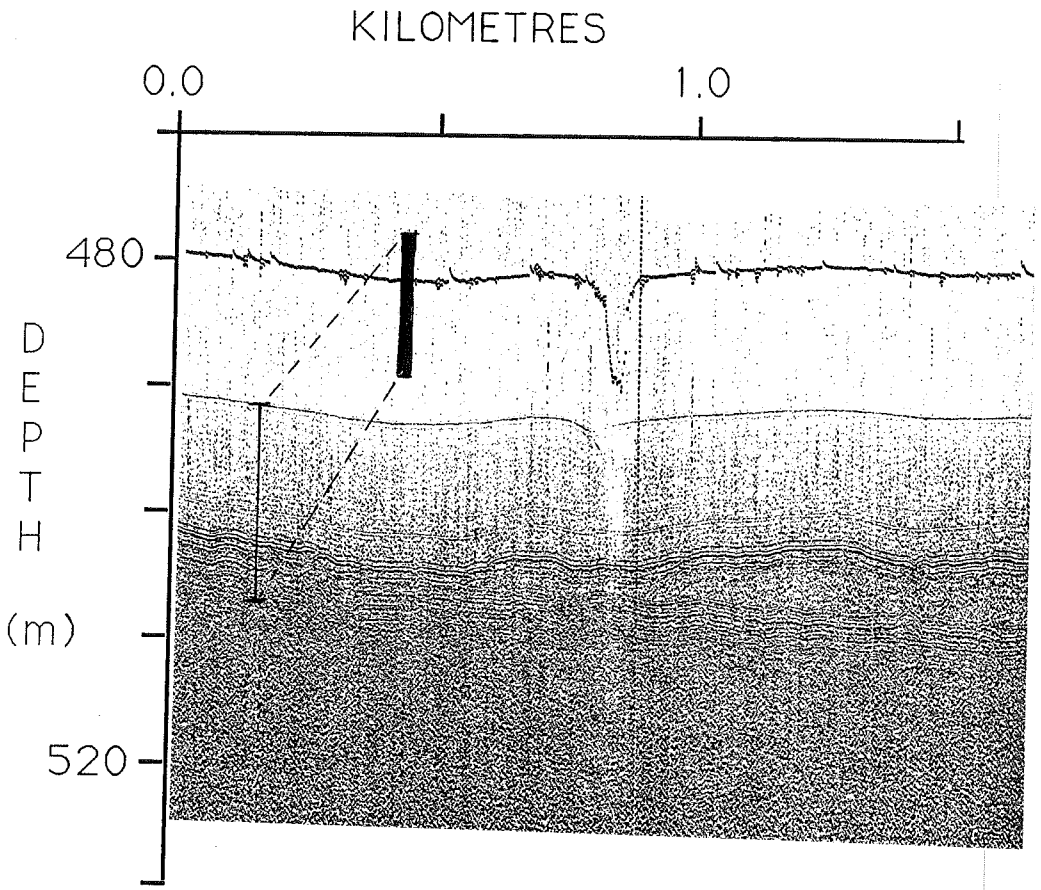
Olive grey silty mud, massive, slightly calcareous


90028 010TWC
CABOT STRAIT
LITHOLOGY
SHEAR STRENGTH (Kpa)
UNCORRECTED VELOCITY (m/sec)
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
END OF CORE
peak
residual
longitudinal
transverse
DEPTH BELOW CORE SURFACE (M)

90028 - 010: Piston Core

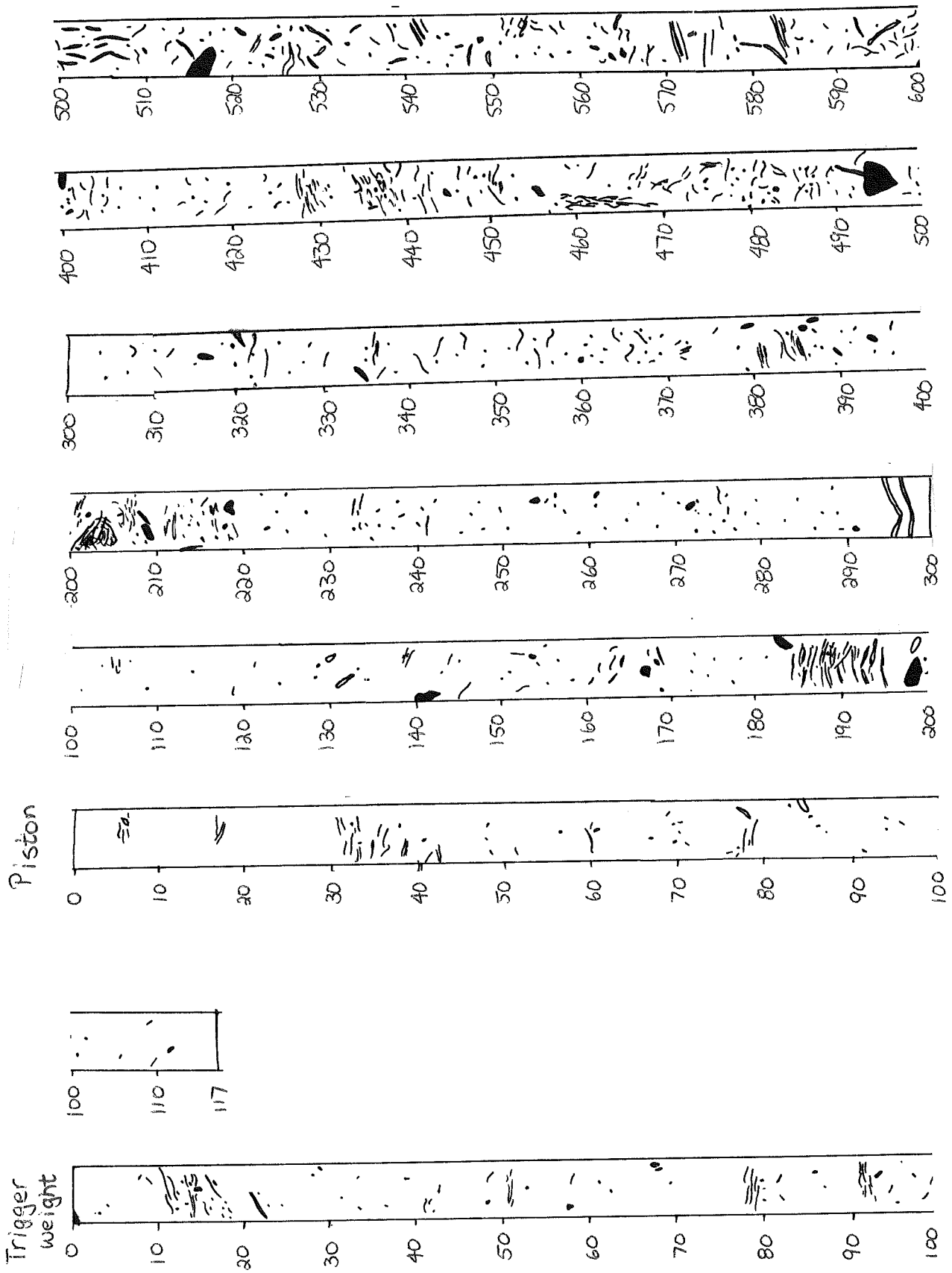
Julian day:	307	GMT Time:	20:46
Latitude:	47 27.57 N	Longitude:	60 00.52 W
Depth:	491 m	Corer length:	1824 cm
App. penetration :	1581 cm	Core recovery:	1155 cm

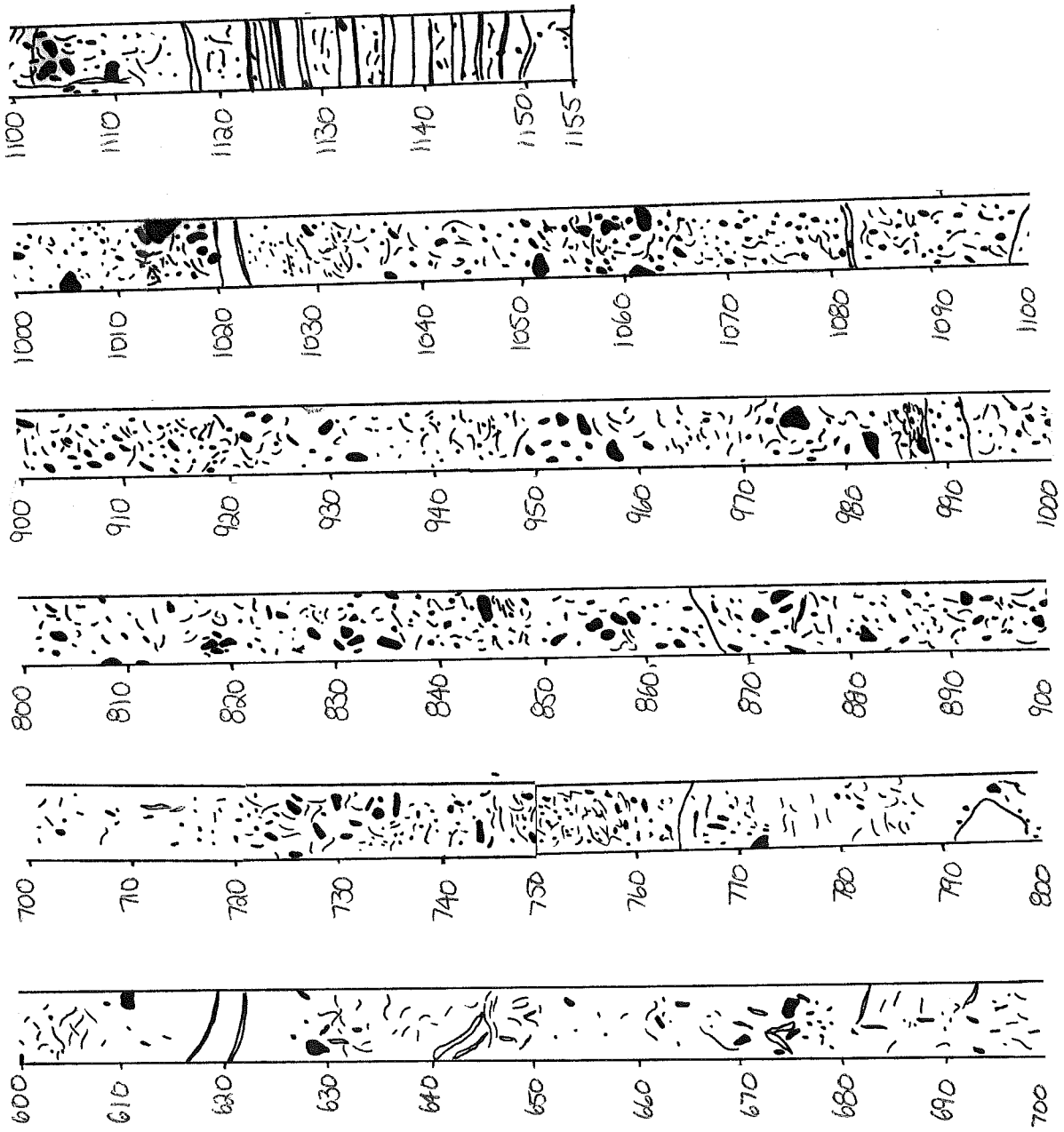
Geographic location: Cabot Strait



HUNTEC DTS profile
core location 90-028-010

LCF CORE STATION HU-029-010




600
610
620
630
640
650
660
670
680
690
700
700
710
720
730
740
750
760
770
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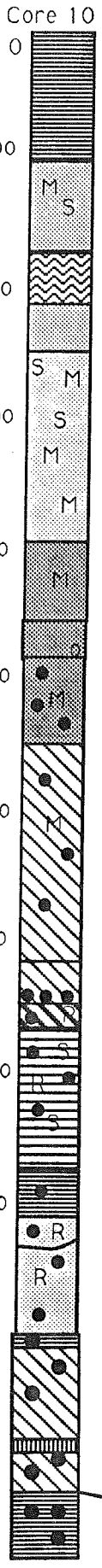
790
800
800
810
820
830
840
850
860
870
880
890
900
900
910
920
930
940
950
960
970
980
990
1000
1000
1010
1020
1030
1040
1050
1060
1070
1080
1090
1100
1100
1110
1120
1130
1140
1150
1155



Massive grey clayey mud, slightly calcareous, fractured

Massive grey sandy mud with shell fragments and black mottling. Very soft, possibly disturbed

Core partially imploded

Massive grey, mud, increasing in stiffmess and sand content.

Stiff, massive, sulphide mottled, moderately calcareous olive grey mud, with occasional shell fragments to 310 cm.

Massive, dark grey brown mud, moderately calcareous, mottled

Dark brown mud, moderately calcareous, with organic fragment at base

Dark grey brown mud, with small angular gravel fragments, moderately calcareous, some mottling.

Dark brown, moderately calcareous silty mud, mottled, with pebbles. Gradual colour change at 580cm to red-brown, and back to dark brown at 640cm.

Dark brown massive silty mud, moderately calcareous, with a pebble layer.

Dark red-brown, mod. calcareous pebbly silt with sand, pebbles and clay balls

Dark brown, moderately calcareous clayey silt with large and small rock clasts, shells, and small red clay balls

Dark brown, moderately calcareous clayey mud with pebbles, incl wacke clast, granitoid.

Brown slightly calcareous, silty sandy mud with pebbles (diamicton), and small red clayballs or mudstone clasts. Deformed red lamina at 930cm; becoming stiffer below.

Mottled olive grey, diamictic, clay mud, slightly calcareous. Schist, metasiltstone, grey mudstone, feldsp sandstone.

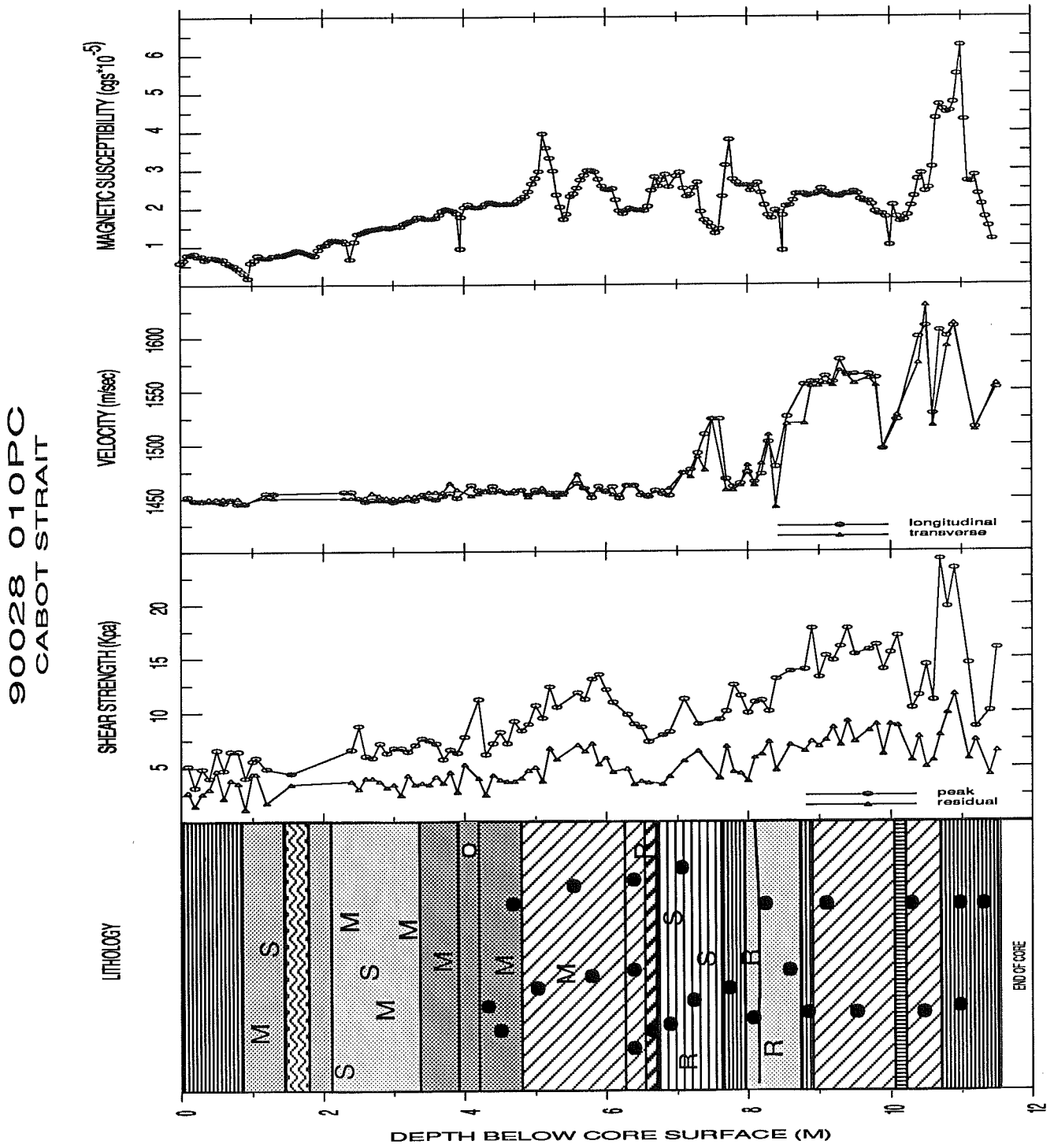
Grading to dark, moderately calcareous red-grey silty mud with pebbles and sand.

Intraformational rip-ups, rounded

Grey brown moderately calcareous silty mud diamicton with siltstone and red sandstone clasts.

Sharp boundary

Red silty clay diamicton with red and grey sandstone clasts. Bullet nose striated limestone clast, red arkosic sandstone. Also sand-smear clast.


90028 010PC
CABOT STRAIT
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
VELOCITY (m/sec)
longitudinal
transverse
SHEAR STRENGTH (Kpa)
peak
residual
LITHOLOGY
END OF CORE
DEPTH BELOW CORE SURFACE (M)

90028 - 011: Trigger Weight Core

Julian day:	308	GMT Time:	14:57
Latitude:	46 45.51 N	Longitude:	61 06.51 W
Depth :	119 m		
App. penetration:	15 cm	TWC length:	-- cm

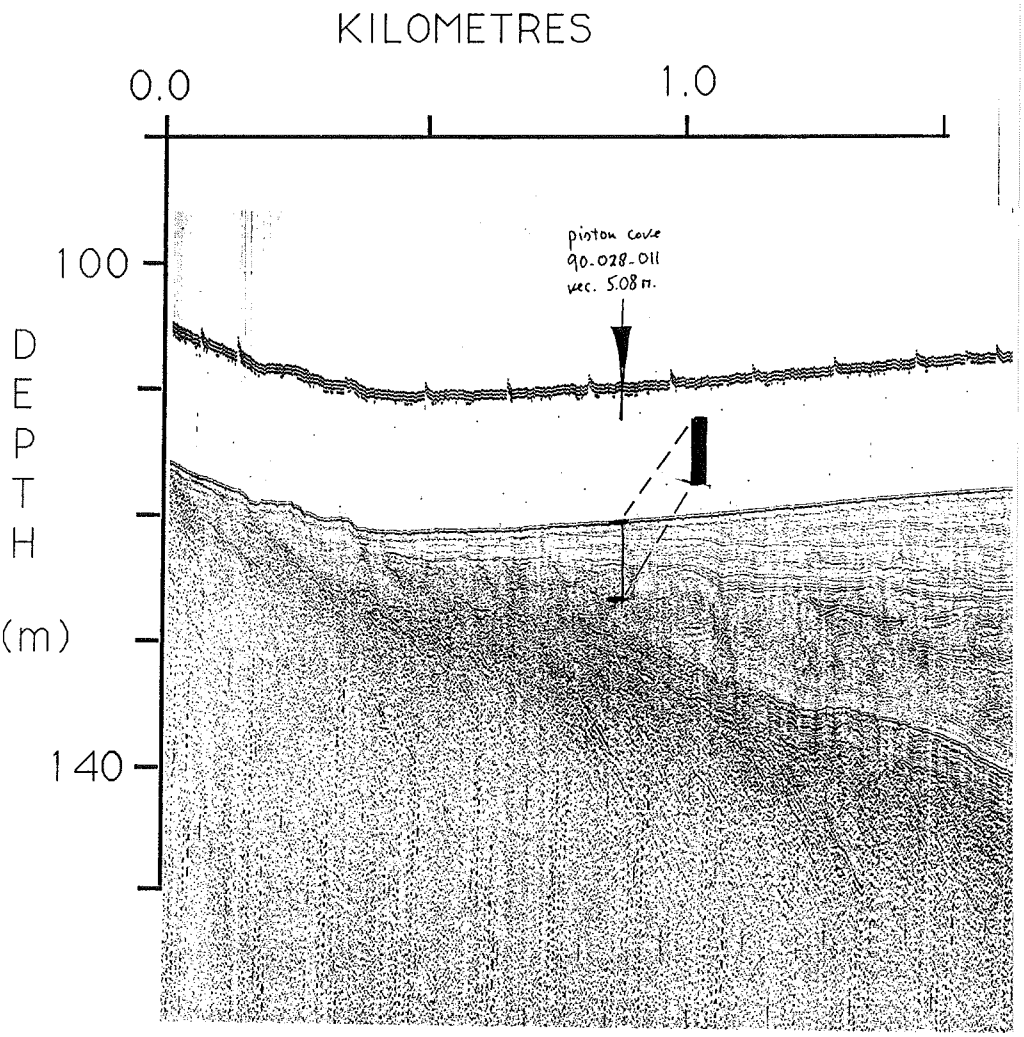
Geographic location: Cape Breton Trough

No sediments recovered in the trigger weight core.

90028 - 011: Piston Core

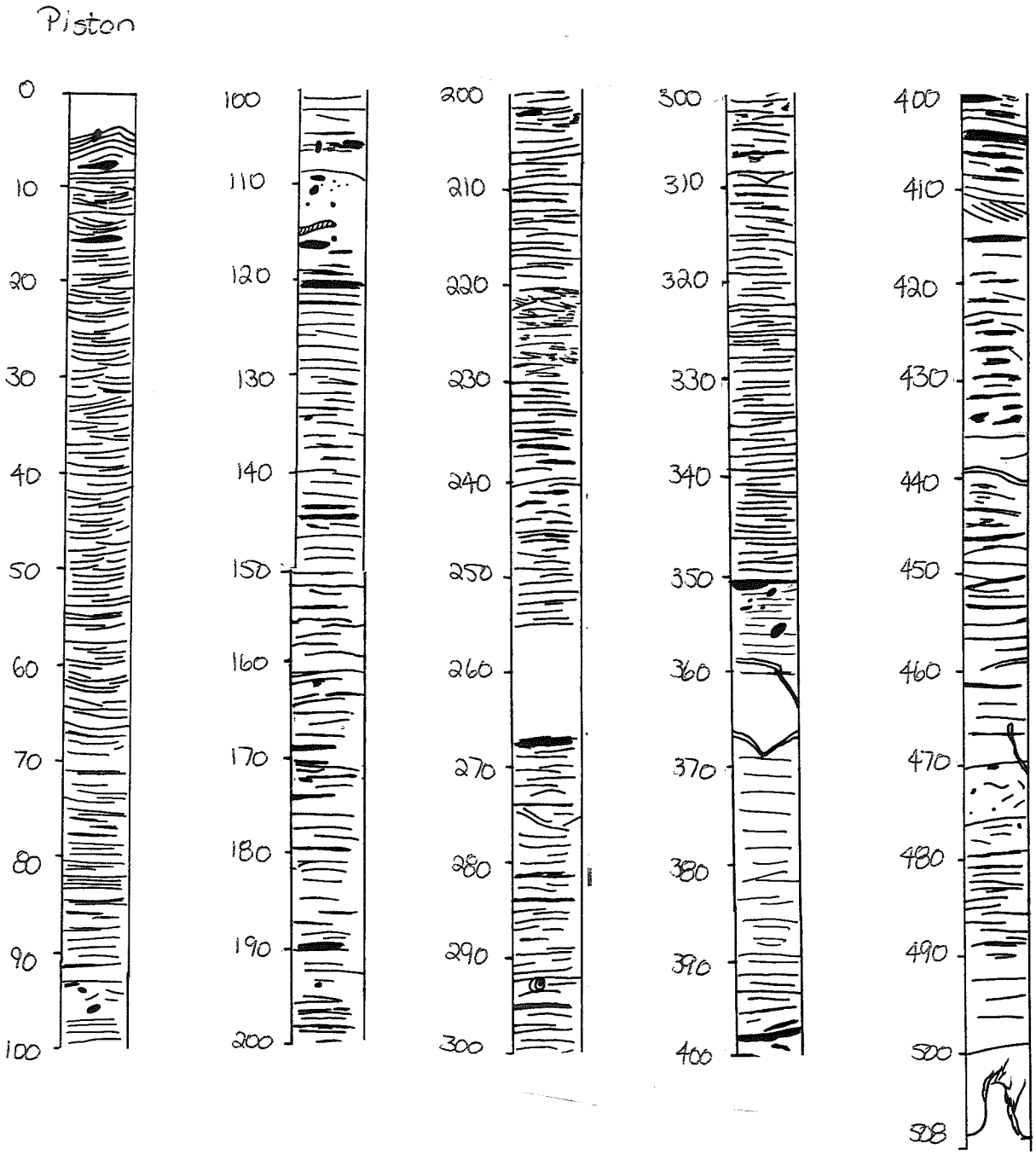
Julian day:	308	GMT Time:	14:57
Latitude:	46 45.51 N	Longitude:	61 06.51 W
Depth :	119 m	Corer length:	1216 cm
App. penetration:	638 cm	Core recovery:	508 cm

Geographic location: Cape Breton Trough

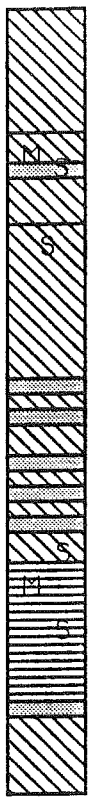


HUNTEC DTS profile
core location 90-028- 011

LCF CORE STATION HU-029-011



90028-011



Banded black and olive grey, moderately clacareous, silty mud. Appears rhythmically banded and may be graded somewhat. Lighter layers are siltier, with silty lenses. Layers are curved opposite to what would be caused by coring. Some cut and fill structures. Strong sulphide smell.

Laminated, but layers less apparent. Black roundish blebs in layers. More mottling.

Shells in silt to fine sand, strong acid reaction.

Black silty mud. Faint laminae and mottling. moderately calcareous

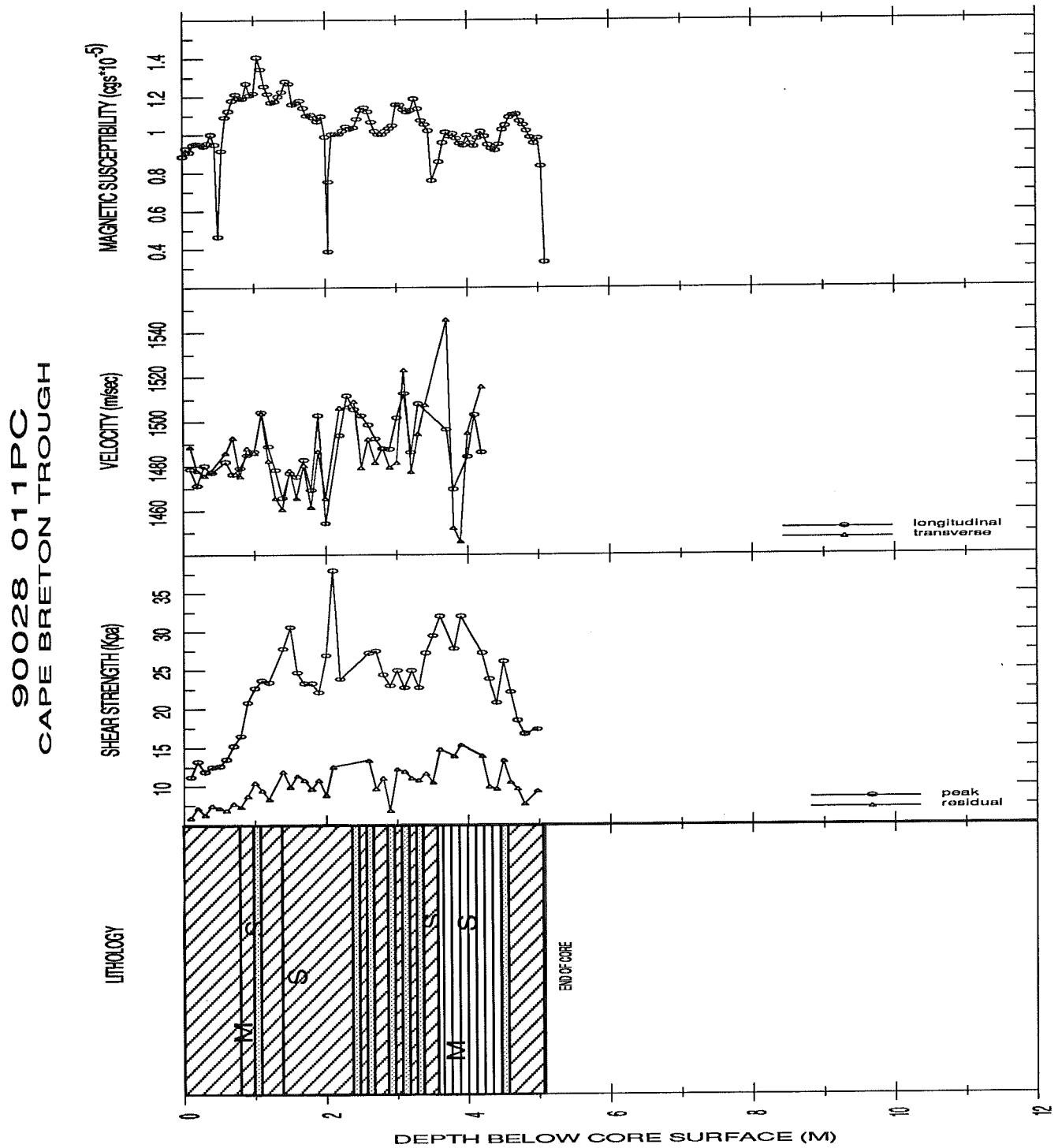
Olive grey, moderately calcareous silty mud. Silt lenses present. Faint, bioturbated laminae. Some shell fragments. Some fine sand lenses and seams below 240cm, and strong bioturbation in places.

Dark, grey brown colour dominates. Stratified, mud with many more lenses an seams of fine sand. Moderately clacareous.

Dark, greyish brown and black silty mud with horizontal lenses of med. sand 1-7mm thick. Oxidizes rapidly to brown sulphide. Swirling reddish bands of silt. Mottling in upper 20cm. Moderately calcareous.

Abrupt planar contact marked by 1mm sand layer. Zone of asymmetric drag folds marked by sand lenses. Slightly calcareous.

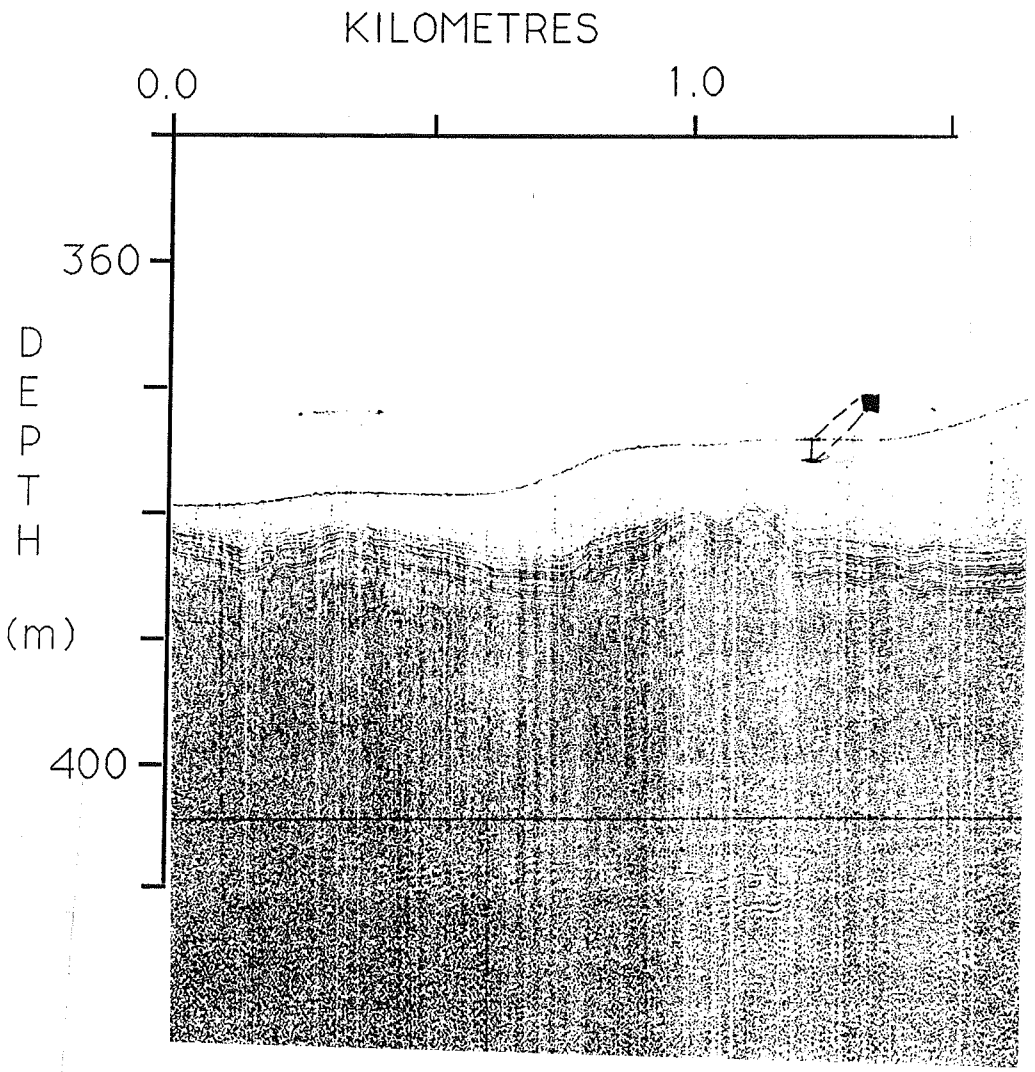
Zoned brown and grey silty mud, mottled at base. Slightly calcareous. Some sand lenses.


90028 011PC
CAPE BRETON TROUGH
MAGNETIC SUSCEPTIBILITY (cgs*10-5)
0.4 0.6 0.8 1 1.2 1.4
VELOCITY (m/sec)
1460 1480 1500 1520 1540
longitudinal
transverse
SHEAR STRENGTH (Kpa)
10 15 20 25 30 35
peak
residual
LITHOLOGY
M
S
S
S
M
END OF CORE
0 2 4 6 8 10 12
DEPTH BELOW CORE SURFACE (M)

90028 - 018: Trigger Weight Core

Julian day:	310	GMT Time:	14:09
Latitude:	49 00.19 N	Longitude:	63 30.24 W
Depth :	378 m		
App. penetration:	183 cm	TWC length:	148 cm

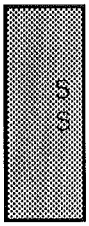
Geographic location: Laurentian Channel



HUNTEC DTS profile
core location 90-028- 018

90028-018TWC

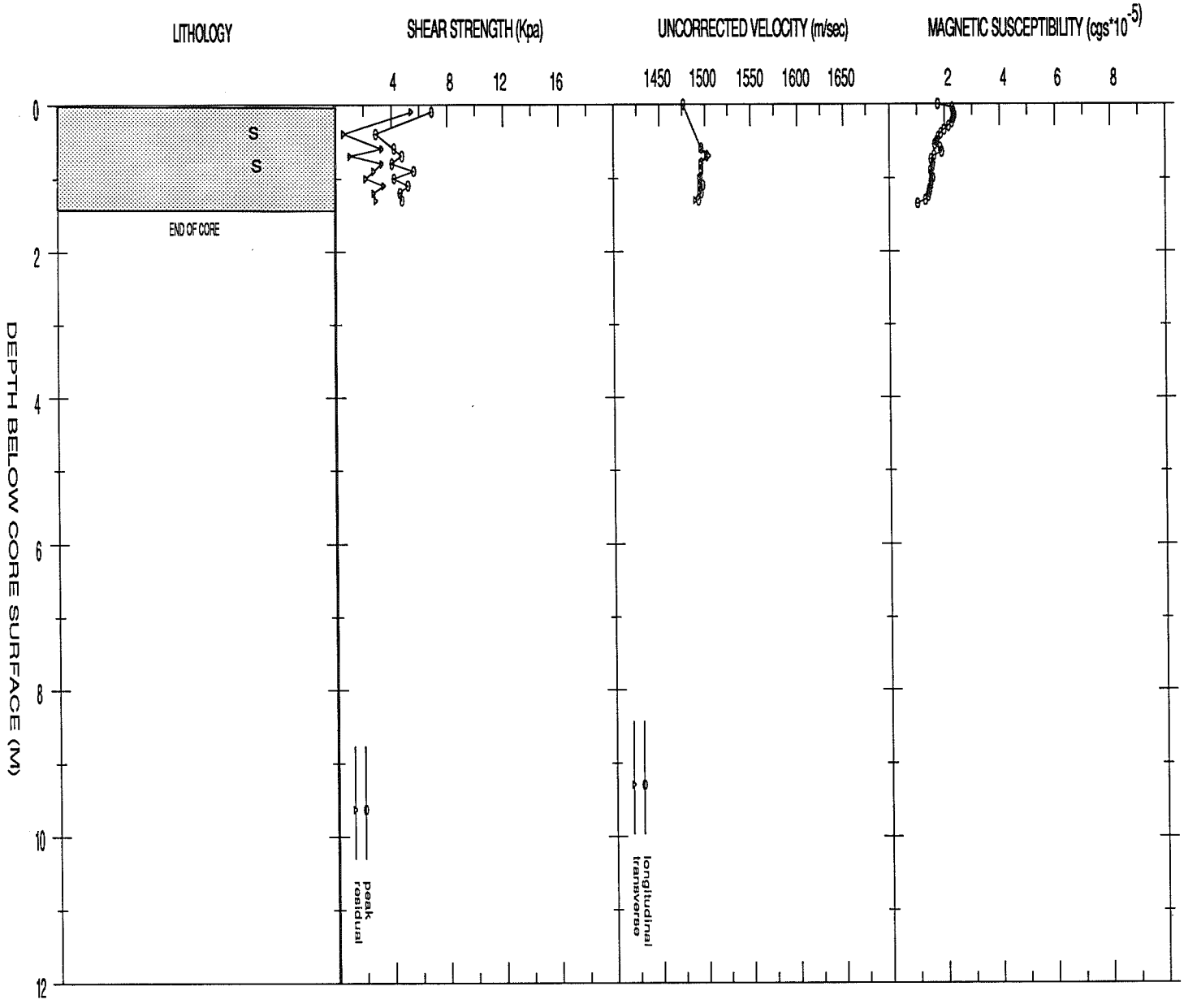
0



143

Massive dark olive grey mud. Moderately calcareous. Very soft. Bubbles in sediment.

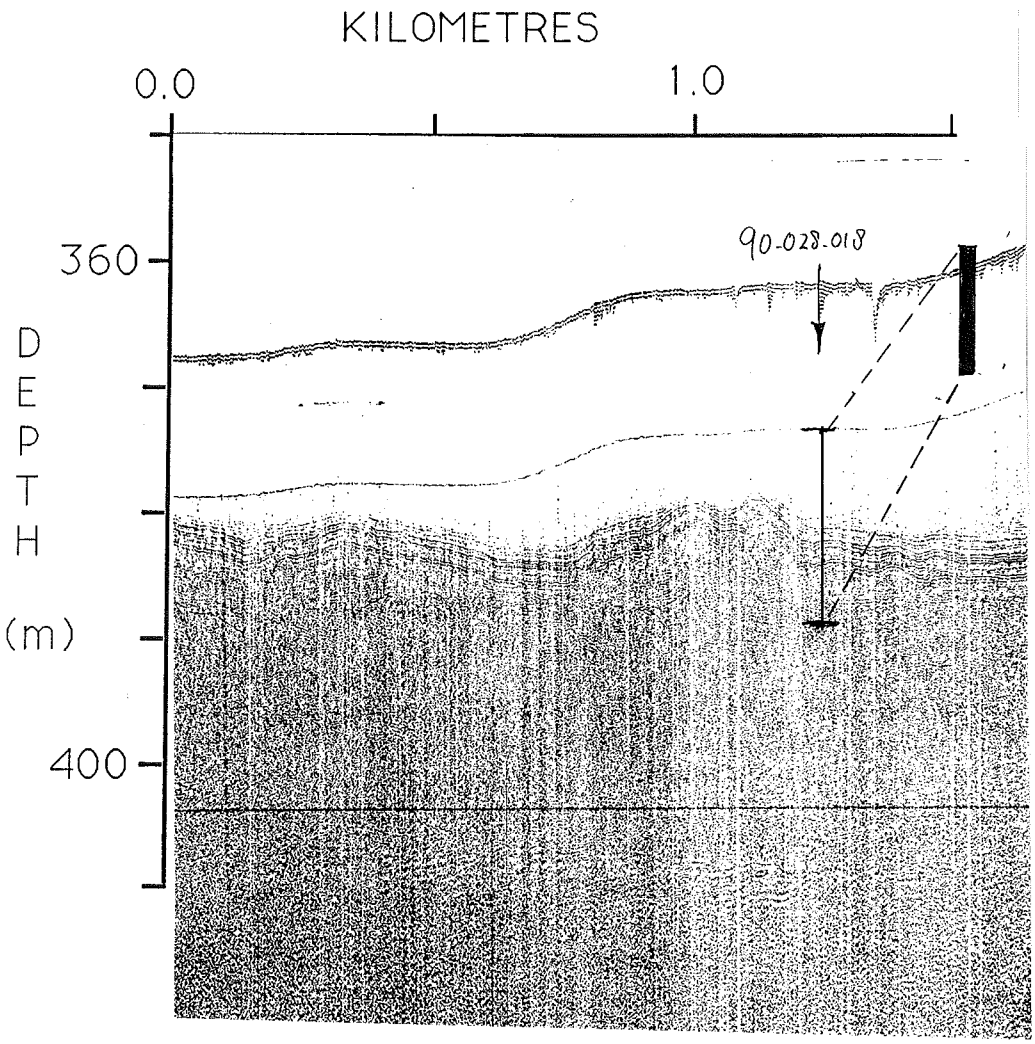
90028 018TWC
LAURENTIAN CHANNEL



90028 - 018: Piston Core

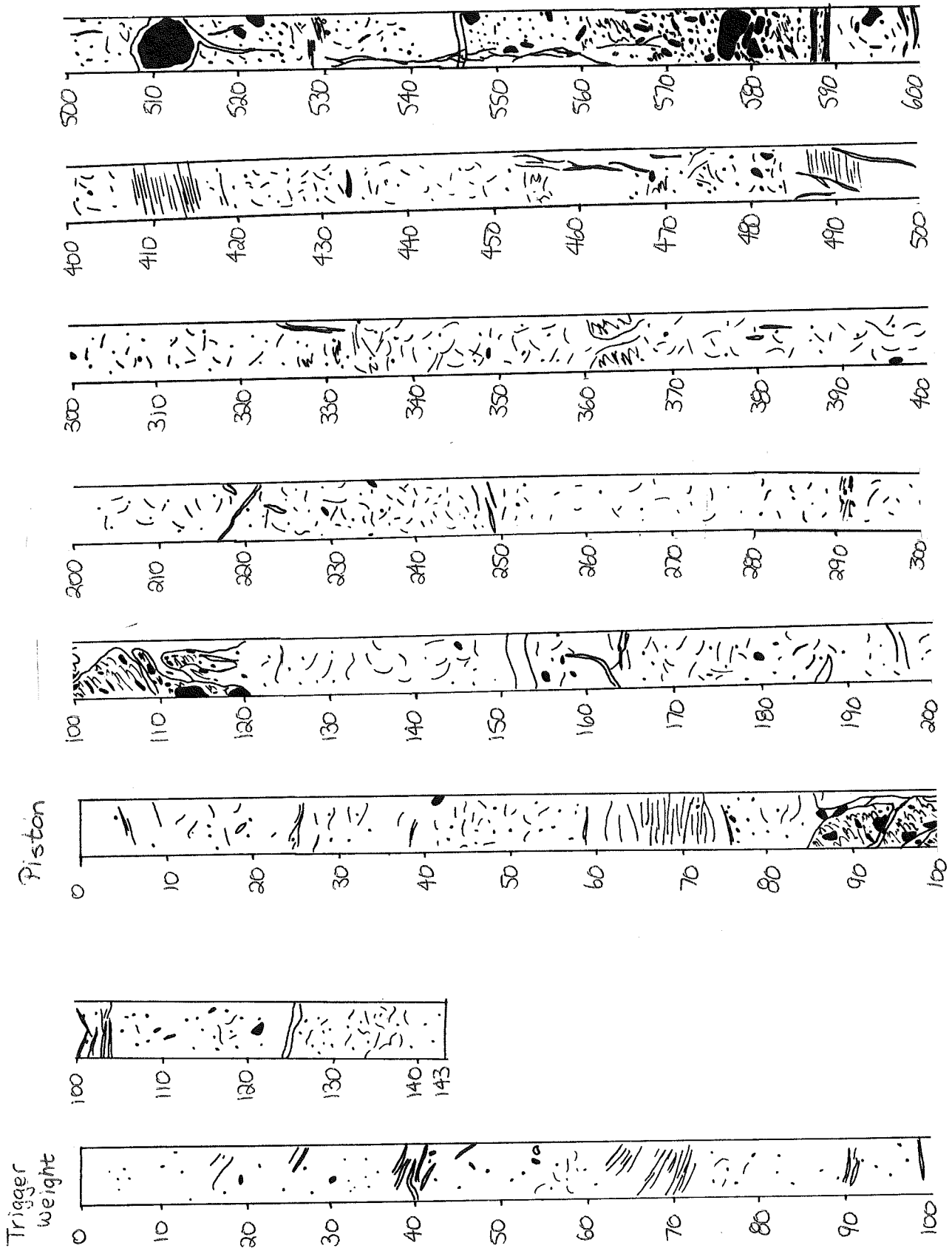
Julian day:	310	GMT Time:	14 :09
Latitude:	49 00.19 N	Longitude:	63 30.24 W
Depth :	378 m	Corer length:	1824 cm
App. penetration :	1520 cm	Core recovery:	1031 cm

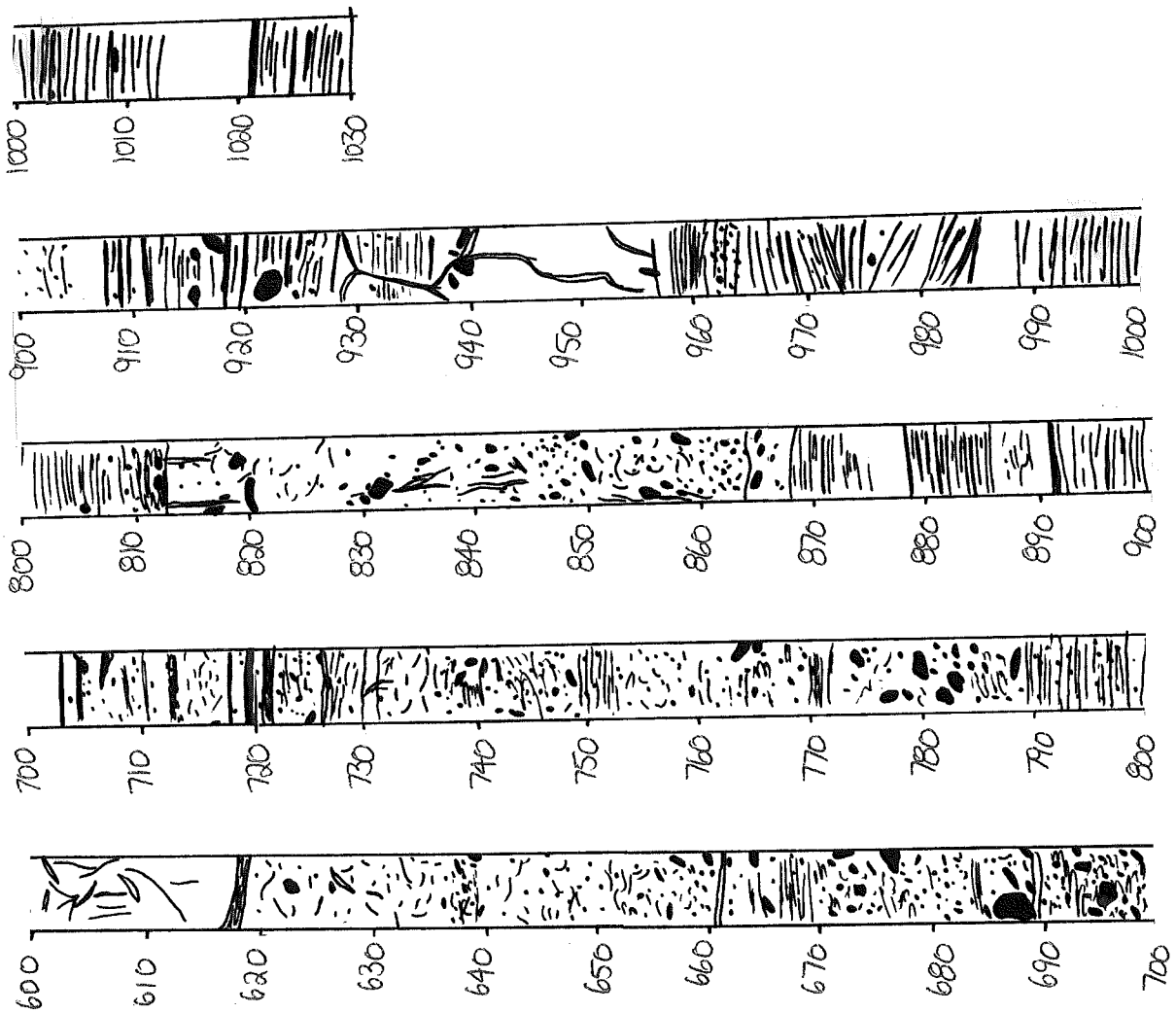
Geographic location: Laurentian Channel



HUNTEC DTS profile
core location 90-028- 018

LCF CORE STATION HU-029-018




1000
1010
1020
1030
900
910
920
930
940
950
960
970
980
990
1000
800
810
820
830
840
850
860
870
880
890
900
700
710
720
730
740
750
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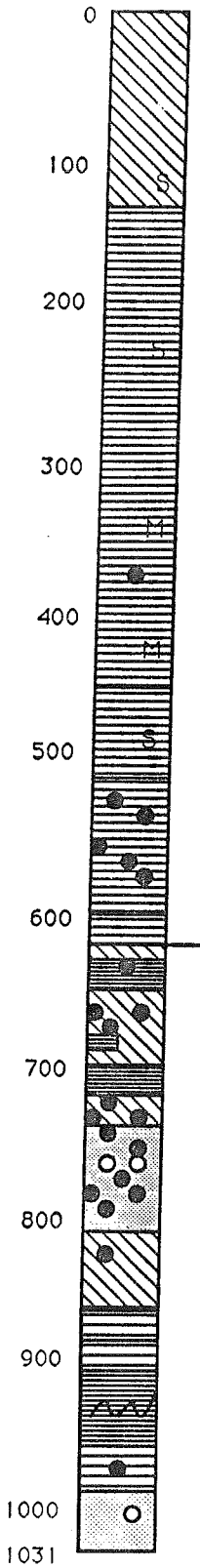
770
780
790
800
600
610
620
630
640
650
660
670
680
690
700

90028-018



massive, very soft, dark grey to olive grey silty mud. Moderately calcareous. Gas bubbles or voilds in upper part of core.

Sand dollar

Dark grey clayey mud, massive. Moderately calcareous. Some pull apart structures, and voids or gas holes near top. Shells 220-240cm, mottled at 340-360cm. Carbonate pebble at 380cm.

Dark grey , moderately calcareous clayey mud with very faint laminations.

Massive dark grey clayey mud, moderately calcareous, with some clasts of limestone (angular), black slate, igneous cobble, and small angular pebbles.Sh fragment at 540cm.

Faint, bowl shaped laminae.
Sharp contact
Brown grey, moderately calcareous, mottled, silty mud, grading to reddish brc clay, with occasional siltstone clasts.

Grades to red-brown silty mud with more pebbles, horizontal pods, and segregations or beds of coarse sand. Some red-brown fine laminae.

Red clay, no pebbles, moderately calcareous.

Red-brown silty mud (diamicton) with sandstone pebbles and clayballs.

Interbedded red-brown moderately calcareous silty sandy mud with pebbles (diamicton) and reddish silty mud, sand lenses.

Intraformational clasts, pods of grey mud. One purple sandstone.
Sharp contact

Grey-brown, moderately calcareous silty mud with occasional granules. Faint laminate 840-850cm.

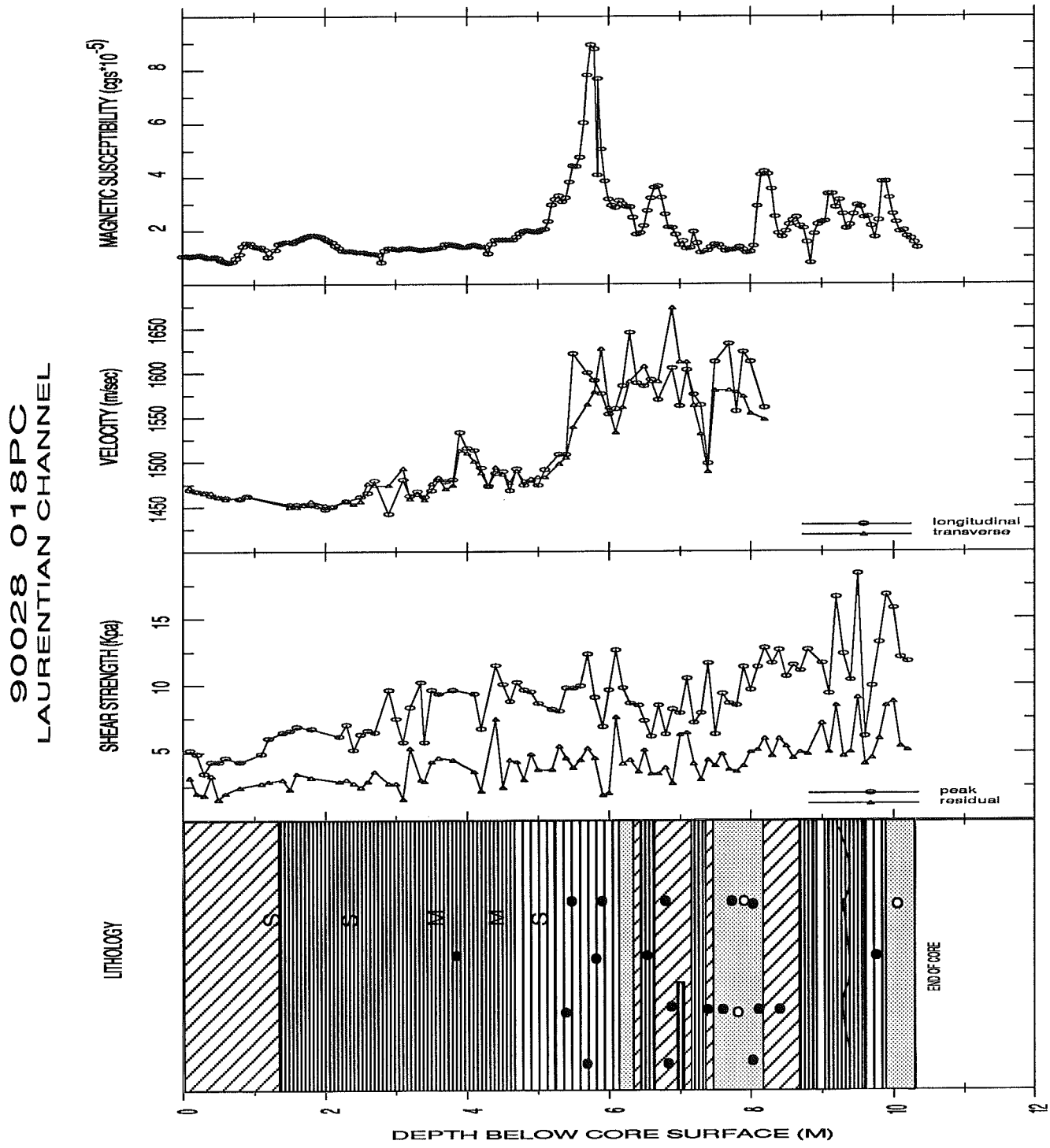
Interbedded red and grey silty clay, with sand lenses. Fining upwards turbidite? sequence in basal 10cm. Moderately calcareous.

Moderately calcareous silty clay, faintly laminated..

Moderately calcareous grey clay, folded red and grey clay, thin clay and sand couplets.

Brown silty clay, some granules, faintly laminated. Moderately calcareous.

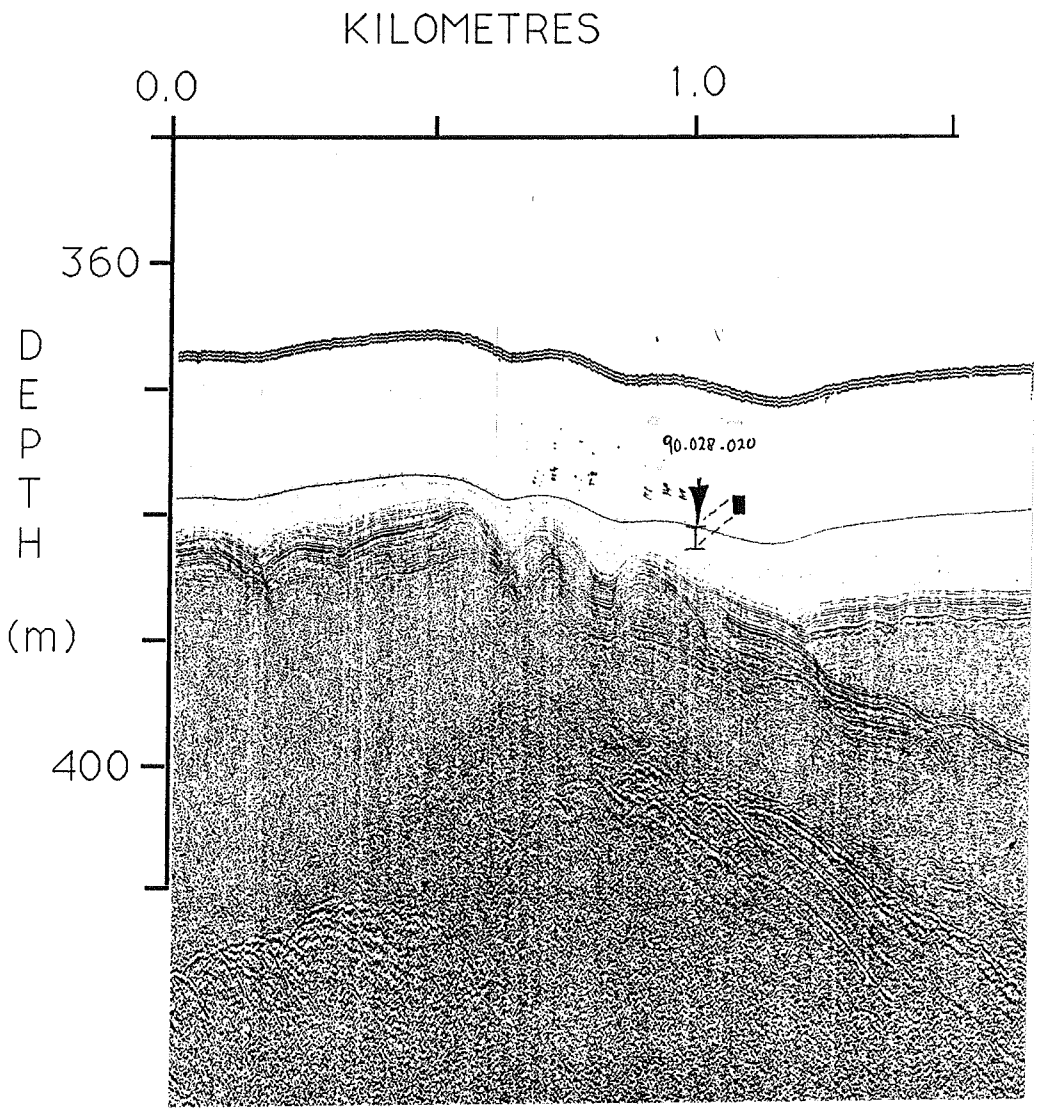
Transition to rhythmically bedded red and brown silty clay beds and brown sand beds, moderately calcareous. Fining upwards sequences of sand to clay. Intraformational clasts at 1010cm. Glaciomarine.


90028 018PC
LAURENTIAN CHANNEL
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
2
4
6
8
VELOCITY (m/sec)
1450
1500
1550
1600
1650
longitudinal
transverse
SHEAR STRENGTH (Kpa)
5
10
15
peak
residual
LITHOLOGY
S
Sm
Mm
S
END OF CORE
0
2
4
6
8
10
12
DEPTH BELOW CORE SURFACE (M)

90028 - 020: Trigger Weight Core

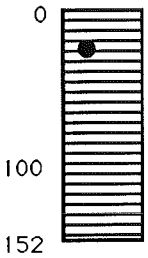
Julian day:	310	GMT Time:	19:40
Latitude:	49 06.43 N	Longitude:	63 48.40 W
Depth:	382 m		
App.penetration:	183 cm	TWC recovery:	152 cm

Geographic location: Laurentian Channel

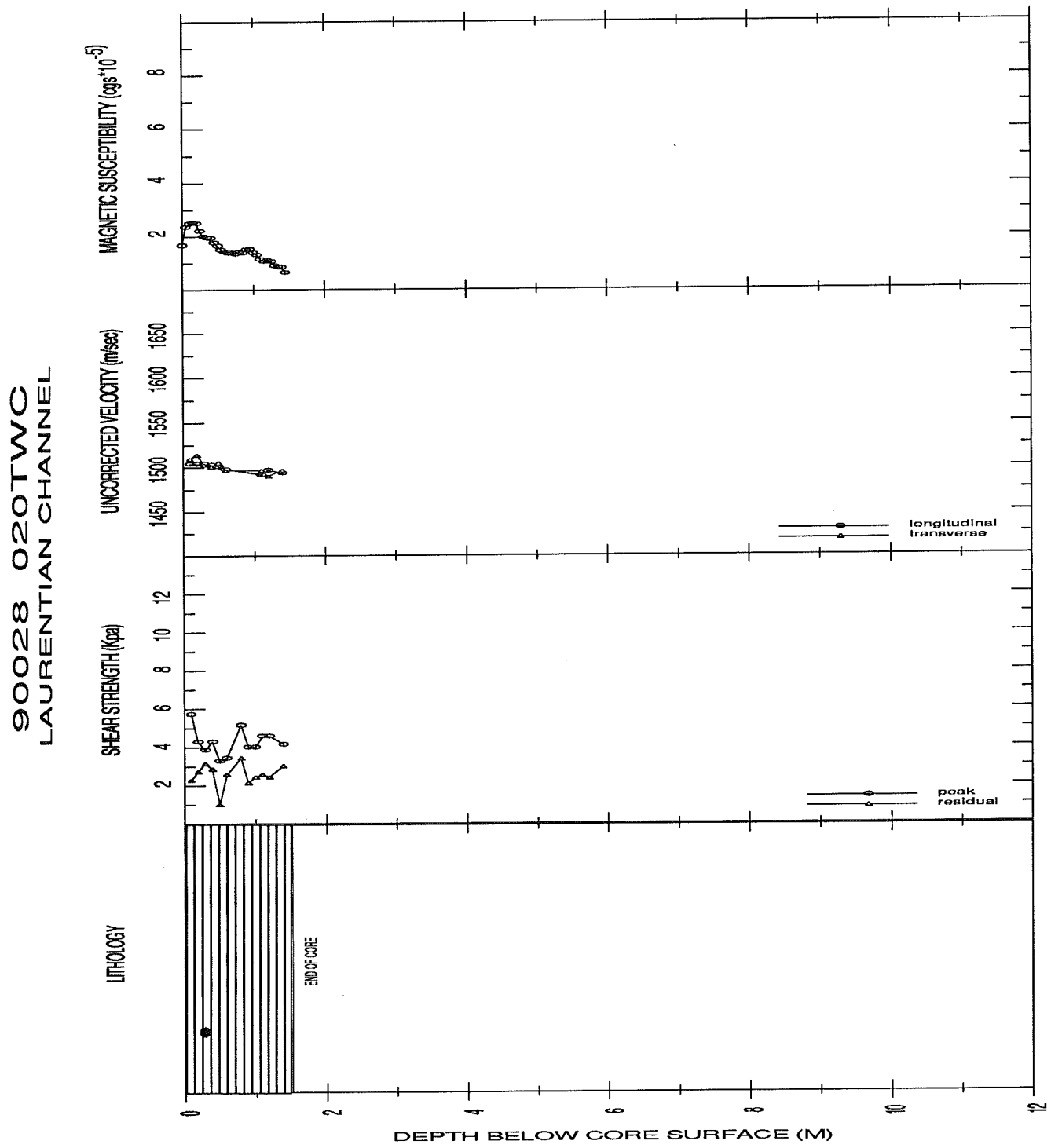


HUNTEC DTS profile
core location 90-028- 020

90028-020 TWC



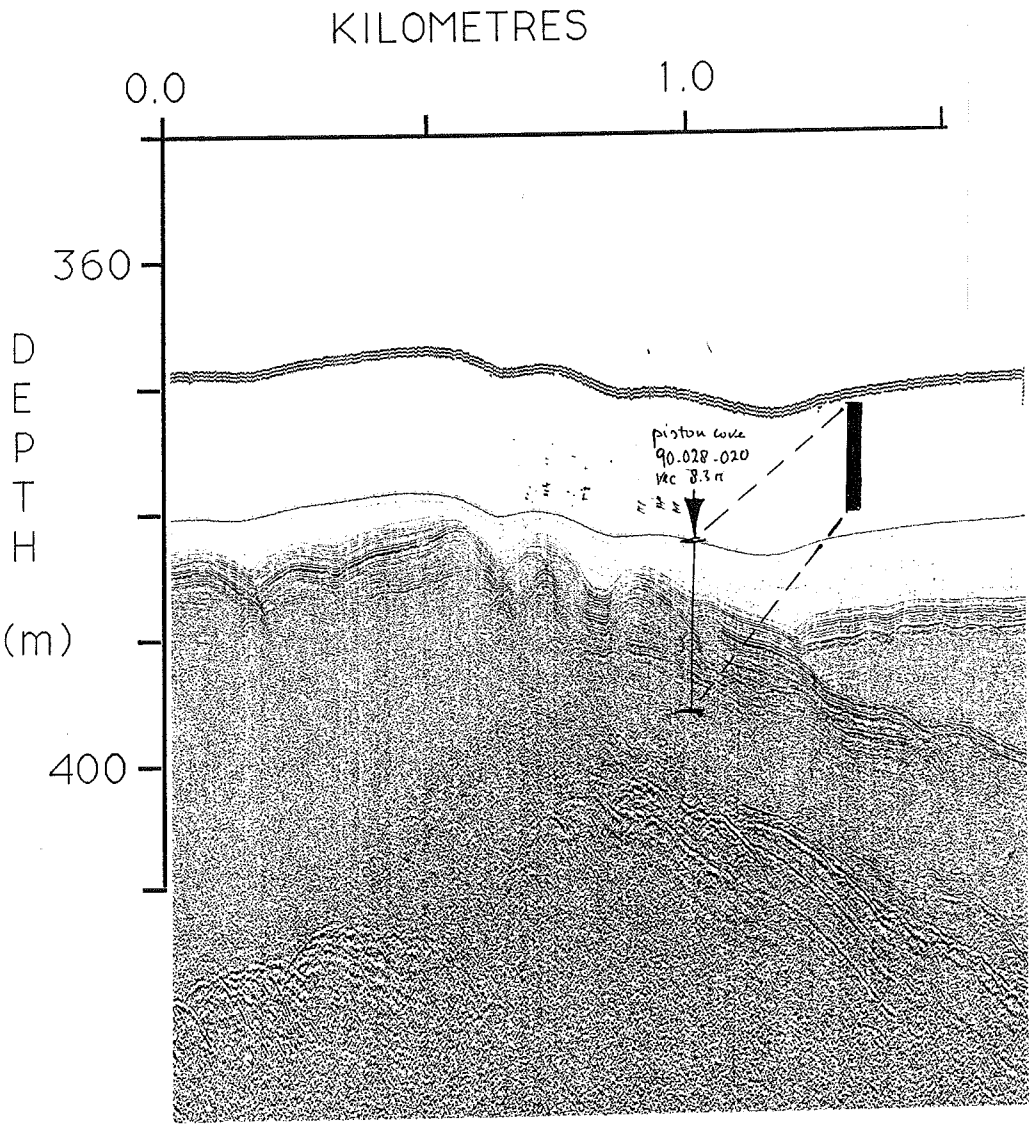
Olive-grey massive silty clay, occasional pebble. Moderately calcareous.


90028 020TWC
LAURENTIAN CHANNEL
LITHOLOGY
END OF CORE
SHEAR STRENGTH (Kpa)
peak
residual
UNCORRECTED VELOCITY (m/sec)
longitudinal
transverse
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
DEPTH BELOW CORE SURFACE (M)

90028 - 020: Piston Core

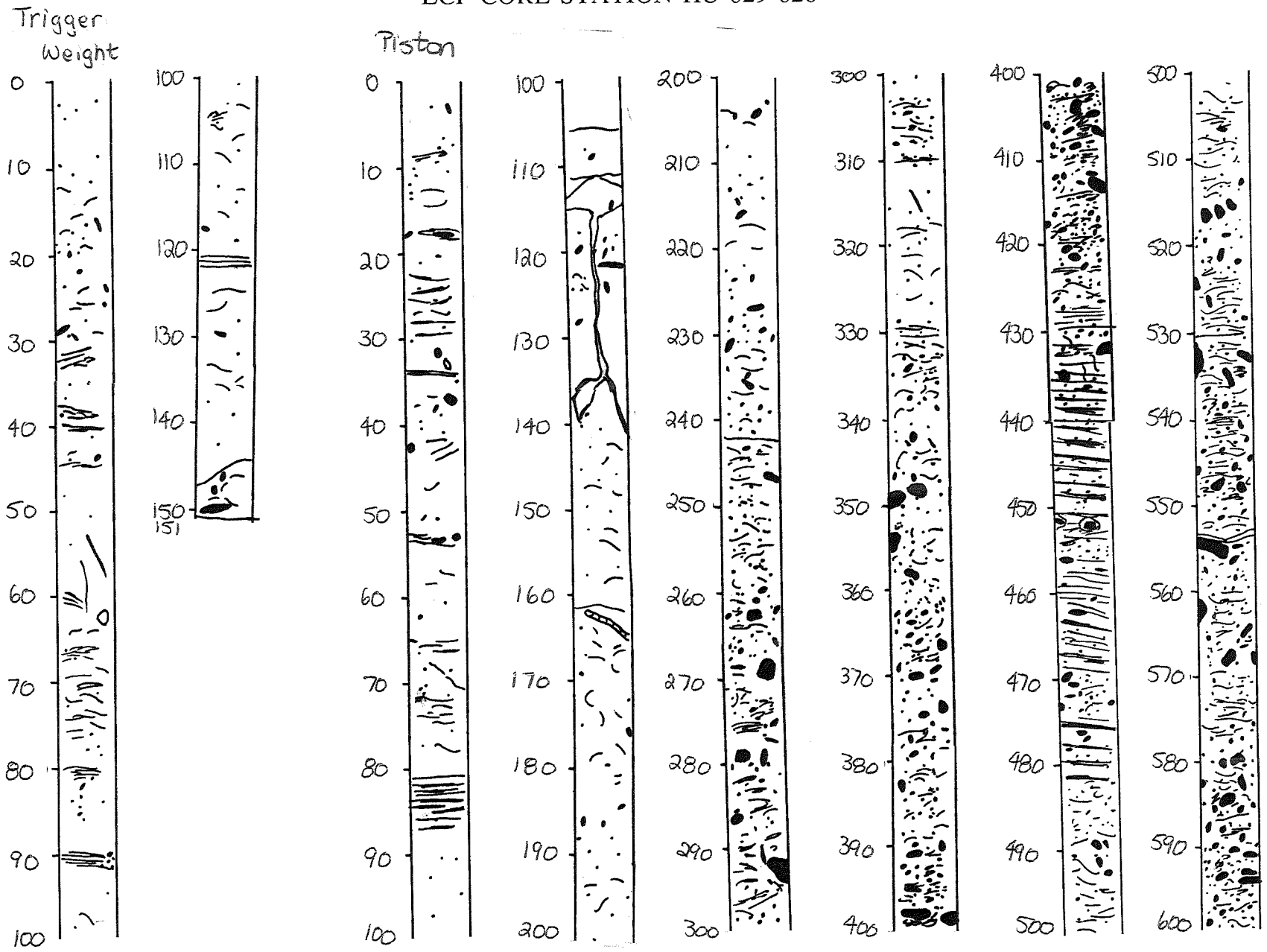
Julian day:	310	GMT Time:	xxxx
Latitude:	49 06.43 N	Longitude:	63 48.40 W
Depth :	382 m	Corer length:	1520 cm
App. penetration:	1368 cm	Core recovery:	829 cm

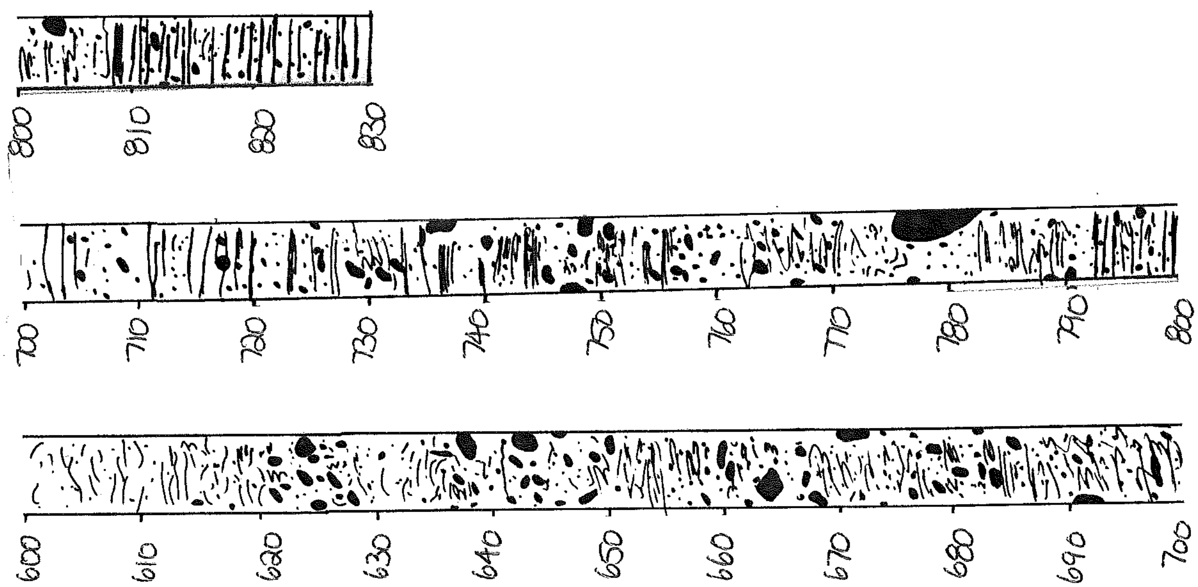
Geographic location: Laurentian Channel



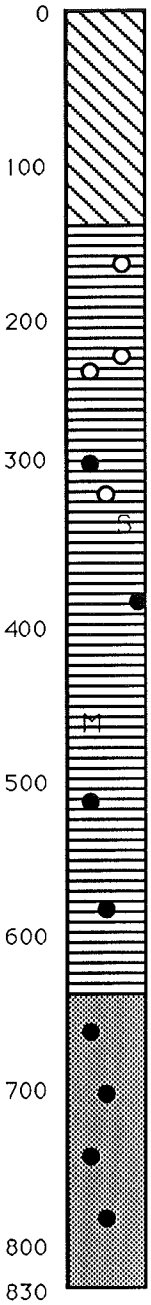
HUNTEC DTS profile
core location 90-028- 020

LCF CORE STATION HU-029-020




800
810
820
830
700
710
720
730
740
750
760
770
780
790
800
600
610
620
630
640
650
660
670
680
690
700

90028-020 Piston

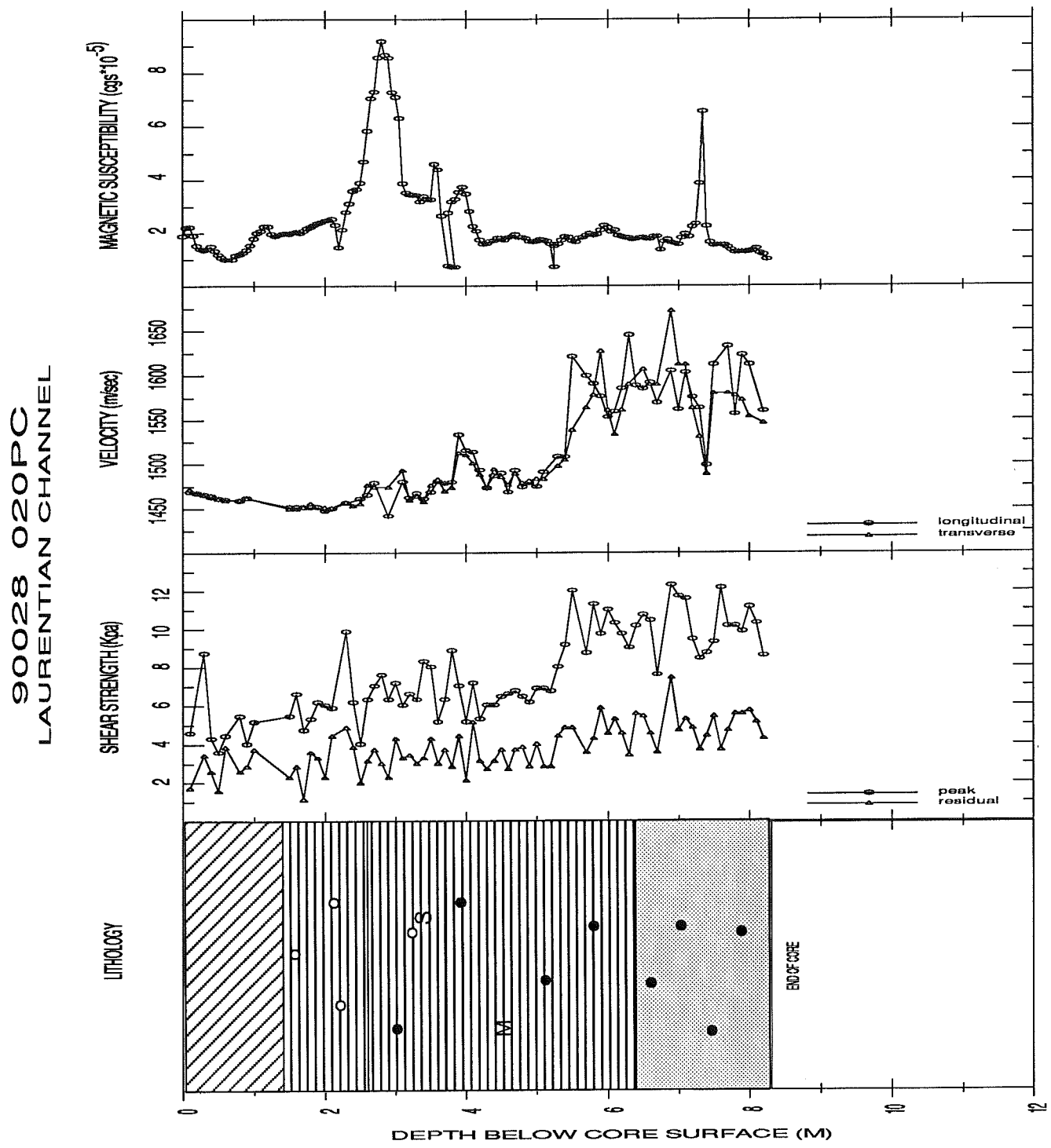


Moderately calcareous dark grey silty mud, no obvious structures.

Moderately calcareous, massive dark grey silty clay with small silt balls that increase in abundance with depth. Mottled 240-260cm.

Dark greyish brown, grading to red brown silty clay with some clasts, grit, and balls of sand. Faintly mottled in some areas. Moderately calcareous. Sandy zones may be disaggregated sandstone clasts. Igneous clasts, grey sandstone, and red sandstone, black shale.

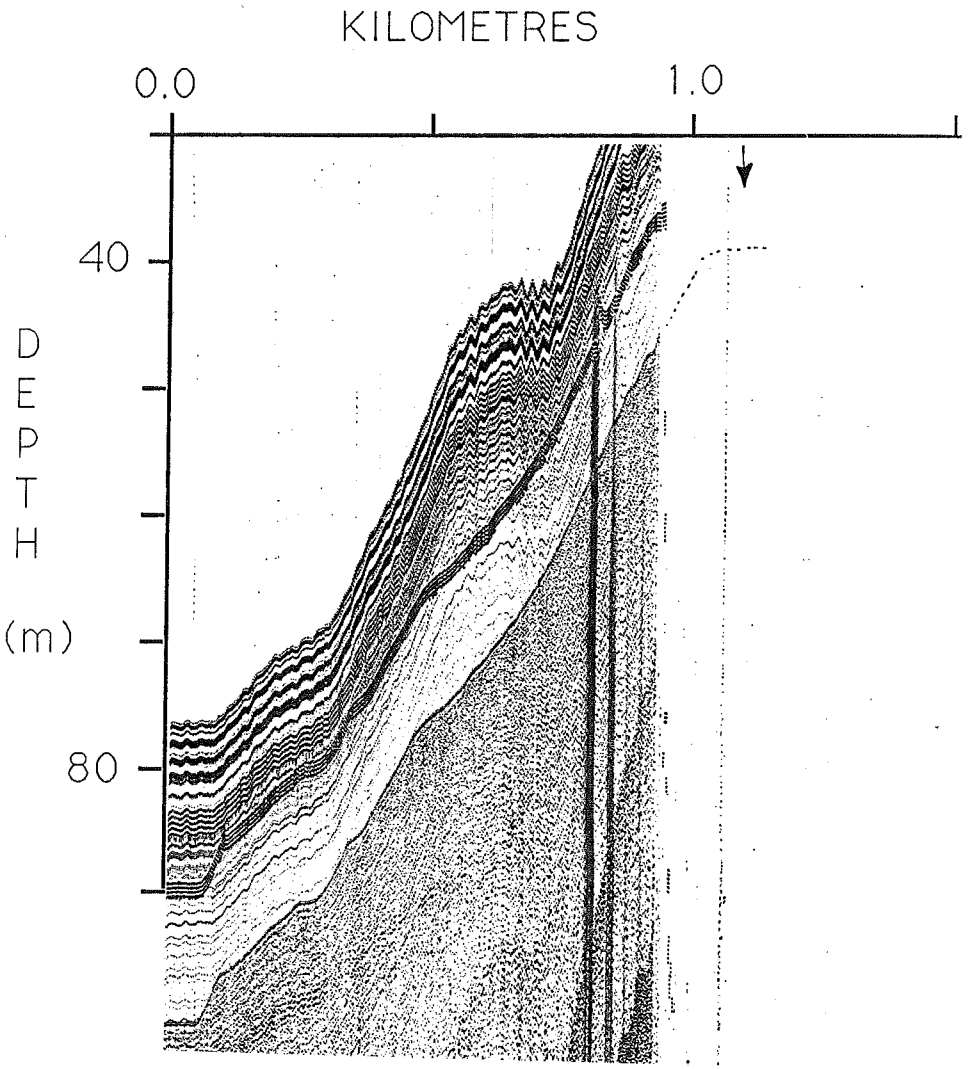
Moderately calcareous, red brown diamicton. Massive, with granules but no pebbles.


90028 020PC
LAURENTIAN CHANNEL
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
VELOCITY (m/sec)
longitudinal
transverse
SHEAR STRENGTH (Kpa)
peak
residual
LITHOLOGY
END OF CORE
DEPTH BELOW CORE SURFACE (M)

90028 - 023: IKU

Julian day:	311	GMT Time:	18:29
Latitude:	49 07.50 N	Longitude:	62 51.56 W
Depth:	36 m		

Geographic location: West coast of Anticosti Island



HUNTEC DTS profile
IKU location 90-028 - 023

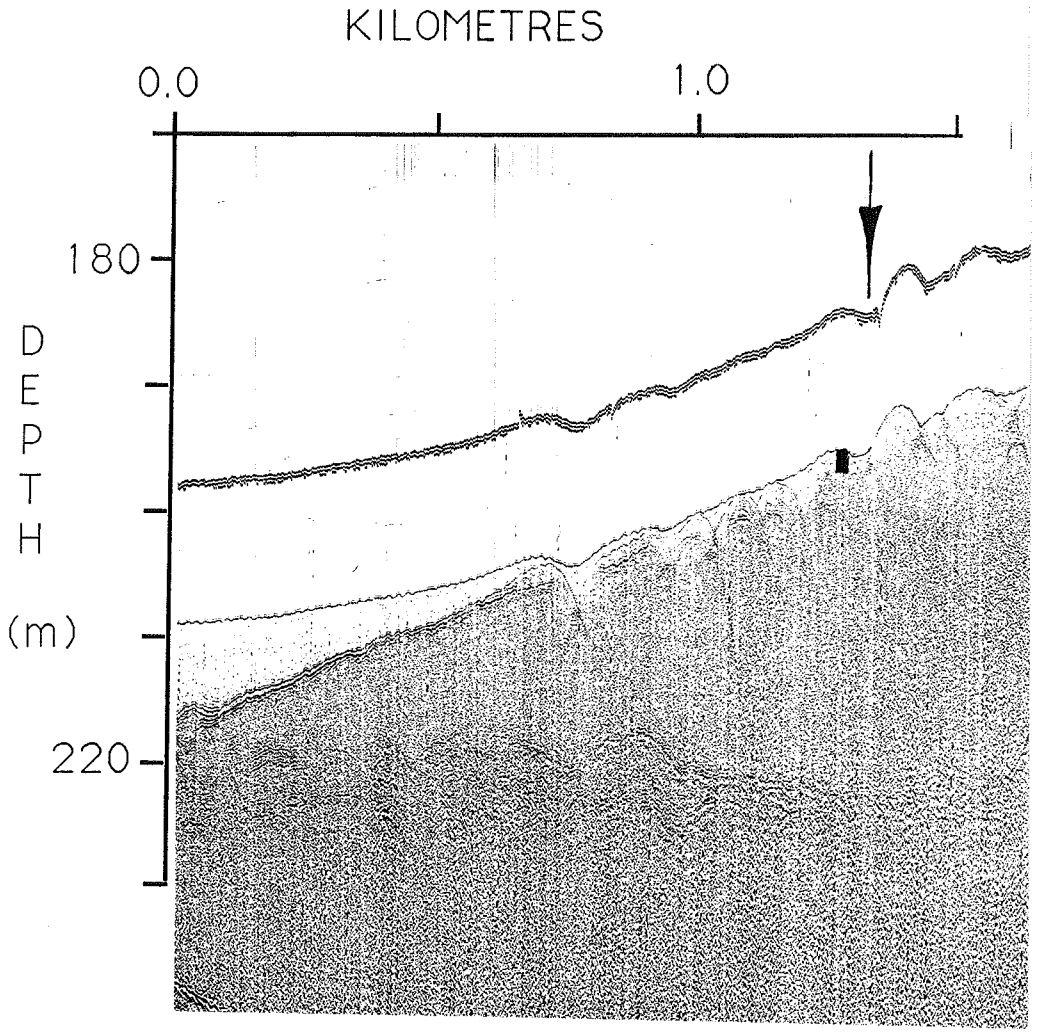
90028- 023 IKU

Grey sandy silty clay mud with many stones. Most are coated with black coral. Most subround and abraded. Striations not preserved - possibly because of the coral formation on the surface. many bioclasts of black and red coral, and shell fragments. About 50% of the "clasts" are shell fragments. Clast count: 90% brown sugary textured limestone, a few with burrough holes; 8% grey blure plagioclase from the North Shore anorthosites - one striated; 1% gneiss or granite weathered grey white; 1% metagabbro with garnet.

90028 - 024: Trigger Weight Core

Julian day:	311	GMT Time:	20:37
Latitude:	48 56.00 N	Longitude:	63 14.57 W
Depth:	194 m		
App. penetration:	183 cm	TWC recovery:	178 cm

Geographic location: Laurentian Channel

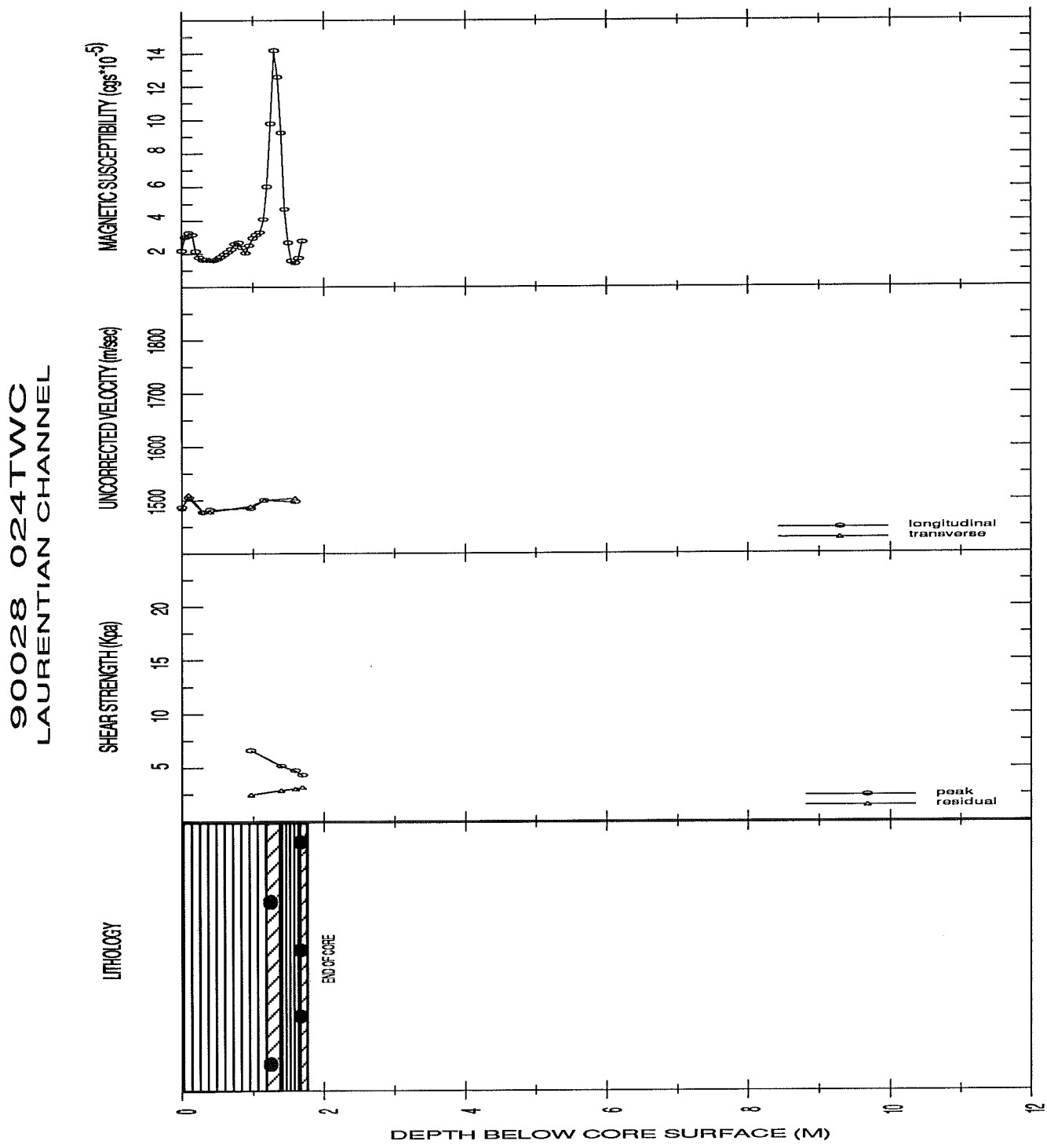


HUNTEC DTS profile
core location 90-028- 024

90028-024 TWC

Olive grey silty clay, massive, slightly calcareous.

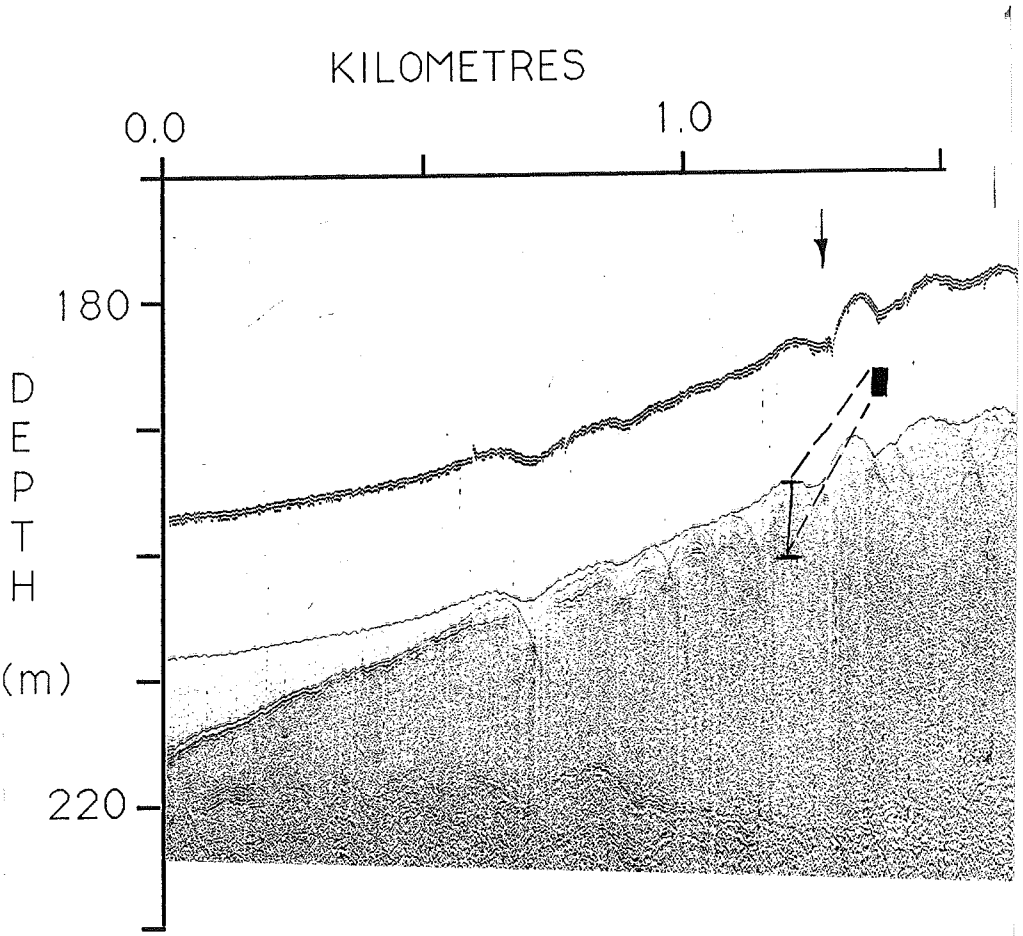
Grading into sandy silty mud, slightly calcareous, with pebbles.
Amphibolite schist pebble.
Red brown clay, moderately calcareous, grading into brownish silty mud diamicton with pebbles.


90028 024TWC
LAURENTIAN CHANNEL
LITHOLOGY
SHEAR STRENGTH (Kpa)
UNCORRECTED VELOCITY (m/sec)
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
END OF CORE
peak
residual
longitudinal
transverse
DEPTH BELOW CORE SURFACE (M)

90028 - 024: Piston Core

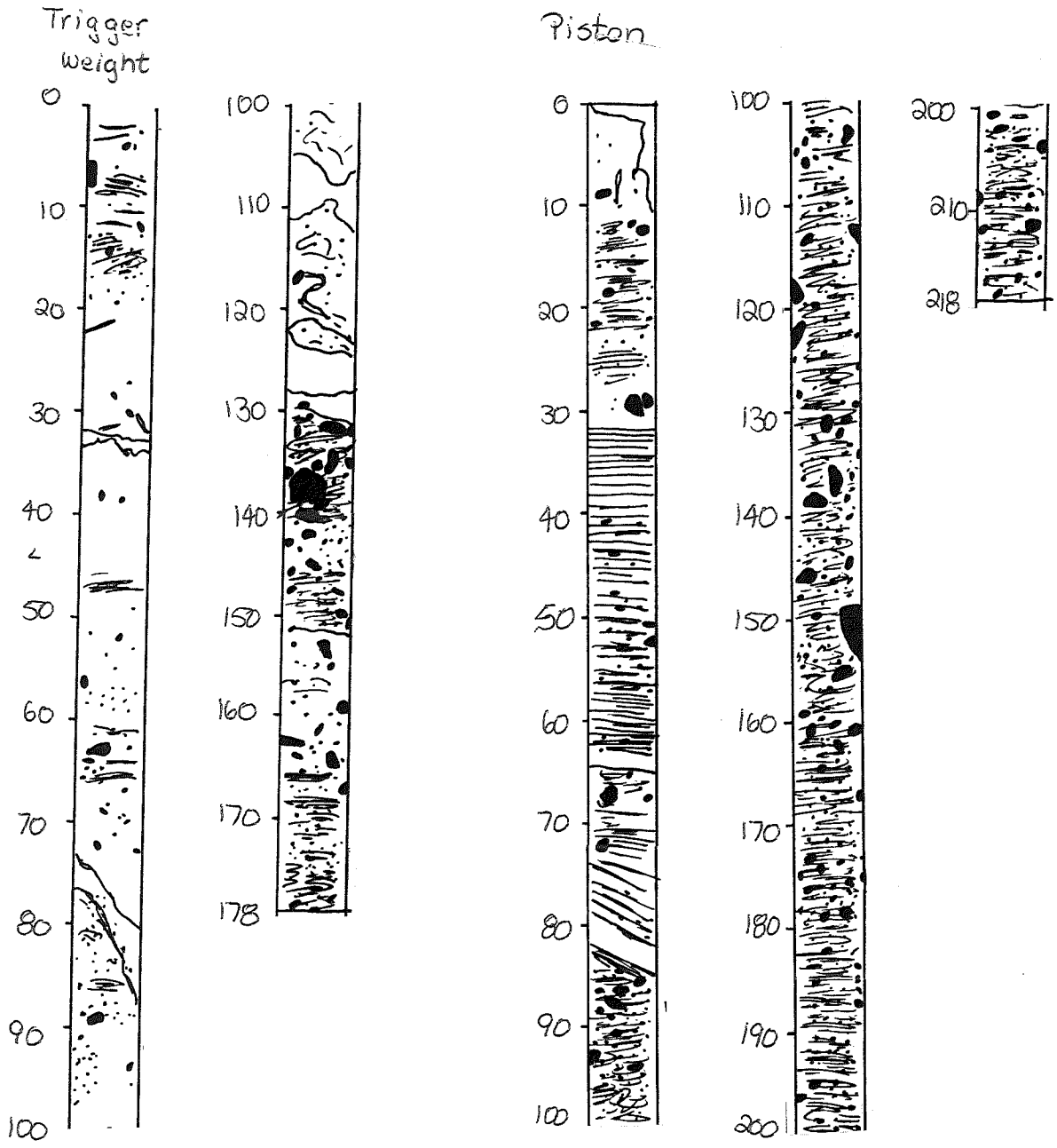
Julian day:	311	GMT Time:	20:37
Latitude:	48 56.00 N	Longitude:	63 14.53 W
Depth:	194 m	Corer length:	608 cm
App. penetration:	608 cm	Core recovery:	224 cm

Geographic location: Laurentian Channel

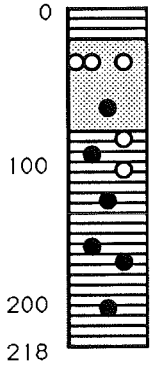


HUNTEC DTS profile
core location 90-028- 024

LCF CORE STATION HU-029-024



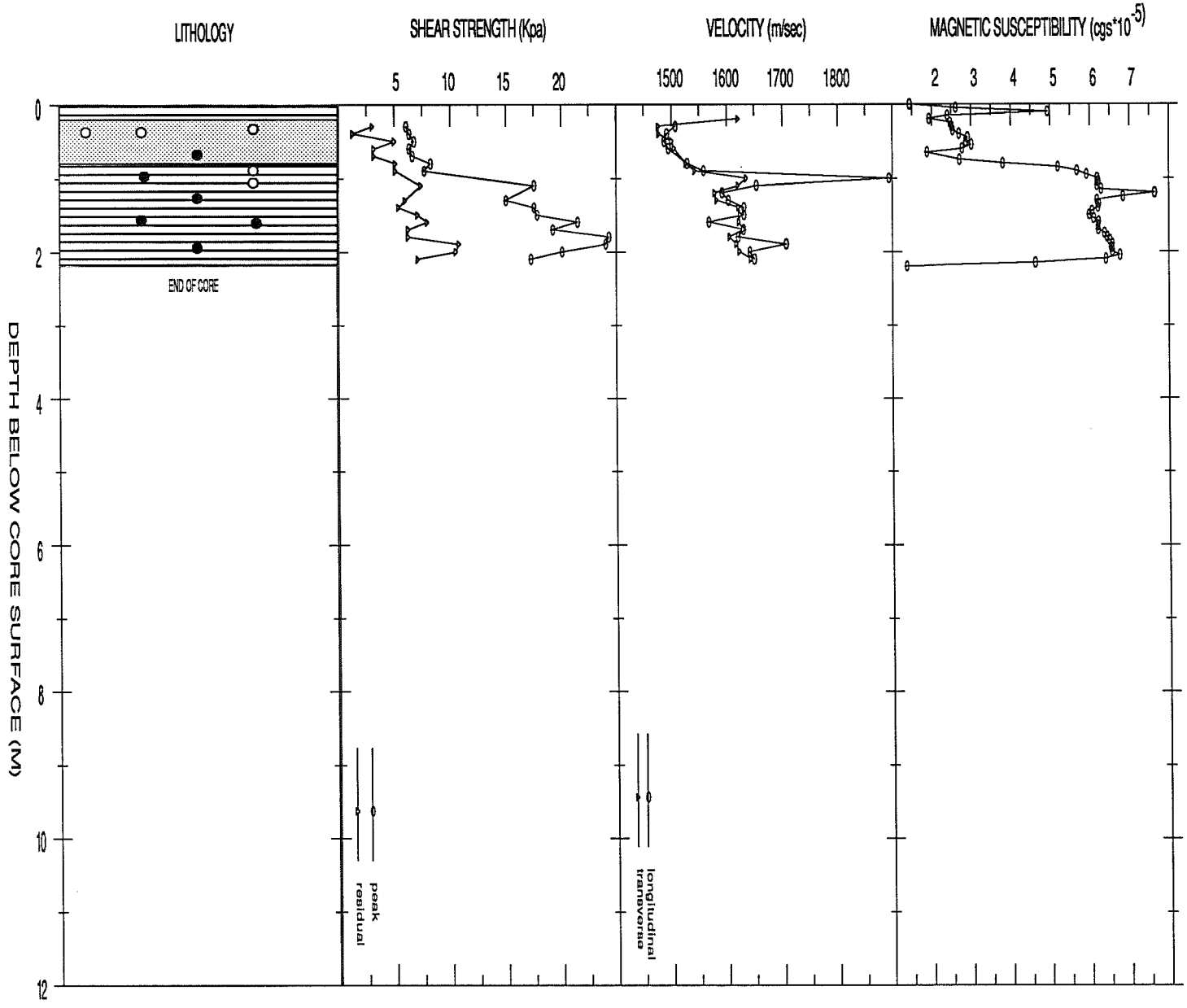
90028- 024 Piston



Slightly calcareous, massive olive grey silty clay, grading into...
Red brown sandy mud with aligned intraformational rip ups of grey clay.
Limestone pebbles. Moderately calcareous.

Massive, stiffer, dark reddish grey silty clay with balls of grey clay, and abundant pebble clasts. Moderately calcareous.

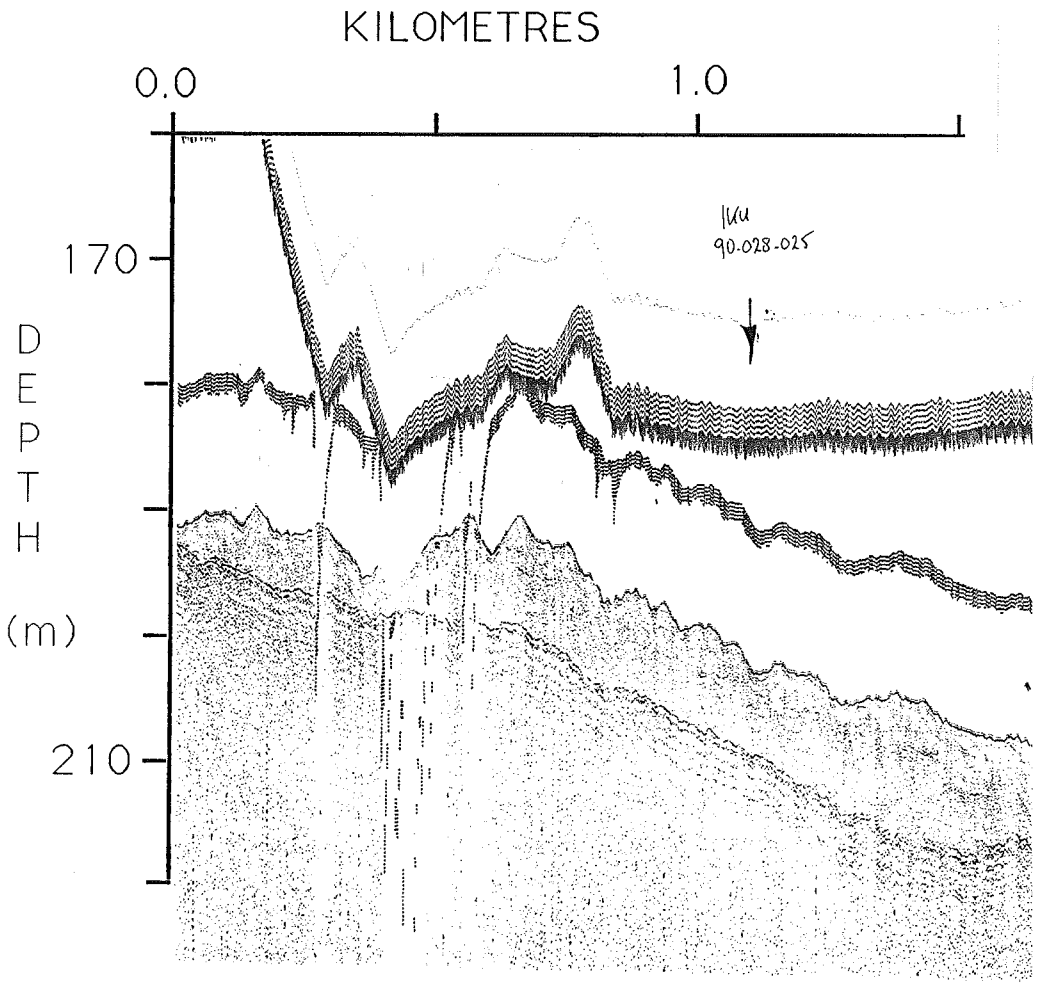
90028 024PC
LAURENTIAN CHANNEL



90028 - 025: IKU

Julian day:	311	GMT Time:	22:36
Latitude:	49 12.39 N	Longitude:	63 17.36 W
Depth:	192 m		

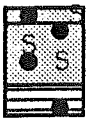
Geographic location: West coast of Anticosti Island



HUNTEC DTS profile
IKU location 90-028 - 025

90028-025B IKU

0

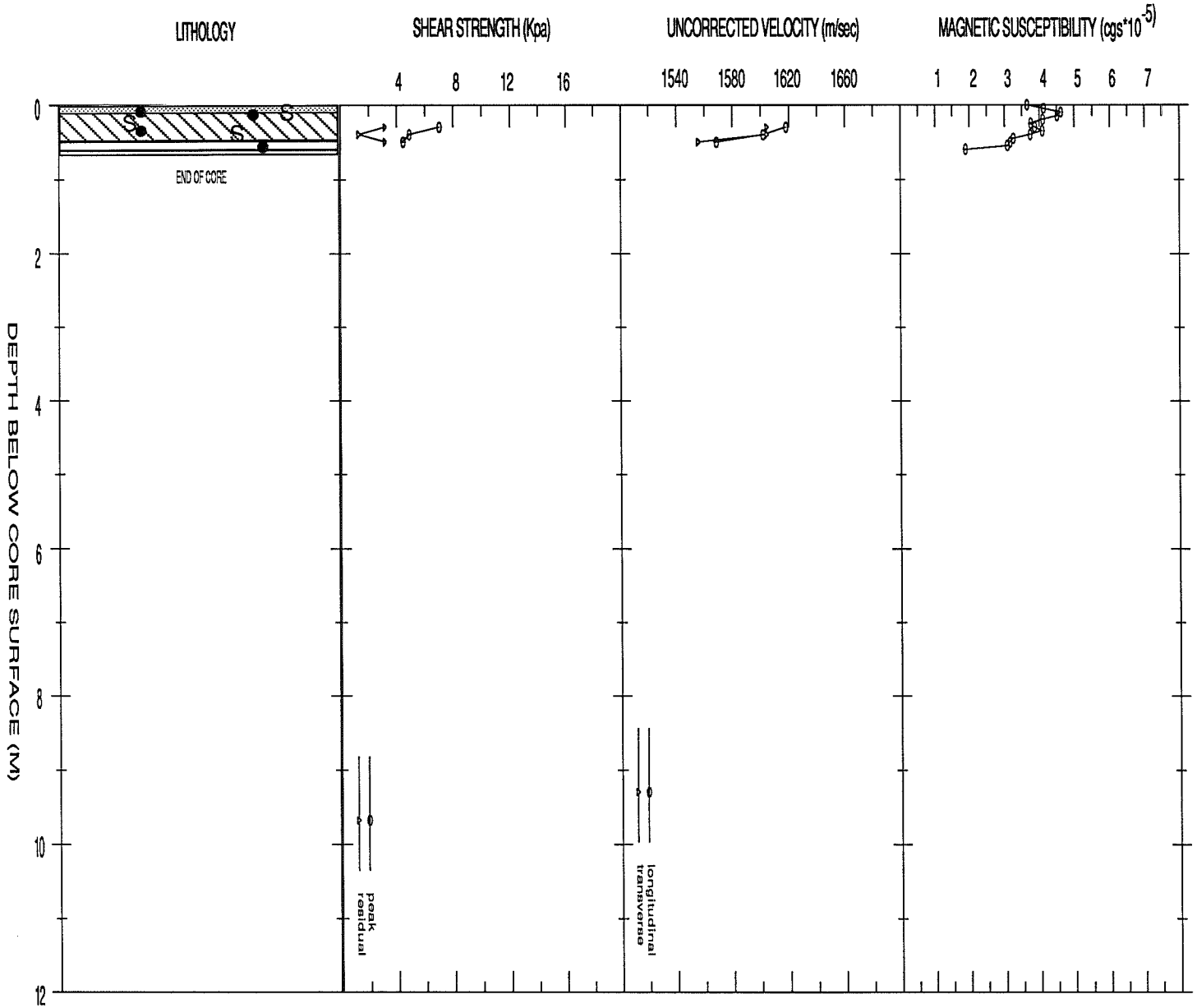


63

Massive olive fine sand with small and large limestone clasts, shells and worm tubes.
Grades down to grey silty sand with some clasts and shells.

Grades to grey silty clay with clasts. Highly calcareous.

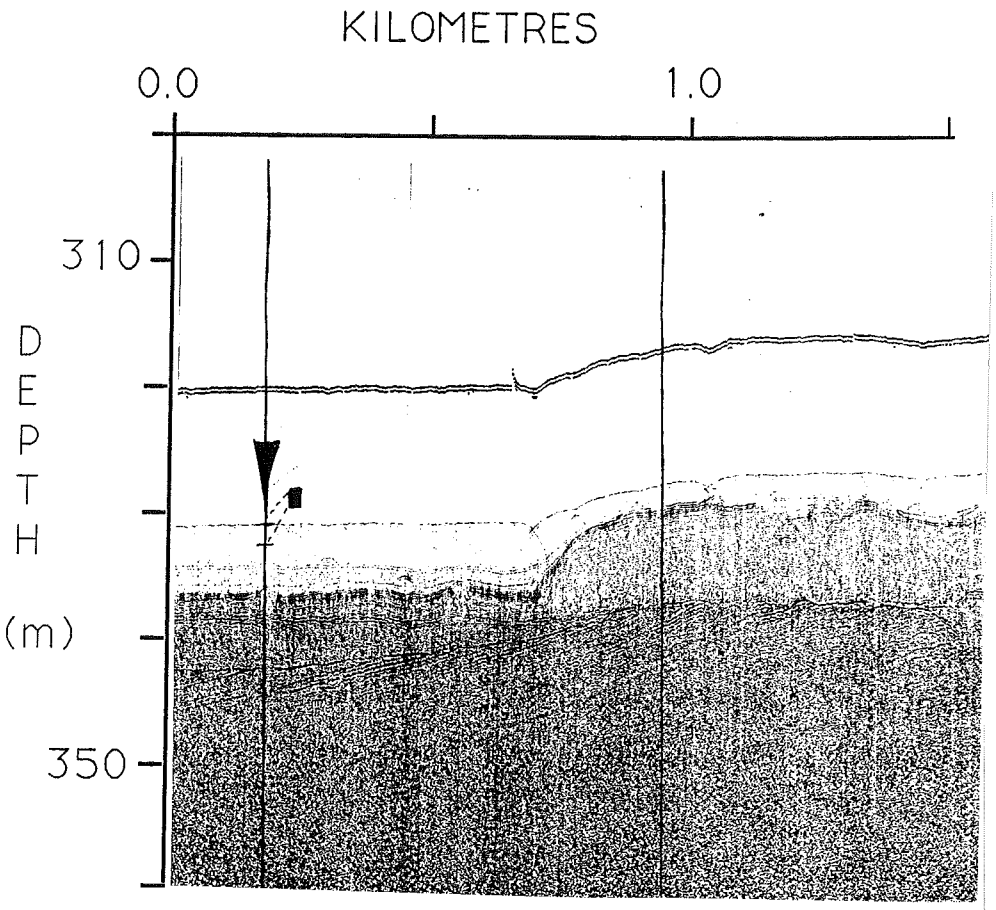
90028 025B IKU
WEST COAST OF ANTICOSTI ISLAND



90028 - 027: Trigger Weight Core

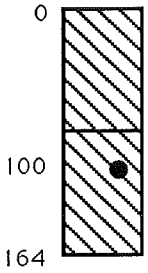
Julian day:	312	GMT Time:	21:37
Latitude:	48 45.53 N	Longitude:	60 01.18 W
Depth:	331 m		
App. penetration:	183 cm	TWC recovery:	164 cm

Geographic location: Port au Port Peninsula



HUNTEC DTS profile
core location 90-028- 027

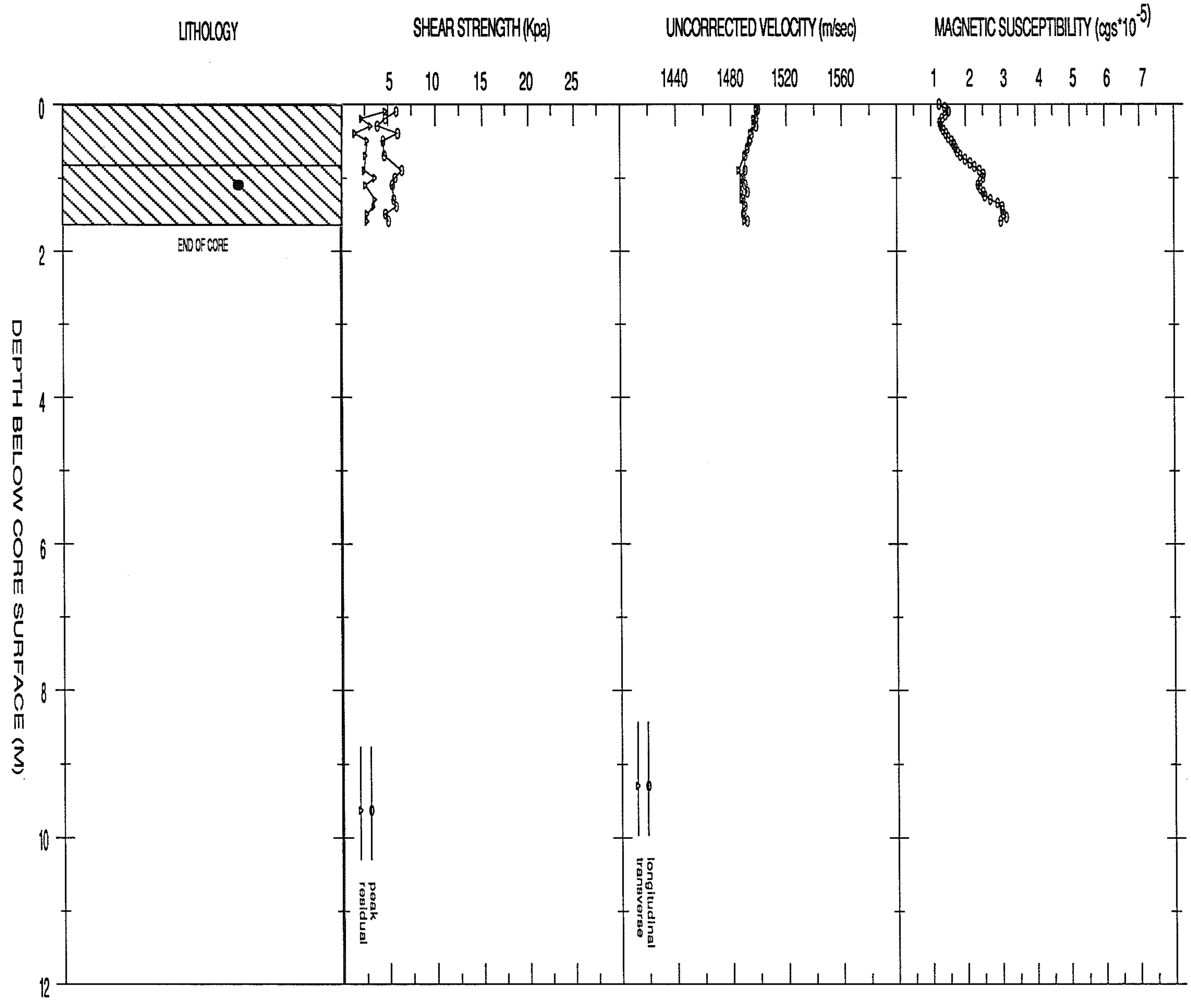
90028-027 TWC



Massive, very soft, dark grey-brown silty mud. Moderately calcareous.

Massive, olive grey silty mud. Moderately calcareous. Angular shale clast at 110cm.

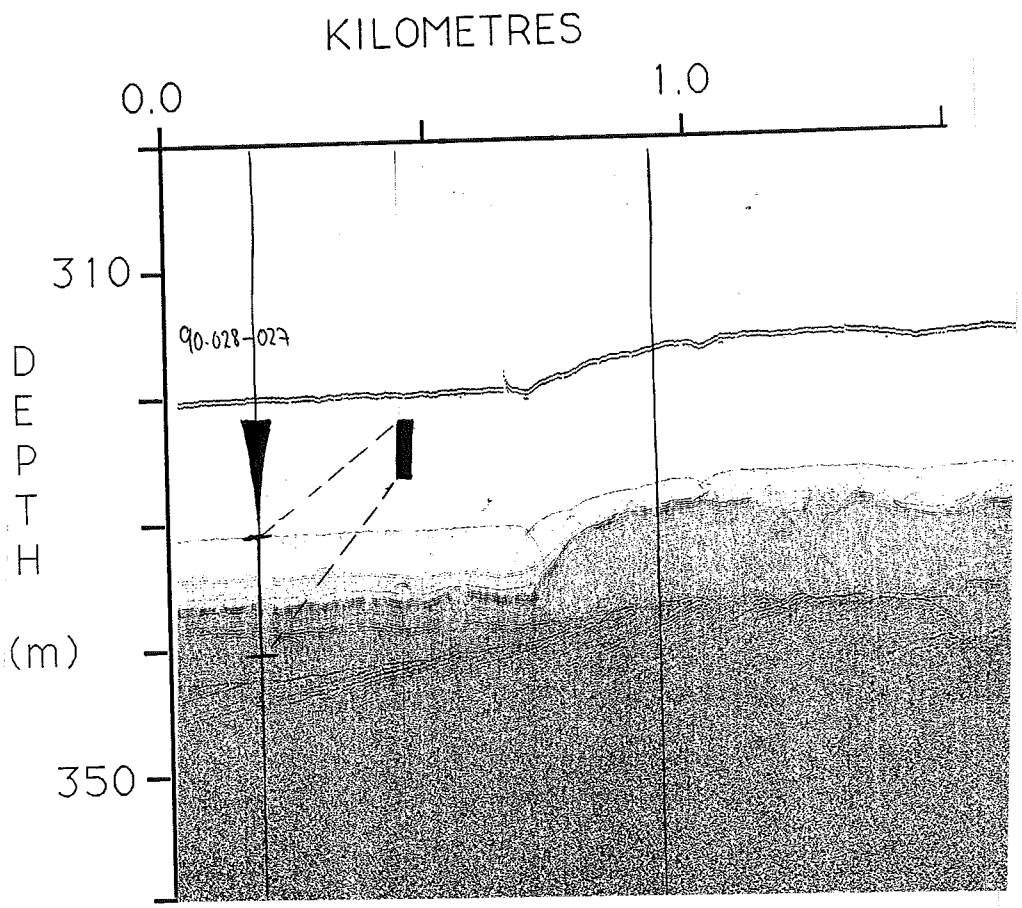
90028 027TWC
PORT AU PORT PENINSULA



90028 - 027: Piston Core

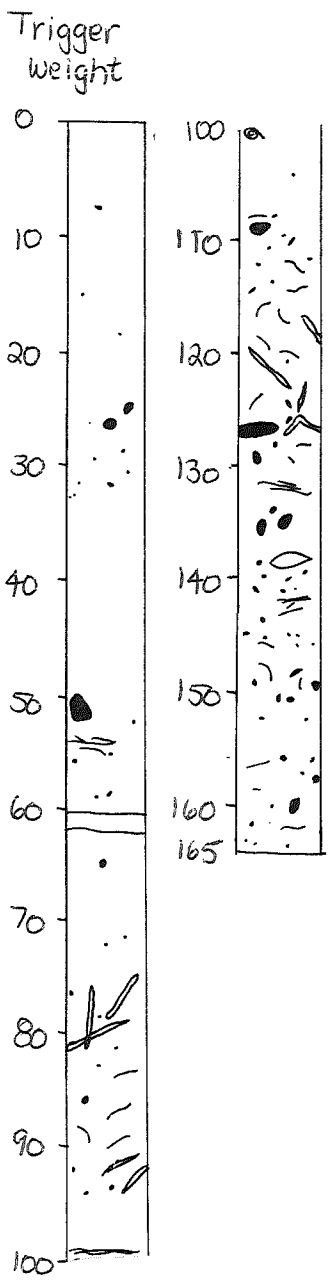
Julian day:	312	GMT Time:	21:37
Latitude:	48 45.53 N	Longitude:	60 01.18 W
Depth:	331 m	Corer length:	1528 cm
App. penetration:	940 cm	Core recovery:	470 cm

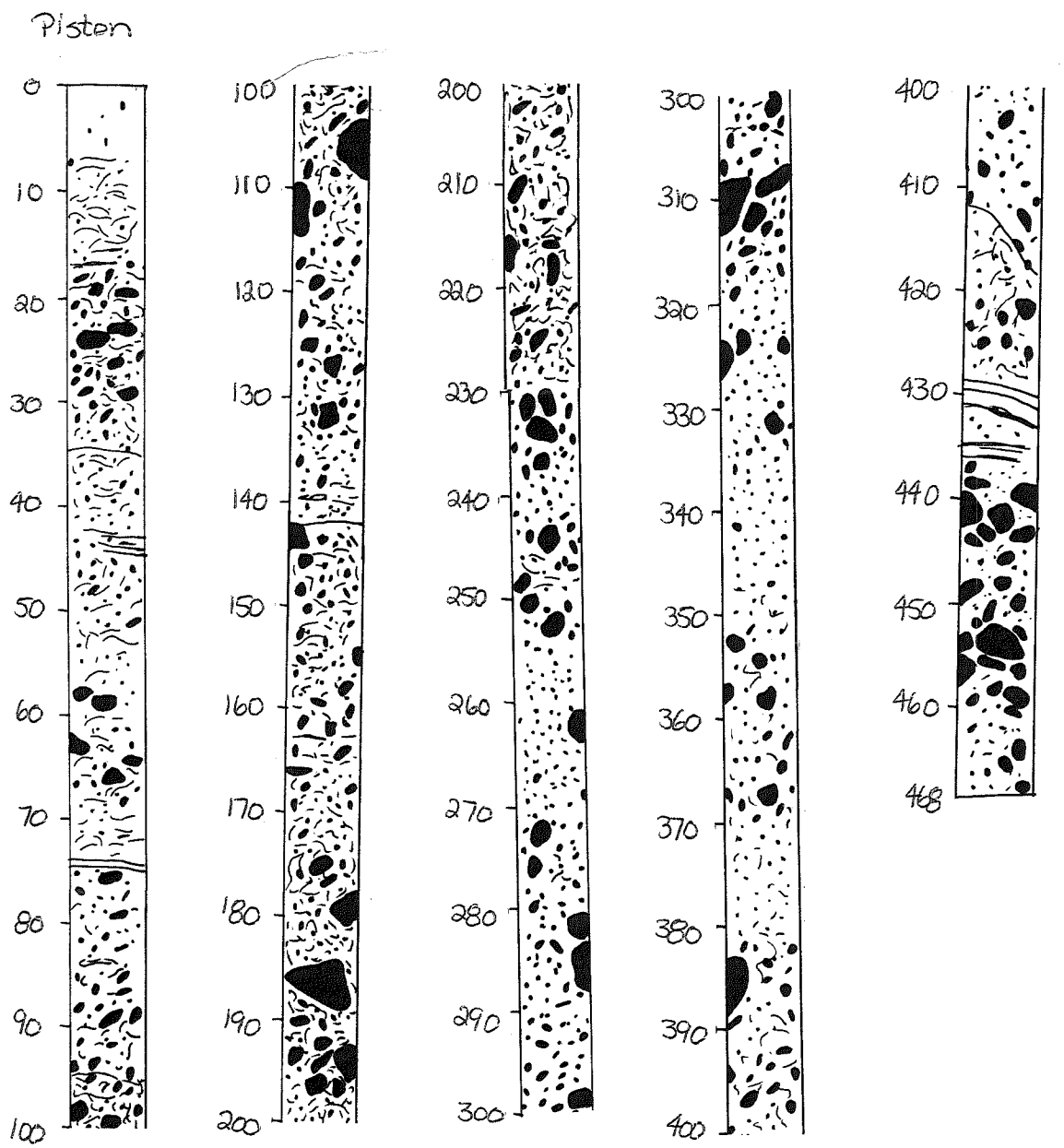
Geographic location: Port au Port Peninsula



HUNTEC DTS profile
core location 90-028- 027

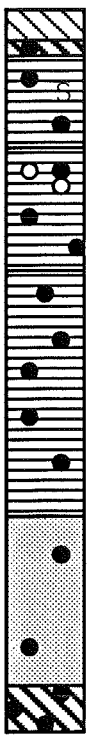
LCF CORE STATION HU-029-027





37.

90028-027 Piston



Dark grey brown silty mud, moderately calcareous.
Gradual change to red-brown sandy silt with sedimentary pebbles.
Sharp change to dark brown silty clay with some small clasts. Shell at 60cm.

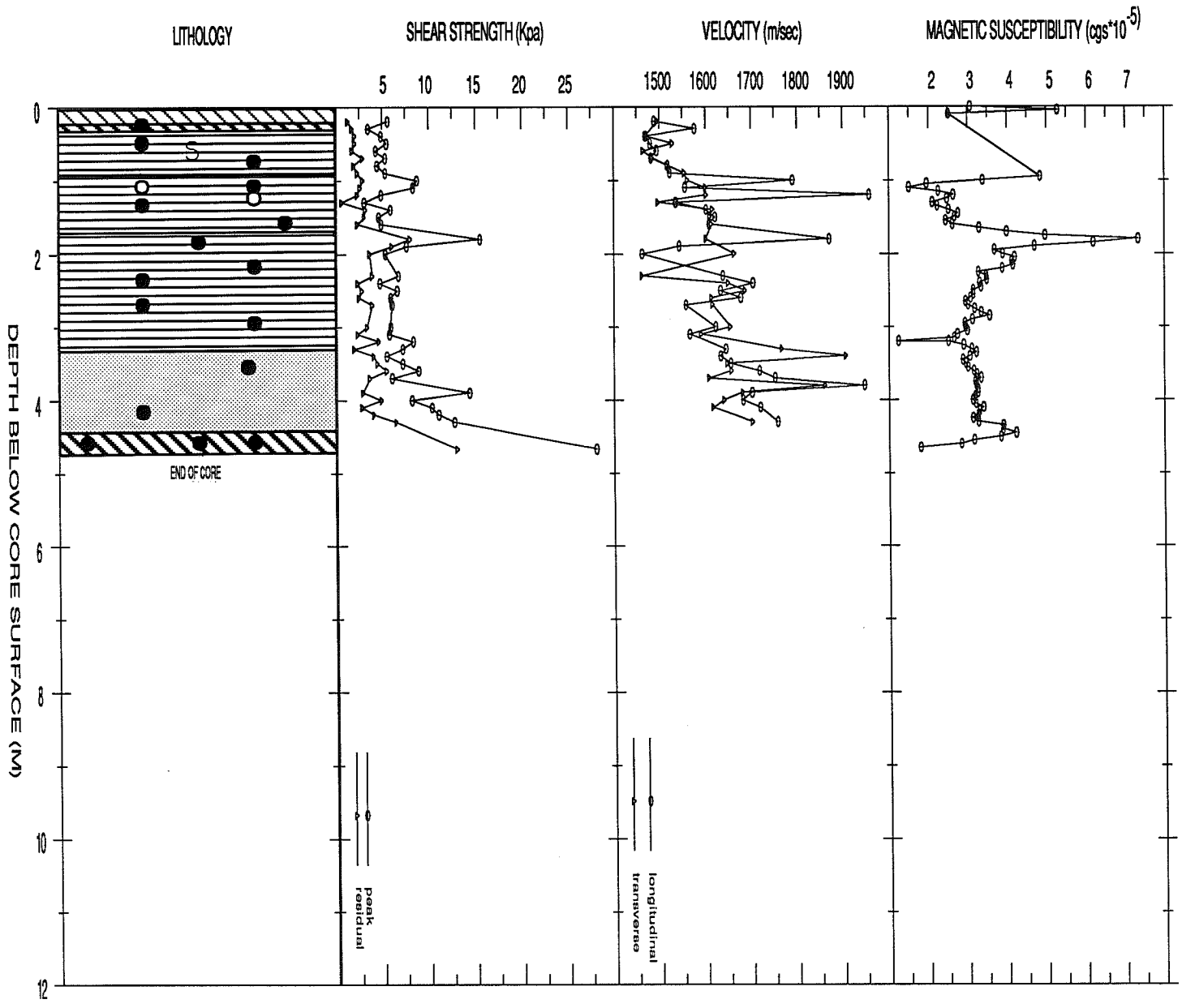
Dark grey silty clay with numerous clay balls and sedimentary clasts. Coarse sand seam at 100cm. Clayey layers throughout. Coarsely banded brown and grey 140-167cm. Moderately calcareous.

Dark grey silty clay with abundant clasts and layers and streaks of dark brown silt giving a banded appearance. Pebbles include quartzite, limestone, siltstone, gneiss. Moderately calcareous.

Faintly laminated silty sandy mud. Laminae of grey silty clay, sand. Moderately calcareous. A few clasts. Intense core deformation.

Sharp contact
Dark brown massive sandy silt diamicton, becoming stiff and dry at base.

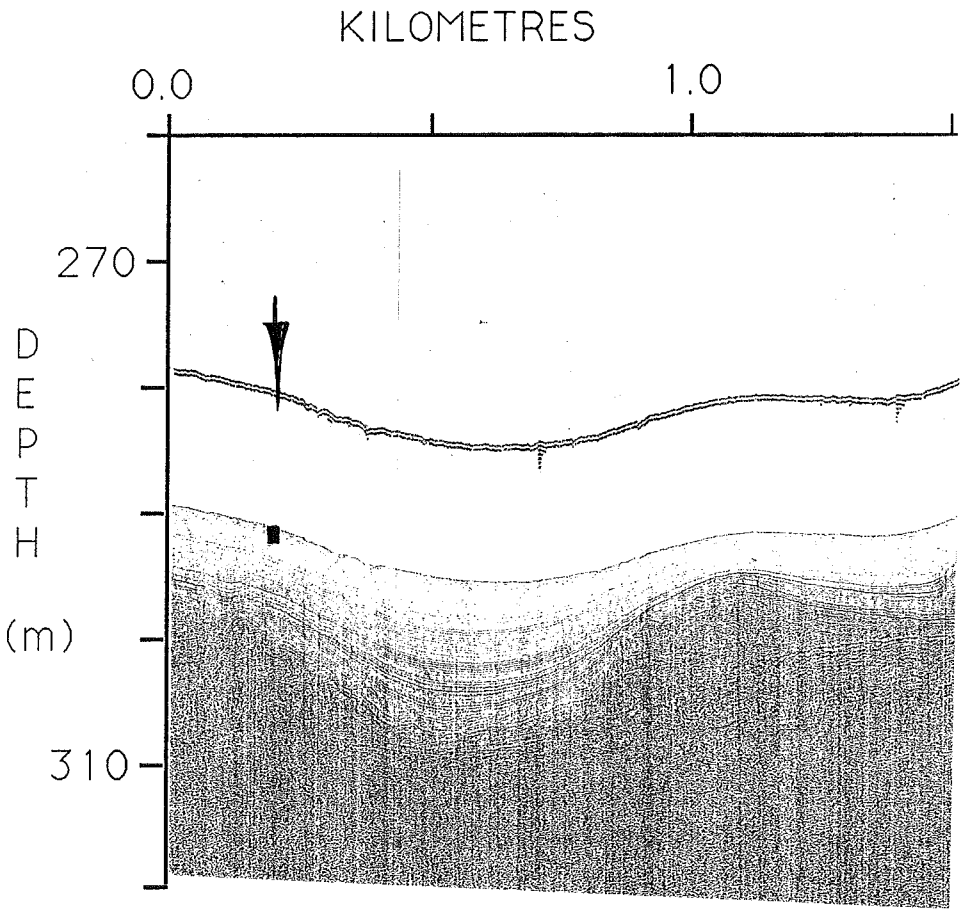
90028 027PC
PORT AU PORT PENINSULA



90028 - 030: Trigger Weight Core

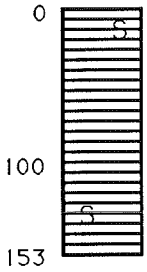
Julian day:	313	GMT Time:	18:30
Latitude:	50 06.36 N	Longitude:	58 45.43 W
Depth :	294 m		
App. penetration:	183 cm	TWC length:	153 cm

Geographic location: Esquiman Channel



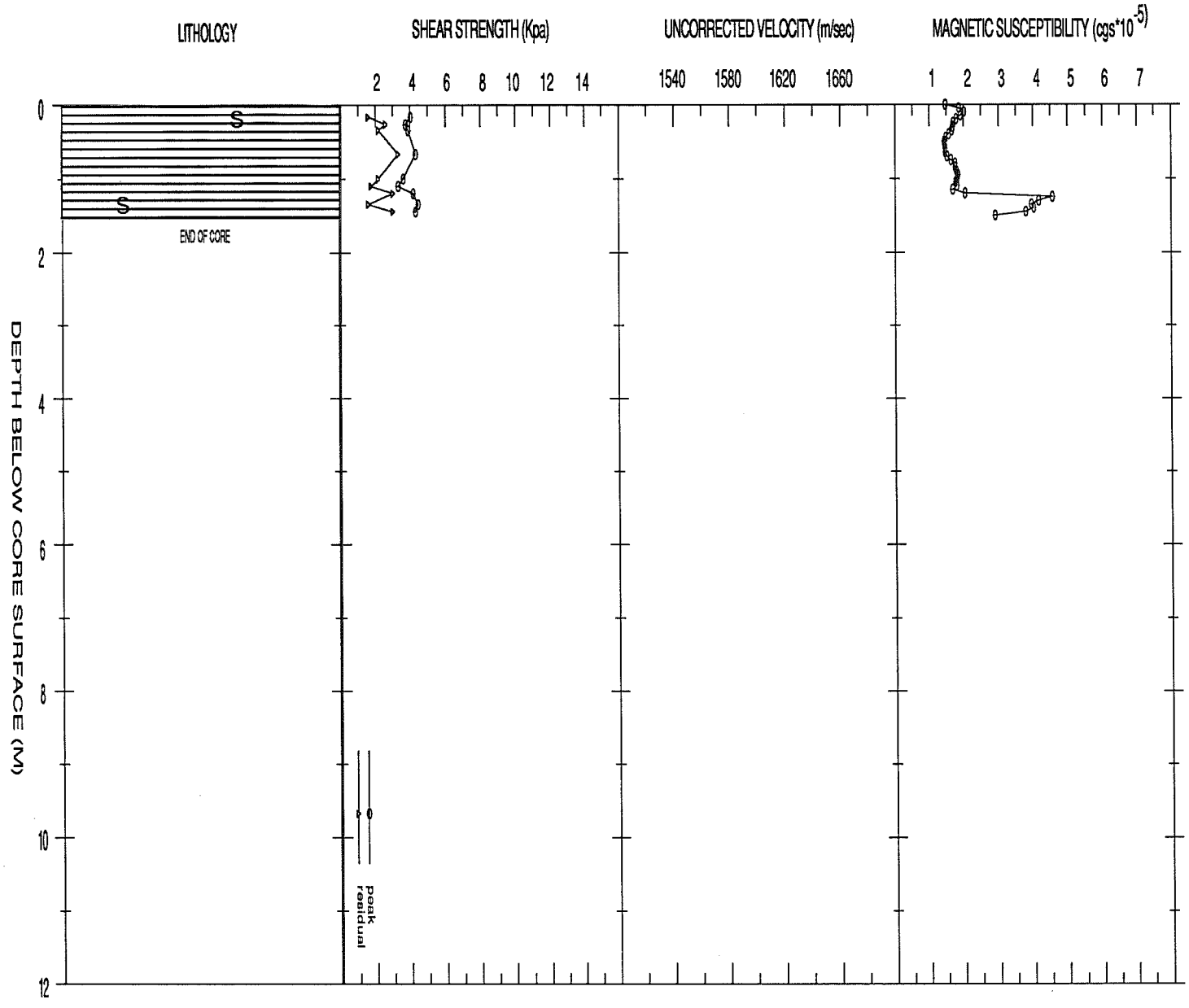
HUNTEC DTS profile
core location 90-028- 030

90028-030 TWC



Massive, soft, olive grey, moderately calcareous silty clay. Sand layer at 125cm. A few shell fragments.

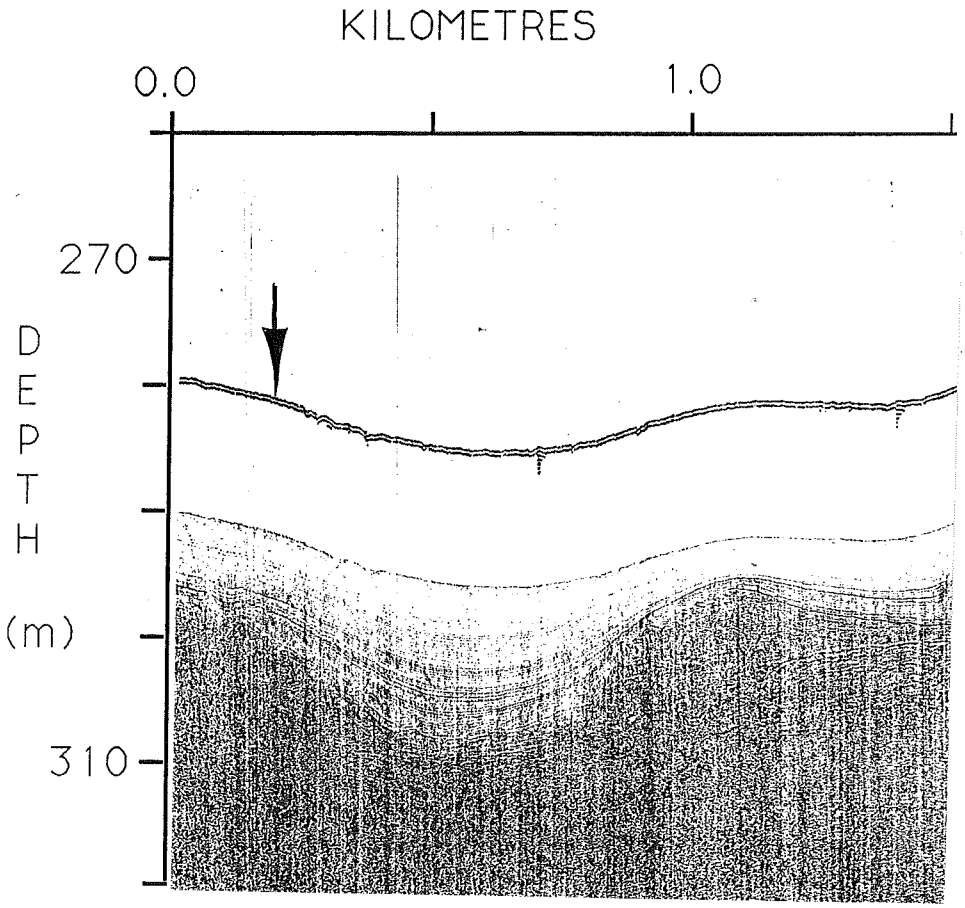
90028 030TWC
ESQUIMAN CHANNEL



90028 - 032: Box Core

Julian day:	313	GMT Time:	22:07
Latitude:	50 05.52 N	Longitude:	58 45.33 W
Depth:	291 m	Penetration:	50 cm

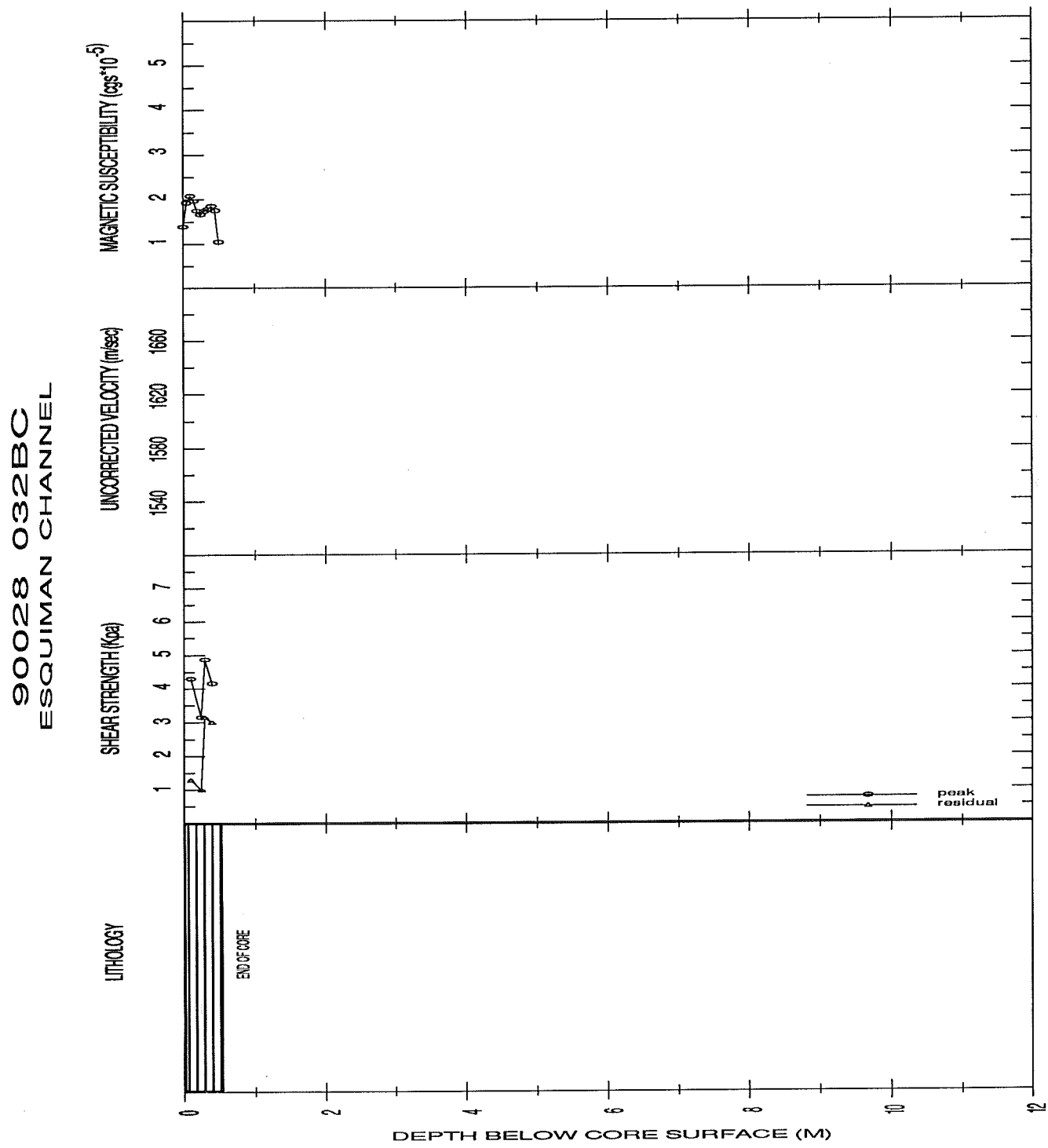
Geographic location: Esquiman Channel



HUNTEC DTS profile
core location 90-028- 032

90028-032 Box

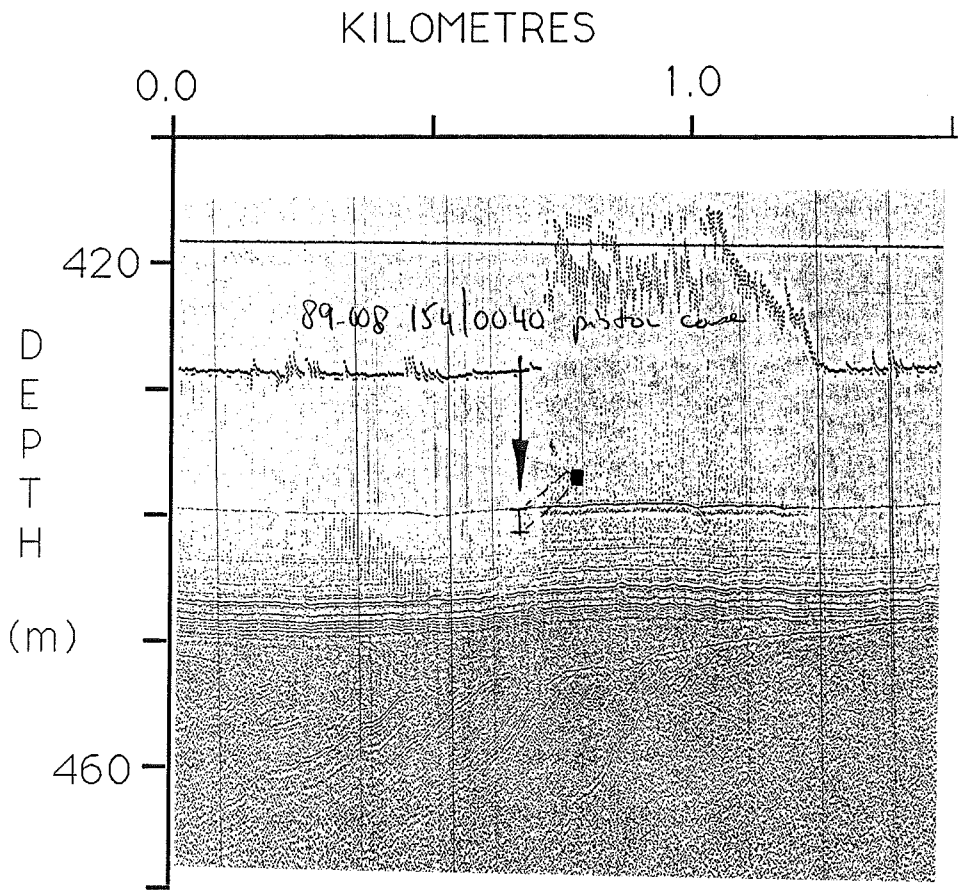
Soft, massive, moderately calcareous, very dark grey silty clay.


90028 032BC
ESQUIMAN CHANNEL
LITHOLOGY
END OF CORE
SHEAR STRENGTH (Kpa)
1 2 3 4 5 6 7
peak
residual
UNCORRECTED VELOCITY (m/sec)
1540 1580 1620 1660
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
1 2 3 4 5
0 2 4 6 8 10 12
DEPTH BELOW CORE SURFACE (M)

90028 - 034: Trigger Weight Core

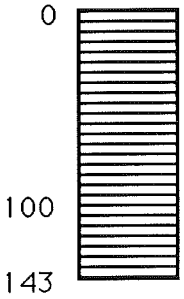
Julian day:	314	GMT Time:	17:57
Latitude:	48 15.00 N	Longitude:	60 39.43 W
Depth:	439 m		
App. penetration:	183 cm	TWC recovery:	144 cm

Geographic location: Laurentian Channel



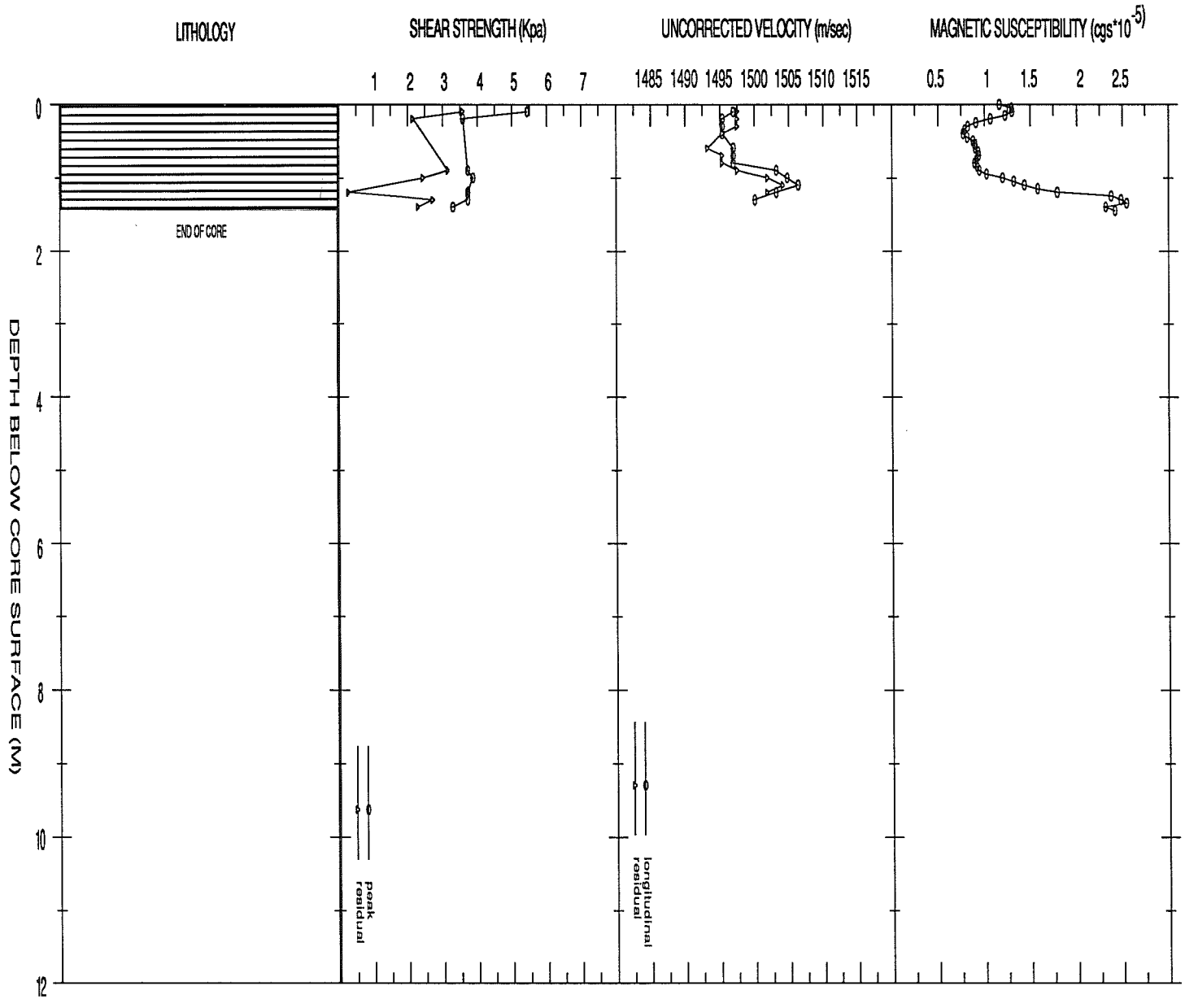
HUNTEC DTS profile
core location 90-028- 034

90028-034 TWC



Massive olive grey silty clay, moderately calcareous.

90028 034TWC
LAURENTIAN CHANNEL

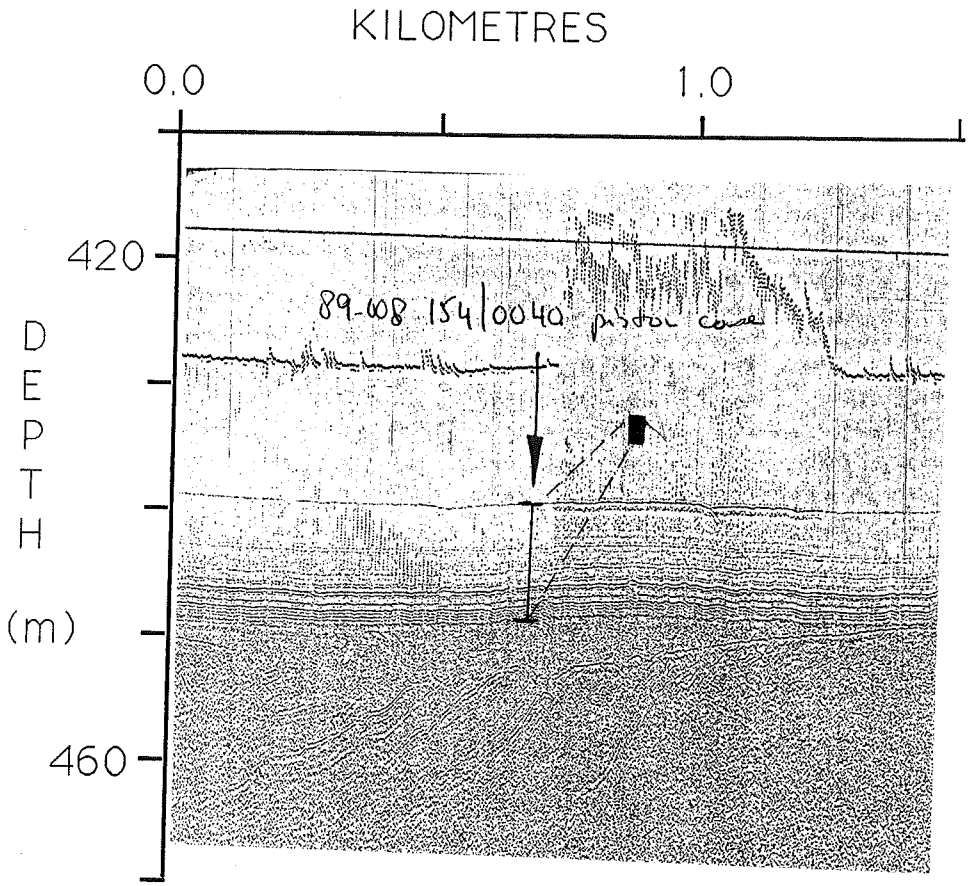


98

90028 - 034: Piston Core

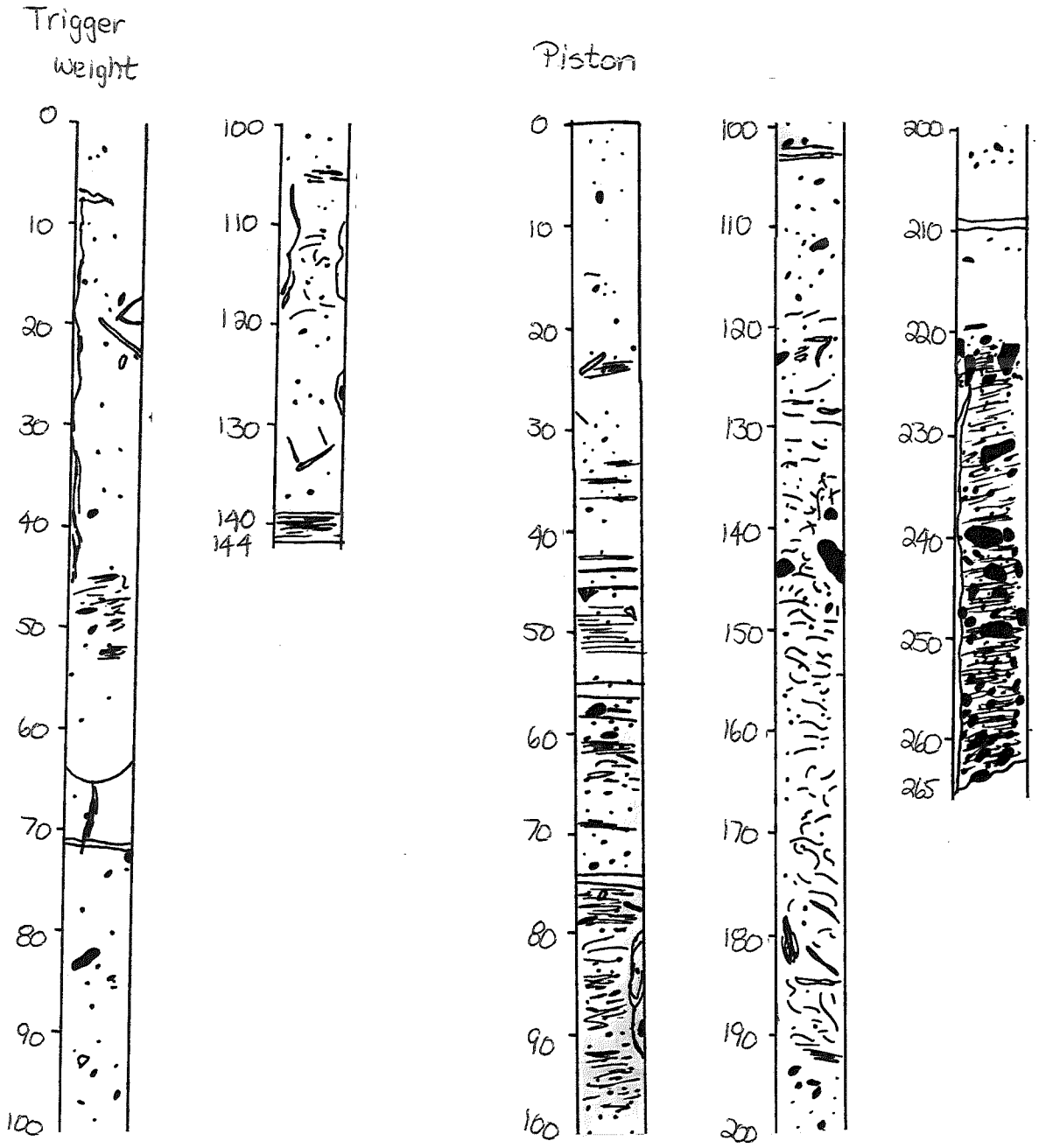
Julian day:	314	GMT Time:	17:57
Latitude:	48 15.00 N	Longitude:	60 39.43 W
Depth:	438 m	Corer length:	1520 cm
App. penetration:	929 cm	Core recovery:	265 cm

Geographic location: Laurentian Channel



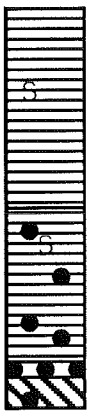
HUNTEC DTS profile
core location 90-028- 034

LCF HU 90-028-34



98.

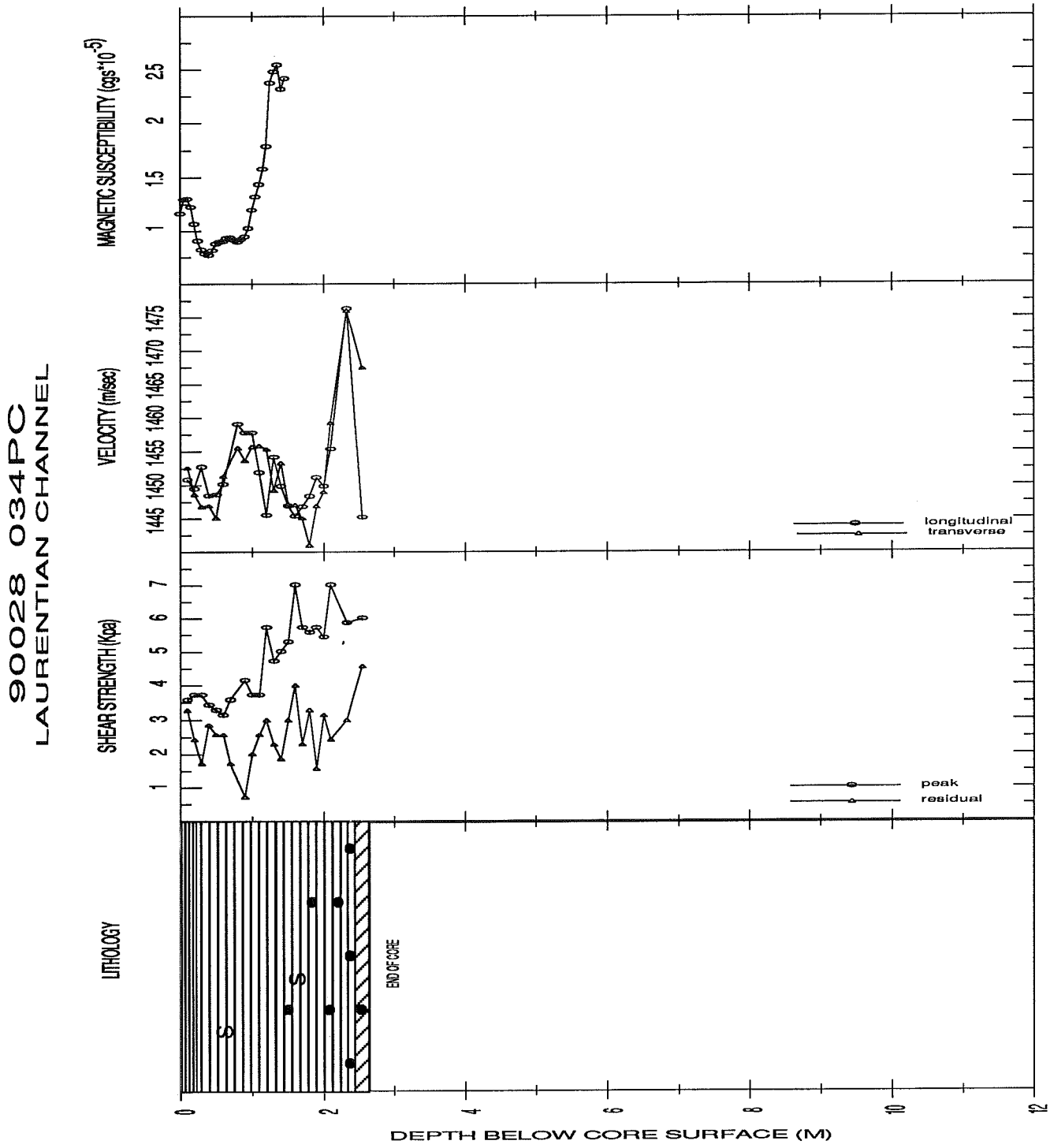
90028-034



Brownish massive silty clay, slightly calcareous.
grading to olive grey silty clay, slightly calcareous. Mollusc at 60cm

Dark grey, moderately calcareous silty clay with small clasts. Some broken shells. Gradual colour change to massive dark brown.

Pebble line
Moderately calcareous clayey silt with grit, bedded with sand layers with pebbles.

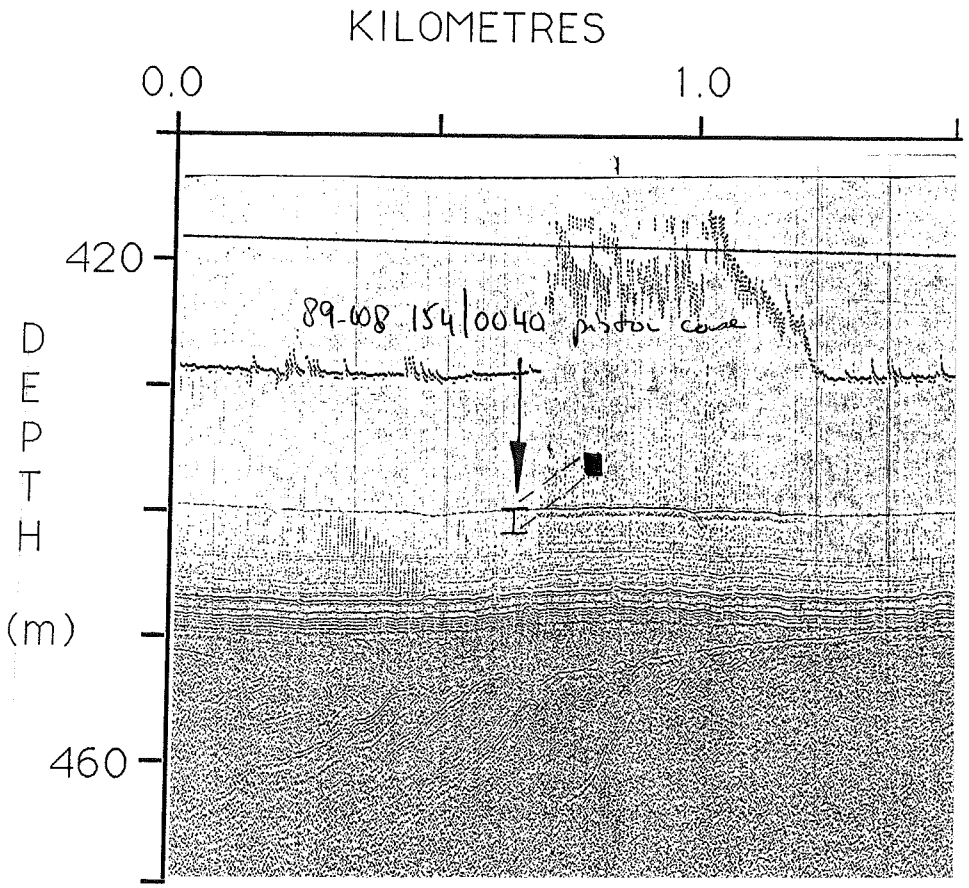

90028 034PC
LAURENTIAN CHANNEL
LITHOLOGY
SHEAR STRENGTH (Kpa)
VELOCITY (m/sec)
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
peak
residual
longitudinal
transverse
END OF CORE
DEPTH BELOW CORE SURFACE (M)

90028 - 037: Trigger Weight Core

Julian day:	314	GMT Time:	20:29
Latitude:	48 15.00 N	Longitude:	60 39.42 W
Depth:	439 m		
App. penetration:	183 cm	TWC recovery:	144 cm

Geographic location: Laurentian Channel

As the core was done in the same area than number 34, the trigger weight core was not subsampled.

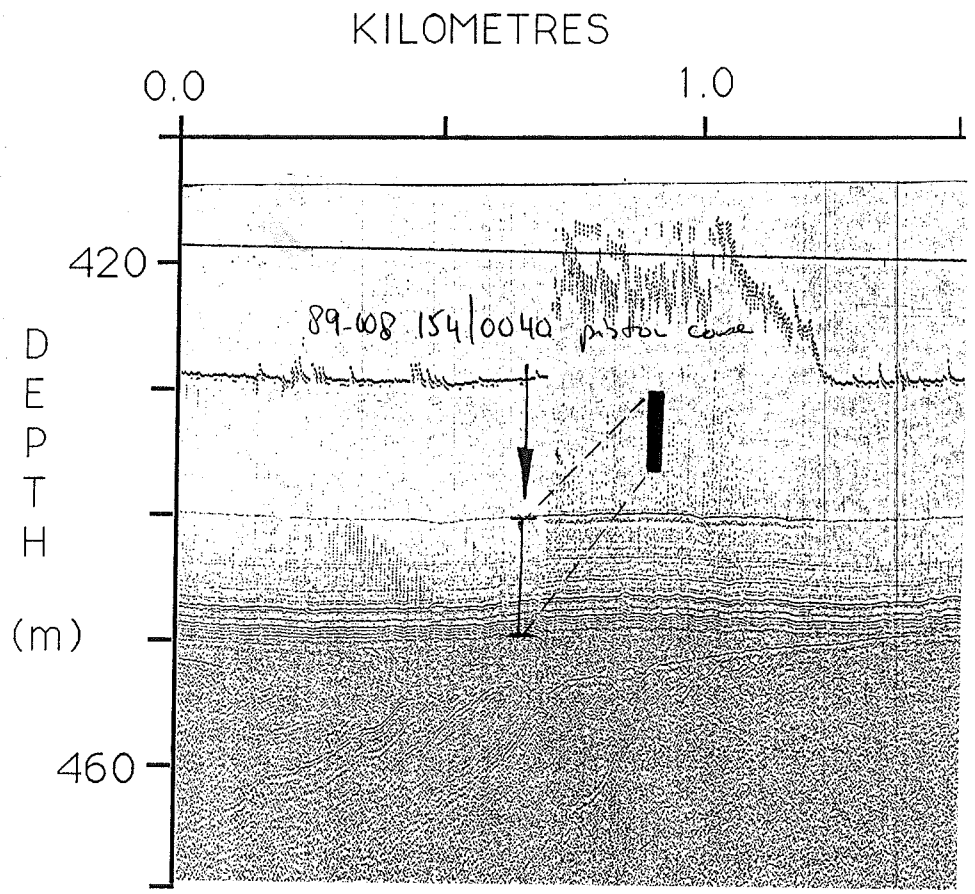


HUNTEC DTS profile
core location 90-028- 037

90028 - 037: L-Piston Core

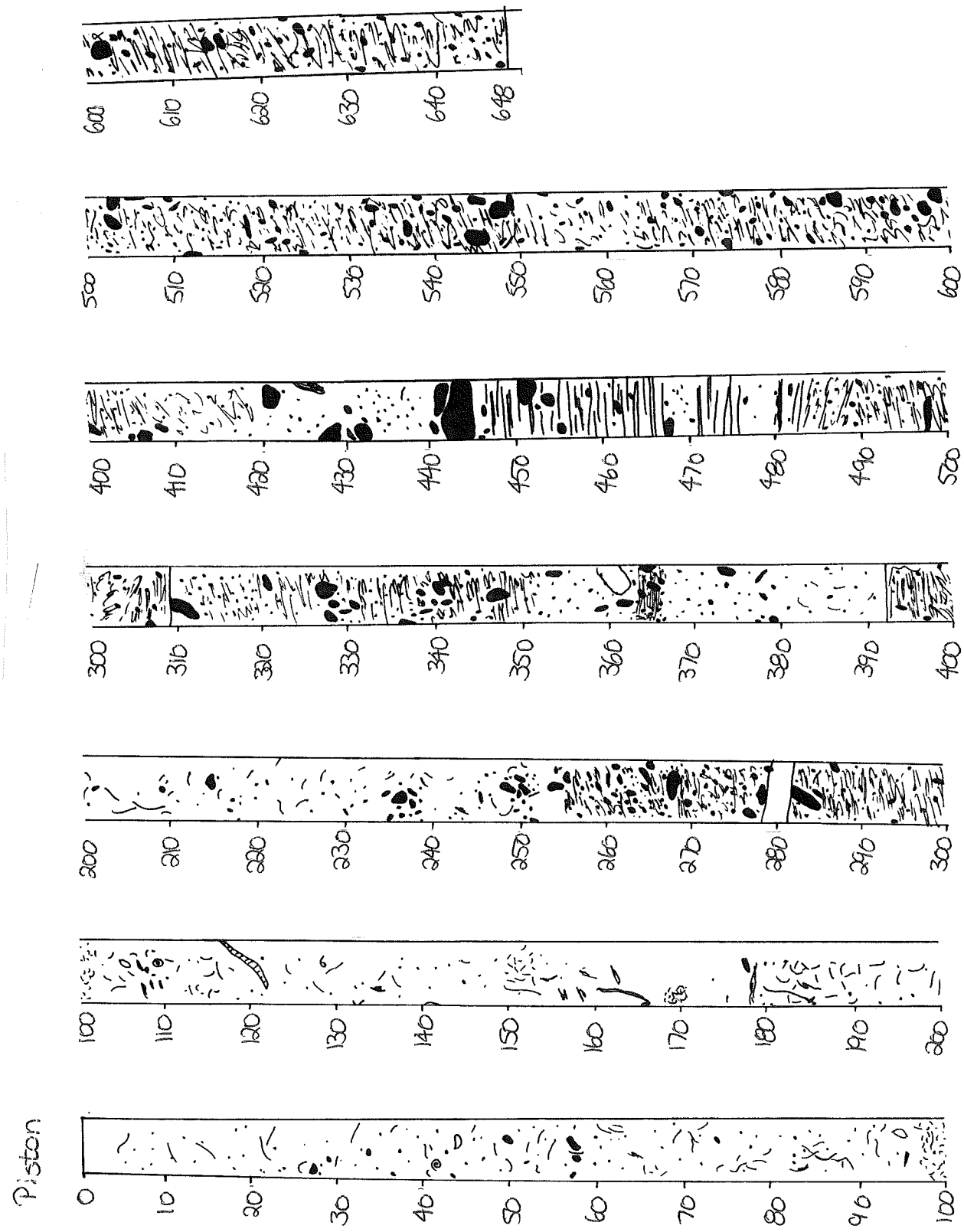
Julian day:	314	GMT Time:	20:29
Latitude:	48 15.00 N	Longitude:	60 39.42 W
Depth:	439 m	Corer length:	1216 cm
App. penetration:	927 cm	Core recovery:	648 cm

Geographic location: Laurentian channel

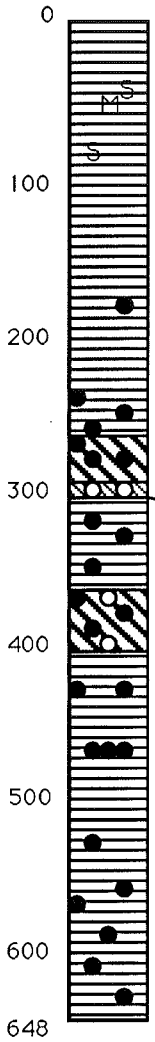


HUNTEC DTS profile
core location 90-028- 037

LCF CORE STATION HU-029-037



90028-037 Piston Core



5cm greyish brown silty mud grading to massive, slightly calcareous brown silty clay with shells in the upper metre and very faint mottling. Some silty areas. Worm tubes 100-160cm. Black volcanic? at 190cm.

Gradual change to siltier reddish brown silt-clay with volcanic or igneous clasts, gneiss and quartz. Slightly calcareous.

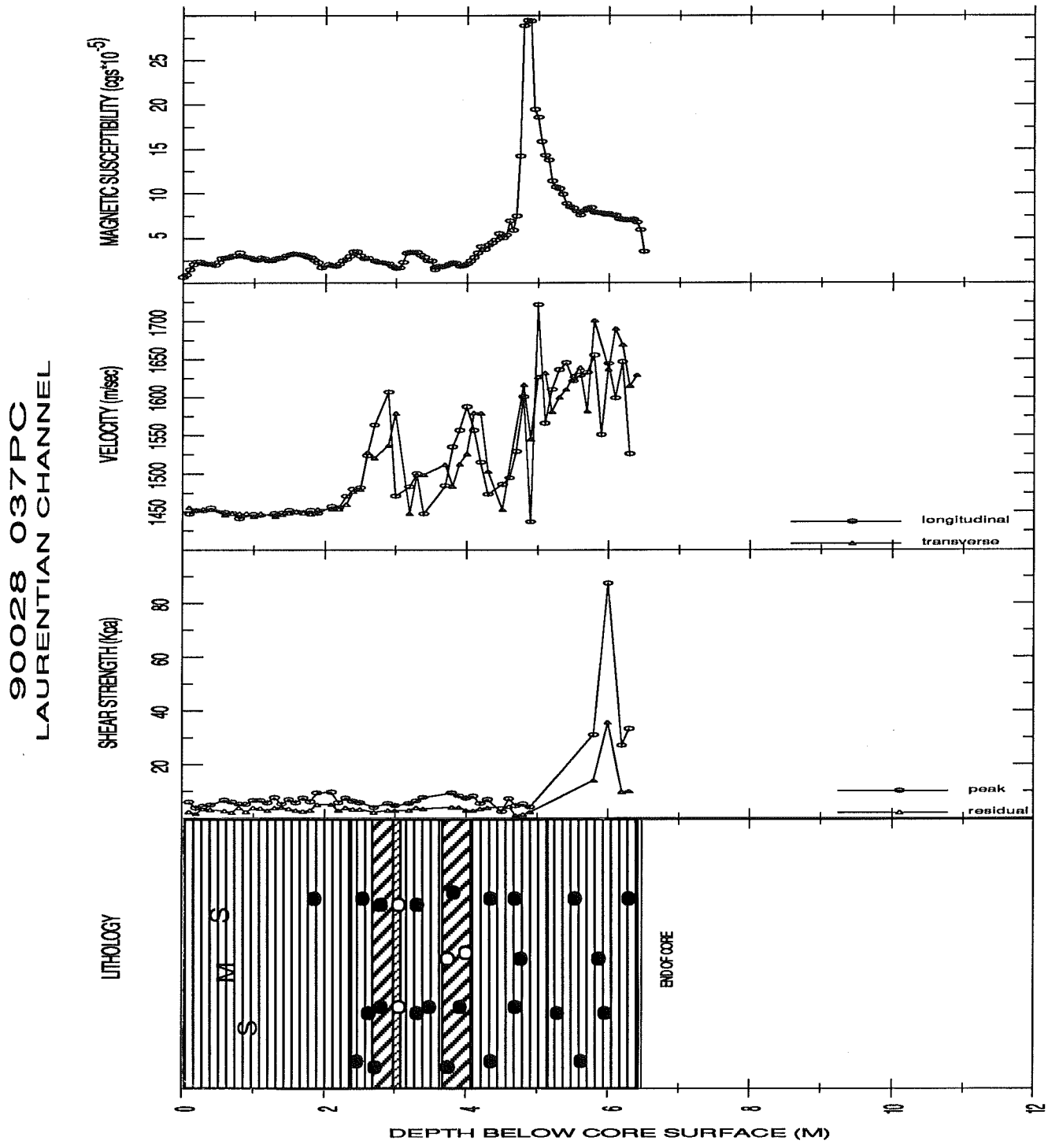
Reddish brown clayey silt with grit and many large clasts - igneous and metamorphic. Moderately calcareous.

Rip up clasts of clay. Pebble layer at basal contact.
Massive reddish brown silty clay with some ig/meta clasts, with reddish silt layers in silty clay 340-350cm.

Gradual change to dark reddish brown clayey silt with clasts and abundant elongated grey clay balls, sand balls, and thin seams. Faintly laminated appearance due to sandy and silty zones. Clasts include sandstone, red siltstone, and igneous pebbles. Moderately calcareous.

Red and grey laminated gritty silt and clay with igneous, metamorphic, and carbonate clasts, sand and pebble layers. Highly calcareous.

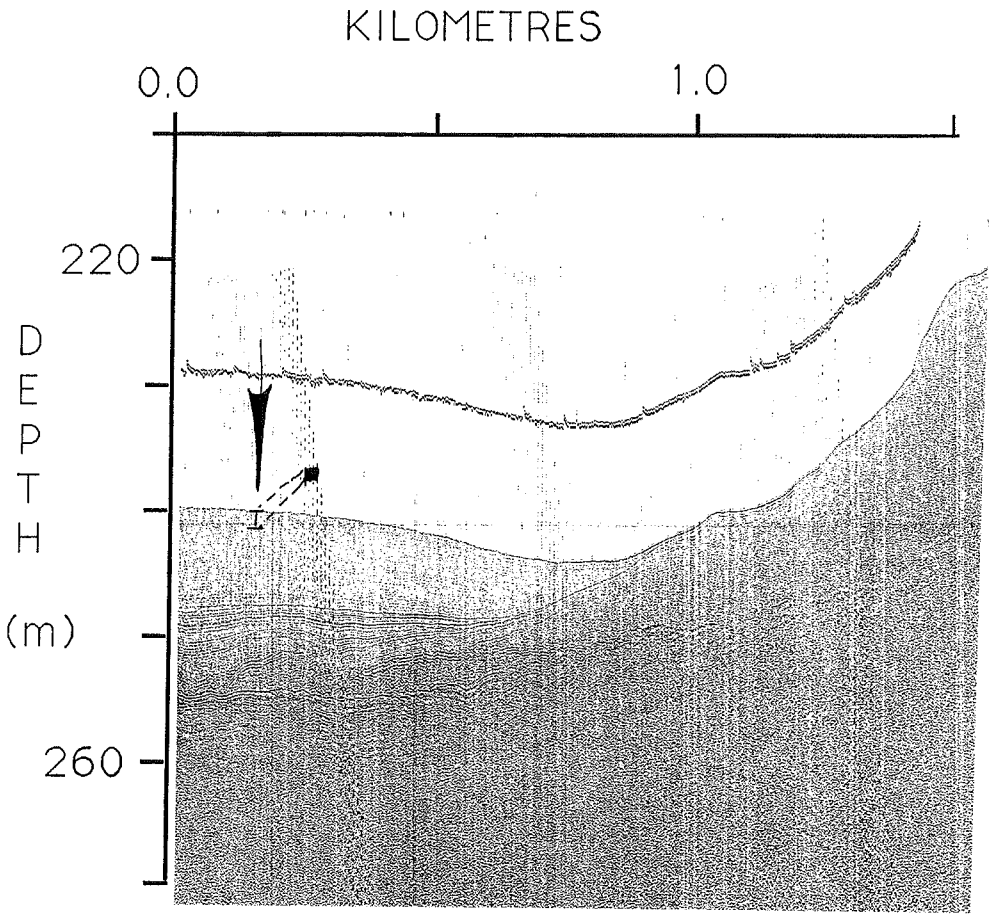
Abrupt change to massive stiff, highly calcareous silty clay with abundant clasts, grit and some silty to sandy areas. Quartz pebble. Clasts appear to be metamorphic.


90028 037PC
LAURENTIAN CHANNEL
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
5
10
15
20
25
VELOCITY (m/sec)
1450
1500
1550
1600
1650
1700
longitudinal
transverse
SHEAR STRENGTH (Kpa)
20
40
60
80
peak
residual
LITHOLOGY
S
M
S
END OF CORE
0
2
4
6
8
10
12
DEPTH BELOW CORE SURFACE (M)

90028 - 038: Trigger Weight Core

Julian day:	315	GMT Time:	14:36
Latitude:	49 46.41 N	Longitude:	62 25.06 W
Depth:	240 m		
App. penetration:	165cm	TWC recovery:	113 cm

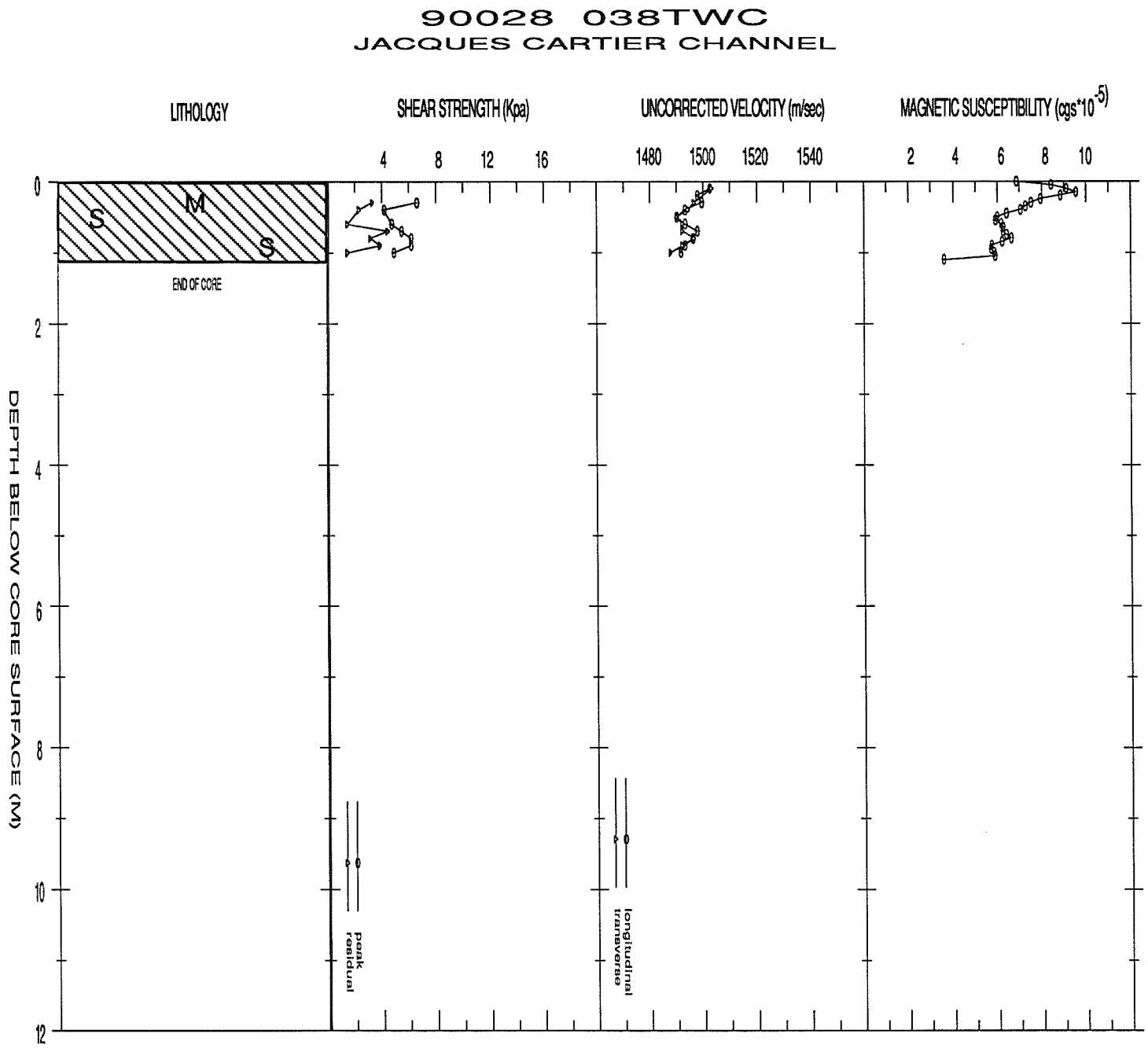
Geographic location: Jacques Cartier Channel



HUNTEC DTS profile
core location 90-028- 038

90028-038 TWC

Soft, massive, slightly calcareous olive grey silty mud with slight bioturbation mottling. Becomes slightly finer with depth, and more calcareous at base.

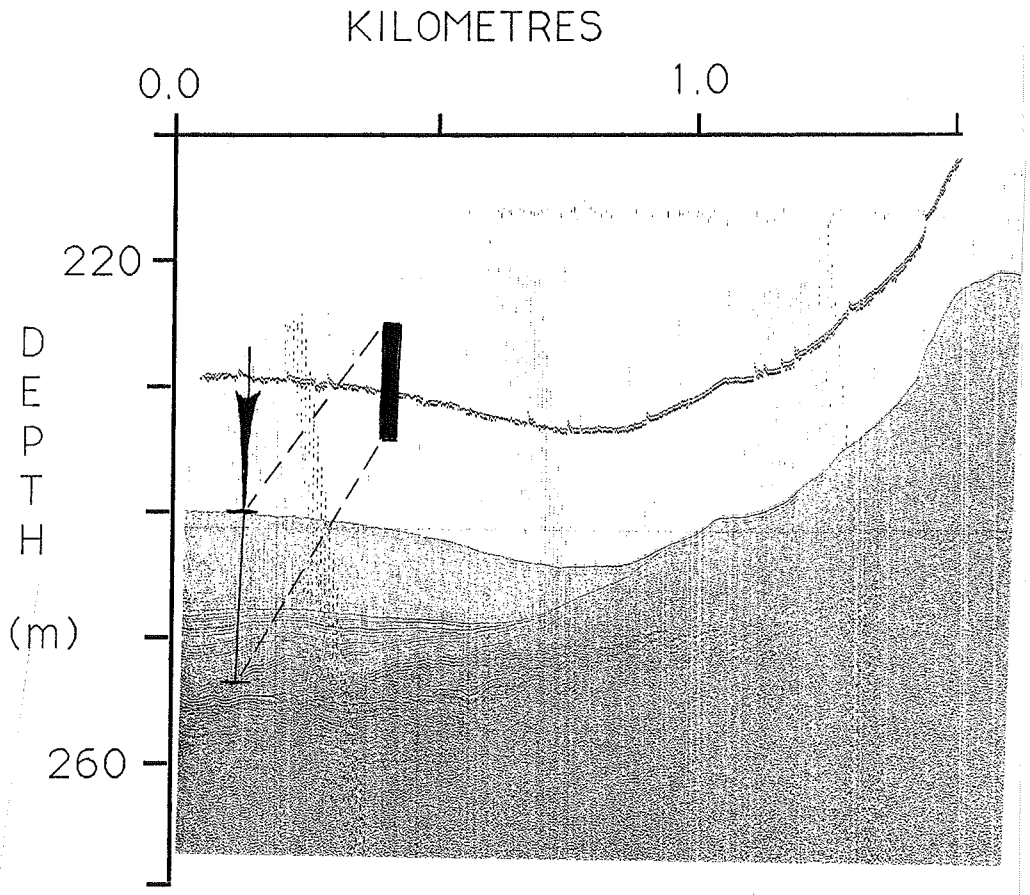

90028 038TWC
JACQUES CARTIER CHANNEL
LITHOLOGY
SHEAR STRENGTH (Kpa)
UNCORRECTED VELOCITY (m/sec)
MAGNETIC SUSCEPTIBILITY (cgs*10^-5)
4
8
12
16
1480
1500
1520
1540
2
4
6
8
10
S
M
S
END OF CORE
0
2
4
6
8
10
12
DEPTH BELOW CORE SURFACE (M)
peak
residual
longitudinal
transverse

98.

90028 - 038: L-Piston Core

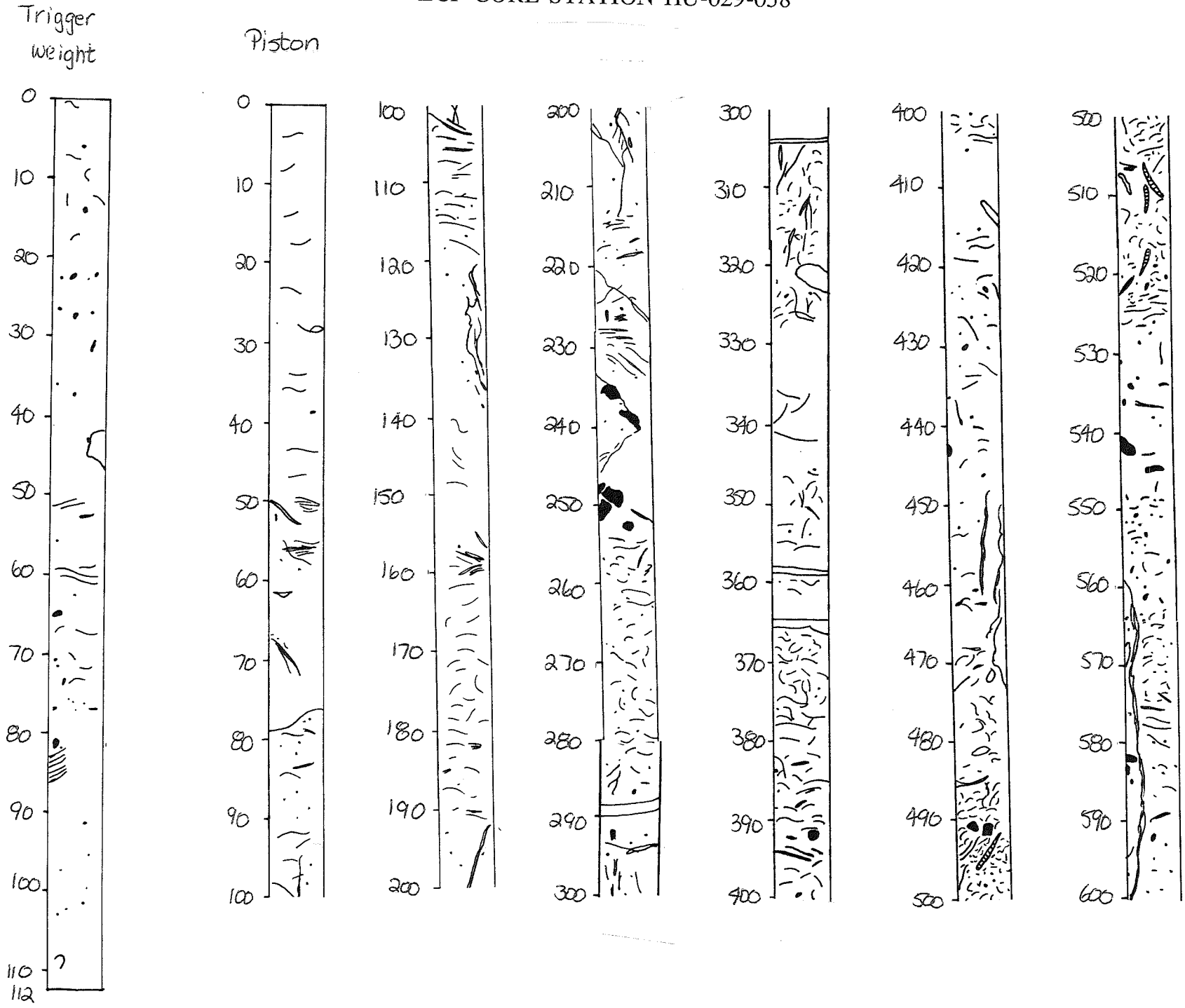
Julian day:	315	GMT Time:	14:36
Latitude:	49 46.41 N	Longitude:	62 25.06 W
Depth:	240 m	Corer length	1520 cm
App. penetration:	xxxx cm	Core recovery:	925 cm

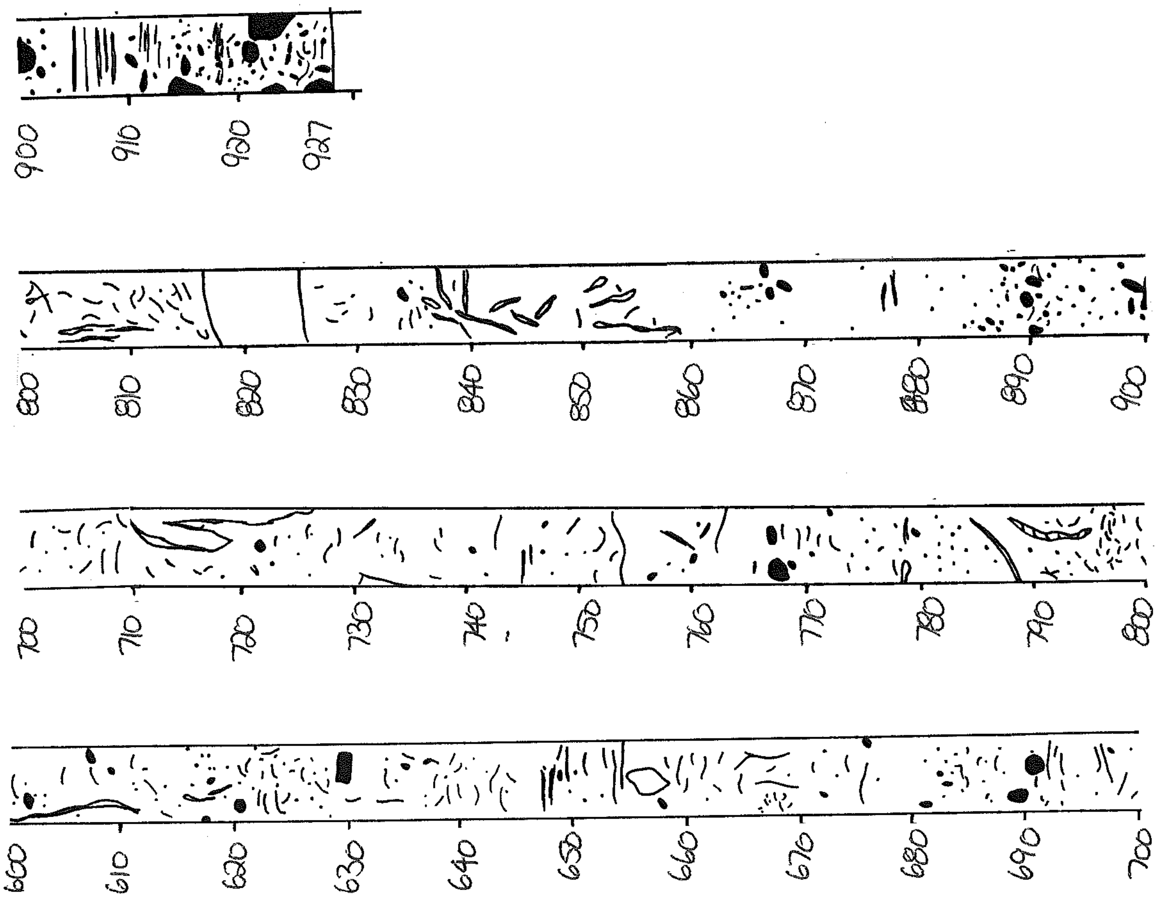
Geographic location: Jacques Cartier Channel



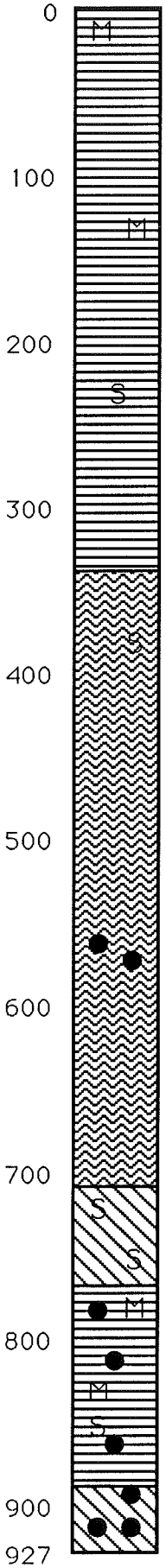
HUNTEC DTS profile
core location 90-028- 038

LCF CORE STATION HU-029-038




900
910
920
927
800
810
820
830
840
850
860
870
880
890
900
700
710
720
730
740
750
760
770
780
790
800
600
610
620
630
640
650
660
670
680
690
700

90028-038 Piston Core



Grey, massive, mottled silty clay, slightly calcareous. Mollusc at 240cm

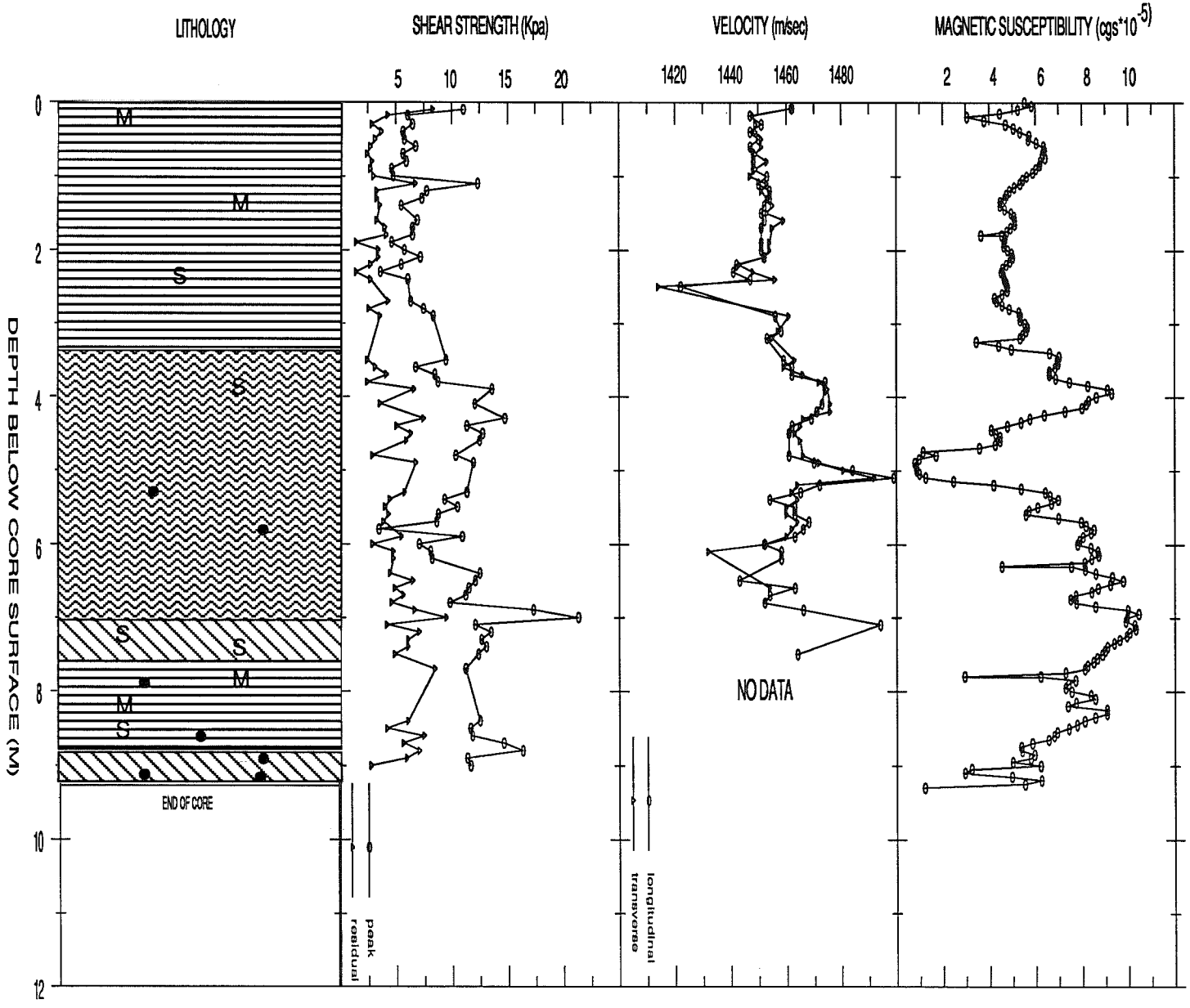
Olive-grey, slightly calcareous massive silty clay, strongly bioturbated. Shell fragments at 390cm. Pebbles at 570cm and 580cm.

Increasing silt content, decreasing bioturbation. Moderately calcareous.

Dark grey, moderately to highly calcareous, massive silty clay with dark bioturbation areas giving a black mottled appearance. Minor clasts throughout and quartzite cobble at 820cm.

Grey, massive, highly calcareous silty clay with some clasts, and sandy seams giving a slightly laminated appearance. Becoming siltier and more pebbly downwards. Limestone pebble at base.

90028 038PC
JACQUES CARTIER CHANNEL



GOLF OF ST-LAWRENCE

HU-090-028

PRELIMINARY REPORT

UQAM

GEOTOP-Group

1. Title of the project : Geochemical & micropaleontological indicators of transitional environments

2. Participants:

(a) On board

Nora Fève (PhD student-UQAM): stable isotopes in foraminifers
Fouad Hamidi (MSc student-UQAM): trace elements (Ba, Cd, Pb) in foraminifers
Bernadette Quémerais (Post-doctoral fellow-UQAM): Th/U disequilibria
André Rochon (MSc studen-UQAM): micropaleontology (marine palynology)
Sophie Tran (Technician-UQAM): hydrochemistry
Sylvain Vallières (PhD student-UQAM): Th/U disequilibria

To embark at Tadoussac

René Canuel (Technician-UQAM): hydrochemistry*
Martine Lapointe (PhD student-UQAM): micropaleontology (diatoms)*

On board activities:

Nora Fève: seismic watch#
Fouad Hamidi: long core sampling#
Bernadette Quémerais: box-cores
André Rochon: water sampling and CTD
Sophie Tran: seismic watch and water sampling#
Sylvain Vallières: long core sampling
René Canuel: box-cores
Martine Lapointe: water sampling and CTD

#Disembark at Tadoussac

On-shore participants:

Anne de Vernal (Prof. UQAM): micropaleontology (marine palynology)*
Claude Hillaire-Marcel (Prof. UQAM): isotope geochemistry
Marc Lucotte (Prof. UQAM): chemical oceanography
Alfonso Mucci (Prof. McGill): elemental geochemistry
Stephen Macko (Prof. U. of Virginia): organic geochemistry
Jim Channell (Prof. U. of Miami): paleomagnetism
Ted Irving (Technician UQAM): micropaleontology (palynology)*
Jennane Anasse (MSc student-UQAM): Short lived radio-isotopes (210Pb, 228Th)*
Patrick Louchouarn (MSc student-UQAM): biogeochemistry*

Robert Lebel (BSc student-UQAM)*
Nicolas Quash (PhD student-UQAM): ^{14}C by TAMS*

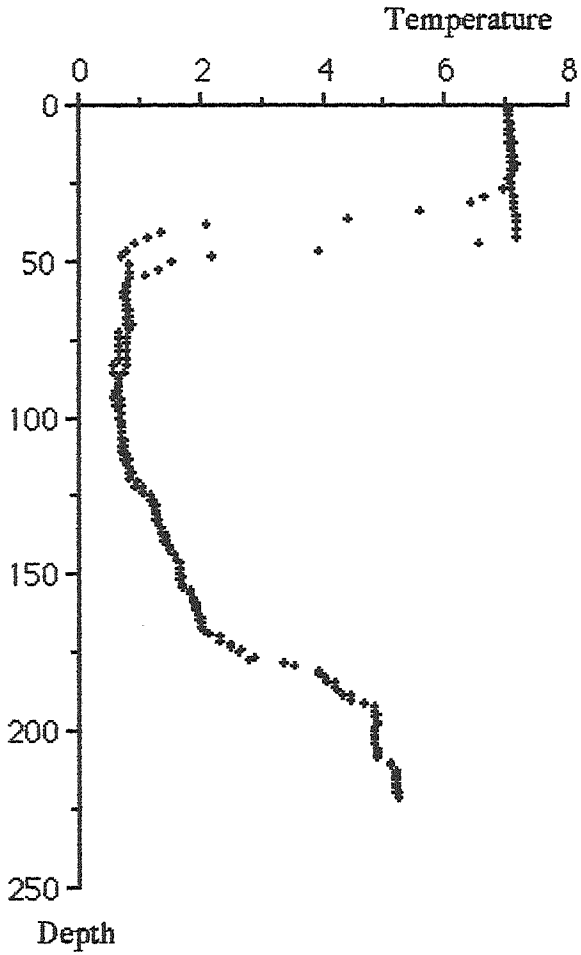
* Participants to cruise HU-90-031

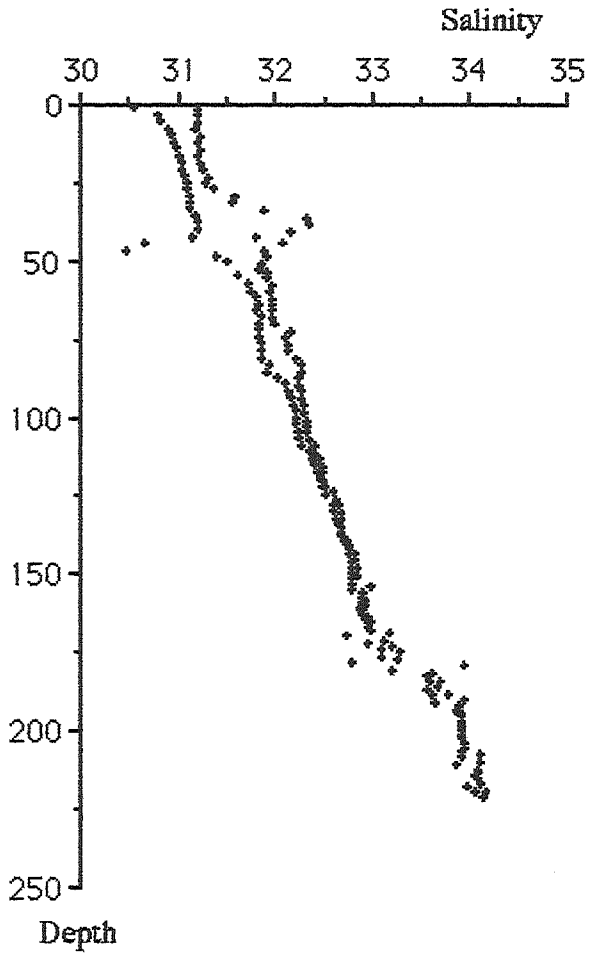
3) Research objectives:
- To modelize geochemical and micropaleontological indicators of salinity gradients
- To document biogeochemical reactions in the water column and at the weater/sediment interface
- To investigate remanent magnetisation aquisition by sediments
- To study environmental changes since deglaciation

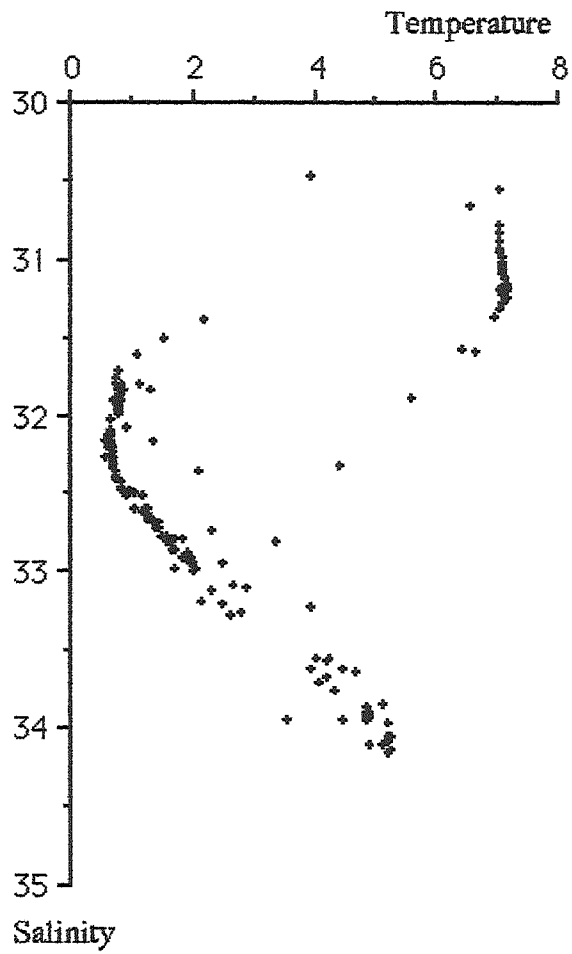
HU-90-028-002: CTD profile

Julian day: 306 Latitude: 47 16.08.738N
GM Time: 19:29 Longitude: 60 09.00.446W
Depth: 250 m.

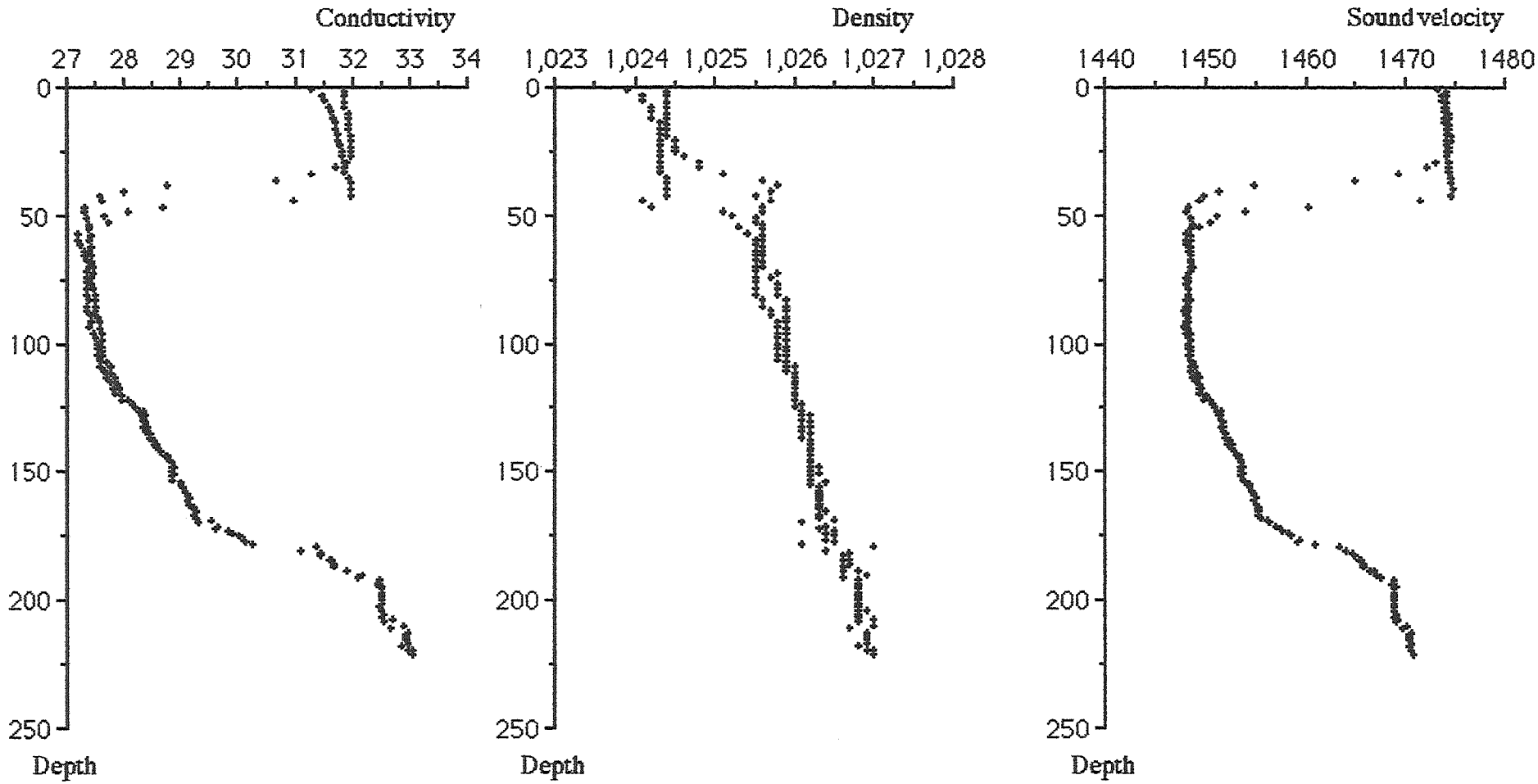
Geographic Location: Cabot Strait







HU-090-028-002 (Cont'd)



HU-90-028

HU-90-028-003: Water sampling[1]

Julian day:	306	GMT Time:	20:15
Latitude:	47°15.59 N	Longitude:	60°08.12 W
Depth:	250 m	Depth intervals sampled:	(I) 2-23 m (II) 119-140 m (III) 220 m

Summary: 2 sets of 4 x [12 L-Niskin] bottles were used for sampling water masses (I) and (II). The trigger of the 50 L bottle (220 m) did not work.

Sampling & on board processing:

(I) 2-23 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 5.76 L
Volume of water filtered through Glass Fiber Filter: 22 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-3
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-001
------	H	13	TIDC	--------

---

1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon ($\sum CO_2$)
3. SPM: Suspended Particular Matter

HU-90-028-003: Water sampling (Cont'd)

(II) 119-140 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 8.36 L
Volume of water filtered through Glass Fiber Filter: 28 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-2
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-002
------	H	13	TIDC	---------

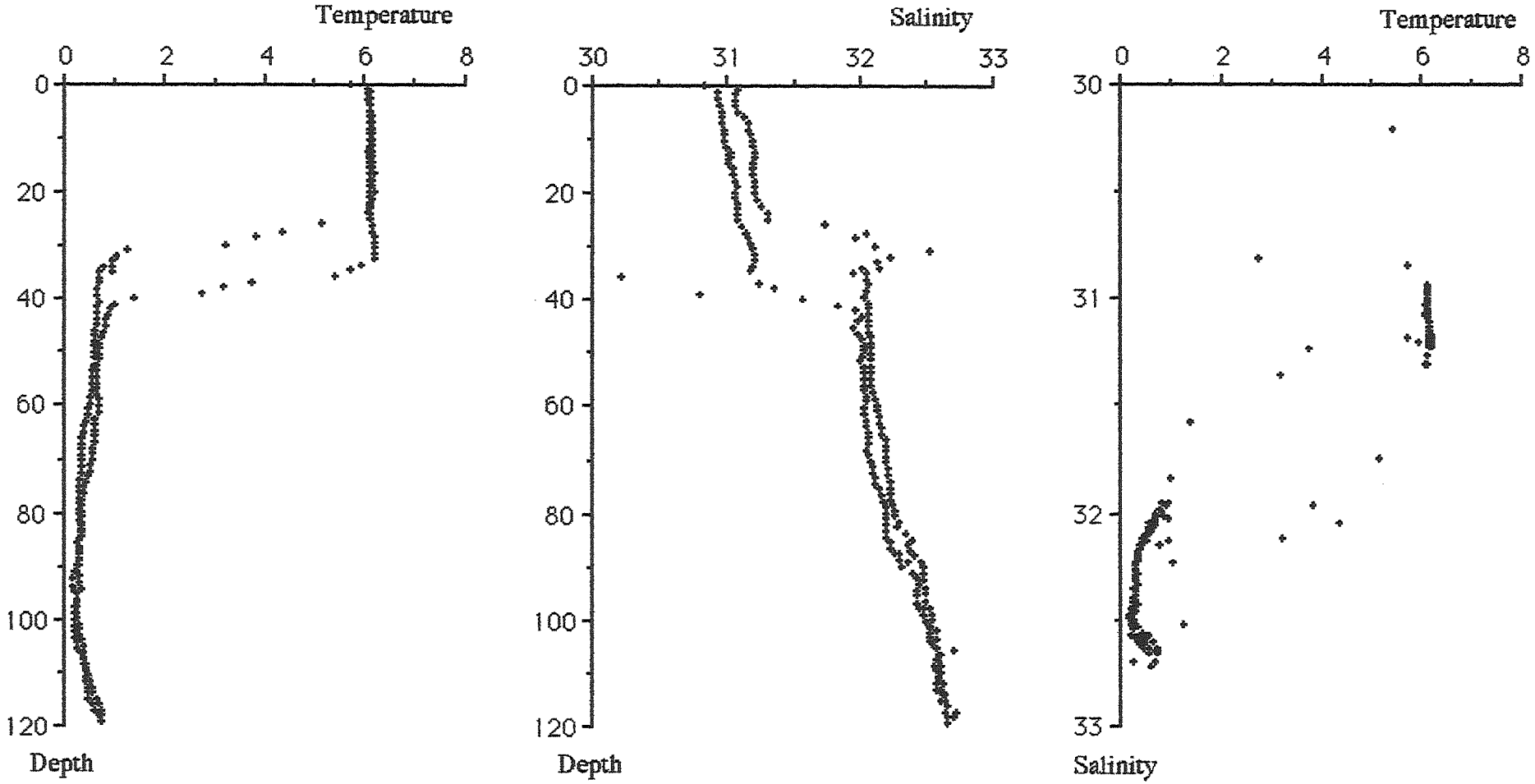
(III) 220 m

The trigger of the bottle did not work and, therefore, no water was recovered.

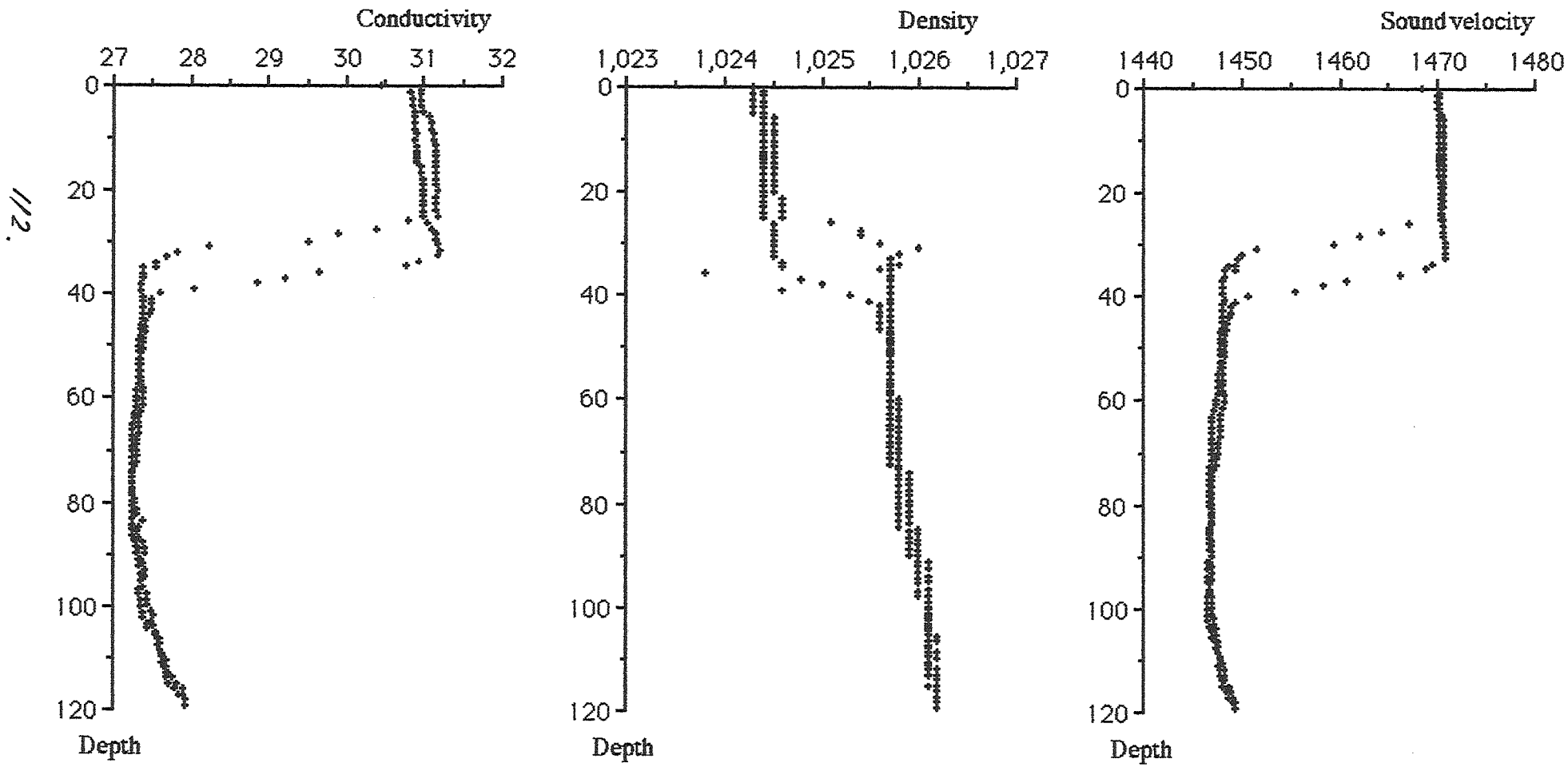
HU-90-028-005: CTD profile

Julian day: 307 Latitude: 47 24.06.274N
GM Time: 00.47 Longitude: 60 16.56.375W
Depth: 146 m.

Geographic Location: Iles de la Madeleine



HU-090-028-005: (Cont'd)



HU-90-028

HU-90-028-006: Box coring[1] + CTD[2]

Julian day:	307	GMT Time:	14:01
Latitude:	47°39.54 N	Longitude:	59°43.31 W
Depth:	521 m	Penetration:	50 cm

Geographic location: Cabot Strait

Description: The sediment consists of brown silty clay on top and gray on bottom with benth fauna.

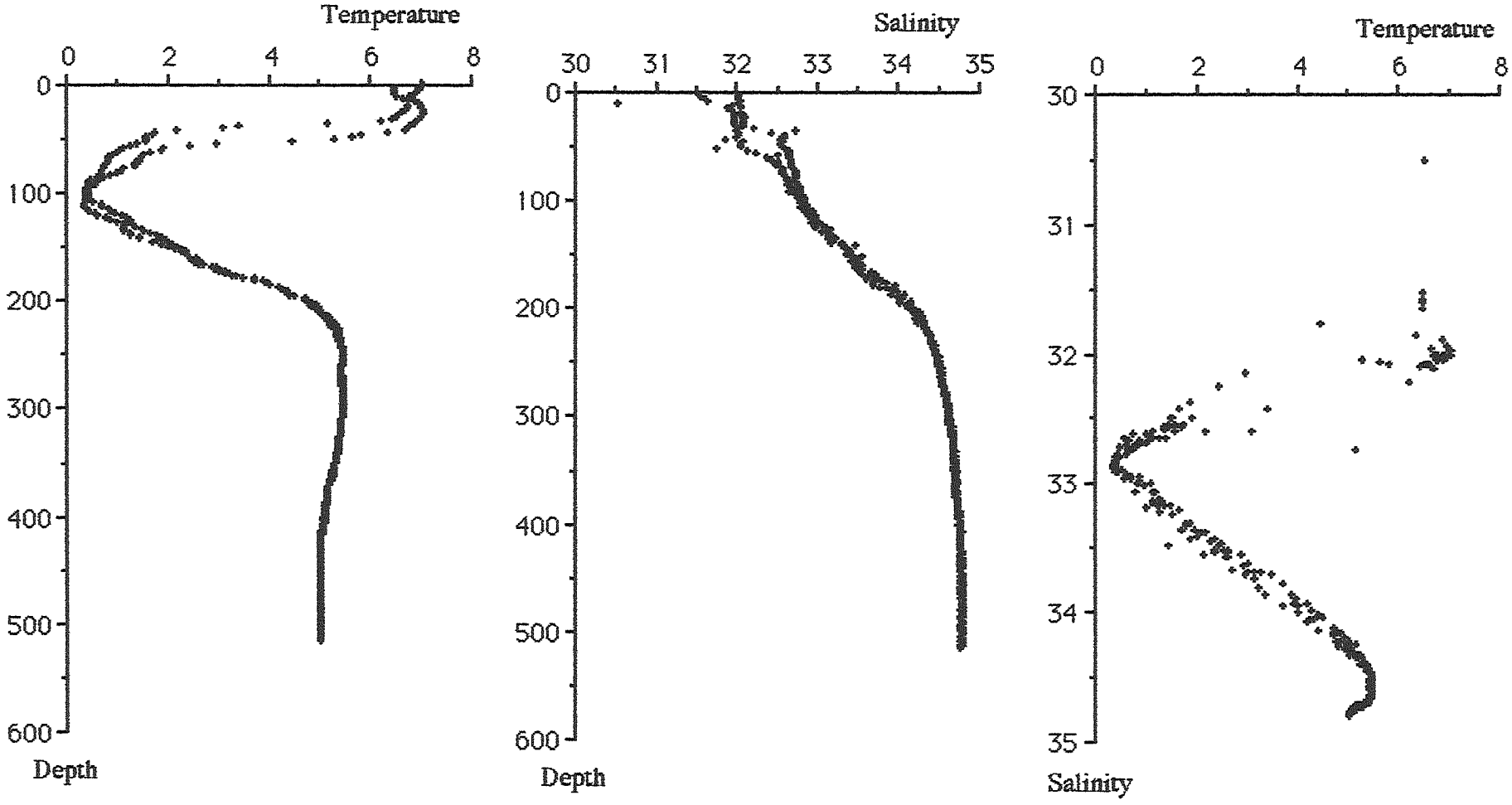
Subsampling:
1 push-core (45 cm long, 15 cm in diameter) for on-board processing
2 push-cores (45 cm long, 7 cm in diameter) for further analysis (UQAM)
4 push-core (45 cm long, 10 cm in diameter) for archives (BIO)
1 "micro-core" (10 cm^3) for bacterial counting (U. of Virginia)
1 sample (250 ml) at the box-core surface for foraminifer study (UQAM).

On-board measurements & subsampling:

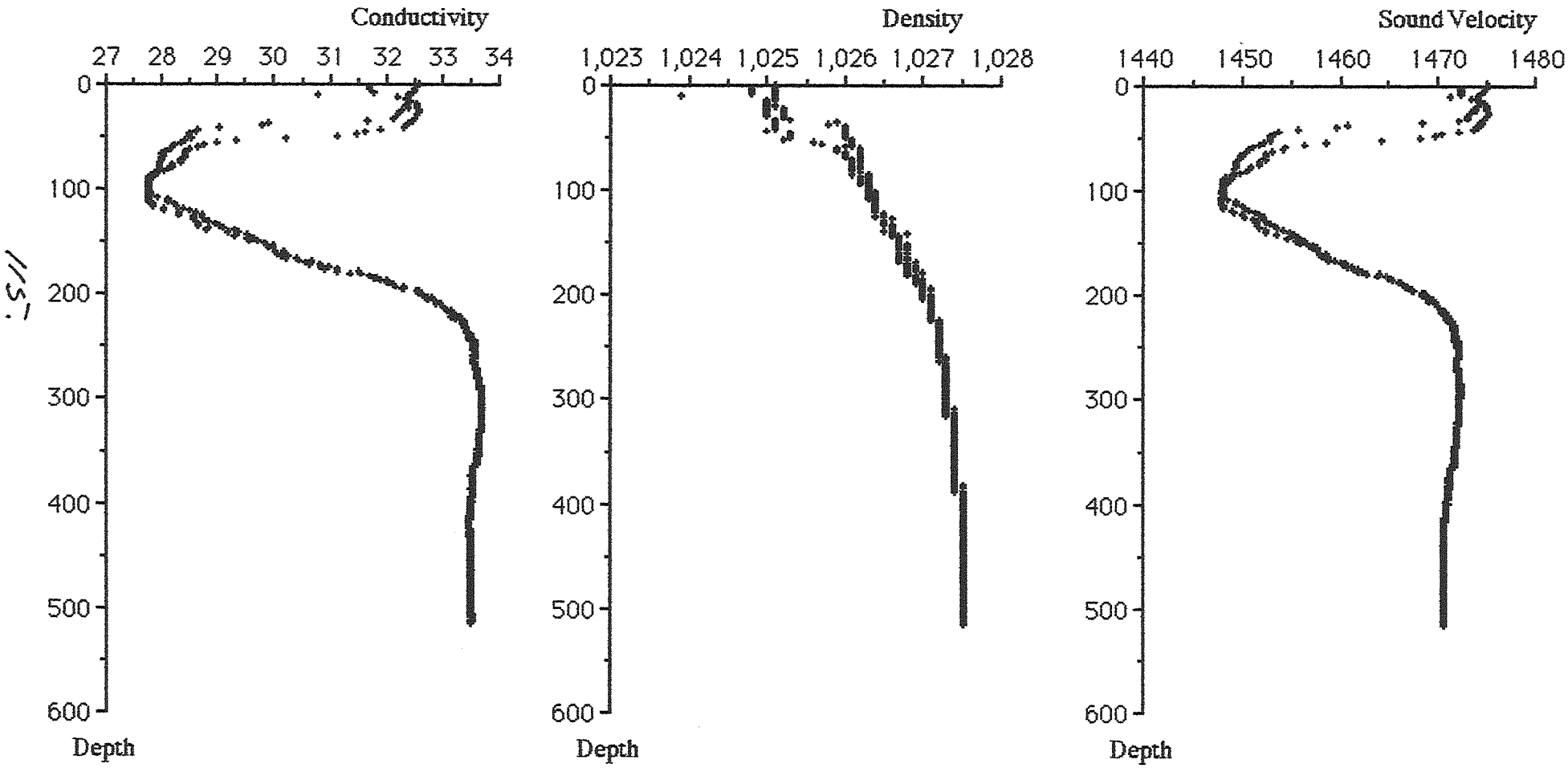
Depth (cm)	Eh (mv)	O_2 (%)	Pore water	Frozen[3] sample	Sediment[4] sample	Squeezed seds.	Porosity sample
0-1	146	0	x	x	x	x	x
1-2	29	1	x	x	x	x	x
2-3	-9	1	--	x	x	x	x
3-4	-5	1	x	x	x	x	x
4-5	-25	1	--	x	x	x	x
6-8	-49	0	x	x	x	x	x
8-10	-53	0	x	x	x	x	x
10-12	-3	0	x	x	x	x	x
12-14	-60	1	--	x	x	x	x
14-16	1	0	x	x	x	x	x
16-18	-70	1	x	x	x	x	x
18-20	-63	0	x	x	x	x	x
20-22	-53	0	x	x	x	x	x
22-23	-68	0	--	--	--	--	--
23-24	-63	0	--	--	--	--	--
24-25	-32	0	--	--	--	--	--
25-26	-61	0	--	--	--	--	--
26-27	-91	0	--	--	--	--	--
27-28	-62	0	--	--	--	--	--
28-29	-399	0	--	--	--	--	--
29-30	-455	0	--	--	--	--	--

1. See appendix 1.3
2. See CTD profiles next pages
3. For bacterial counting
4. For micropaleontological & geochemical studies

HU-90-028-006 (Cont'd)



HU-090-028-006 (Cont'd)



HU-90-028-008: Water sampling[1]

Julian day:	307	GMT Time:	16:38
Latitude:	47°39.52 N	Longitude:	59°43.29W
Depth:	523 m	Depth intervals sampled:	(I) 2-23 m (II) 95-116 m (III) 419-440 m

Summary: 3 sets of 4 x [12 L-Niskin] bottles were used for sampling water masses (I), (II) and (III).

Sampling & on board processing:

(I) 2-23 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 6 L
Volume of water filtered through Glass Fiber Filter: 24, 12.2 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-4
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-003
GFF	--	---	" " "	90-007
------	H	13	TIDC	--------

---

1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon (∂CO_2)
3. SPM: Suspended Particular Matter.

HU-90-028-008: Water sampling (Cont'd)

(II) 95-116 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 4 L
Volume of water filtered through Glass Fiber Filter: 35.3 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-5
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-004
------	H	13	TIDC	---------

(III) 419-440 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

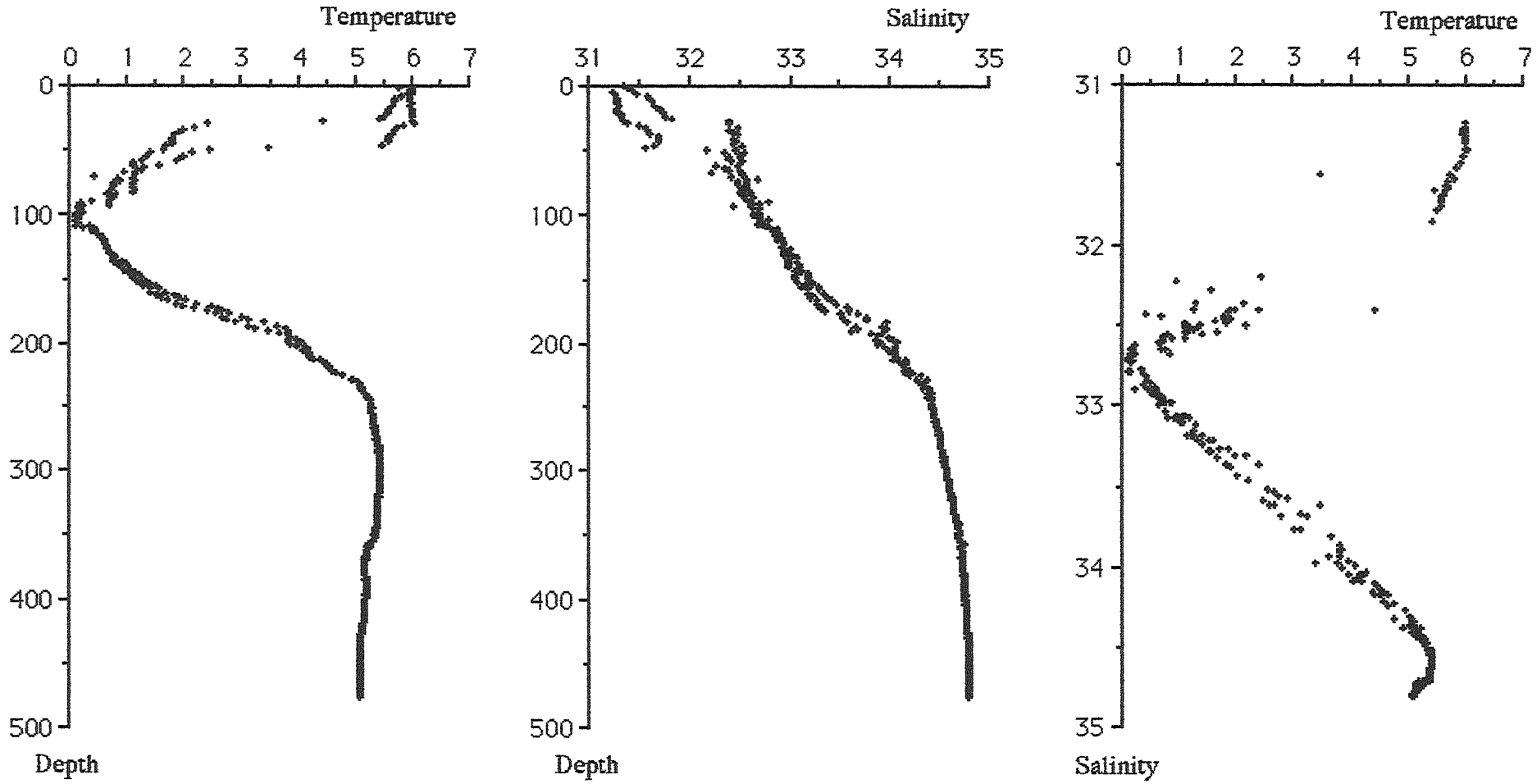
Volume of water filtered through 0.45 micron filter: 4 L
Volume of water filtered through Glass Fiber Filter: 26, 9.4 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-6
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-005
GFF	--	---	" " "	90-008
------	H	13	TIDC	---------

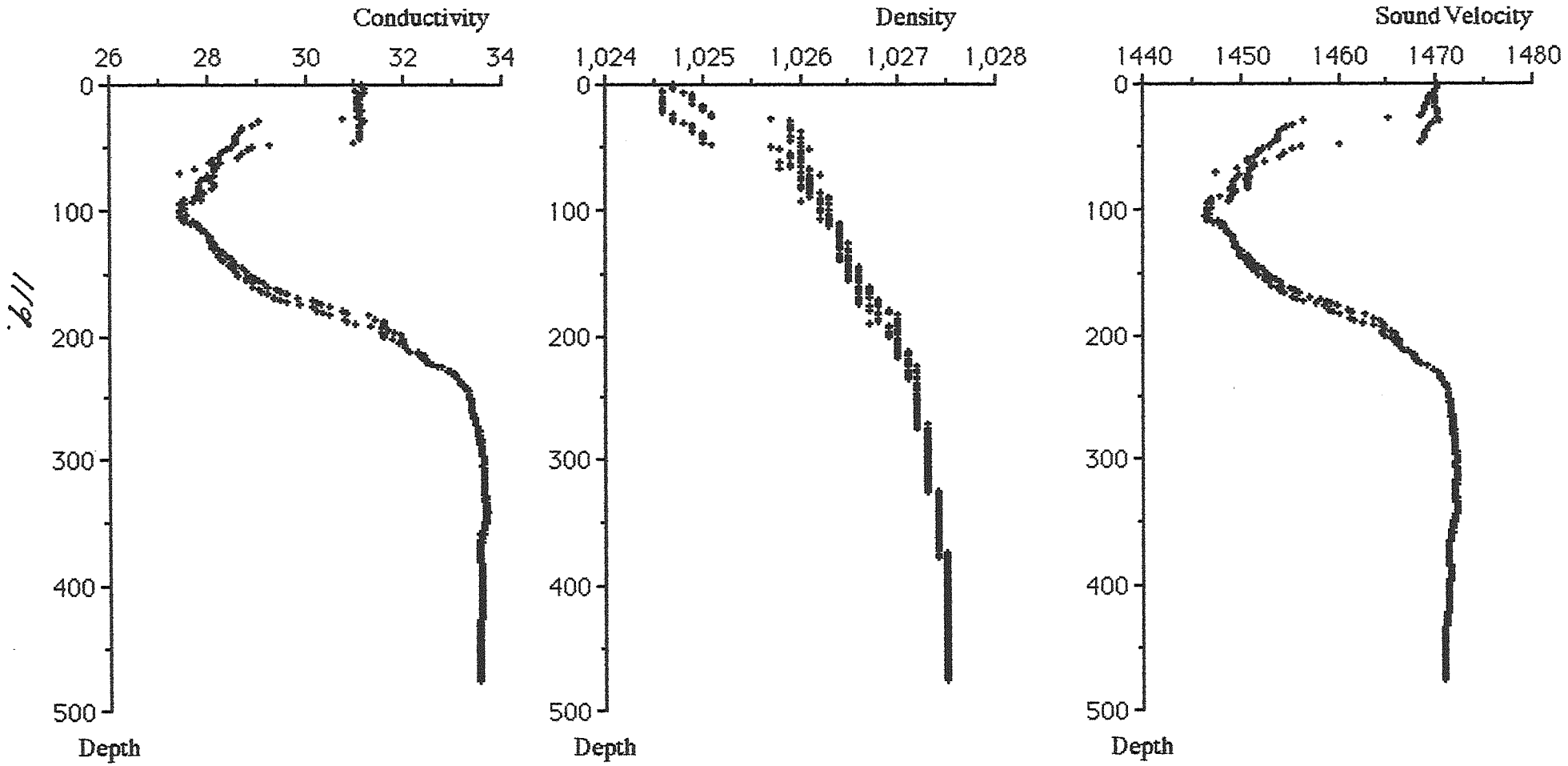
HU-090-028-009: CTD profile

Julian day: 307 Latitude: 47 27.74N
GM Time: 19:15 Longitude: 60 00.59W
Depth: 497m.

Geographic Location: Cabot Strait



HU-090-028-009 (Cont'd)



HU-90-028

HU 90-028-010 TWC: Trigger Weight Coring

Julian day:	307	GMT Time:	20:46
Latitude:	47°27.57 N	Longitude:	60°00.52 W
Depth:	491 m		
Penetration:	183 cm	TWC length:	109 cm

Geographic location Cabot Strait

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x

HU-90-028

HU 90-028-010 P : L-Piston Coring

Julian day:	307	GMT Time:	20:46
Latitude:	47°27.57 N	Longitude:	60°00.52 W
Depth:	491 m	Corer length:	1824 cm
Penetration:	1581 cm	Core length:	1155 cm

Geographic location Cabot Strait

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
2-4	x	x	x	x
22-24	x	x	x	x
43-45	x	x	x	x
63-65	x	x	x	x
80-82	x	x	x	x
97-99	x	x	x	x
119-121	x	x	x	x
139-141	x	x	x	x
159-161	x	x	x	x
179-181	x	x	x	x
199-201	x	x	x	x
219-221	x	x	x	x
239-241	x	x	x	x
254-256	x	x	x	x
274-276	x	x	x	x
294-296	x	x	x	x
314-316	x	x	x	x
334-336	x	x	x	x
374-376	x	x	x	x
404-406	x	x	x	x
424-426	x	x	x	x
444-446	x	x	x	x
484-486	x	x	x	x
504-506	x	x	x	x
524-525	x	x	x	x
544-546	x	x	x	x
554-556	x	x	x	x
574-576	x	x	x	x
594-596	x	x	x	x
604-606	x	x	x	x
634-636	x	x	x	x
654-656	x	x	x	x
674-676	x	x	x	x
694-696	x	x	x	x

HU 90-028-010 P : L-Piston Coring (Cont'd)

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
704-706	x	x	x	x
714-716	x	x	x	x
724-726	x	x	x	x
744-746	x	x	x	x
764-766	x	x	x	x
784-786	x	x	x	x
804-806	x	x	x	x
824-826	x	x	x	x
844-846	x	x	x	x
864-866	x	x	x	x
883-885	x	x	x	x
903-905	x	x	x	x
923-925	x	x	x	x
943-945	x	x	x	x
963-965	x	x	x	x
983-985	x	x	x	x
1002-1004	x	x	x	x
1014-1016	x	x	x	x
1034-1036	x	x	x	x
1054-1056	x	x	x	x
1074-1076	x	x	x	x
1094-1096	x	x	x	x
1114-1116	x	x	x	x
1134-1136	x	x	x	x
1154-1156	x	x	x	x

HU-90-028

HU 90-028-011 TWC: Trigger Weight Coring

Julian day:	308	GMT Time:	14:57
Latitude:	46°45.51 N	Longitude:	61°06.51 W
Depth:	119 m		
Penetration:	15 cm	TWC length:	-- cm

Geographic location Cape Breton Trough

No sediments were recovered in the trigger weight core.

HU-90-028

HU 90-028-011 P : L-Piston Coring

Julian day:	308	GMT Time:	14:57
Latitude:	46°45.51 N	Longitude:	61°06.51 W
Depth:	119 m	Corer length:	1216 cm
Penetration:	638 cm	Core length:	508 cm

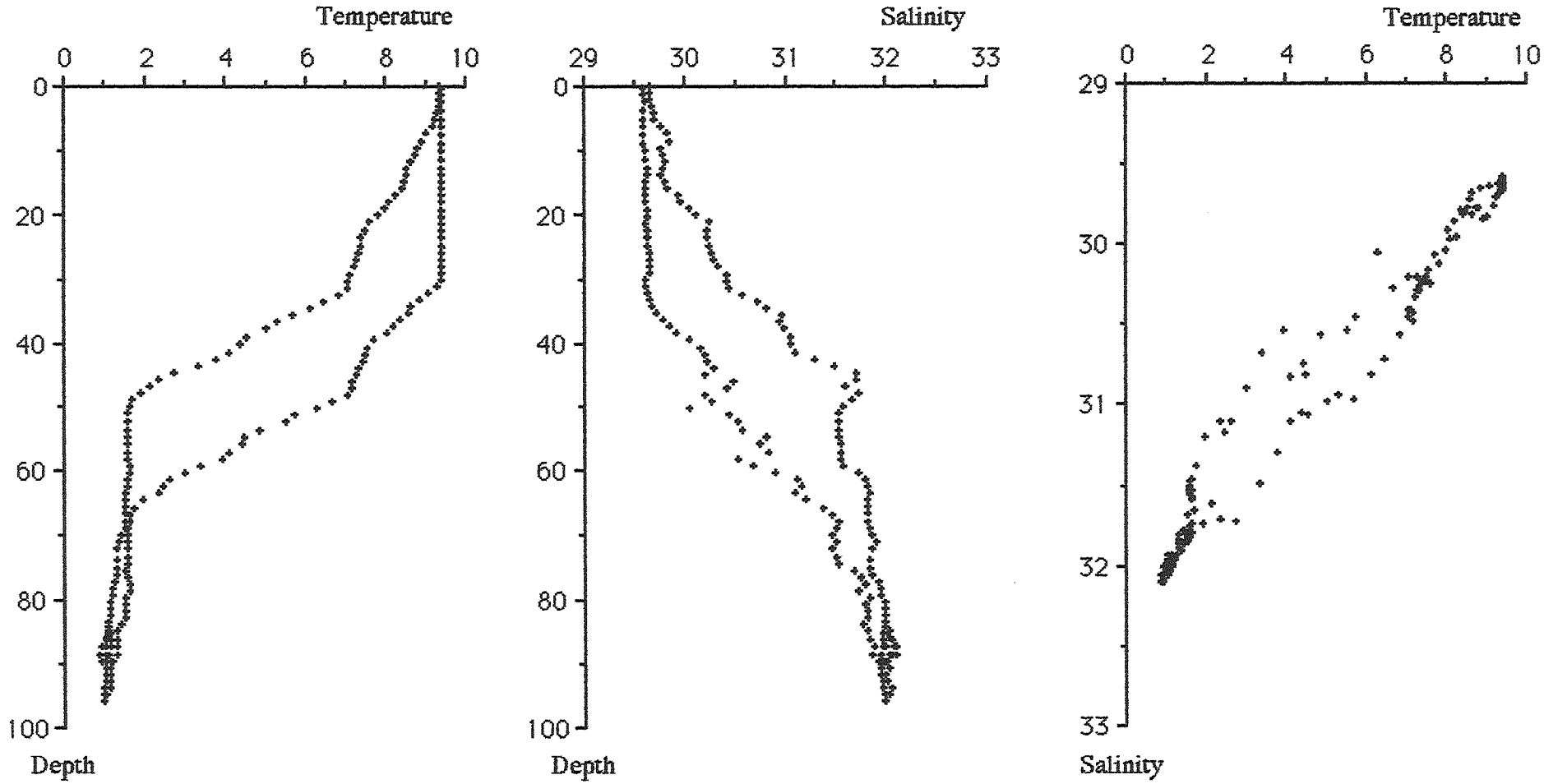
Geographic location Cape Breton Trough

Depth s.b . (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
124-126	x	x	x	x
144-146	x	x	x	x
164-166	x	x	x	x
184-186	x	x	x	x
206-208	x	x	x	x
226-228	x	x	x	x
246-248	x	x	x	x
266-268	x	x	x	x
286-288	x	x	x	x
306-308	x	x	x	x
326-328	x	x	x	x
346-348	x	x	x	x
364-366	x	x	x	x
384-386	x	x	x	x
404-406	x	x	x	x
424-426	x	x	x	x
444-446	x	x	x	x
464-466	x	x	x	x
484-486	x	x	x	x

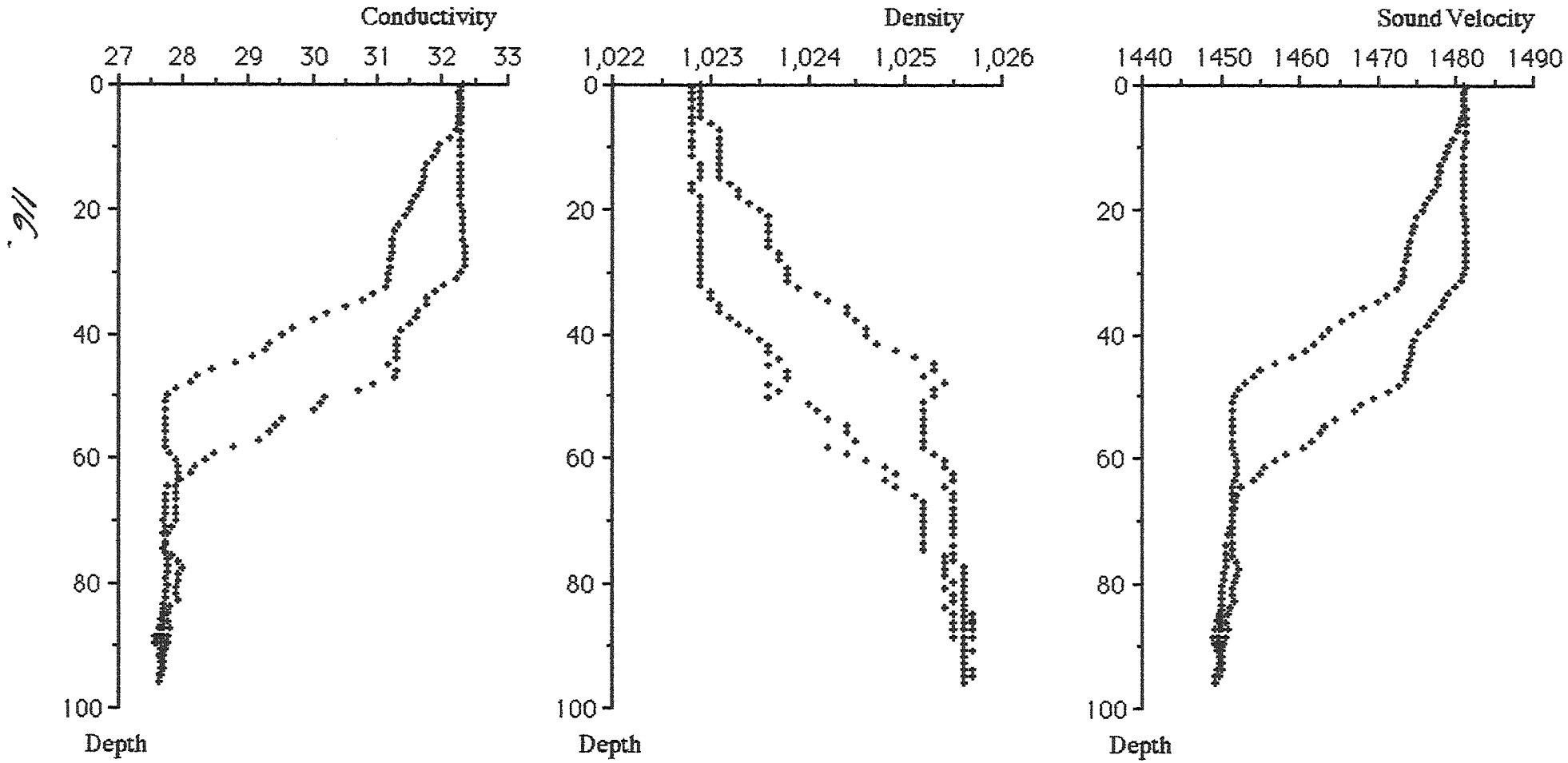
HU-090-028-012: Camera and CTD profile

Julian day: 308 Latitude: 46 45.50N
GM Time: 15:26 Longitude: 61 06.70W
Depth: 130 m.

Geographic Location: Cape Breton trough



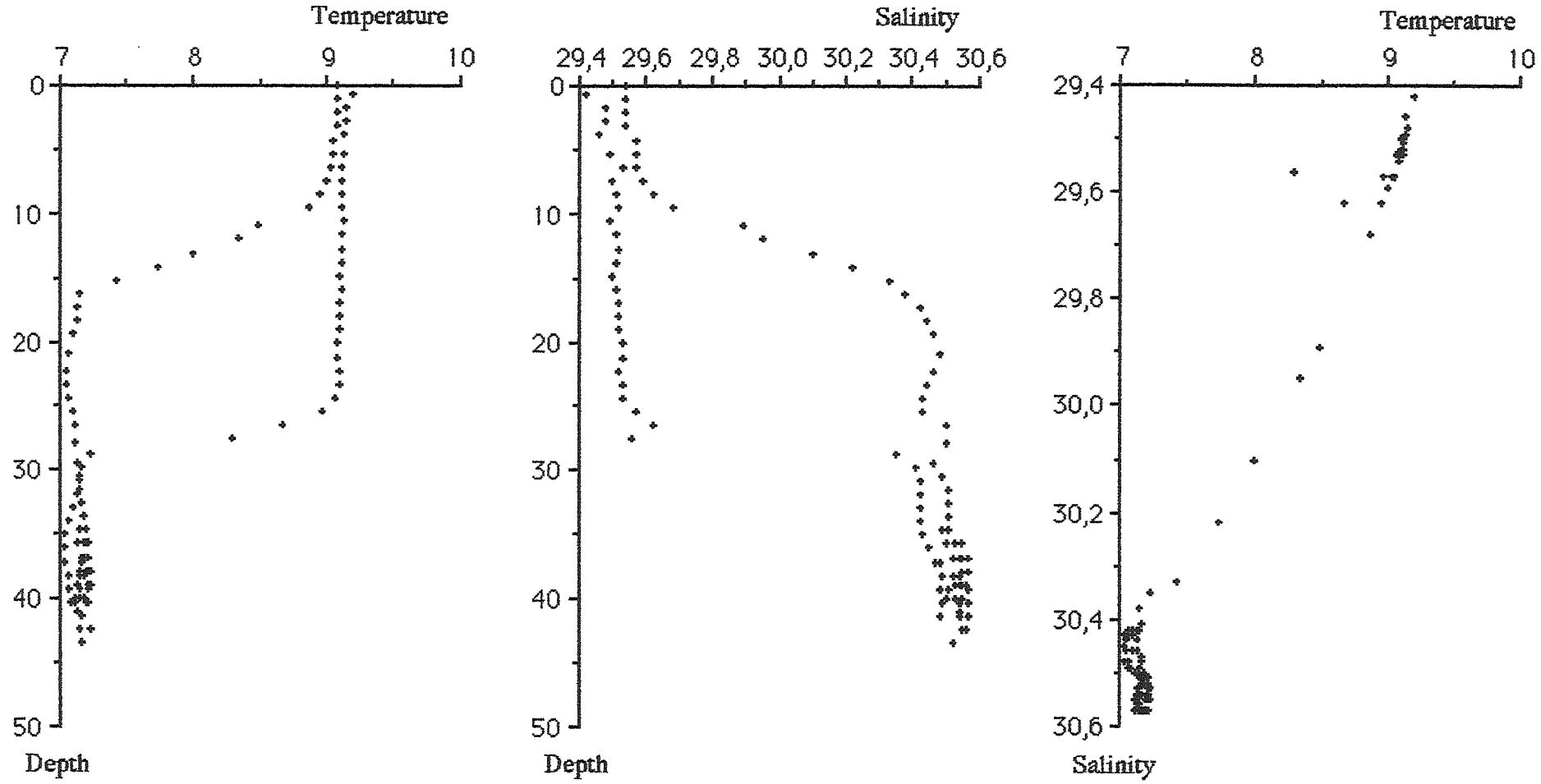
HU-090-028-012 (Cont'd)



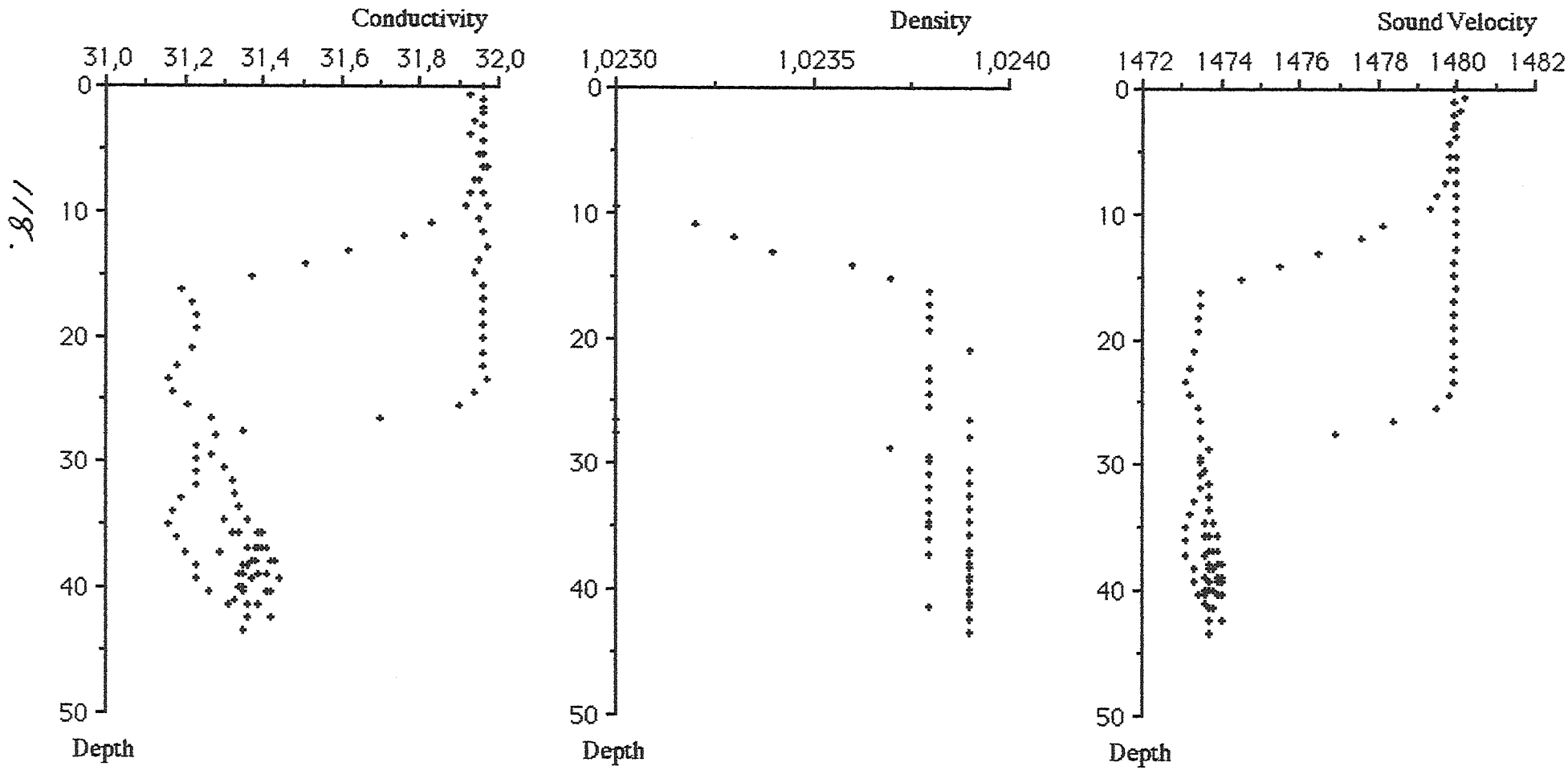
HU-090-028-015: Camera and CTD profile

Julian day: 308 Latitude: 46 39.51N
GM Time: 22.24 Longitude: 6140.05W
Depth: 64 m.

Geographic Location: South East Golfe



HU-090-028-015 (Cont'd)



HU-90-028-016: Water sampling[1]

Julian day:	308	GMT Time:	23:18
Latitude:	46°39.42 N	Longitude:	61°40.00W
Depth:	64 m	Depth intervals sampled:	(I) 2-10m (II) 40-53 m

Geographic location. South East Gulf

Summary: 1 set of 2 x [12 L-Niskin] bottles were used for sampling water masse (I), and 1 set of 3 x [12 L-Niskin] bottles were used for sampling water masse (II).

Sampling & on board processing.

(I) 2-10 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 6 L
Volume of water filtered through Glass Fiber Filter: 15.1 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-7
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-009
------	H	13	TIDC	--------

---

1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon (∂CO_2)
3. SPM: Suspended Particular Matter.

HU-90-028-016: Water sampling (Cont'd)

(II) 40-53 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 4 L
Volume of water filtered through Glass Fiber Filter: 14 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-8
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-010
------	H	13	TIDC	---------

HU-90-028

HU 90-028-018 TWC: Trigger Weight Coring

Julian day:	310	GMT Time:	14:09
Latitude:	49°00.19 N	Longitude:	63°30.24 W
Depth:	378 m		
Penetration:	183 cm	TWC length:	148 cm

Geographic location Laurentian Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
9-11	x	x	x	x
29-31	x	x	x	x
49-51	x	x	x	x
69-71	x	x	x	x
89-91	x	x	x	x
109-111	x	x	x	x
129-131	x	x	x	x

HU-90-028

HU 90-028-018 P : L-Piston Coring

Julian day:	310	GMT Time:	14:09
Latitude:	49°00.19 N	Longitude:	63°30.24 W
Depth:	378 m	Corer length:	1824 cm
Penetration:	1520 cm	Core length:	1031 cm

Geographic location Laurentian Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
124-126	x	x	x	x
134-136	x	x	x	x
154-156	x	x	x	x
174-176	x	x	x	x
194-196	x	x	x	x
214-216	x	x	x	x
234-236	x	x	x	x
254-256	x	x	x	x
274-276	x	x	x	x
284-286	x	x	x	x
304-306	x	x	x	x
324-326	x	x	x	x
344-346	x	x	x	x
364-366	x	x	x	x
384-386	x	x	x	x
404-406	x	x	x	x
424-426	x	x	x	x
444-446	x	x	x	x
464-466	x	x	x	x
484-486	x	x	x	x
504-506	x	x	x	x
524-526	x	x	x	x
544-546	x	x	x	x
564-566	x	x	x	x
585-587	x	x	x	x
605-607	x	x	x	x
625-627	x	x	x	x
645-647	x	x	x	x

HU 90-028-018 P : L-Piston Coring (Cont'd)

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
665-667	x	x	x	x
685-687	x	x	x	x
705-707	x	x	x	x
726-728	x	x	x	x
744-746	x	x	x	x
764-766	x	x	x	x
784-786	x	x	x	x
804-806	x	x	x	x
824-826	x	x	x	x
844-846	x	x	x	x
864-866	x	x	x	x
884-886	x	x	x	x
894-896	x	x	x	x
915-917	x	x	x	x
936-938	x	x	x	x
955-957	x	x	x	x
975-977	x	x	x	x
995-997	x	x	x	x
1014-1016	x	x	x	x

HU-90-028

HU-90-028-019: Box coring[1] + CTD[2]

Julian day:	310	GMT Time:	18:10
Latitude:	49°06.49 N	Longitude:	63°47.58 W
Depth:	382 m	Penetration:	50 cm

Geographic location: Honguedo-Anticosti

Subsampling:
1 push-core (45 cm long, 15 cm in diameter) for on-board processing
2 push-cores (45 cm long, 10 cm in diameter) for further analysis (UQAM)
3 push-core (45 cm long, 10 cm in diameter) for archives (BIO)
1 "micro-core" (10 cm^3) for bacterial counting (U. of Virginia)
1 sample (250 ml) at the box-core surface for foraminifer study (UQAM).

On-board measurements & subsampling:

Depth (cm)	Eh (mv)	O_2 (%)	Pore water	Frozen[3] sample	Sediment[4] sample	Squeezed seds.	Porosity sample
0-1	----	--	x	x	x	x	x
1-2	----	--	x	x	x	x	x
2-3	----	--	x	x	x	x	x
3-4	----	--	x	x	x	x	x
4-5	----	--	x	x	x	x	x
5-6	----	--	x	x	x	x	x
6-7	----	--	x	x	x	x	x
7-8	----	--	x	x	x	x	x
9-11	----	--	x	x	x	x	x
11-13	----	--	x	x	x	x	x
13-15	----	--	x	x	x	x	x
15-17	----	--	x	x	x	x	x
17-19	----	--	x	x	x	x	x
19-22	----	--	x	x	x	x	x
22-24	----	--	x	x	x	x	x
26-28	----	--	--	--	x	--	--
30-32	----	--	--	--	x	--	--
34-36	----	--	--	--	x	--	--
38-40	----	--	--	--	x	--	--
42-44	----	--	--	--	x	--	--
46-48	----	--	--	--	x	--	--

Continuous sampling has been made all along the push-core for paleomagnetism[5].

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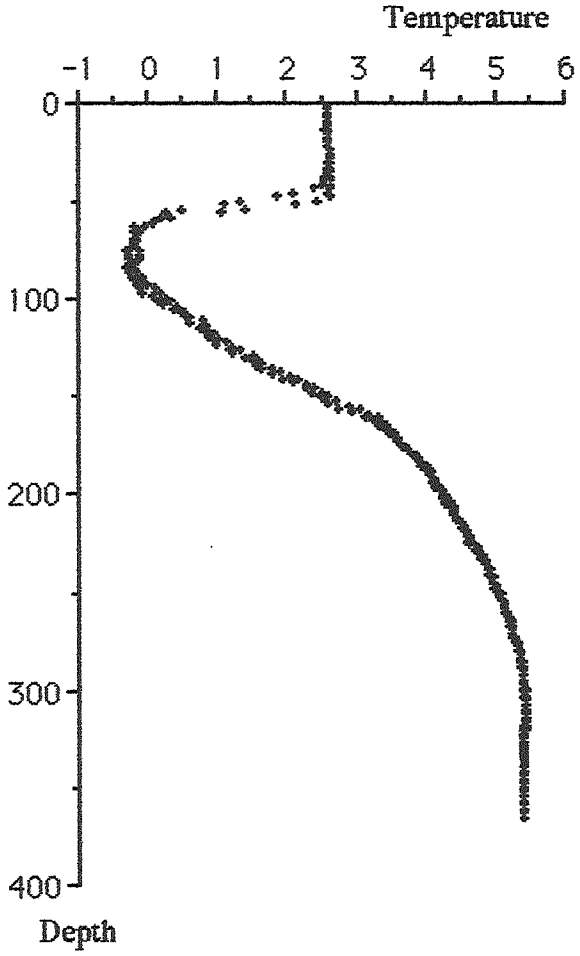
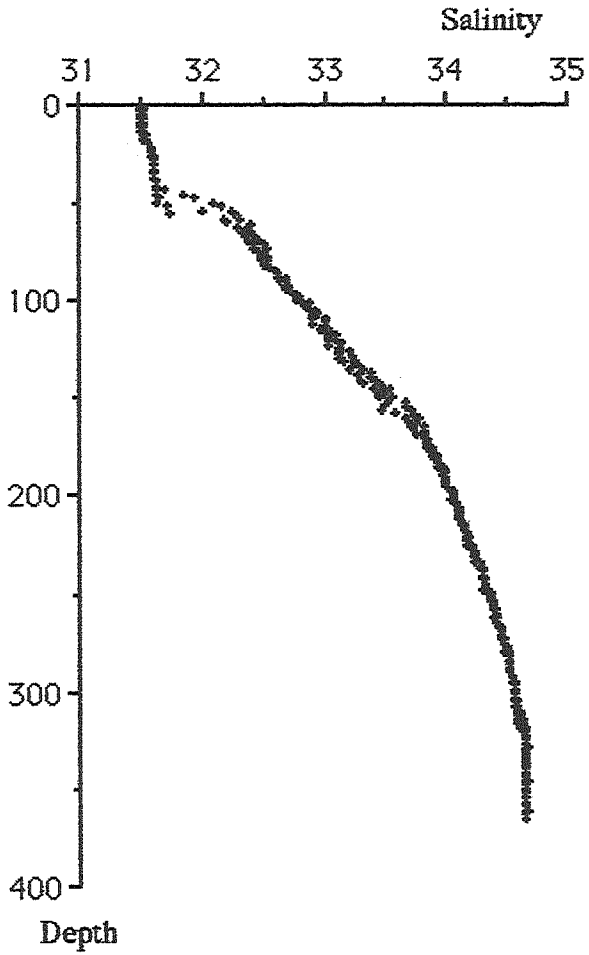
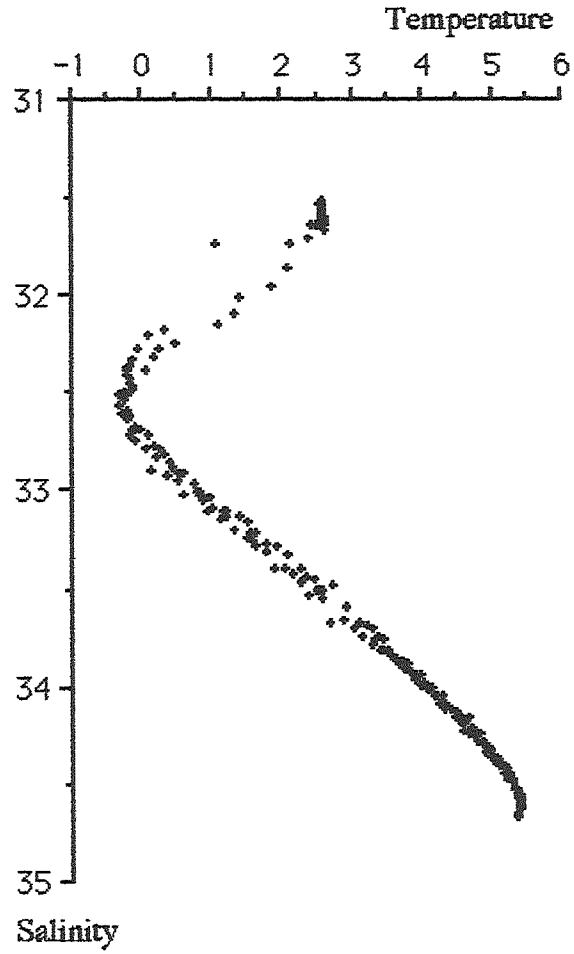
1. See appendix 1.3
2. See CTD profile next pages
3. For bacterial counting
4. For micropaleontological & geochemical studies
5. See appendix 1.1

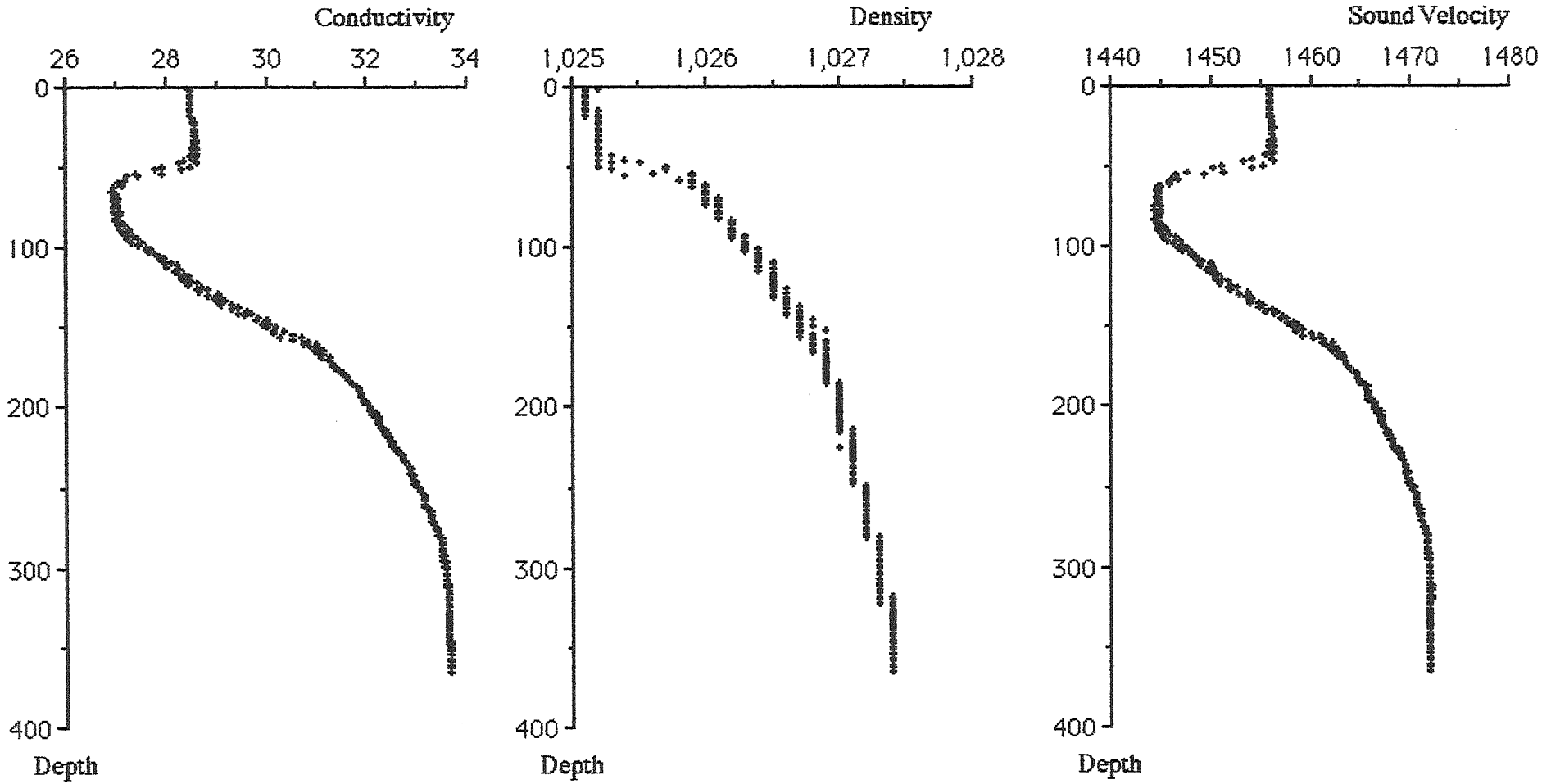
HU-090-028-019 (Cont'd)







HU-090-028-019 (Cont'd)



129.

HU-90-028

HU 90-028-020 TWC: Trigger Weight Coring

Julian day:	310	GMT Time:	19:40
Latitude:	49°06.43 N	Longitude:	63°48.40 W
Depth:	382 m		
Penetration:	183 cm	TWC length:	152 cm

Geographic location Honguedo-Anticosti

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
124-126	x	x	x	x
144-146	x	x	x	x

HU-90-028

HU 90-028-020 P : L-Piston Coring

Julian day:	310	GMT Time:	xxxx
Latitude:	49°06.43 N	Longitude:	63°48.40 W
Depth:	382 m	Corer length:	1520 cm
Penetration:	1368 cm	Core length:	829 cm

Geographic location Laurentian Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
74-76	x	x	x	x
94-96	x	x	x	x
114-116	x	x	x	x
134-136	x	x	x	x
154-156	x	x	x	x
174-176	x	x	x	x
194-196	x	x	x	x
214-216	x	x	x	x
224-226	x	x	x	x
244-246	x	x	x	x
264-266	x	x	x	x
284-286	x	x	x	x
304-306	x	x	x	x
324-326	x	x	x	x
344-346	x	x	x	x
364-366	x	x	x	x
374-376	x	x	x	x
394-396	x	x	x	x
414-416	x	x	x	x
434-436	x	x	x	x
454-456	x	x	x	x
474-476	x	x	x	x
494-496	x	x	x	x
514-516	x	x	x	x
525-527	x	x	x	x
545-547	x	x	x	x
585-587	x	x	x	x
605-607	x	x	x	x
625-627	x	x	x	x
645-647	x	x	x	x

HU 90-028-020 P : L-Piston Coring (Cont'd)

Depth s.b . (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
665-667	x	x	x	x
685-687	x	x	x	x
704-706	x	x	x	x
724-726	x	x	x	x
744-746	x	x	x	x
765-767	x	x	x	x
785-787	x	x	x	x
804-806	x	x	x	x
824-826	x	x	x	x

HU-90-028-021: Water sampling[1]

Julian day:	310	GMT Time:	20:40
Latitude:	49°06.70 N	Longitude:	63°04.80W
Depth:	384 m	Depth intervals sampled:	(I) 2-23 m (II) 65-86 m (III) 300-321 m

Summary: 3 sets of 4 x [12 L-Niskin] bottles were used for sampling water masses (I), (II) and (III).

Sampling & on board processing:

(I) 2-23 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 6 L
Volume of water filtered through Glass Fiber Filter: 20 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-9
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-013
------	H	13	TIDC	--------

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1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon (∂CO_2)
3. SPM: Suspended Particular Matter.

HU-90-028-021: Water sampling (Cont'd)

(II) 65-86 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 22 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-10
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C,^{15}N,CHNS	90-014
------	H	13	TIDC	---------

(III) 300-321 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 30 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-11
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C,^{15}N,CHNS	90-015
------	H	13	TIDC	---------

HU-90-028

HU 90-028-024 TWC: Trigger Weight Coring

Julian day:	311	GMT Time:	20:37
Latitude:	48°56.00 N	Longitude:	63°14.53 W
Depth:	194 m		
Penetration:	183 cm	TWC length:	178 cm

Geographic location Laurentian Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
124-126	x	x	x	x
144-146	x	x	x	x
164-166	x	x	x	x

HU-90-028

HU 90-028-024 P : L-Piston Coring

Julian day:	311	GMT Time:	20:37
Latitude:	48°56.00 N	Longitude:	63°14.53 W
Depth:	194 m	Corer length:	608 cm
Penetration:	608 cm	Core length:	224 cm

Geographic location Laurentian Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
124-126	x	x	x	x
144-146	x	x	x	x
164-166	x	x	x	x
184-186	x	x	x	x
204-206	x	x	x	x

HU-90-028

HU 90-028-027 TWC: Trigger Weight Coring

Julian day:	312	GMT Time:	21:37
Latitude:	48°45.53 N	Longitude:	60°01.18 W
Depth:	331 m		
Penetration:	183 cm	TWC length:	164 cm

Geographic location Port au Port Peninsula

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
124-126	x	x	x	x
144-146	x	x	x	x

HU-90-028

HU 90-028-027 P : L-Piston Coring

Julian day:	312	GMT Time:	20:39
Latitude:	48°45.53 N	Longitude:	60°01.18 W
Depth:	331 m	Corer length:	1528 cm
Penetration:	940 cm	Core length:	470 cm

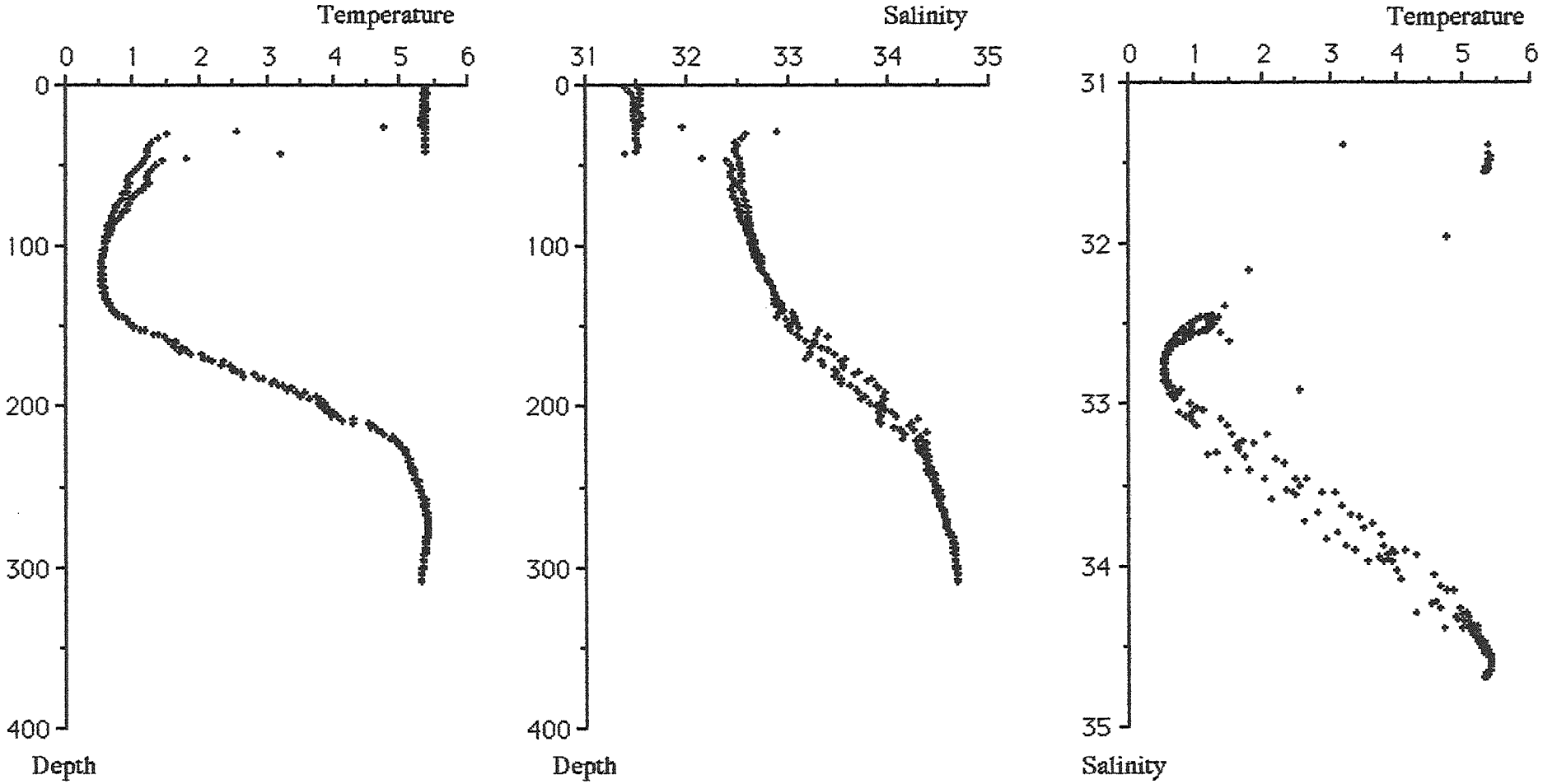
Geographic location Port au Port Peninsula

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
24-26	x	x	x	x
34-36	x	x	x	x
54-56	x	x	x	x
74-76	x	x	x	x
94-96	x	x	x	x
114-116	x	x	x	x
134-136	x	x	x	x
154-156	x	x	x	x
174-176	x	x	x	x
194-196	x	x	x	x
214-216	x	x	x	x
234-236	x	x	x	x
254-256	x	x	x	x
274-276	x	x	x	x
294-296	x	x	x	x
314-316	x	x	x	x
334-336	x	x	x	x
354-356	x	x	x	x
374-376	x	x	x	x
394-396	x	x	x	x
414-416	x	x	x	x
434-436	x	x	x	x

HU-090-028-028: Camera and CTD profile

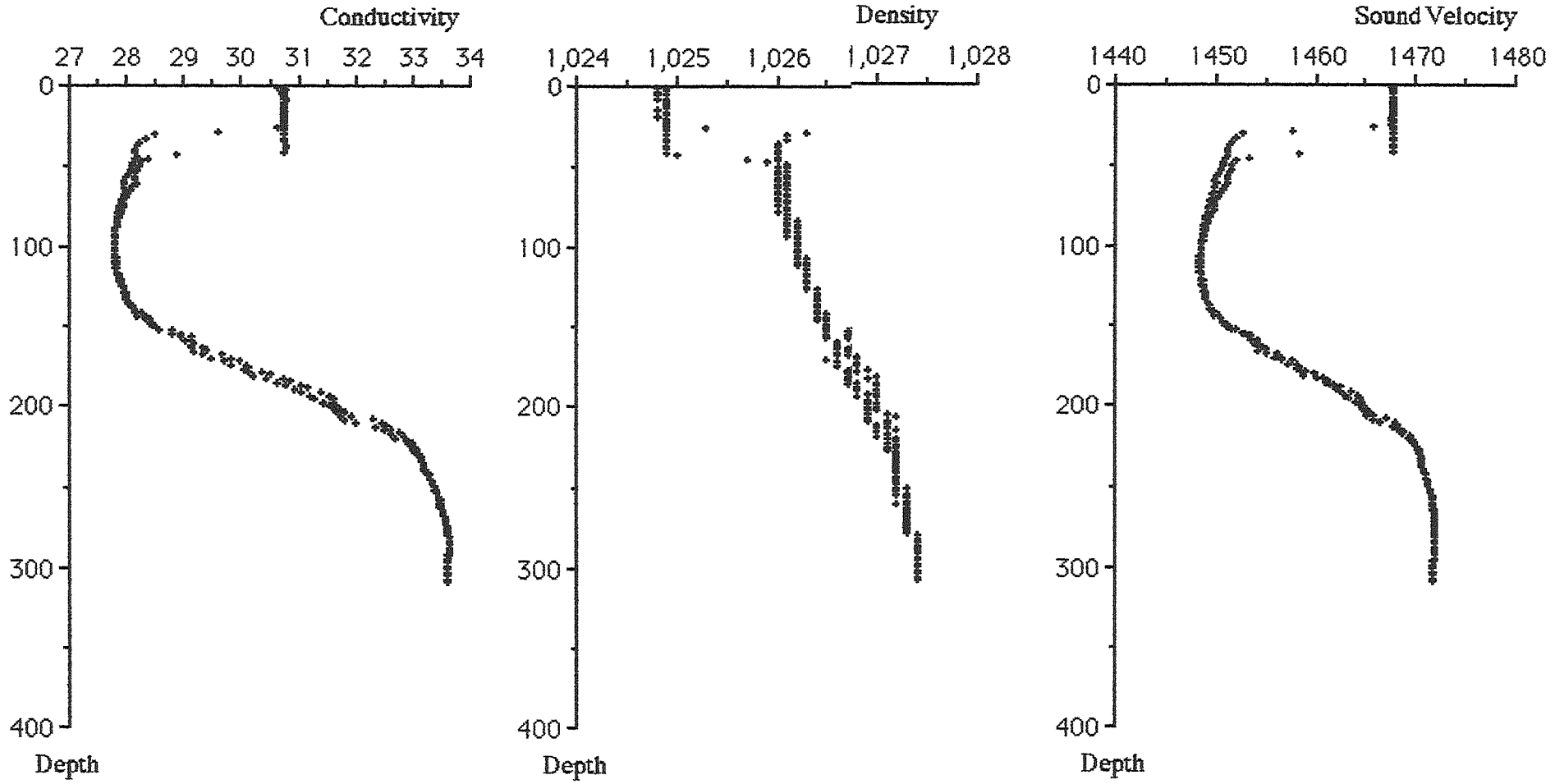
Julian day: 312 Latitude: 48 45.30N
GM Time: 22:46 Longitude: 59 59.55W
Depth: 332 m.

Geographic Location: Port au Port peninsule



136.

HU-090-028-028 (Cont'd)



HU-90-028-029: Water sampling[1]

Julian day:	312	GMT Time:	22:40
Latitude:	48°45.30 N	Longitude:	59°59.55W
Depth:	332 m	Depth intervals sampled:	(I) 2-23 m (II) 100-121 m (III) 270-291 m

Summary: 3 sets of 4 x [12 L-Niskin] bottles were used for sampling water masses (I), (II) and (III).

Sampling & on board processing:

(I) 2-23 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 6 L
Volume of water filtered through Glass Fiber Filter: 22, 9.3 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-12
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-017
GFF	--	---	" " "	90-021
------	H	13	TIDC	--------

---

1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon (∂CO_2)
3. SPM: Suspended Particular Matter.

HU-90-028-029: Water sampling (Cont'd)

(II) 100-121 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 37.4 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-13
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-018
------	H	13	TIDC	---------

(III) 270-291 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

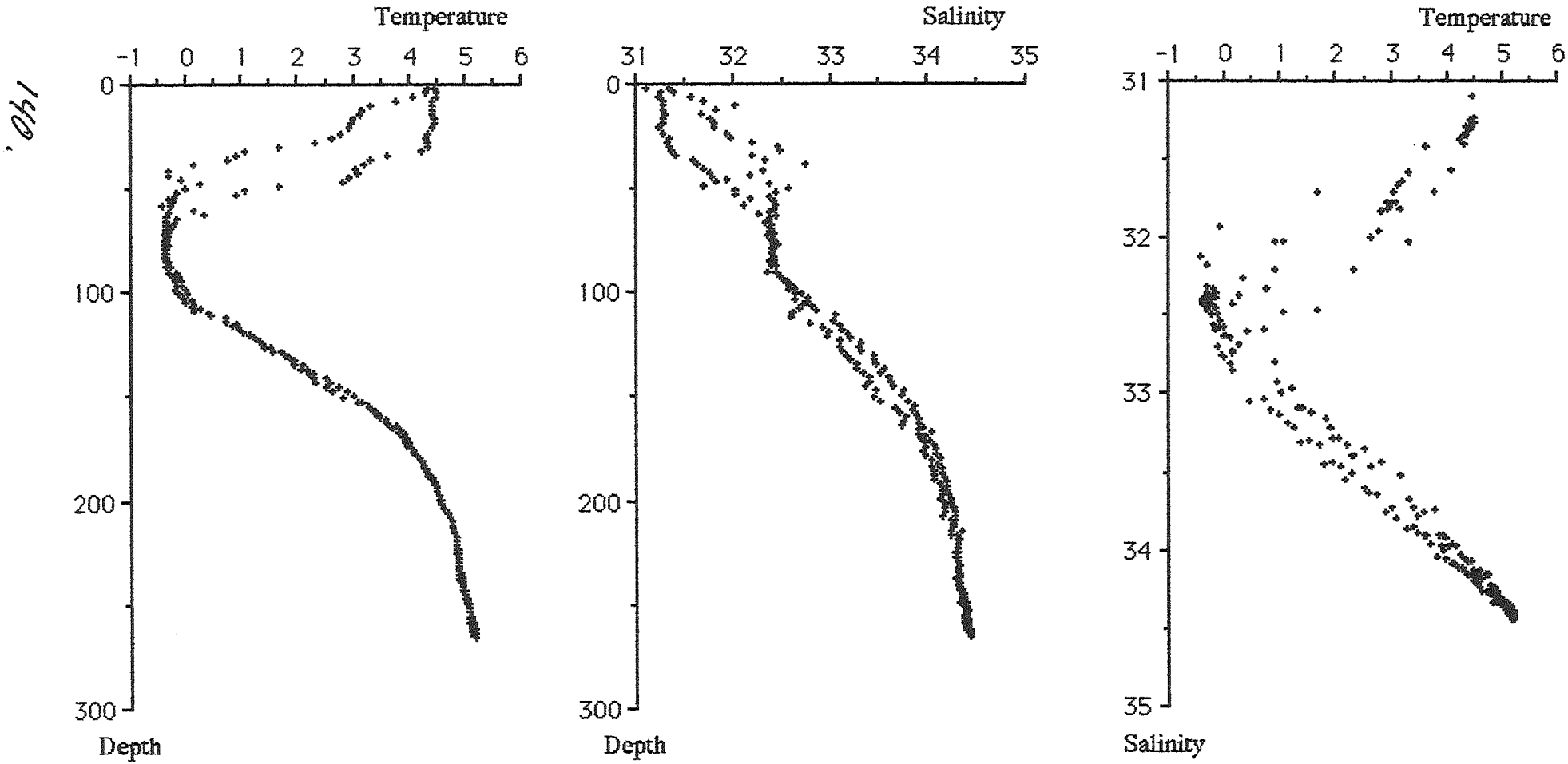
Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 31.2 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-14
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-019
------	H	13	TIDC	---------

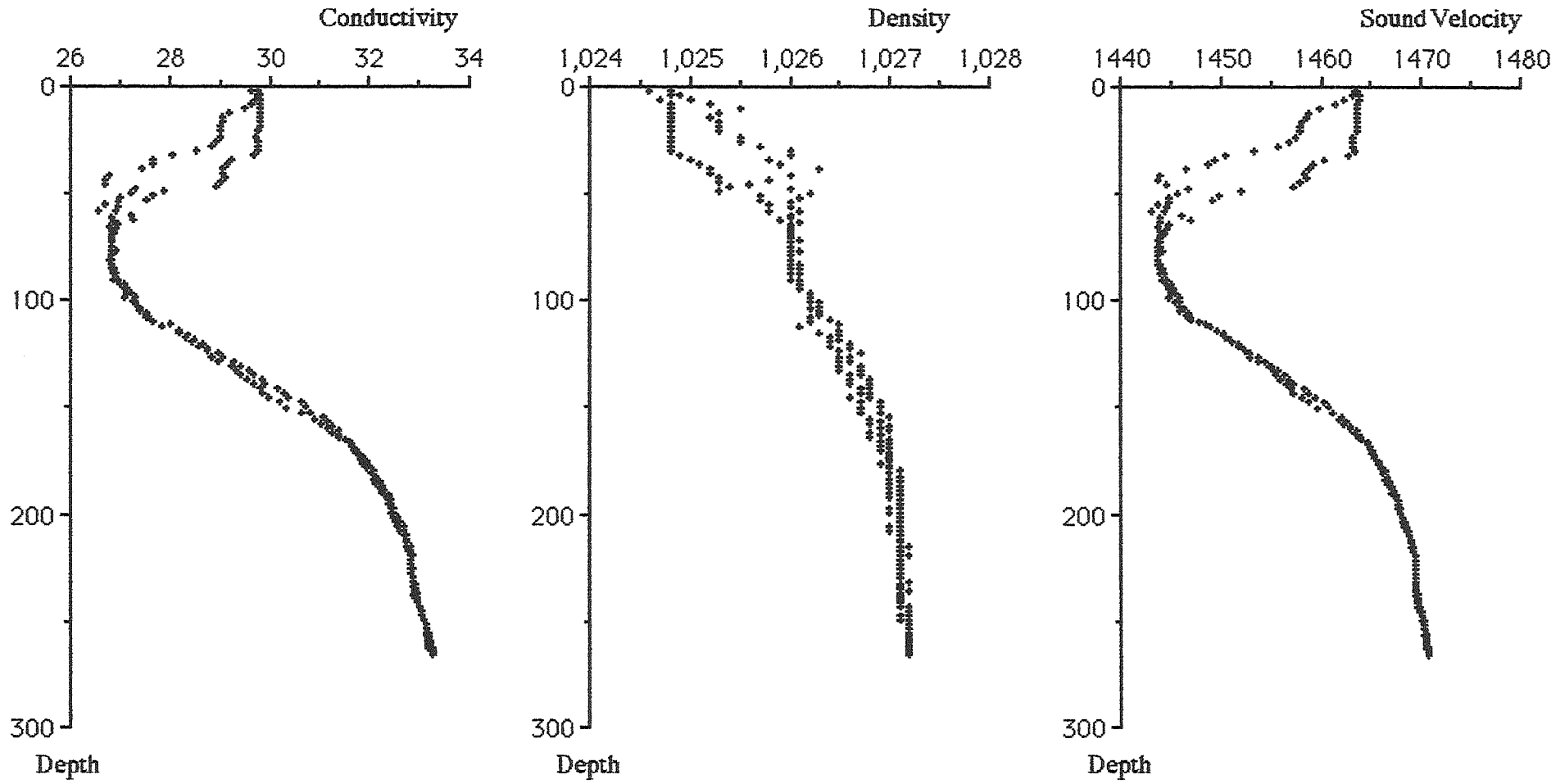
HU-090-028-031: Camera and CTD profile

Julian day: 313 Latitude: 50 06.00N
GM Time: 21:37 Longitude: 58 45.40W
Depth: 294 m.

Geographic Location: Esquiman Channel



HU-090-028-031 (Cont'd)



HU-90-028

HU-90-028-032: Box coring[1]

Julian day:	313	GMT Time:	22:07
Latitude:	50°05.52 N	Longitude:	58°45.33 W
Depth:	291 m	Penetration:	50 cm

Geographic location: Esquiman Channel

Subsampling:
1 push-core (30 cm long, 15 cm in diameter) for on-board processing
2 push-cores (45 cm long, 10 cm in diameter) for further analysis (UQAM)
4 push-core (45 cm long, 10 cm in diameter) for archives (BIO)
1 "micro-core" (10 cm^3) for bacterial counting (U. of Virginia)
1 sample (250 ml) at the box-core surface for foraminifer study (UQAM).

On-board measurements & subsampling:

Depth (cm)	Eh (mv)	O_2 (%)	Pore water	Frozen[2] sample	Sediment[3] sample	Squeezed seds.	Porosity sample
0-1	----	--	x	x	x	x	x
1-2	----	--	x	x	x	x	x
2-3	----	--	x	x	x	x	x
3-4	----	--	x	x	x	x	x
4-5	----	--	x	x	x	x	x
5-6	----	--	x	x	x	x	x
6-7	----	--	x	x	x	x	x
7-8	----	--	x	x	x	x	x
9-11	----	--	x	x	x	x	x
11-13	----	--	x	x	x	x	x
13-15	----	--	x	x	x	x	x
15-17	----	--	x	x	x	x	x
17-19	----	--	x	x	x	x	x
19-21	----	--	x	x	x	x	x
21-23	----	--	x	x	x	x	x
23-25	----	--	x	x	x	x	x
30-32	----	--	--	x	x	--	--
34-36	----	--	--	x	x	--	--
38-40	----	--	--	x	x	--	--
42-44	----	--	--	x	x	--	--
46-48	----	--	--	x	x	--	--
50-52	----	--	--	x	x	--	--

Continuous sampling has been made all along the push-core for paleomagnetism[4].

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1. See appendix 1.3
2. For bacterial counting
3. For micropaleontological & geochemical studies
4. See appendix 1.1

HU-90-028-033: Water sampling[1]

Julian day:	313	GMT Time:	23:00
Latitude:	50°05.23 N	Longitude:	58°45.42 W
Depth:	290 m	Depth intervals sampled:	(I) 2-16 m (II) 60-74 m (III) 220-241 m

Summary: 2 sets of 3 x [12 L-Niskin] bottles were used for sampling water masses (I) and (II). 1 set of 4 x [12 l-Niskin] bottleswas used for sampling water mass (III).

Sampling & on board processing:

(I) 2-16 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 6 L
Volume of water filtered through Glass Fiber Filter: 22 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-16
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-023
------	H	13	TIDC	--------

---

1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon (∂CO_2)
3. SPM: Suspended Particular Matter.

HU-90-028-033: Water sampling (Cont'd)

(II) 60-74 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 26 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-17
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-024
------	H	13	TIDC	---------

(III) 220-241 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 25, 9.4 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-18
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-025
------	H	13	TIDC	---------

HU-90-028

HU 90-028-034 TWC: Trigger Weight Coring

Julian day:	314	GMT Time:	17:57
Latitude:	48°15.00 N	Longitude:	60°39.43 W
Depth:	439 m		
Penetration:	183 cm	TWC length:	144 cm

Geographic location Laurentian Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
124-126	x	x	x	x

HU-90-028

HU 90-028-034 P : L-Piston Coring

Julian day:	314	GMT Time:	17:57
Latitude:	48°15.00 N	Longitude:	60°39.43 W
Depth:	439 m	Corer length:	1520 cm
Penetration:	929 cm	Core length:	265 cm

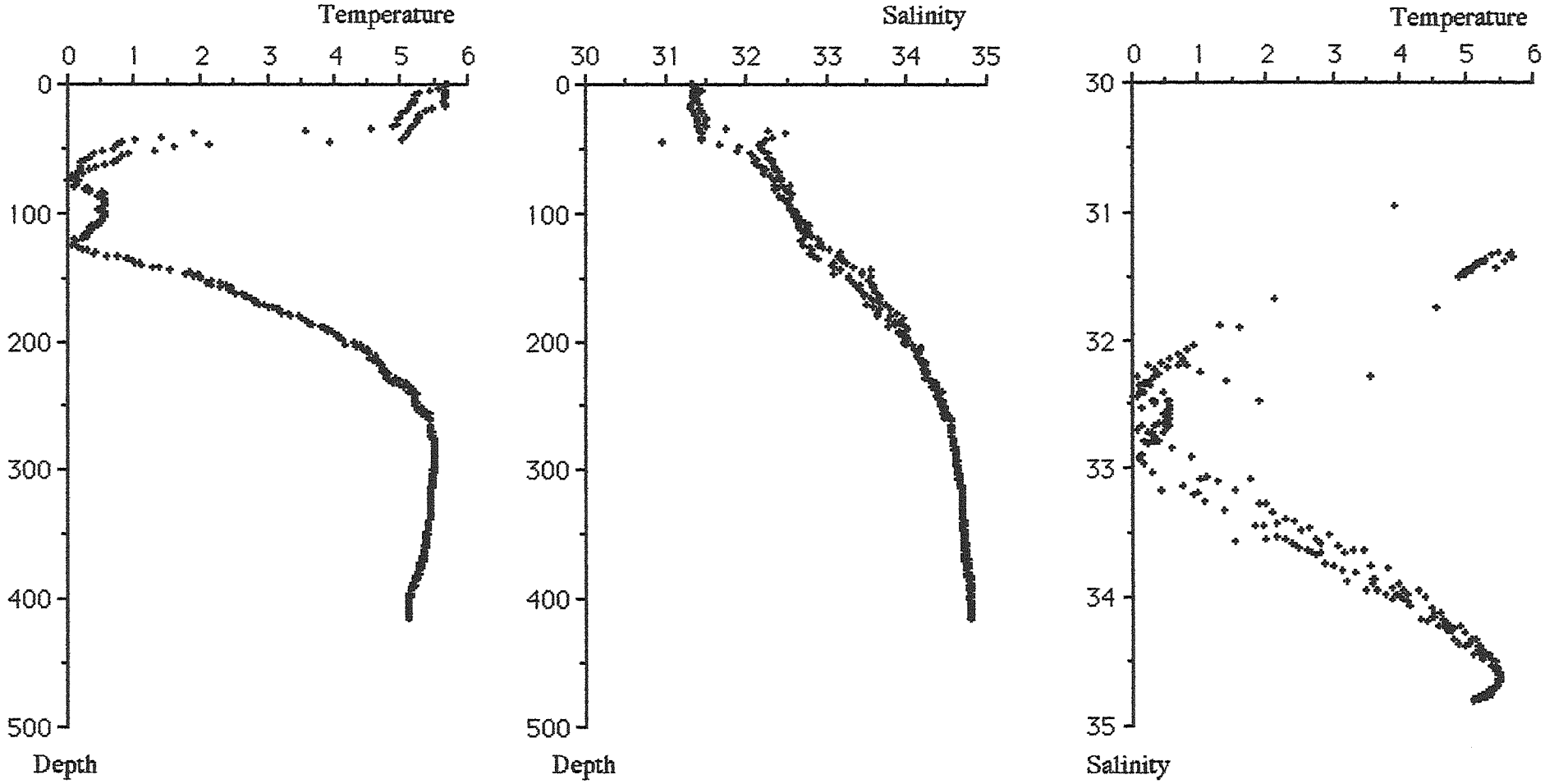
Geographic location Laurentian Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
115-117	x	x	x	x
134-136	x	x	x	x
154-156	x	x	x	x
174-176	x	x	x	x
194-196	x	x	x	x
214-216	x	x	x	x
234-236	x	x	x	x
254-256	x	x	x	x

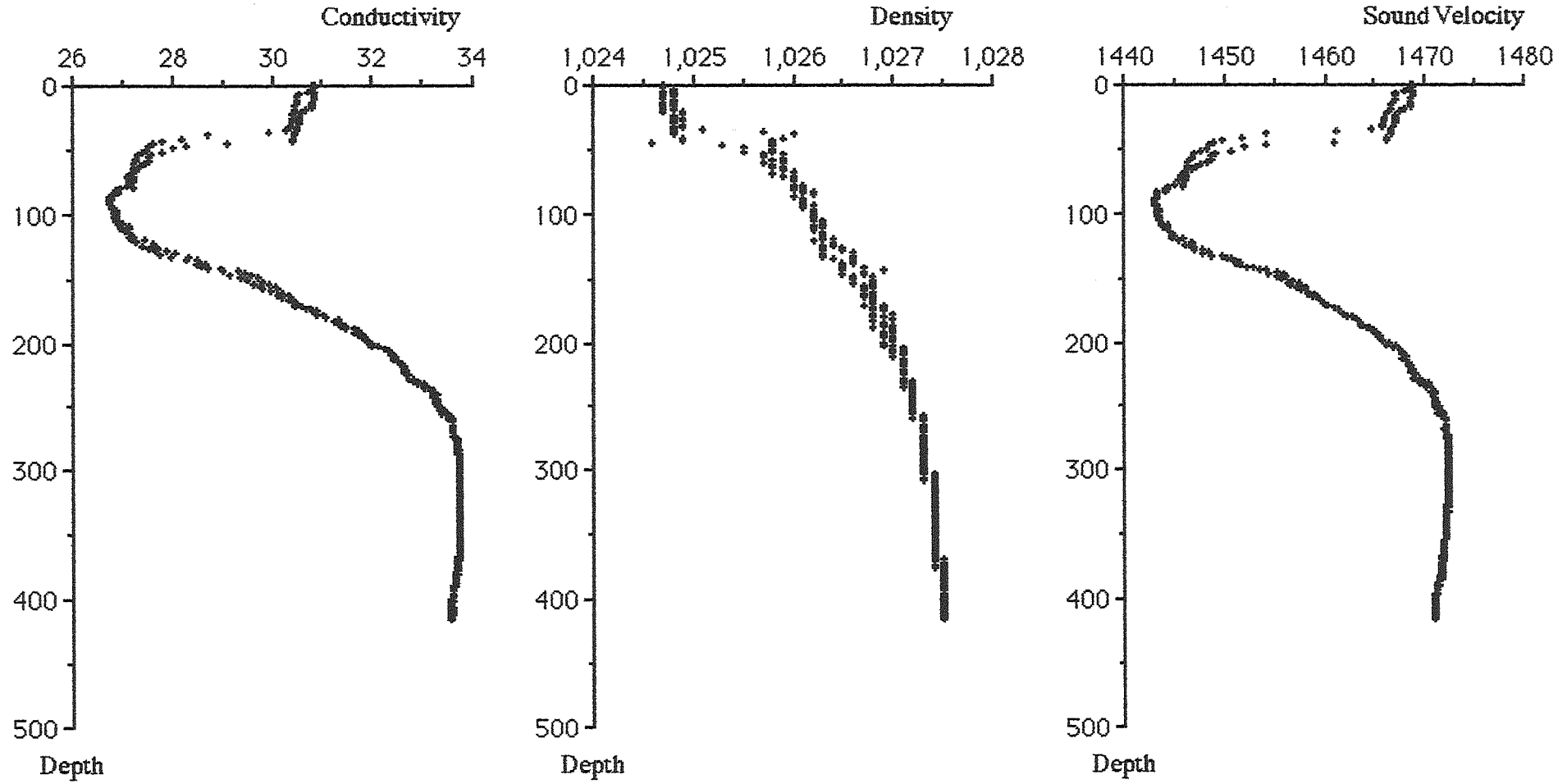
HU-090-028-036: Camera and CTD profile

Julian day: 314 Latitude: 48 12.02N
GM Time: 20:00 Longitude: 60 39.41W
Depth: 439 m.

Geographic Location: Laurentian Channel



HU-090-026-036 (Cont'd)



HU-90-028

HU 90-028-037 TWC: Trigger Weight Coring

Julian day:	314	GMT Time:	20:29
Latitude:	48°15.00 N	Longitude:	60°39.42 W
Depth:	439 m		
Penetration:	183 cm	TWC length:	144 cm

Geographic location Laurentian Channel

As the core was done in the same area than core number 34, The trigger weight core was not subsample on board.

HU-90-028

HU 90-028-037 P : L-Piston Coring

Julian day:	314	GMT Time:	20:29
Latitude:	48°15.00 N	Longitude:	60°39.42 W
Depth:	439 m	Corer length:	1216 cm
Penetration:	927 cm	Core length:	648 cm

Geographic location Laurentian Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
54-56	x	x	x	x
74-76	x	x	x	x
74-76	x	x	x	x
114-116	x	x	x	x
134-136	x	x	x	x
154-156	x	x	x	x
174-176	x	x	x	x
194-196	x	x	x	x
204-206	x	x	x	x
214-216	x	x	x	x
234-236	x	x	x	x
254-256	x	x	x	x
274-276	x	x	x	x
294-296	x	x	x	x
314-316	x	x	x	x
334-336	x	x	x	x
354-356	x	x	x	x
374-376	x	x	x	x
394-396	x	x	x	x
414-416	x	x	x	x
434-436	x	x	x	x
454-456	x	x	x	x
474-476	x	x	x	x
494-496	x	x	x	x

The last section (A-B), was not sampled because it was a diamicton.

HU-90-028

HU 90-028-038 TWC: Trigger Weight Coring

Julian day:	315	GMT Time:	14:36
Latitude:	49°46.41 N	Longitude:	62°25.06
Depth:	240 m		
Penetration:	165 cm	TWC length:	113 cm

Geographic location Jacques Cartier Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x

HU-90-028

HU 90-028-038 P : L-Piston Coring

Julian day:	315	GMT Time:	14:35
Latitude:	49°46.41 N	Longitude:	62°25.06 W
Depth:	240 m	Corer length:	1520 cm
Penetration:	xxxx cm	Core length:	928 cm

Geographic location Jacques Cartier Channel

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
4-6	x	x	x	x
24-26	x	x	x	x
44-46	x	x	x	x
64-66	x	x	x	x
84-86	x	x	x	x
104-106	x	x	x	x
124-126	x	x	x	x
144-146	x	x	x	x
164-166	x	x	x	x
184-186	x	x	x	x
204-206	x	x	x	x
224-226	x	x	x	x
244-246	x	x	x	x
264-266	x	x	x	x
284-286	x	x	x	x
304-306	x	x	x	x
324-326	x	x	x	x
344-346	x	x	x	x
364-366	x	x	x	x
384-386	x	x	x	x
404-406	x	x	x	x
424-426	x	x	x	x
444-446	x	x	x	x
464-466	x	x	x	x
484-486	x	x	x	x
504-506	x	x	x	x
524-526	x	x	x	x
544-546	x	x	x	x
564-566	x	x	x	x
584-586	x	x	x	x
604-606	x	x	x	x
624-626	x	x	x	x
634-636	x	x	x	x
654-656	x	x	x	x
674-676	x	x	x	x

HU 90-028-038 P : L-Piston Coring (Cont'd)

Depth s.b. (cm)	Foram. sample (30 cc)	Bacterial counting (1 cc)	Pollen & Dinocysts (2 cc)	Diatoms & Coccoliths (2 cc)
694-696	x	x	x	x
714-716	x	x	x	x
734-736	x	x	x	x
754-756	x	x	x	x
784-786	x	x	x	x
804-806	x	x	x	x
824-826	x	x	x	x
844-846	x	x	x	x
864-866	x	x	x	x
884-886	x	x	x	x
904-906	x	x	x	x
924-926	x	x	x	x

HU-90-028

HU-90-028-040: Box coring[1] + CTD[2]

Julian day:	318	GMT Time:	13:52
Latitude:	48°21.16N	Longitude:	70°23.04W
Depth:	258 m	Penetration:	55 cm

Geographic location: Central Saguenay River

Subsampling:
1 push-core (45 cm long, 15 cm in diameter) for on-board processing
2 push-cores (55 cm long, 10 cm in diameter) for further analysis (UQAM)
2 push-core (55 cm long, 10 cm in diameter) for archives (BIO)
2 push-cores (55 cm long, 10 cm in diameter) for on-board processing(U. Laval)
1 "micro-core" (10 cm^3) for bacterial counting (U. of Virginia)
1 sample (250 ml) at the box-core surface for foraminifer study (UQAM).

On-board measurements & subsampling:

Depth (cm)	Eh (mv)	O_2 (%)	Pore water	Frozen[3] sample	Sediment[4] sample	Squeezed seds.	Porosity sample
0-1	----	--	x	x	x	x	x
1-2	----	--	x	x	x	x	x
2-3	----	--	x	x	x	x	x
3-4	----	--	x	x	x	x	x
4-5	----	--	x	x	x	x	x
5-6	----	--	x	x	x	x	x
6-7	----	--	x	x	x	x	x
7-8	----	--	x	x	x	x	x
9-11	----	--	x	x	x	x	x
11-13	----	--	x	x	x	x	x
13-15	----	--	x	x	x	x	x
15-17	----	--	x	x	x	x	x
17-19	----	--	x	x	x	x	x
19-21	----	--	x	x	x	x	x
21-23	----	--	--	x	x	x	x
23-25	----	--	x	x	x	x	x
27-29	----	--	--	x	x	--	--
31-33	----	--	--	x	x	--	--
35-37	----	--	--	x	x	--	--
39-41	----	--	--	x	x	--	--
43-45	----	--	--	x	x	--	--
47-49	----	--	--	x	x	--	--
51-53	----	--	--	x	x	--	--

Continuous sampling has been made all along the push-core for paleomagnetism[5].

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1. See appendix 1.3
2. See CTD profile next pages
3. For bacterial counting
4. For micropaleontological & geochemical studies
5. See appendix 1.1

HU-090-028-040: (Cont'd)

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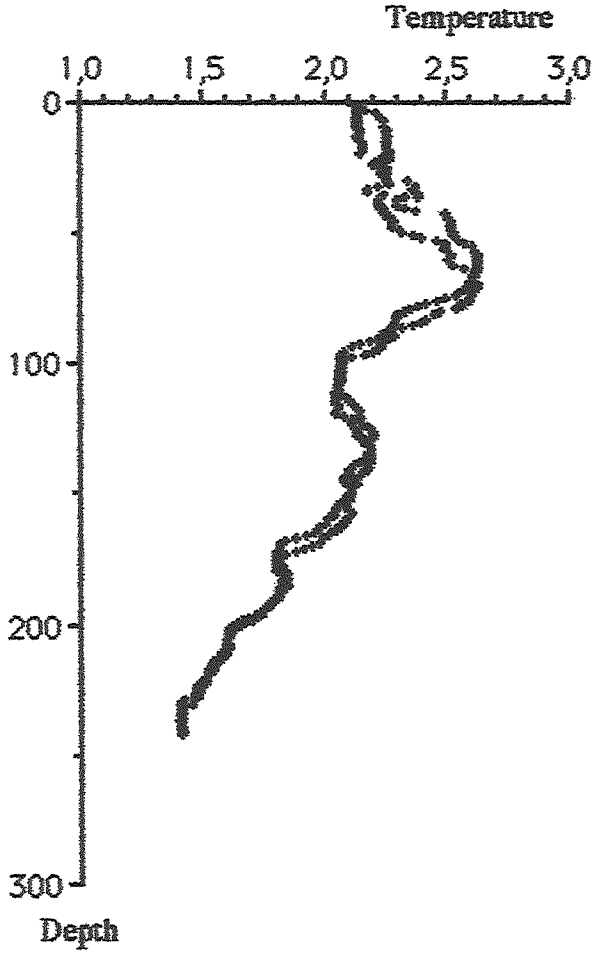
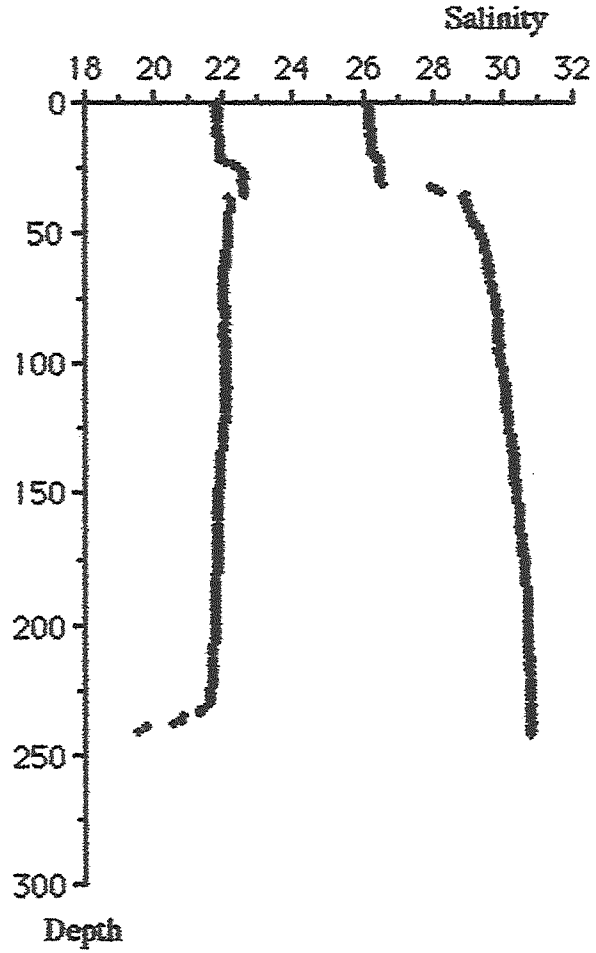
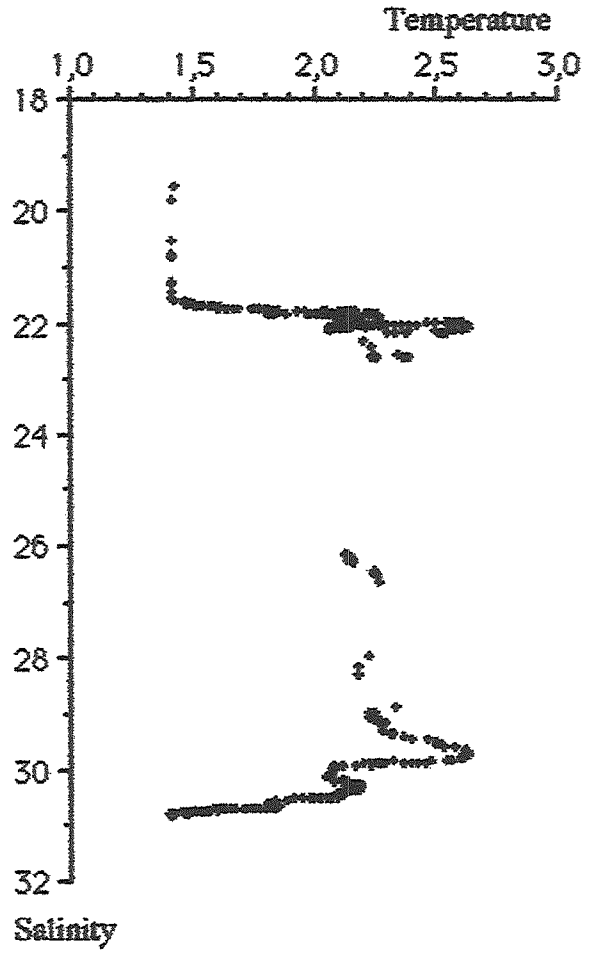
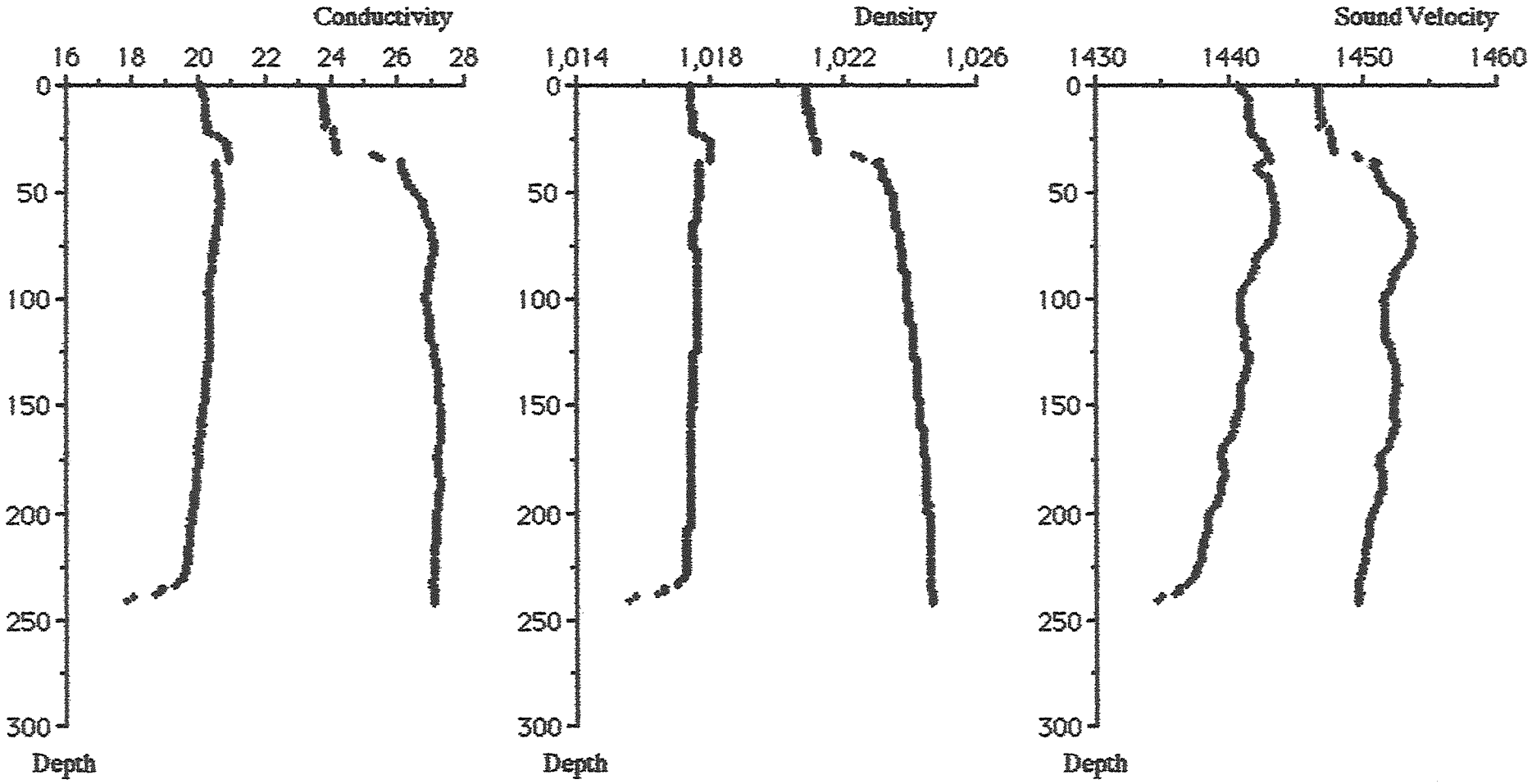






HU-090-028-040 (Cont'd)

151



HU-90-028-42: Water sampling[1]

Julian day:	318	GMT Time:	16:05
Latitude:	48°21.21 N	Longitude:	70°23.03W
Depth:	206 m	Depth intervals sampled:	(I) 2-23 m
			(II) 140-168 m

Summary: 1 set of 4 x [12 L-Niskin] bottles was used for sampling water masse (I) and 1 set of 5 x [12 L-Niskin] bottles was used for sampling water mass (II).

Sampling & on board processing:

(I) 2-23 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 3.34 L
Volume of water filtered through Glass Fiber Filter: 9.52, 8 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-26
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-027
GFF	--	---	" " "	90-029
------	H	13	TIDC	--------

1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon (∂CO_2)
3. SPM: Suspended Particular Matter.

HU-90-028-042: Water sampling (Cont'd)

(II) 140-168 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

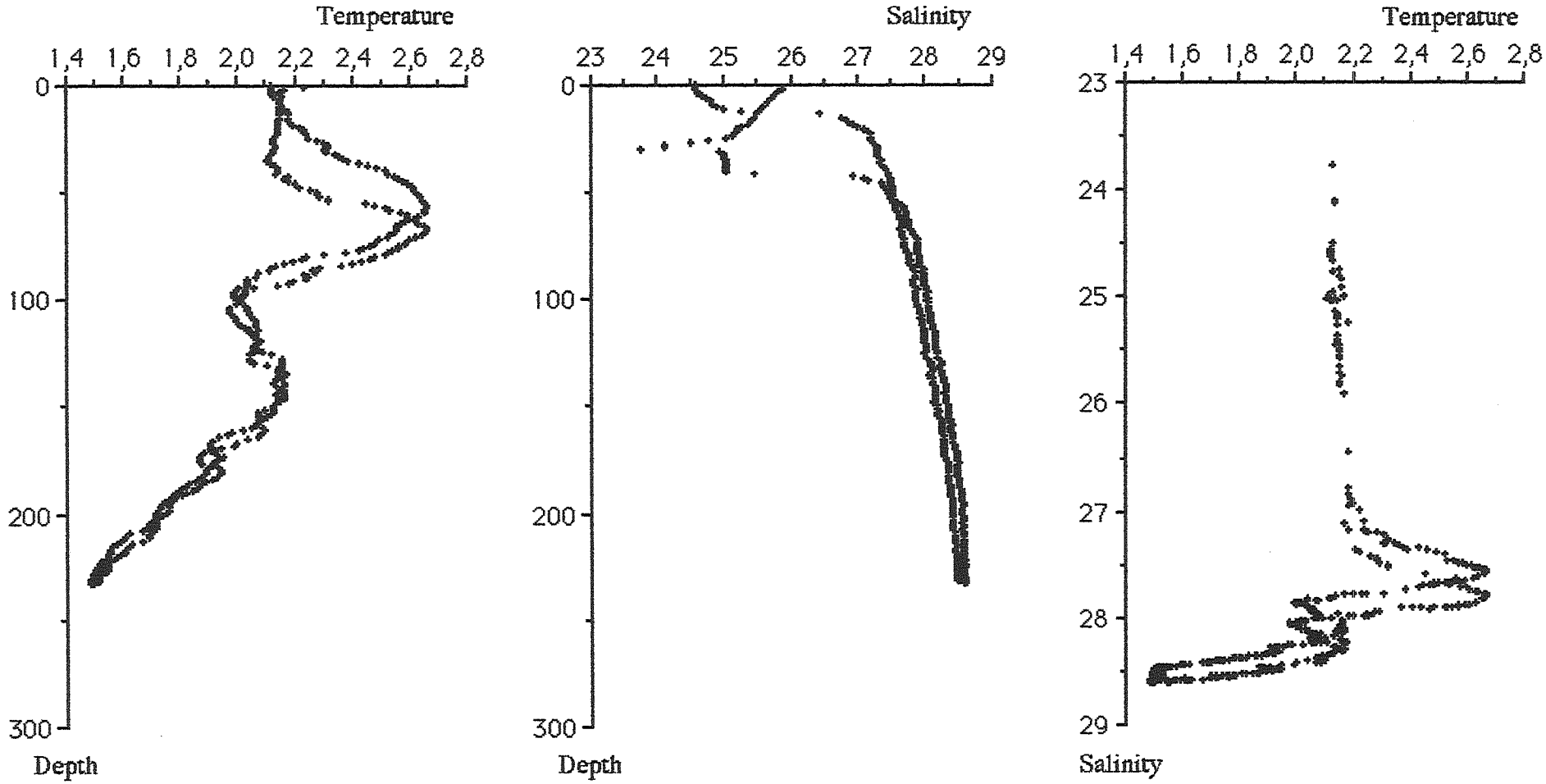
Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 30.2, 10.6 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-27
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-028
GFF	--	---	" " "	90-030
------	H	13	TIDC	---------

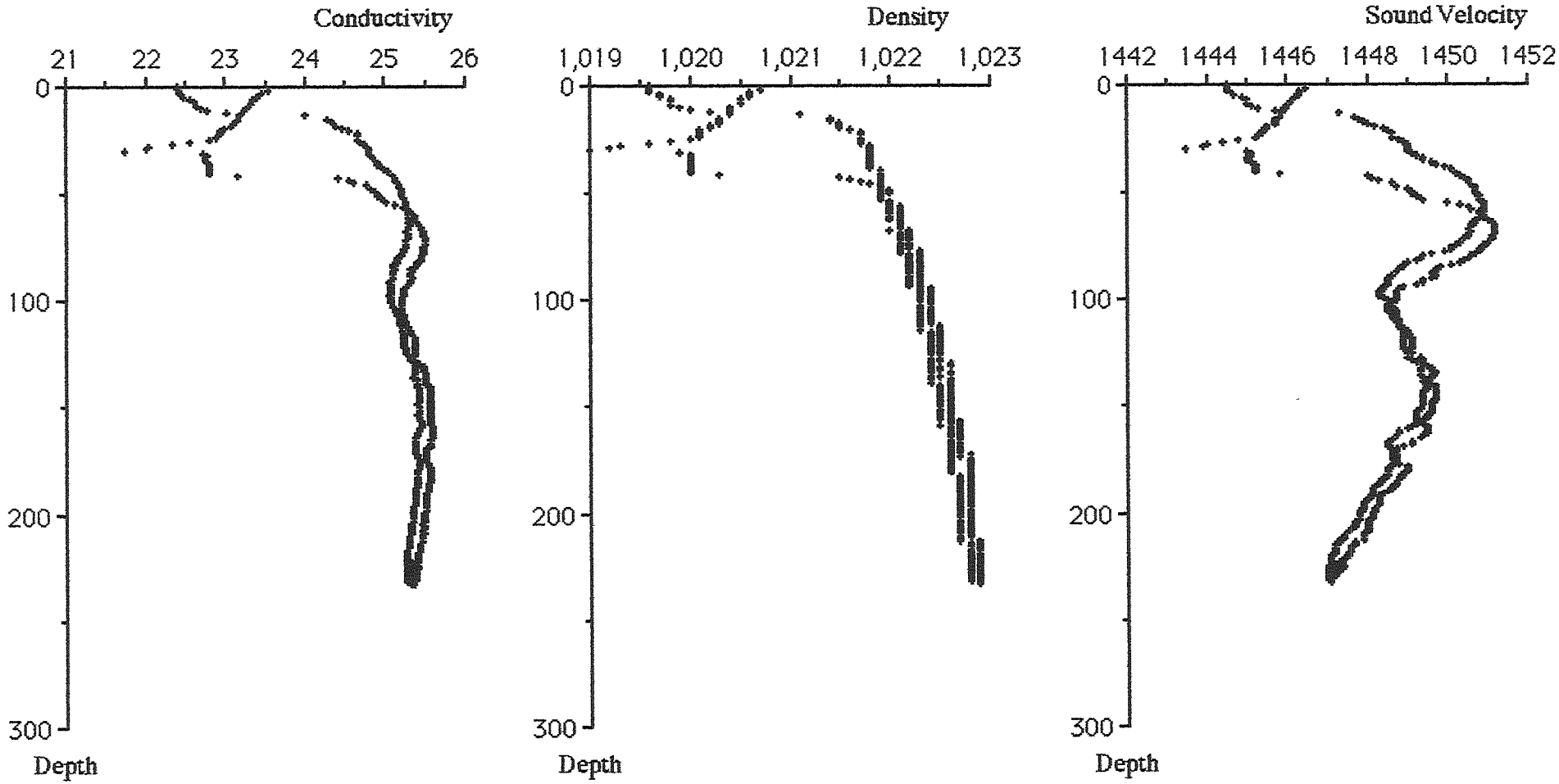
HU-090-028-045: Camera and CTD profile

Julian day: 319 Latitude: 48 21.21N
GM Time: 03:48 Longitude: 70 21.08W
Depth: 254

Geographical Location:



HU-090-028-045 (Cont'd)



160.

HU-90-028

HU-90-028-047: Box coring[1] + CTD[2]

Julian day:	319	GMT Time:	16:07
Latitude:	48°24.25N	Longitude:	70°48.44W
Depth:	104 m	Penetration:	62 cm

Geographic location: ?

Subsampling:
1 push-core (45 cm long, 15 cm in diameter) for on-board processing
2 push-cores (62 cm long, 10 cm in diameter) for further analysis (UQAM)
2 push-core (62 cm long, 10 cm in diameter) for archives (BIO)
1 push-cores (62 cm long, 10 cm in diameter) for on-board processing (U. Laval)
1 "micro-core" (10 cm^3) for bacterial counting (U. of Virginia)

On-board measurements & subsampling:

Depth (cm)	Eh (mv)	O_2 (%)	Pore water	Frozen[3] sample	Sediment[4] sample	Squeezed seds.	Porosity sample
0-1	-263	--	x	x	x	x	x
1-2	-342	--	x	x	x	x	x
2-3	-355	--	x	x	x	x	x
3-4	-403	--	x	x	x	x	x
4-6	-403	--	x	x	x	x	x
6-8	-400	--	x	x	x	x	x
8-10	-382	--	x	x	x	x	x
10-12	-382	--	x	x	x	x	x
13-15	-396	--	x	x	x	x	x
15-17	-396	--	x	x	x	x	x
17-20	-424	--	x	x	x	x	x
20-22	-424	--	x	x	x	x	x
24-26	----	--	--	x	x	--	--
28-30	----	--	--	x	x	--	--
32-34	----	--	--	x	x	--	--
36-38	----	--	--	x	x	--	--
40-42	----	--	--	x	x	--	--
44-46	----	--	--	x	x	--	--
48-50	----	--	--	x	x	--	--
52-54	----	--	--	x	x	--	--
56-58	----	--	--	x	x	--	--
60-62	----	--	--	x	x	--	--

Continuous sampling has been made all along the push-core for paleomagnetism[5].

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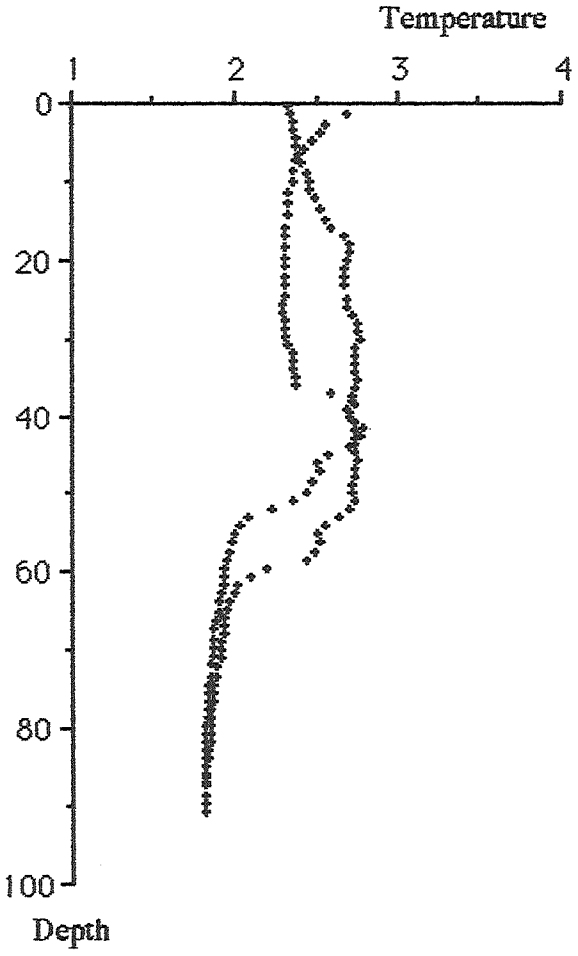
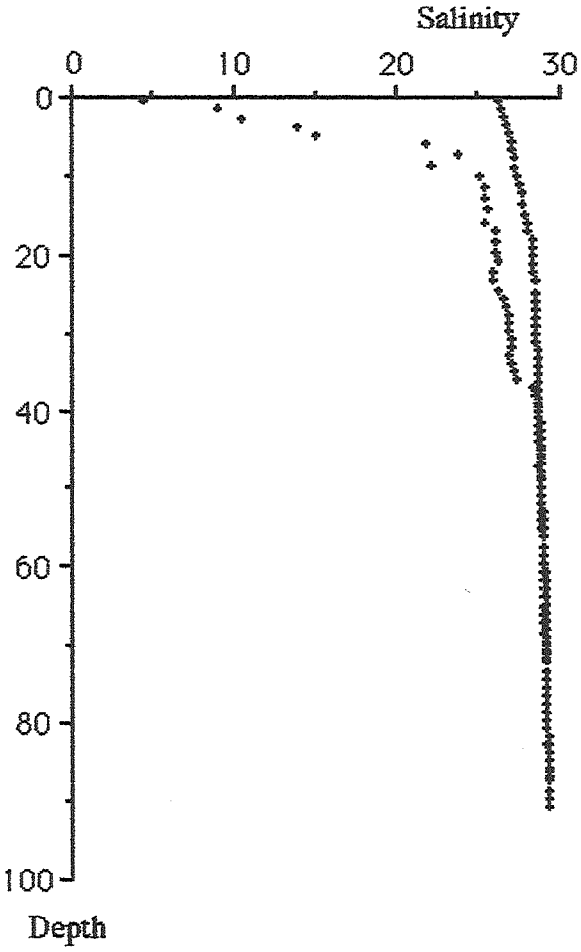
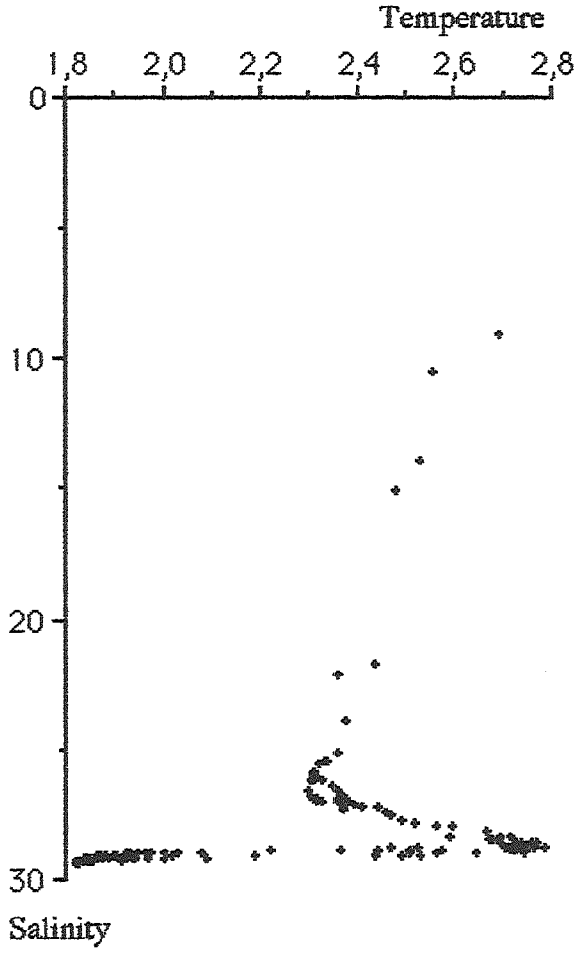
1. See appendix 1.3
2. See CTD profile next page
3. For bacterial counting
4. For micropaleontological & geochemical studies
5. See appendix 1.1

HU-090-028-047 (Cont'd)







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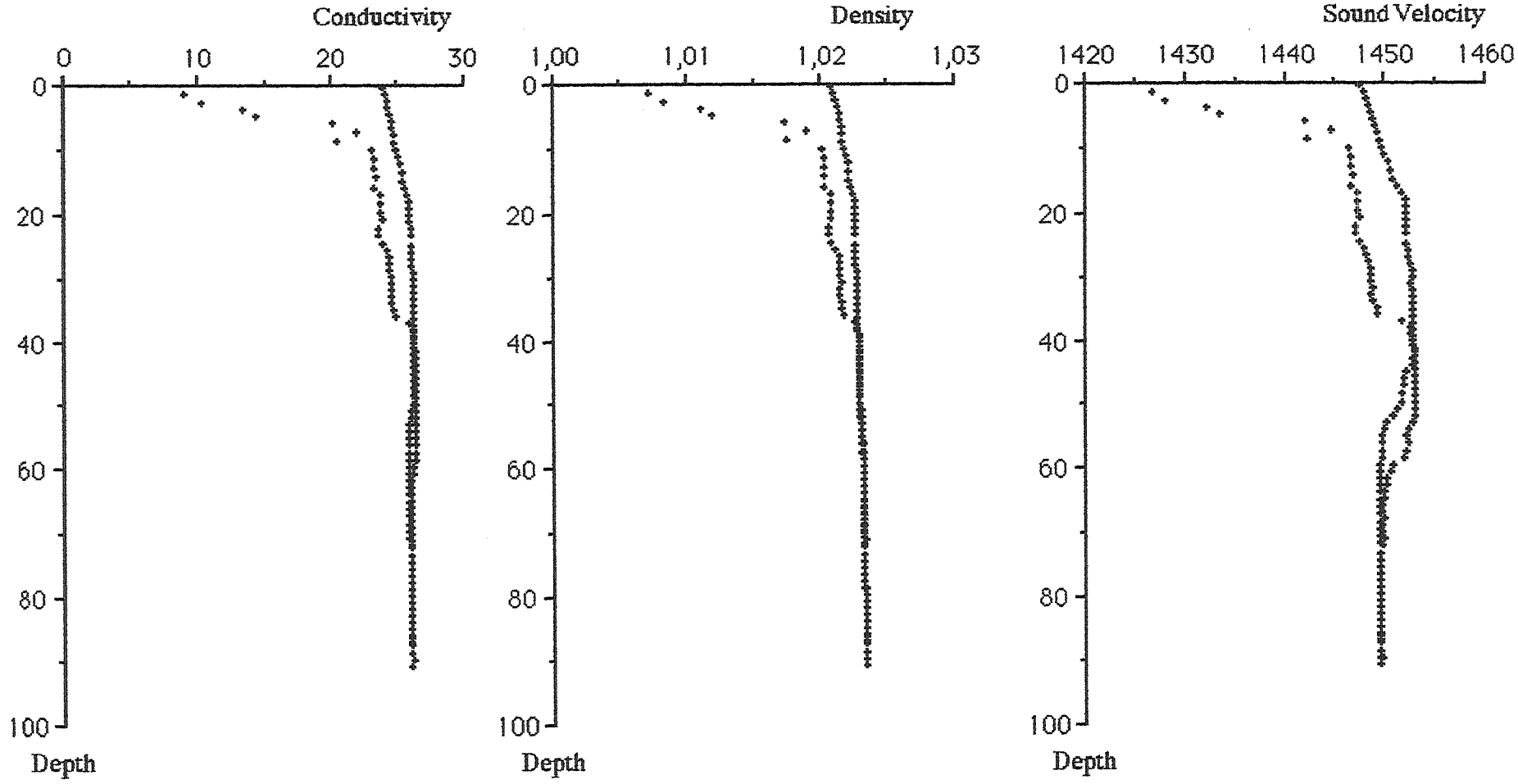
HU-090-028-047 (Cont'd)



163

HU-90-028

HU-90-028-048: Box coring[1] + CTD[2]

Julian day:	319	GMT Time:	18:05
Latitude:	48°22.09N	Longitude:	70°44.12W
Depth:	192 m	Penetration:	52 cm

Geographic location: ?

Subsampling: 1 push-cores (52 cm long, 10 cm in diameter) for further analysis (UQAM)
2 push-core (52 cm long, 10 cm in diameter) for archives (BIO)
1 push-cores (52 cm long, 10 cm in diameter) for on-board processing (U. Laval

On-board measurements & subsampling:

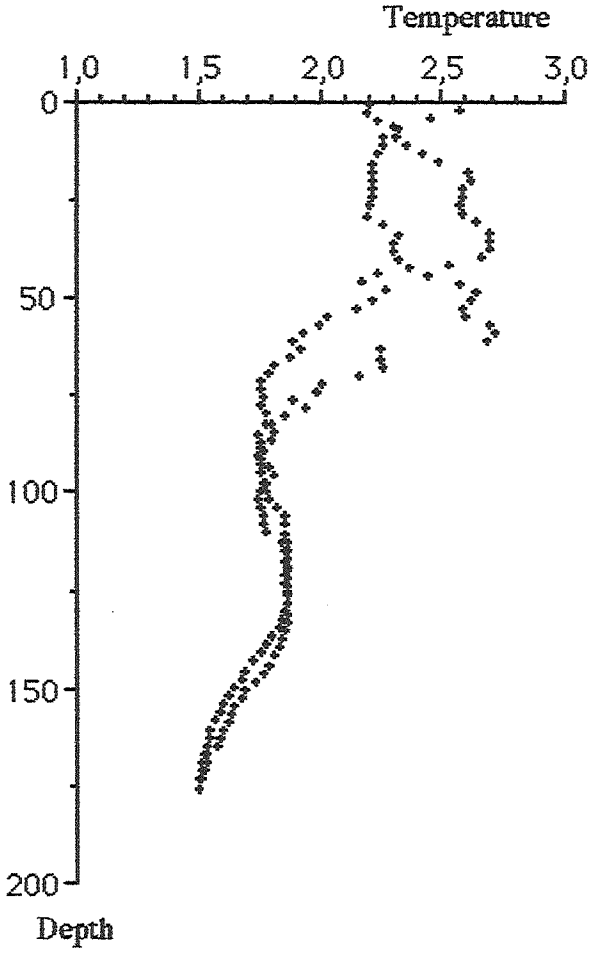
Depth (cm)	Eh (mv)	O_2 (%)	Pore water	Frozen[3] sample	Sediment[4] sample	Squeezed seds.	Porosity sample
0-2	----	--	--	x	x	--	x
2-4	----	--	--	x	x	--	x
4-6	----	--	--	x	x	--	x
6-8	----	--	--	x	x	--	x
8-10	----	--	--	x	x	--	x
10-12	----	--	--	x	x	--	x
12-14	----	--	--	x	x	--	x
14-16	----	--	--	x	x	--	x
16-18	----	--	--	x	x	--	x
18-20	----	--	--	x	x	--	x
20-22	----	--	--	x	x	--	x
22-24	----	--	--	x	x	--	x
26-28	----	--	--	x	x	--	--
30-32	----	--	--	x	x	--	--
34-36	----	--	--	x	x	--	--
38-40	----	--	--	x	x	--	--
42-44	----	--	--	x	x	--	--
46-48	----	--	--	x	x	--	--
50-52	----	--	--	x	x	--	--

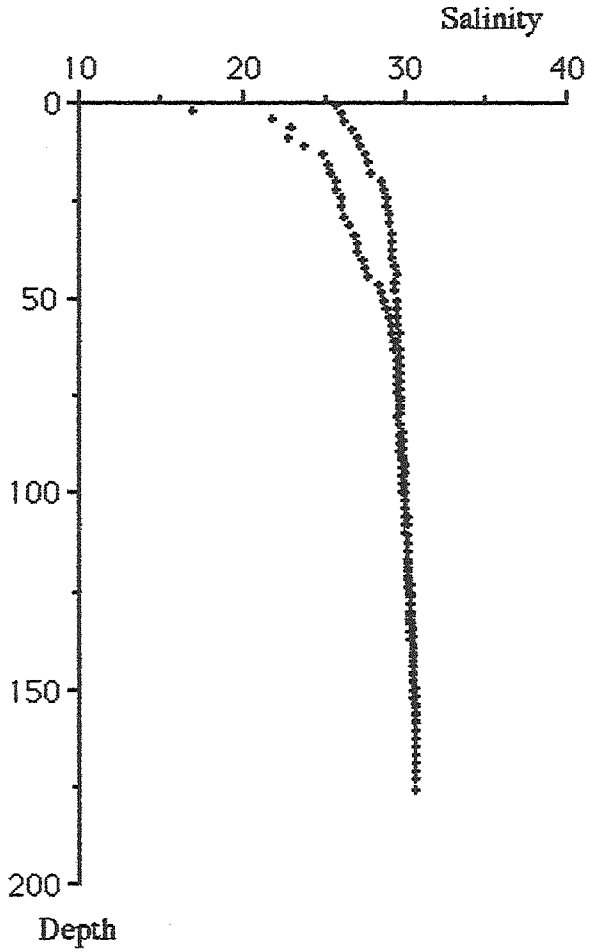
Continuous sampling has been made all along the push-core for paleomagnetism[5].

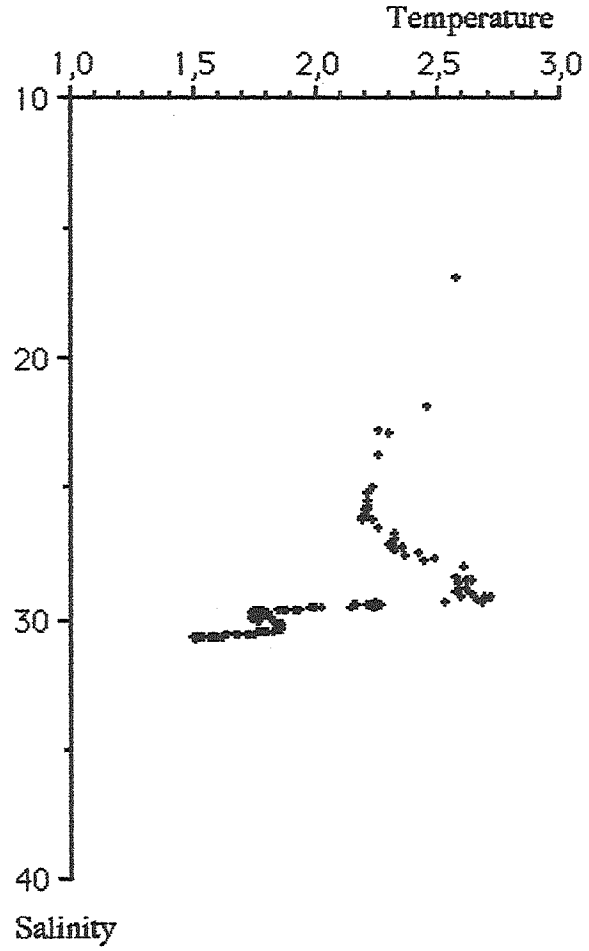
---

1. See appendix 1.3
2. See CTD profile next pages
3. For bacterial counting
4. For micropaleontological & geochemical studies
5. See appendix 1.1

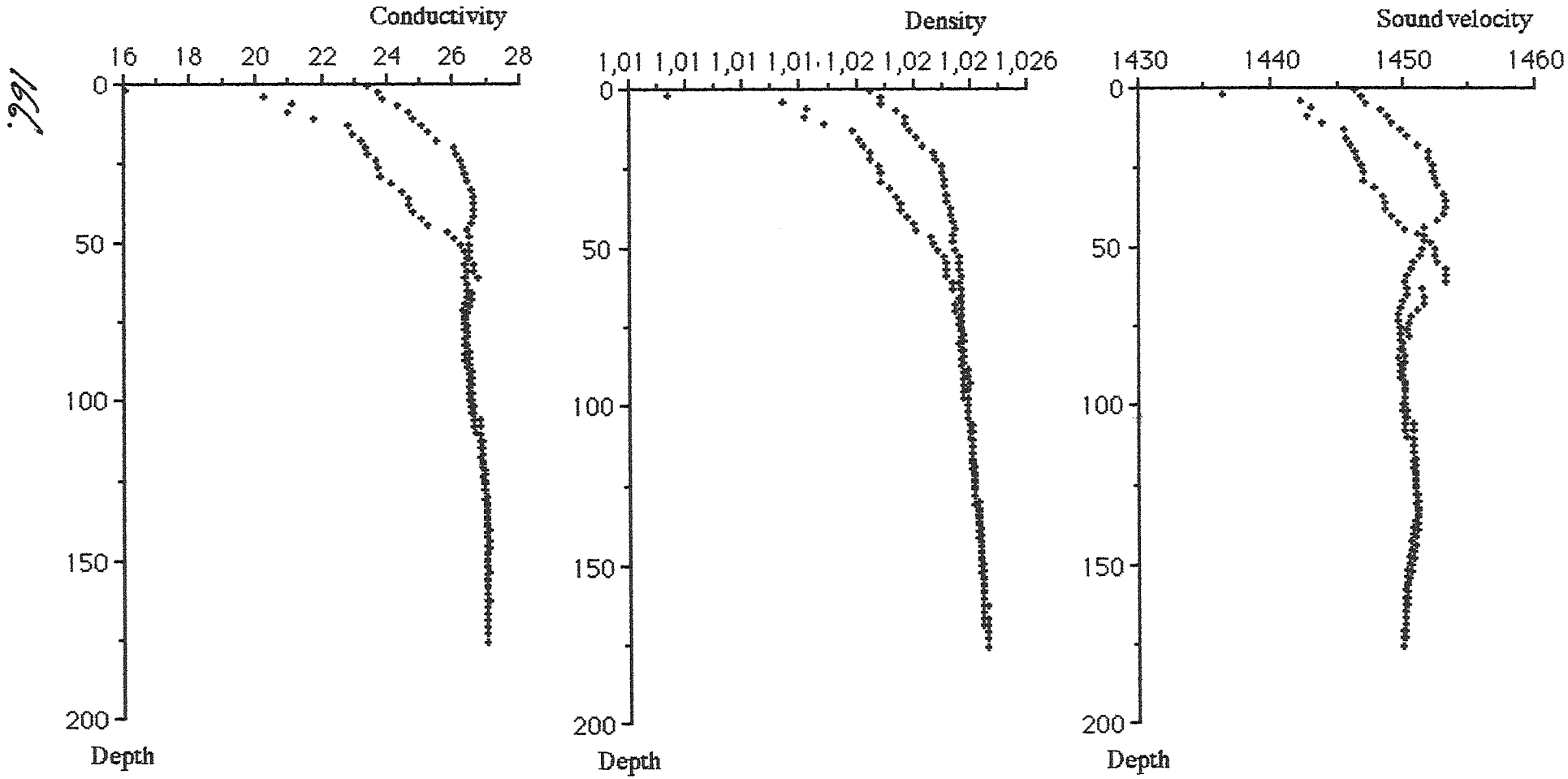
HU-090-028-048 (Cont'd)







HU-090-028-048 (Cont'd)



HU-90-028-050: Water sampling[1]

Julian day:	319	GMT Time:	20:17
Latitude:	48°22.05 N	Longitude:	70°44.07 W
Depth:	523 m	Depth intervals sampled:	(I) 2-23 m (II) 70-91 m (III) 120-141 m

Summary: 3 sets of 4 x [12 L-Niskin] bottles were used for sampling water masses (I), (II) and (III).

Sampling & on board processing:

(I) 2-23 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 2.8 L
Volume of water filtered through Glass Fiber Filter: 9.1, 10 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-28
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-031
GFF	--	---	" " "	90-034
------	H	13	TIDC	--------

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1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon (∂CO_2)
3. SPM: Suspended Particular Matter.

HU-90-028-050: Water sampling (Cont'd)

(II) 70-91 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 27.2 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-29
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-032
------	H	13	TIDC	---------

(III) 120-141 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 6 L
Volume of water filtered through Glass Fiber Filter: 23.54 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-30
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-033
------	H	13	TIDC	---------

HU-90-028

HU-90-028-051: Box coring[1]

Julian day:	319	GMT Time:	23:07
Latitude:	48°21.43N	Longitude:	70°32.02W
Depth:	261 m	Penetration:	65 cm

Geographic location: ?

Subsampling:
1 push-cores (45 cm long, 10 cm in diameter) for further analysis (UQAM)
2 push-core (65 cm long, 10 cm in diameter) for archives (BIO)
2 push-cores (65 cm long, 10 cm in diameter) for on-board processing (U. Laval)
1 sample (250 ml) at the box-core surface for foraminifer study (UQAM).

On-board measurements & subsampling:

Depth (cm)	Eh (mv)	O_2 (%)	Pore water	Frozen[2] sample	Sediment[3] sample	Squeezed seds.	Porosity sample
0-2	----	--	--	x	x	--	x
2-4	----	--	--	x	x	--	x
4-6	----	--	--	x	x	--	x
6-8	----	--	--	x	x	--	x
8-10	----	--	--	x	x	--	x
10-12	----	--	--	x	x	--	x
12-14	----	--	--	x	x	--	x
14-16	----	--	--	x	x	--	x
16-18	----	--	--	x	x	--	x
18-20	----	--	--	x	x	--	x
20-22	----	--	--	x	x	--	x
22-24	----	--	--	x	x	--	x
26-28	----	--	--	x	x	--	--
30-32	----	--	--	x	x	--	--
34-36	----	--	--	x	x	--	--
38-40	----	--	--	x	x	--	--
42-44	----	--	--	x	x	--	--
46-48	----	--	--	x	x	--	--
50-52	----	--	--	x	x	--	--
54-56	----	--	--	x	x	--	--
58-60	----	--	--	x	x	--	--
62-64	----	--	--	x	x	--	--

Continuous sampling has been made all along the push-core for paleomagnetism[4].

---

1. See appendix 1.3
2. For bacterial counting
3. For micropaleontological & geochemical studies
4. See appendix 1.1

HU-90-028

HU-90-028-056: Box coring[1]

Julian day:	320	GMT Time:	18:12
Latitude:	48°15.14N	Longitude:	70°10.53W
Depth:	196 m	Penetration:	40 cm

Geographic location: Anse Saint-Jean

Subsampling:
1 push-core (40 cm long, 15 cm in diameter) for on-board processing
2 push-cores (40 cm long, 10 cm in diameter) for further analysis (UQAM)
2 push-core (40 cm long, 10 cm in diameter) for archives (BIO)
1 "micro-core" (10 cm^3) for bacterial counting (U. of Virginia)
1 sample (250 ml) at the box-core surface for foraminifer study (UQAM).

On-board measurements & subsampling:

Depth (cm)	Eh (mv)	O_2 (%)	Pore water	Frozen[2] sample	Sediment[3] sample	Squeezed seds.	Porosity sample
0-1	33	--	x	x	x	x	x
1-2	-185	--	x	x	x	x	x
2-3	-157	--	x	x	x	x	x
3-4	-195	--	x	x	x	x	x
4-5	-218	--	x	x	x	x	x
5-6	-235	--	x	x	x	x	x
6-7	-235	--	x	x	x	x	x
7-8	-207	--	x	x	x	x	x
9-11	-207	--	x	x	x	x	x
11-13	-207	--	x	x	x	x	x
13-15	-230	--	x	x	x	x	x
15-17	-230	--	x	x	x	x	x
17-19	-216	--	--	x	x	--	x
19-21	-216	--	--	x	x	--	x
21-23	-216	--	--	x	x	--	--
23-25	-192	--	--	x	x	--	--
25-27	-192	--	--	x	x	--	--
27-29	-204	--	--	x	x	--	--
30-32	----	--	--	x	x	--	--
34-36	----	--	--	x	x	--	--
38-40	----	--	--	x	x	--	--

Continuous sampling has been made all along the push-core for paleomagnetism[4].

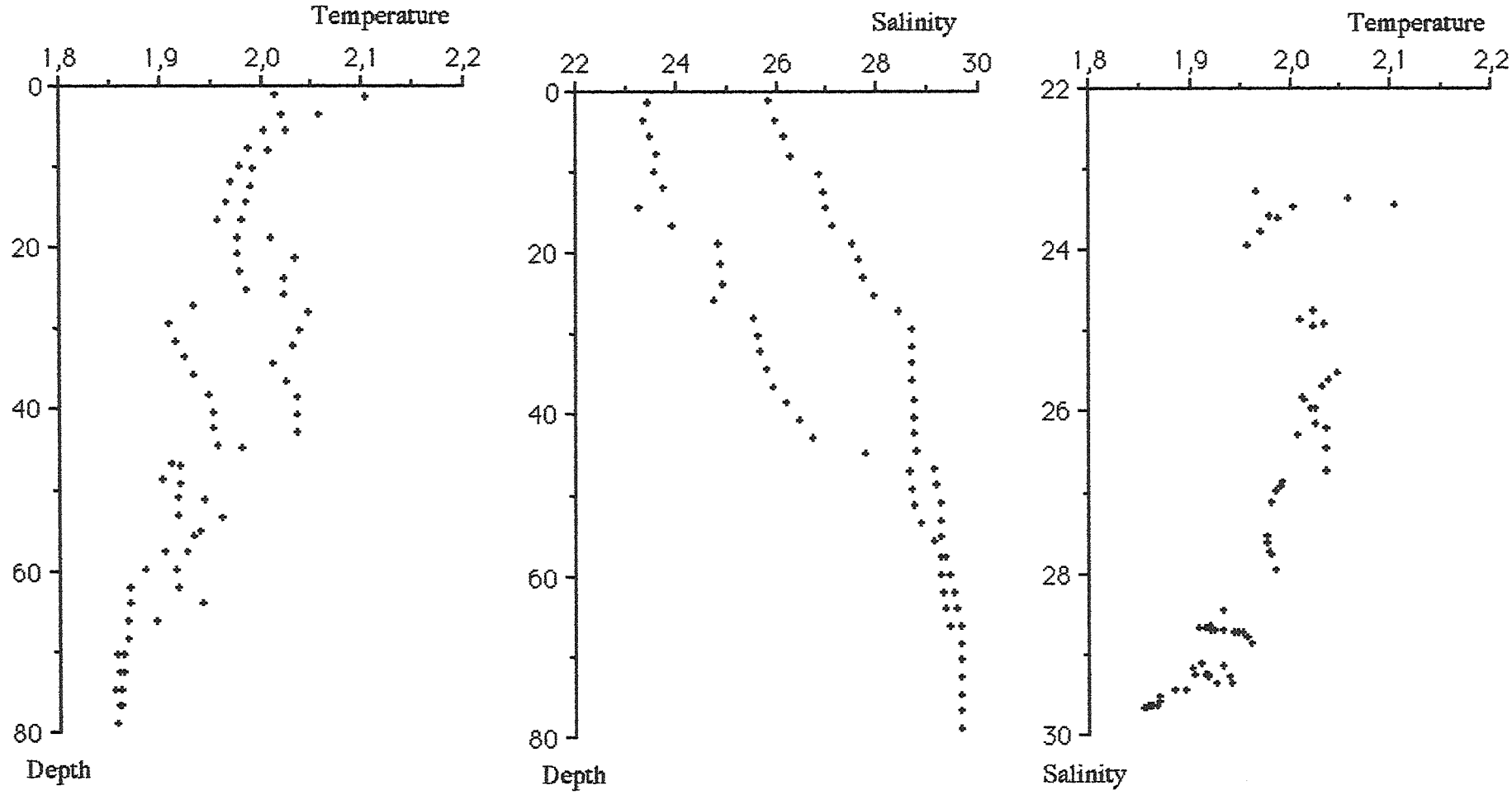
---

1. See appendix 1.3
2. For bacterial counting
3. For micropaleontological & geochemical studies
4. See appendix 1.1

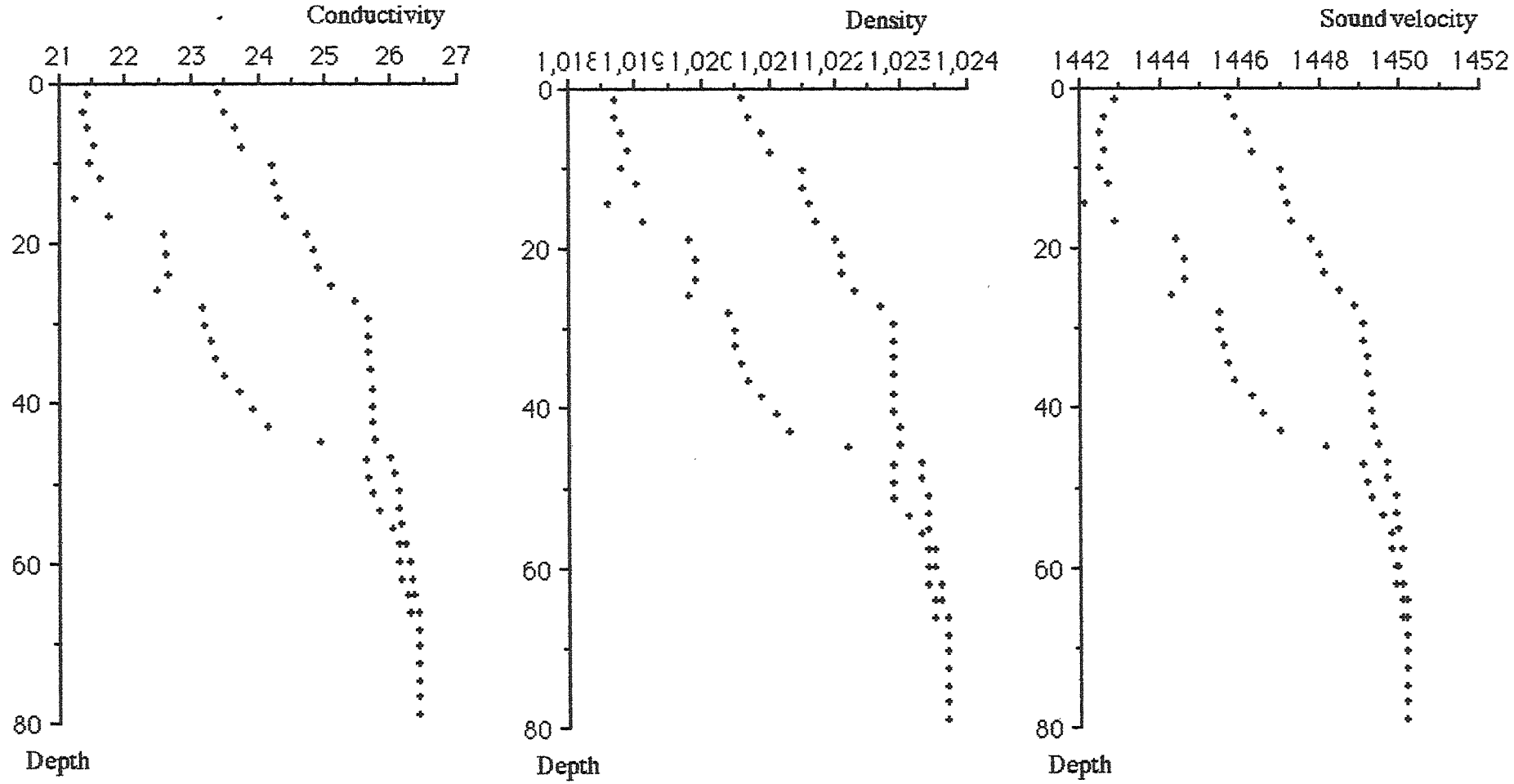
HU-090-028-058: CTD profile

Julian day: 320 Latitude: 48 14.47N
GM Time: 16:04 Longitude: 69 58.17W
Depth: 97 m.

Geographic location: Baie Ste-Marguerite



HU-090-028-058 (Cont'd)



HU-90-028-059: Water sampling[1]

Julian day:	320	GMT Time:	22:20
Latitude:	48°14.54 N	Longitude:	69°58.27 W
Depth:	97 m	Depth intervals sampled:	(I) 2-23 m (II) 68-89 m

Summary: 2 sets of 4 x [12 L-Niskin] bottles were used for sampling water masses (I) and (II).

Sampling & on board processing:

(I) 2-23 m interval

(a) Non filtered water:

Sample	Volume (ml)	Analytical purpose
A	250	^{13}C of TIDC[2]
B	250	Phytoplankton
C	30	^{18}O of water
D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 µm filter: 3.2 L
Volume of water filtered through Glass Fiber Filter: 14, 14 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM[3] + SiO_2	90-31
------	E	30	SiO_2 + NH_3	--------
------	F	13	Alkali	--------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-036
GFF	--	---	" " "	90-038
------	H	13	TIDC	--------

---

1. See appendix 1.2 for technical details on sample preservation
2. TIDC: Total Inorganic Dissolved Carbon (∂CO_2)
3. SPM: Suspended Particular Matter.

HU-90-028-059: Water sampling (Cont'd)

(II) 65-86 m interval

(a) Non filtered water:	Sample	Volume (ml)	Analytical purpose
	A	250	^{13}C of TIDC
	B	250	Phytoplankton
	C	30	^{18}O of water
	D	30	PO_4 & NO_3 analyses

(b) Filtered water (pre-weighted filters):

Volume of water filtered through 0.45 micron filter: 3.42 L
Volume of water filtered through Glass Fiber Filter: 15.1, 10 L

Filter type	Sample #	Volume (ml)	Analytical purpose	Filter #
0.45 µm	--	---	SPM+ SiO_2	90-32
------	E	30	SiO_2 + NH_3	---------
------	F	13	Alkali	---------
GFF	--	---	^{13}C, ^{15}N, CHNS	90-037
GFF	--	---	" " "	90-039
------	H	13	TIDC	---------

APPENDIX 1

ON BOARD SAMPLING PROCEDURES

APPENDIX 1.1: Sampling procedures for paleomagnetic measurements

Scientific objective to measure paleomagnetic declination and inclination of the sediments in order to reconstruct secular fluctuations of the magnetic field.

Rationale (1) basic studies of high resolution paleomagnetic changes;
(2) their possible link with climatic fluctuations (due to rotational changes induced by loading/unloading of continents by ice sheets?);
(3) magnetostratigraphy and correlations of cored sequences based on secular changes. [Ref.: Thouveny: *J. can. Sci. Terre* 25 (1988), 833-843].

Sampling objective to sample sediments as undisturbed as possible and as carefully oriented as possible with 2 cc-edge plastic cubes pushed in continuity along half-sections;

Material needed Centimetric tape; Cutting blade; Curved spatula; Permanent markers (fine)
Tweezers; Metallic plate (aluminum)
Sticking plaster (band-aid™) cut into 25 mm^2 sqares
8-cc plastic cubes (2 cc-edge) and covers for sampling
Hermetic plastic box for storage

Procedures

01. Drill a hole (*ca* 1mm^2) in the corner of the face of each cube opposite to the cover [event to let the air out when pushing the cube into the sediment].

02. Try to cut as evenly as possible each working half-section of the core (electric knife or wire) along the lines already made on liners when recovered from the barrels (in order to limit relative rotation of sections).

03. Push the cubes into the sediment along the working half axis, with a uniform and vertical pression; insure that the drilled face of the cube is parallel to the surface of the sediment and maintain the other faces of the cubes parallel (lateral faces) or perpendicular (fore and aft faces) to the axis.

04. Plug the cube events with the already cut sticking plaster pieces (the plaster should be cut first into 25 mm^2 sqares on the aluminum plate).

05. Indicate the core top direction with an arrow on each cube; alternately, only on the top and bottom cubes of each working half, if all working halves are processed similarly, *e.g.*, with the top of the section at left hand and writings (see below) from left (=top) to right (=bottom).

06. On each cube, indicate the core section number on left top, and the depth (from top of the section) of the center of the face (at ± 1 mm). Indicate the core number on the top cube of each section.

07. On the log book: note the exact length of each section in cm. Note sampling hiatuses if any (*e.g.*, disturbance due to sample processing, pebbles, coarse layers...).

08. Remove the cubes as gently as possible with tweezers and a curved spatula (to cut the mud at the base of the cube); avoid to twist the sampled mud.

09. Cut and remove the mud in excess.

10. Put the covers on the cubes.

11. Clean the cubes and store them in numerical order in a hermetic box.

12. Put a wet paper towel in the box (to prevent dehydration) before storage in a refrigerator.

APPENDIX 1.2. Water sampling procedures

Based on casts with 12 L-Niskin bottles (1 or 2 for surface water; 4 to 6 for deeper water masses).

Scientific objective — to analyse the chemical and isotopic composition of water, dissolved carbon, suspended particulate matter, etc.

Rationale — basic studies of water mass properties and of organic matter composition. [Ref.: Lucotte (1989a), *Can J. Fish. Aquat. Sci.* 46, 59-65; (1989b): *Estuar. Coastal Shelf Sci.* 29, 293-304; Lucotte *et al.* (1990), in print: *Estuar. Coastal Shelf Sci*].

Sampling objective — to collect sample large enough for all chemical and isotopic analyses; to avoid (when necessary) isotopic exchange with atmospheric water vapor, or CO_2, during storage; to restrict (when necessary) bacterial activity during storage.

Material needed — Nalgene™ vials (250 ml, 30 ml, 13 ml)
Filters: 0.45 mm; Glass Fiber Filters;
Funnels; vacuum pump (to force percolation through filters when needed);
Hoses; vacuum chamber or oven to dry samples on filters;
Tweezers (to avoid contamination of filters); plastic bags; markers, etc.

Procedures

1.2.1. *Non filtered water:*

(A) Fill a 250 ml Nalgene™ vial (with hermetic caps) for ^{13}C analysis. Add a few drops of $HgCl_2$ and store at room temperature.

(B) Fill a 250 ml Nalgene™ vial for phytoplankton studies. Add a few drops of Lugol and store at room temperature.

(C) Fill a 30 ml Nalgene™ vial (with hermetic cap) for ^{18}O (and ^{2}H if planned) analysis. Refrigerate.

(D) Fill a 30 ml Nalgene™ vial for PO_4 and NO_3 analysis. Freeze.

1.2.2. *Filtered water on pre-weighted 0.45 mm filters*

(E) Fill a 30 ml Nalgene™ vial for SiO_2 and NH_3 analysis. Freeze.

(F) Fill a 13 ml Nalgene™ vial for alkali analysis. Add a few drops of HCl (30%) and refrigerate.

(G) For SPM+SiO_2 (biogenic) analysis: poor the sampled water on the filter until it is "plugged" and note the volume (generally ≥ 4L). Remove the zooplankton (*e.g.*, copepods) and transfer it on a Glass Fiber Filter. Dry the filters, then store them.

APPENDIX 1.2. Water sampling procedures (Cont'd)

1.2.3. *Filtered water on pre-weighted Glass Fiber Filters:*

(H) Fill a 13 ml Nalgene™ vial for CO_2 analysis. Add a few cristals of $HgCl_2$, close hermetically and refrigerate.

(I) For ^{13}C, ^{15}N and C, H, N, S, analysis: poor water on the filter until it is "plugged" and note the volume (as much as possible). Remove zooplankton as above and transfer it on another Glass Fiber Filter. Dry the filters.

Note on plankton tow sample processing:

1. Fill 2 x 250 ml Nalgene™ vials; add 5 ml of Formaldehyde (20%) in each. Refrigerate.
2. Fill 2 x 250 ml Nalgene™ vials and freeze.
3. Make sure that the plankton net is carefully cleaned after each use.

APPENDIX 1.3. Box core sampling procedures

Scientific objective to measure Eh and O_2, to sample pore water and surface sediments, to measure the porosity.

Rationale (1) to investigate biogeochemical processes occuring at the water/sediment interface;
(2) to study the early diagenesis of the organic matter;
(3) to sample fossil assemblages, carbonates and organic matter really representative of modern conditions in the water column and in nearby neritic zones.

Sampling objective to measure Eh and dissolved oxygen as little changed from original values as possible; to extract and "settle" pore water; to avoid further chemical and/or bacterial activity in the pore water samples.

Material needed "push corers" (pieces of liners) of 1 cm, 7 cm and 15 cm in diameter, with caps;
a glove box to process the sub-cores under nitrogen atmosphere;
nitrogen tanks and regulators;
squeezers for mud with filter holders and tubing attachments; syringes to recover the filtered pore water;
pH meter; probe for dissolved oxygen measurements;
hermetic plastic vials; towels; plastic bags; a plastic cutter to slice the sediment;
wood blocks -or a jack- to lift the sediment into the liner; plastic film; etc.

Procedures

01. Holes (2 to 3 mm in diameter) should be drilled longitudinally at 1 cm intervals in one or two plastic cylinders of *ca* 15 cm in diameter to be used as "push [working] corers"; a plastic tape should be used to plug the holes untill the working core(s) is (are) stored in the glove box (to avoid oxydation).

02. When the box-core is on deck, take a picture of the surface and collect "macros" if any and if needed.

03. Insert rapidly as many "push corers" as needed (**f**: 1 cm, 7 cm , 15 cm).

04. Collect the first mm of "liquid mud" at the surface of the box core and store it in a numbered vial.

05. Remove the push cores and protect the 15 cm-working core top and bottom with a plastic film (to restrict Eh changes); transfer the working core in the glove box under N_2 flow.

06. Seal the 7 cm-push cores; one should be labelled for archives and all should be stored in a refrigerator untill further processing as needed; subsample the 1 cm-diameter push core at 1 cm intervals; transfer each 1 cc sample in centrifuge tubes containing some $HgCl_2$; refrigerate for further bacterial counting.

07. All other operations will be done in the glove box; most sampling operations will then be made with plastic tools (to avoid sample contamination).

08. Use the drilled holes at 1 cm intervals to measure Eh and dissolved oxygen profiles (a 2 mm in diameter platinium wire -of a few cm in length- should be introduced as deeply as possible in the working core for Eh measurements; note that artefacts may often occur when introducing the O_2 probe in the holes).

Box core sampling procedures (Cont'd)

09. By using the wood blocks (or the jack), lift progressively the working core out of the liner in 1 cm steps.

10. At 1 cm intervals: (1) collect 1 cc for amino-acid studies, store the sample in a pre-numbered vial; at the end of sampling operations in the glove box, these will be kept frozen; (2) collect 30 cc for micropaleontological studies in an appropriate pre-numbered vial to be refrigerated later on; (3) collect 2 cc for porosity measurements and store as appropriate.

11. Take as much as possible of each 1 cm-thick slice of sediment by using a plastic cutter, avoid to tuse the possibly contaminated outer ring of the core; transfer the sediment into the pre-set (with filters) sample-squeezer, close it; when all squeezers are filled and closed, transfer them on the squeezer rack.

12. Further processing takes place on the rack; set the sample squeezers in place and plug tubings and syringes; start squeezing; rince the syringes with the firts cc of pore water recovered and put them back in place; squeeze again until maximum volume of pore water is obtained.

13. Subsample pore water in Nalgene™ vials:
    - 10 ml for U isotope measurements, add 0.5 ml of HCl (30%);
    - 6 ml for Total Inorganic Dissolved Carbon -TIDC-studies (CO_2 & ^{13}C), add $HgCl_2$ (powder);
    - 4 ml for alkali, add $HgCl_2$ (powder);
    - 3 ml for Ca^{2+} and SO_4^{2-};
    - 5 ml for Fe^{2+} & Mn^{2+}, add 0.5 ml of HCl (30%);
    - 2 ml for dissolved organic carbon -DOC- in a centrifuge tube to store frozen;
    - 15 ml for nutrient studies, freeze;

14. Store squeezed sediments in plastic labelled bags and freeze.

15. Clean carefully all equipments and set everything back in place for next box coring operation.

APPENDIX 1.4 Long Piston- and Trigger Weight core sampling procedures

Scientific objective High resolution studies of (1) sedimentary petrology, (2) micropaleontological assemblages, (3) elemental and isotope geochemistry.

Rationale (1) to set a a stratigraphy (litho-, eco-, and isotope stratigraphy...)
(2) basic studies of paleoceanographical/paleoclimatic changes;
(3) assesment of carbon paleofluxes and paleobudgets, paleoproductivity studies;
(4) investigations on the behaviour of a few elements or isotopes in relation to paleoceanographical changes; diagenetic processes, etc. [Ref.: Hillaire-Marcel *et al.* (1990): *Geology* 18: 162-165; see also papers in *Proc. Ocean Drilling Progr.* 105, part A (1987) & B (1989), Srivastava, Arthur & Clement, eds.; Hillaire-Marcel & de Vernal (1989): *Géogr. phys. Quaternaire* 43 (3): 263-290.].

Sampling objective to sample sediments as undisturbed as possible and to avoid contamination;

Material needed

Centimetric tape	Cutting blades, spatulas (plastic)
Permanent markers	Plastic vials and bags
Paper towels, etc.	

Pre-sampling procedures

01. Check apparent penetration indicators on the corer.

02. When the corer is secured along deck, insure proper identification (A-C, C-E, E-G, etc.) and orientation (Top-Bottom) of 3m-segments during disassembling operations (including "declination" of each 3 m-liner *vs* its neighbours/longitudinal mark); cut the mud with a blade (preferably in plastic) between the barrels; and secure carefully the liners with caps and electrical tape before transportation to the cold room or to the laboratory; repeat the operation until there is no sediment left in the corer; cut the empty part of the top lining and secure it.

03. Recover the sediments in the core cutter, try to store them as a small oriented core in a PVC-craddle, otherwise put what is found in a bag, label and seal; .

04. Recover the sediments in the core catcher, put them in a labelled bag.

05. Cut each 3 m-segment into *ca* 1.5 m sections; secure; complete the labelling of each section (B, D, F, etc. tags).

06. Store sections into the cold room until further processing; wax the section ends when the core is not to be opened within 72 hours.

07. If by mistake any mud falls out from a lining, recover it, get rid of the contaminated part and store the balance in a labelled bag; take note in the log book (this may unfortunately happen during deck processing operations of the core).

Sampling procedures:

08. Sample preferably sections in stratigraphic order (from top to bottom of the core, *i.e.*, from the upper section "N" to "A", then to core cutter).

Long Piston- and Trigger Weight core sampling procedures (Cont'd)

09. Secure each section on the cutting-rack and insure that the cut will be made along the orientation (declination) mark on the liner; to cut the liner, use preferably the AGC cutter (if available), otherwise, a saw r; be careful during further operations (the liner has lost its rigidity).

10. Cut the mud with a thin metallic wire (piano wire) or with an electrical knife; stick a centimetric tape along each half-section; put numbers on both tapes from top to bottom; insure to carry on the ordinatedepth s.b. (in cm), from one section to the next.

11. One of the half-sections ("archive-section") is used for description and photographied immediately (to avoid changes in colour due to oxydation); then, after appropriate labelling, it is carefully wrapped (a plastic film should be placed on the mud surface; then the section is introduced in a plastic sleeve tightly taped at both ends and finally stored in a D-(rigid)-tube, with caps taped with electrical tape); a good precaution against dehydration is to put a wet paper towel in the D-tube before closure; insure appropriate labelling of the D-tube for AGC archives.

12. The description (texture, structure, color-Munsell chart, smell, $CaCO_3$ content, bioturbations, drop stones, etc.) should be reported on appropriate sheets provided by AGC.

13. The working half should be subsampled as soon as possible (to avoid dehydration) as required for further studies. On a routine basis, sampling should be as follows:
- firstly, clean the mud surface by removing a thin layer of sediments (which may have been "contaminated during cutting operation);
- set a continuous track of plastic cubes for paleomagnetic measurements (as in appendix 1.1.);
- at 10 cm intervals, triple the cubes (one control sample to keep refrigerated; one sample for Th/U disequilibria studies);
- at 10 cm intervals, sample as much sediment as possible in 2-cm thick layers (avoid to sample the outer 1 to 0.5 cm-ring of the half core which was contaminated during core penetration in the deep sea sediments); take 1 cc in a plastic bag to be frozen for further organic carbon studies; fill 1 (2 if possible) 33 cc-plastic can with hermetic covers; label all samples as appropriate and report sample numbers and detailed information in the log book; the 33 cc (or more) samples will be used for sedimentary petrology, routine geochemistry and micropaleontological studies; they should be stored in a refrigerator.

14. Fill hollows in the working section with pieces of foam to avoid mixing of the sediments in the liners during further handling and storage operations.

15. Wrap carefully the working half-section as in [11] above and label the host D-tube. Store it into a cold room until final storage by AGC personnel.

HUDSON 90-028

EQUIPMENT LIST
SAMPLES/TAPES/RECORDS INVENTORY
PARAMETER LINE KILOMETRES

compiled by

J.A. Nielsen, B.L. Johnston, G. Standen, A. Boyce, B. Chapman

with assistance from Maureen MacDonald

Appendix A1

HUDSON 90-028 FACTS SHEET

SAMPLE INVENTORY:

VANVEEN GRABS ----	2
IKU GRABS --------	4
AGC LONG CORES ---	13
CAMERA STATIONS --	7
CTD STATIONS -----	10
BOTTLE CASTS -----	6
BOXCORES ---------	3

KILOMETRES RUN:

BIO 75 KHZ SIDESCAN ----------	73 Km
100/500 KHZ KLEIN SIDESCAN ----	73 Km
50 KHZ KLEIN SS (HUNTEC) -------	494 Km
HUNTEC DTS ----------	932 Km
3.5 KHZ BATHYMETRY ----------	2224 Km
12 KHZ BATHYMETRY ----------	55 Km
SLEEVEGUN SEISMICS ----------	978 Km

BIO REFLECTION SEISMICS

Seismics Reflection equipment consisted of an T.I. sleeve gun sound source of 40 cubic inch received on a combination of an NSRF-Type LT-18 element 25 foot streamer, a 25 foot S.E. streamer and a 100 foot S.E. streamer. The air compressor was a RIX J-196, 65 cfm running at 1800 psi. Lab equipment consisted of a NSRF pre-amp, coupled to the AGC Time Varied Gain (TVG) unit onto a Krohn-Hite Model 3323 Filter, (band pass set for 180-650 Hz); and a Raytheon LSR1811 Graphic Recorder, running at a 1 second sweep. The 100 foot streamer inputs to an amplifier coupled to the AGC time varying gain control unit, via a Kron-Hite filter set at 120-850 Hz. displayed on a Raytheon LSR 1811 recorder at a 1 second sweep. This LSR, however, had a bad jitter which makes the data look sligtly out of focus.

The seismic data was tape recorded onto VHS cassette tapes on the TEAC XR-5000 multi-track unit (see cruise set-up specifications for sweep, paper speeds, etc). The TEAC tape recorder occasionally stopped recording for no apparent reason. Meticulous cleaning of all surfaces touched by the tape would decrease the frequency of such occurences. If the tape back tension is the problem, consideration for future purchasing of higher quality tapes may be required. The two tension measuring devices in the unit are sealed spring-units deep inside the transport mechanism and have no obvious adjustment.

The timing control was accomplished by using the Airgun Seismics Computer coupled to a Ship Clock Repeater triggering the Airgun Firing/Control Unit and the TVG unit. Ship time was based on the Cesium Beam controlled SHIPCLOCK computer, which provided accurate timing to the various Ship Clock Repeaters located throughout the ship. All graphic recorders were synchronized using the 6.4 kHz from the Huntec Deep Tow System (DTS) to prevent record cross-talk. The 5-minute pulse output of the AGC Ship's Clock Repeater was used to trigger the event annotation time for the TSS 312B annotator, to write "day/time, course/speed" on the records of all systems.

The seismic system performed very well with only a short found in one of the umbilical firing lines. This was repaired doing a station and no time was lost.

RECOMMENDATIONS FROM A. GRANT

1. **For single airgun operations, set trigger pulse = time zero (i.e., no dalay by cpu gun control option);**

2. **To optimize record quality:**
   a) **use airgun tow system that allows easy adjustmennt of tow depth;**
   b) **install depth controllers (birds) on the hydrophone;**

3. **AGC should strive for <u>standards</u> in seismic recording re time scale. Eg, records from Baffin, Dawson and Hudson Cruises in Gulf of St. Lawrence are at three different widths/time scales.**

HUNTEC DEEP TOW SYSTEM (DTS)

The Huntec Deep Tow System (DTS) number AGC 3 was deployed this cruise to generate high resolution seismic data. A high voltage boomer sound source of 540 Joules generated signals for a LC-10 single hydrophone internally mounted under the boomer plate. A Nova Scotia Research Foundation (NSRF) type 10 element 15 foot streamer was towed behind the vehicle and connected to the ship via a 750 meter tow cable on the Hydromac winch.

The LC-10 hydrophone data is the "internal hydrophone" data which is amplified and TVG'd through an adaptive signal processor unit and bandpass filtered in the system console before displaying on a EPC 4100 graphic recorder.

The towed streamer data is the "external hydrophone" data which is processed similarly but at lower filter setting through an external Krohn-Hite Model 3700 Bandpass Filter. This external hydrophone data is also displayed on another EPC 4100 graphic recorder.

The internal and external data is magnavox tape recorded on a TEAC XR-5000 VHS cassette recorder on Direct Record channels along with two other channels for (a) the Trigger/Sync. signal of 1 volt peak, 6.4 kHz EPC sync. pulse train with a negative master trigger pulse and a positive fire point pulse; and (b) a zero pulse graphic recorder trigger signal. All data is tow vehicle heave compensated in the pressure mode.

For settings, gains, power output, etc., please see cruise set-up specifications.

The AGC 3 DTS comes with the 50 Khz Klein sidescan attachment which was powered and displayed on the 595 Klein Thermal recorder at 200-800 metre swaths. The 50 Khz recorder Amp/TVG boards were modified with onboard gain pots. and installed in the 100 Khz (ch. 1 & 2) slots in the 595 unit.

The Hydromac winch worked fairly well, although there were problems which caused the remote control to malfunction when paying out.

Tow cable maintenance considerations are: a) adding a lay setting shell to the drum; b) removing and reloading the tow cable on backwards so a damaged conductor at the bottom of the present coil can be fixed while providing fresh cable for the tow fish end; and c) pressure lubrication of the tow cable during unloading and loading.

A high voltage short circuit in the winch drum junction box caused the AGC 3 System to be down for repair during the whole of the Saguenay River survey with Dr. J. Locat.

BATHYMETER 3.5 Khz ACOUSTIC PROFILER (HULL MOUNTED)

Bathymetry information is recorded every 5 minutes as measured on a EPC 4100 recorder triggering the ORE 140 Transceiver to a hull mounted transducer.

The 3.5 Khz was run during transit between stations, while on station and during transit to new survey areas. Having the 3.5 going while on station, records a true indication of the sub-bottom at the time the sampling equipment hits bottom. The 3.5 worked very well in good to fair weather conditions but deteriorates with increased ship motion.

BIO SIDESCAN SONAR SYSTEMS

The BIO Side Scan Sonar was deployed to generate long range,72.5 kHz seafloor topography/reflectivity data of 1.5 km swath. Data is displayed on the Klein 521 recorder with 5 minute event markers and day/time annotation. Data is also stored along with the trigger transmit pulse on a TEAC XR-5000 multitrack VHS cassette magnavox tape recorder in the FM unipolar (+) record mode. Transducer angle from horizontal is set at around -8° mounted in the MOBY 1 low noise/drag tow vehicle, connected to the ship via a 700 m tow cable. With all the tow cable deployed, layback at 5 knots is about 5 minutes.

Data collected on this cruise was typical of other cruises.

During the Saguenay River Survey, the system produced excellent 1.5 to 2.0 km. swath data, line #35, up the center of the river and 750 m. swath data during the Baie des Ha! Ha! mosaic where the system was set for high resolution; i.e. 0.4 ms. pulse, 4.0Khz Bandwidth, 375 m. range.

KLEIN SIDE SCAN SONAR

Two Klein type side scans were used alternately during night surveys. They were the 100 Khz, higher resolution one degree standard Klein towfish attached to the new K-WING II depressor; and the 50 Khz, low resolution sidescan incorporated in the Huntec Deep Towed System (DTS) vehicle.

Although the K-WING II depressor decreased Klein towfish layback and increased winch response over tow depth, the BIO sidescan and the Huntec DTS vehicle onboard side scan achieved greater towing depth at the high 5 to 6 knot survey speeds specified. The 50 Khz side scan/DTS was used extensively, producing 300 to 400 metre range(800 m swath) speed corrected data. With the weight of the Huntec vehicle and the length of its tow cable, it achieved the greatest depths of all the sidescans. Both the 50 and 100 Khz data was recorded alternately on the Klein 595 Thermal Recorder/Transceiver.

During the Banc Beauge' survey, the 100 Khz Klein towfish and the BIO 72.5 Khz sidescan sonars were deployed. The 3.5 Khz Hudson Hull mounted profiler was rewired to be fired by the Klein 100 Khz 595 system and, after amplification (20 db) by a K/H filter, connected to a channel 5(AUX) on the Klein 595 Recorder. This produced a thermal record displaying both the 100 Khz side scan data and 3.5 Khz hull profiler data side by side. The 3.5 Khz profiler data was simultaneously recorded on the EPC 4800 graphic recorder, (Banc Beauge survey only).

The 100 Khz Klein and BIO sidescans were used minimally this cruise as they would cause undesired increased watchkeeping complexity and increased acoustical interference on the 50 Khz DTS/sidescan data.

During the Saguenay River, an attempt to use the Klein 100Khz Towfish with K-Wing II was hampered by deep water, high ship speed against river currents, and a suspect E.O. cable on the towcable termination. It was observed that the K-Wing II increased towfish depth capabilities by a factor of two times, but since the BIO Sidescan can produce data at higher altitudes, the Klein was not used.

SHIP POWER FAILURE COMMENTS:

Major electrical power failures occurred several times during the cruise causing computer systems in the lab to shut-down, requiring re-booting and stored data to be lost. More seriously, towed systems such as the Huntec vehicle, nearly collided with the sea bottom.

A few failures blacked out the entire ship; some only the aft end of the ship including the lab and Quarterdeck; and some the Quarterdeck and half of the lab electrical service depending on the circuit breakers affected. At one occurence the 'A'Frame/ring main hydraulic system and 50 HP Huntec winch were powered up and took out the power distribution breaker in the forward hangar, disabling half the quarterdeck and lab outlets. The suggestion in this instance is to re-route the essential lab outlets away from the influence of the breaker lines powering the quarterdeck heavy equipments.

During major electrical failures, the main 200 Amp. Aft Ship Service breaker trips in the engine control room as power to it is removed in the failure, but as main power is restored, engine room personnel are too busy 'picking up the pieces' so-to-speak to notice this breaker is still off. Twice during this type of failure, the Huntec technician had to run down to the ship's control room ..turn on this breaker.. and run back to the lab to turn on the 50 HP winch ..and quickly pull up the Huntec vehicle, just barely avoiding collision with the sea bottom. Needless to say, the lab personnel are not allowed to go in the control room and turn on main breakers, but when communication is down and towed systems are deployed, there is no alternative. Engine Control room personnel should be made aware by the bridge when priority should be maintained for essential power for control of deployed equipment.

NAVIGATION

Primary navigation was provided by a Trimble 4000sx GPS receiver rented from McElhanney Offshore Services Limited. The present satellite configuration consists of 15 high altitude satellites (space vehicles) providing for coverage of from 20 to 21 hours per day.

A secondary navigation source was provided by a NORTHSTAR 800/800X receiver (ship's equipment-bridge mounted) using the 5930 chain with a master station at Caribou (Main), and secondary stations at Nantucket, Fox Harbour and Cape Race.

Both receivers were configured into the newly purchased (Hydrography) ISAH integrated navigation package to provide real time displays to the bridge and GP lab. Neither of the two video output displays provided all necessary information, therefore, three video monitors were installed on the bridge and one in the GP lab. Two bridge monitors provided information for the officer of the watch and the quartermaster for station keeping and line running, and the third provided latitude and longitude information for the officer of the watch. A slave monitor to the one showing Latitude and Longitude was mounted in the GP lab for watchkeepers. This was not 100% satisfactory as this screen does not show course and speed. This was only a minor problem as this information was available from the bridge ISAH, which performed 99% up to its capabilities with the exception of a ship's head value which gyrated back and forth between true value and 270 degrees west.

Because the GPS coverage is not complete, the ships position symbol on the Polar plot screen would freeze when Gps could no longer position. This caused considerable inconvenience when it occured as the ship was zeroing in on site to drop the sampler. To solve this problem, a Loran-C lat and long was taken at the site location (located by GPS) and punched in as a seperate examination point. If the GPS froze up, this Loran-C Exam point would be put on the screen and the Primary and Secondary nav systems (GPS and Loran-C) would be swaped (because ISAH always uses the Primary). Loran-C would become the Primary and GPS the Secondary. Because the Loran-C lats and longs were true in relation to the GPS site lats and longs, the position on the monitor would change only slightly. Disregard the fact that the GPS and Loran-C lats and longs differ considerably. Using Loran-C on station has the advantage of being a continuous source of fixing but the disadvantage of being jumpy. Therefore GPS should be used when possible with the Loran-C site punched in as a reserve should the screen freeze for any period of time.

The Primary and Secondary nav sources would then be swaped again prior to leaving the station to insure the GPS data was being logged to the Vax.

ISAH has been developed specifically for the Hydrographic service, mainly for launch work, so it will need significant modifications in two key areas to meet the needs of AGC and the ships officers who will be most affected by its final configuration.

(A) Monitor displays

ISAH is designed with two video output displays, one for the helmsman and one for the hydrographer. Neither of the two video displays include all necessary information for the bridge or for the lab and probably now contain information which is not necessary to the type of operation typically done by AGC.

Suggestions are:

(1) Larger monitors (color)

(2) A note field (30 characters) should be associated with each entry in the LINE, WAYPOINT and EXAM databases to allow the operator to include a short descriptor of the entry. This descriptor would then appear on the screen as each entry is displayed. (EXAM example = AGC LCF # 14) (LINE example = sidescan line 26 over scours 126,127) (WAYPOINT example = Halifax harbour survey grid). This avoids confusion between the lab and the bridge and insures the same sample number is entered in all logs and sample sheets.

(3) When in line running mode the screen should display (with examples in brackets to show number of decimals):
   (a) the number and name of the line being run;
   (b) the latitude and longitude of the vessel expressed in degrees, minutes and decimal minutes (not seconds, BIO never use seconds, always minutes and decimal minutes!); 48 23.456N 64 21.341W
   (c) ships speed (knots) over the ground; e.g. 11.5
   (d) ships speed (knots) through the water (ie ships log);
   (e) azimuth of the line being run; 235
   (f) ships head (degrees);
   (g) course made good (degrees);
   (h) SOL and EOL distances expressed in kilometres and nautical miles (two decimal places); 234.21 km
   (i) cross track error (metres) (- port, + stbd); 34 metres
   (j) depth (fathoms and metres) (calibrated for draft); 2451 fms
   (k) the screen scale must be clearly shown and must clearly indicate what it denotes (ex. distance from line indicator to screen edge);
   (l) colors should be used to clearly convey the information to the watch officer;
   (m) the screen should be split in such a way as to have information required at a glance (ie. the line indicator, ship symbol, cross track error) separate from the remainder of the information on the screen.

(4) When in homing mode (polar plot) the screen should display:
   (a) the number and name of the target (ie. sample site);
   (b) the latitude and longitude of the vessel expressed in degrees, minutes and decimal minutes (not seconds);
   (c) the bearing (degrees) of the target from the ship;
   (d) distance to target (metres);
   (e) use bulls eye rings overlain on a cross hair (north up) where the scale of the rings from the centre point will automatically increase or decrease at preset ranges as distance to target changes. This feature allows the ship to home on a target from twenty or more miles away and always have the target displayed on a workable scale down to metres when on position. The ring scales must be clearly shown on the screen;
   (f) the vessel position should be indicated on the screen by a ship symbol where the symbol ships head denotes the true ships head. The size of the ship displayed should be drawn to true scale. (ISAH will have to know the ship lenth.) This gives an immediate feel for how far something is in "ship lengths", the most universal unit of measure. At very long ranges this does not work so a square box with a heading line can be used.
   (g) course made good (degrees);
   (h) SOL and EOL distances expressed in kilometres and nautical miles (two decimal places);
   (i) depth (fathoms and metres) (calibrated for draft);

(B) Operator interaction with the system

The routine jobs of data entry into the three databases (waypoints, lines and exams) must be made less complicated.

Suggestions are:

(1) Replace the present keyboard with a PC style keyboard. The keyboard now used is designed for harsh environments. Keys are small, indented and have a raised rubber seal around each key, making for a very slow and uncomfortable input device.

(2) A number of key strokes are now necessary to move from the data entry stage to the data display stage, requiring a sound knowledge of the workings of ISAH. The software must be made more friendly for the entry/verification of waypoints, lines etc. Consideration should be given to installing a monitor and keyboard on the bridge to allow the officer of the watch to enter such information in the absence of a navigation tech.

(C) Overall system modifications required

(1) The ability to define a priority list for recievers and auto selection down the list as recievers fail or are temporarily at rest because of a lack of input data. The navigation source being used must be displayed prominently at all times on all monitors.

(2) Positions from Loran-C recievers must be calculated from the Td's and not from algorithms within the recievers. As an example the Northstar reciever used as backup on this trip compared very well with GPS when Td's were used to plot locations but were in discrepancy by 3-5 cables when lats and longs were compared.

(3) ISAH time should be syncronized with the ships master clock to insure navigation times and record annotation times are the same. A substancal drift rate of 5-6 seconds per day for the ISAH clock was observed on this cruise.

(D) General comments

ISAH is a well tested product and all options worked as expected. A number of interesting features not before available in BIONAV are included in this package and deserve attention as to whether they can be used by AGC. The system has the ability to track and display the location of a towed body at all times which colud be very useful on some AGC cruises. Also a digitized coastline can be displayed on the COAST video option with selected waypoints. This option might be more useful on smaller vessels such as the NAVICULA which are primarily used for near shore work. Full GPS coverage will make this very attractive.

ISAH has a simulator mode within which the user has full control of all ISAH features as if a real survey were underway. Working values appear on all screens and ship speed and course are controlled by the operator. Very useful as a training aid and to refresh nav techs prior to the survey season.

A drawback to learning the system for this cruise was the lack of an up to date manual. The manual is being updated by the company at this time. Overall, a well thought out package which is a bit cumbersome and requires substantial practice to become familiar with its workings. First impression is of a 100 + menu monster but with practice a method to their madness begins to unravel.

NAVIGATION LOGGING

Data were logged via an RS232 link from the printer output port of ISAH at 9600 baud directly into port TXA5: on the VAX. A routine was written to reformat this file into SHIPAC format for processing via the shipboard system.

Navigation quality was excellent with the GPS positions and positions plotted with Loran-C TD's agreeing at all times. A discrepancy with radar when at long range was noted.

DATA PROCESSING (VAX)

Data processing was carried out on a Microvax II minicomputer using the SHIPAC shipboard/shore geophysical processing and display software. The Microvax was configured with 4Mb of menory, three 72Mb RD53 hard disk drives, a 640 Mb disc and a 95 Mb Tk50 tape cartridge. Communications with the Vax were accomplished through two VT220 (System Console) and one VT240 graphics terminal. An LXY12 line printer was available for printing and an HP7586E pen plotter for plotting.

As explained above, a new input routine was written to accommodate the output from ISAH as well as several routines to improve overall processing efficiency. All routines are callable from the Shipac menus.

Recommendations

On request from Heiner/John, navigation from several past cruises was loaded from the multi-parameter file to the vax via a TK50 prior to the ship sailing. Routines were then written on board to accommodate this format into the Shipac system. These files proved to be very valuable for track plotting purposes to check crossovers and as a source of navigation points for site selections.

All navigation files from the multi-parameter database should be available from a library of Vax compatable tapes and such tapes should travel with the shipboard system at all times. Tapes to be updated at regular intervals.

The final cruise data files were backed up to a TK50 data cartridge. The backup tape will then be loaded to the shore VAX at BIO where the navigation and bathymetry data will be transferred to the CYBER and then into our multi-parameter database where it will be available to all users.

FINSS INVENTORY SYSTEM (RECORDS,TAPES,SAMPLES)

The Dbase 3 Plus (based) inventory system (FINSS) was used to handle the storage and report generation of all samples, records and tapes collected on the cruise. A full inventory generated by FINS of all collected data is included at the end of this report.

Hardware for this system includes a BULL Power Mate 386 computer operating at 16 Mh with a 1.2 Mb floppy drive and a 20 Mb hard disc. Printing capability was provided by a HEWLETT PACKARD Thinkjet and a backup EPSON FX-100 printer.

FINSS INVENTORY SYSTEM (SUBSAMPLE ANALYSIS)

This cruise was about the fourth trip at sea for the subsampling version of FINS. A lot of improvements have been made since the spring but work remains to be done. Further improvements must be made in the area of speed and on screen cursor movement. Dbase 3 has a serious drawback in its ability to allow error checking of

input from the screen at entry time and still leave the user able to move backwards to previously entered data. Full screen freedom is easily available at the expense of no error checking of input until the entire screen is to be processed by a (PgDn) command. The user could be informed of any errors at this point and the screen could be refreshed for editing (maybe this is the solution). FINS will be converted to Dbase 4 this winter and hopefully methods exist in Dbase 4 to solve this problem. Improvements in speed can be achieved by more efficient programming now that the majority of the required code exists and is in working order.

The code will be reviewed this winter and improvements made in this area. A faster machine would also be an improvement. All suggestion for improvements which have accumulated from this field season will be addresed now that the field season is over (almost). In general it has proved to be an asset to the sampling program and will be even better for next season.

SAMPLING EQUIPMENT

AGC Large Diameter Corer
General

The piston coring system used on cruise 90028 is a large diameter system, 30 meter design that was modified for shipboard use on the CSS Hudson. The core sample obtained is 11 cm. diameter with potential lengths varing from 10 m to 30 m. Corer components consist of the following:

(1) Core head: 3m long, 0.6m diameter
(2) Core pipe: 4,25" I.D. with 3/8" and 3/4" wall thickness
(3) Couplings, straight and reduced for connecting barrels
(4) CAB liner
(5) Split Piston
(6) Core Catcher and Cutter
(7) Trip Arm
(8) 4.25" diameter gravity corer, used as trigger weight
(9) 3/4" diameter wire cable (6000m long) and end termination.
(10) Associated items such as set screws etc.

Due to the size of the corer, (maximum 30m long weighing approximately 4300 lbs) a special handling system was installed on the Hudson. This system consists of the following:

(1) Rotating core cradle
(2) Outboard support brackets
(3) Monorail transport system
    - Trolly
    - Chain hoists
(4) Lifting winches
(5) Process container which consists of storing, cutting and handling facilities for the core pipe and sample

Deployment/Recovery of piston Core

The core barrels are stored in the process container located on the starboard waist. Barrels are sequentially loaded onto the trolley on the monorail and transported to the foredeck where they are coupled to the core head. The core head is secured in a rotating "cradle" resting outboard of the starboard rail. Using the appropriate coupling, each barrel is connected untill the desired length of core is obtained. The barrels are nominally 3m. long. Plastic liners are inserted into the barrels to contain the sample.

Once rigged, the piston corer is rotated from its horizontal postion at the rail to the vertical position. This is accomplished using pickup winches located near the process container. Wire cable runs from the winches to the appropriate pickup points along the core barrel. The corehead rests in the core cradle until vertical, then it is released and loaded with the trip arm. The corer is a standard oceanograghic piston corer which is fitted with a split (breakaway piston) to eliminate sample flow-in during pullout. Recovery of the corer is basically reverse sequence of the above. The corehead is placed into its cradle, rotated to the horizontal position at the rail and secured. The barrels are decoupled and transported to the process container. Here the linered sample is removed, capped, labelled and cut into 1.53 m. sections. The sample is then stored in a refrigerated container until further processing is completed.

Core Head Acceleration and Tilt System (CHATS)

CHATS is an instrument package developed by AGC to be used with AGC's coring equipment. It logs core head deceleration and tilts during sea floor penetration and pullout. The instrument is housed in an 18" long, 7" diameter package and mounts inside the top of the core head. The package is powered by an internal battery pack.

Before each deployment certain intial logging parameters are entered into the electronics package using standard RS-232 serial communications (we use **MIRROR**). The package consists of a Tattle Tale micro-computer running AGC developed software. The program logs and stores four data channels:

(1) Hydrostatic pressure,
(2) acceleration,
(3) tilt x-axis, and
(4) tilt y-axis.

Data sampling may be selected from 1 to 10 samples per second. At a ten sample per second rate, 38 minutes of data may be stored. As the data sample rates are reduced, a proportionate increase in logging time is realized. The package can be "put to sleep" after the logged data has been recovered from the instrument's memory, and in this mode little battery current is drawn. We estimate battery life expectancy to be an entire field season, and thus the instrument package does not have to be opened after every lowering for battery change. (One battery pack will last a cruise even if CHATS is not put to sleep.) Figure 3.1.4.1 is an example of the **CHATS** raw data during core penetration and pullout. This cruise was the first test of **CHATS**. In an initial evaluation of the package, the results are very promising.

Metrox Shive Block

AGC/PSS developed software program to monitor the serial data coming from the Metrox Metering Block. The purpose for this was to establish a data file of extension rates, equipment weight, cable tension and, in the case of the coring equipment, pullout tension. This data was logged on an IBM XT located in the forward lab on CSS Hudson for cruise 90028.

The Metrox Block is a micro-processor based metering device. The system consists of a shive spool through which the Pengo winch cable passes, and a console located in the forward winch room. It continuously measures cable extension rates using a series of magnets located on the face of a spool and a Hall Effect switch fixed to the spool support structure. Cable tension is measured with a load cell located in the shive axel. The two signals are fed to the console by a multicore cable. The console has analog metering of tension and extension rates located on the cabinet front.

The micro-processor within the Metrox console has a standard serial communications port which allows the user to input certain control parameters, and may also be used as a source of serial data for tension and extension rate. Upon set up, the cable diameter correction factor is entered into the micro-processor. The correction factor entered prior to leaving BIO proved to be about 10% low. This error will be corrected in harbour before the next cruise. It should be noted that the tension reading was inaccurate by a factor of two (approximately). It is unclear why this occurred and an investigation is required.

The nylon spacers which run between the shive supports and the spool are worn badly. This can be caused by the sideways pull on the block as the equipment is being lowered over the side, when the ship is manoevering on station. These spacers will have to be replaced, as the magnets on the spool are hitting the Hall Sensor and causing erroneous extension rate readings.

Up to the time of the spacer failure on the spool, the extension rate and the cable tension were logged for each core station. The spacer problem on the spool caused the AGC-developed software on the monitoring computer in the forward lab, to "time out" when no return extension data was recieved. To still allow cable extension to be monitored, Mirror was run to display the unprocessed data from the Metrox console. The data was not recorded after the nylon spacers were damaged.

The data from the Metrox proved to be extremely useful working in very deep water, as a visible change in cable tension reflected a trip of the core equipment into the bottom. It also allowed the winch operator to have a more accurate idea of cable extension. Further development of the system will allow scientists to compare data sets for various core sites, in particular, the pullout force (tension).

In order to improve operational use, it is recommended that the tension be displayed graphically so that the operator can better distinguish between true tension drops or increases and those caused by the ship's heave.

CORE PROCESSING

All cores collected on Hudson 90028 were processed onboard. The core processing for this cruise included sediment description and colour measurement, split core photography, physical property measurement, acoustic property measurement, magnetic susceptibility measurement, and subsampling for a variety of land-based measurements. The core processing was accomplished by following the procedures and core flow established on cruises 87003, 87008, 88010 and 89038. Processing began on deck upon core recovery.

The deck procedures which were followed utilized the newly modified half height core pipe handling and extrusion container located forward of the AGC refrigerated core container. Prior to removal from the core barrel, the end of the core was tested for methane and hydrogen sulfide content using a portable gas analyzer. The core samples were removed one section at a time from the core barrels and cut into 1.5 m (nominal) sections, labeled, capped and taped, and stored vertically in the container. The labeling at this stage of the processing was cruise number, sample number, zero depth mark, up arrow, and the section letter code (starting with 'A' at the bottom of the core. The core sections were moved into the refrigerated container through the horizontal hatch which was adjacent to the cutting table. The cores were cut using the tube liner cutter.

Core samples were brought into the General Purpose (GP) laboratory one section at a time for further processing. Each section was initially measured and labeled with archive, working, and depth downcore using white centimeter tape. All subsequent measurements and subsamples were then identified with the depth on the labeled section. The whole core was tested for magnetic susceptibility with a Saphire susceptibility meter. All magnetic susceptibility measurements were made after the cores reached a minimum temperature of 16° C. This measurement was made at a 5 cm interval downcore.

The core liner was split using the AGC motorized device. The splitter had been used during previous cruises this season and was found in a very poor condition. All components were caked with dried mud. It is strongly recommended that a routine maintenance program be followed during all cruise and lab operations. After a thorough cleaning, greasing and some minor adjustment, the core splitter worked very well throughout the cruise.

Following splitting of the core liner, the core sample was split with either a wire saw or the osmotic knife (for very soft sediment). Wherever possible, the same half was used as working in order to provide consistency for paleomagnetics. The archive half was photographed and described for colour, texture, structure, and consistency. In addition, the archive half was measured for colour using the Colormet instrument at a 5 cm interval. The working half of the core was used for for all measurements and subsampling. The velocimeter measurement was made using the Dalhousie/AGC velocimeter at an interval of 10 cm. A longitudinal and transverse measurement was made at each interval.

Undrained shear strength was measured on all cores at a 10 cm interval using the AGC motorized miniature vane device. A 1.27 cm^2 vane was used at a rotation rate of 50°/minute. Residual strength was measured by continuation of the test post-peak.

The working half was used for subsampling. Subsamples for density, salinity and water content determinations were taken from the working half at the same interval as the velocity measurements. Samples for biostratigraphy were taken at a minimum interval of 5 cm and a maximum interval of 20 cm. Some of the biostratigraphic samples will be analyzed at WHOI for O^{18} and AMS C^{14}. Others will be analyzed at UQAM for foraminifera, pollen, and diatoms. Samples for mineralogy and petrology were taken at selected intervals. All test and subsample information was entered directly into FINSS. This eliminated the need for handwritten annotation of sample/test information. The system saved time and reduced errors associated with mis-labeling samples.

All removed sections of the working half were filled with foam prior to wrapping. Each half was wrapped with plastic and bagged and sealed with black tape. The bags were labeled with cruise number, sample number, section depth interval, working or archive, and a top arrow. Bagged cores were then stored in D-tubes. All processed cores were stored in the refrigerated container at 4° to 10° C.

LAB EQUIPMENT SET-UP SPECIFICATIONS

Seismics

Raytheon 1811
Sweep = 1.0 second
Airgun firing rate = 3.0-4.0 seconds
40 in^3 Sleeve gun on a 20" Norweigan Float
N.S.R.F. LT-18 Streamer on side boom, port
Filtered 150-1500 Hz, 40 db gain + TVG
SEISMICS ENGINEERING 100 ft. Streamer, midships
Filtered 120-1500 Hz, 20 db gain + TVG

Huntec D.T.S.

AGC # 3
with 2nd adaptive processor
EPC 4100 x 2 each - S/N 317 & 181
Boomer firing rate = 0.75 sec.
Boomer power = 4 Kvolts (app. 400 joules)
Bottom tracking (adaptive) TVG to max. 4 volt level
Tow vehicle heave compensated in pressure mode
Internal hydrophone filtered - 0.5 to 10 kHz
External hydrophone filtered - 0.5 to 10 kHz

BIO Sidescan Sonar

Transducers: SP152TT --> 800 watts --> -8° angle
Transceiver: EDO Western 248E
Range (Firing): 1 sec. = 750 meters = 1.5 km swath
Klein 521 graphic recorder - paper rate = 30 l/cm
scale line each 75 m
taped time marker each 5 minutes

Klein Sidescan Sonar

Transducers: one degree 50 Khz on DTS or 100 Khz Towfish
Recorder/transceiver: Klein 595 Thermal four channel, 18"
Range: 50 Khz = 300-400 m. 100 Khz = 250-300 m.
Scale lines 15 m. each Speed corrected...50 Khz
Slant range/speed corrected..100 Khz

Automatic Graphic Annotation

Technical Survey Services Model 312B-S/N 040
External Event - each 5 min. from seismics clock/timing unit
channel 1 - Hull Profiler 3.5Khz data on EPC 4100
channel 2 - Seismics data on LSR 1811 in series
channel 3 - BIO Sidescan on Klein 521 recorder
channel 4 - Huntec DTS data on Two EPC 4100 recorders

TEAC XR5000 Multitrack VHS Cassette Recorder

S/N 723346
Tape speed = 2.4 cm/sec
T120 tape = 2 hr. 52 min.
ID code every 4 seconds in TIME CODE priority
Search for file # 0007 - Title: HUDSON 90-028 for
recording conditions on tape with time and tape counter (0.1 m)

Recording Conditions

Cha. #	Date	Mode	Input Range	Input Zero	Output Level	Output Zero	Filter Type	Band #
1	Raw Seismics NSRF	DR	0.3v		2v			
2	Seismics Trigger	FM	3.0v	+000%	5v	0v	LP	7
3	Raw 100'SE eel Seismics	DR	0.7v		2v			
4	DTS Internal Signal	DR	0.3v		2v			
5	DTS Trigger/Sync.	DR	1.0v		5v			
6	DTS External Signal	DR	0.7v		2v			
7	Klein 595 ch1(50/100Khz)	FM	2.0v	-100%	2v	+100%	FA	0

Cha. #	Date	Mode	Input Range	Input Zero	Output Level	Output Zero	Filter Type	Band #
8	Klein 595 Sync.	DR	3.0v		5v			
9	Klein 595 ch2(50/100Khz)	FM	2.0v	-100%	2v	+100%	FA	0
10	BIOSSS - Port data	FM	3.0v	-099%	2v	+100%	FA	0
11	BIOSSS - Trigger	FM	3.0v	+000%	5v	0v	LP	7
12	BIOSSS-Stbd(or595 Anno.)	FM	3.0v	-099%	2v	+100%	FA	0
13	ID Code	FM	5.0v	+000%	5v	0v	LP	7
14	DTS - EPC Page pulse	FM	3.0v	+000%	5v	0v	LP	0
15	DR - Voice Memo from Mike - each 1 hr.							

TEAC System Set-up

*1.	Tape servo ch.:	Data
2.	Ch. 13 memo read:	Off
3.	Inhibit on rec.:	On
4.	Erase:	On
*5.	FM band select:	Hi Band
6.	I.D. code format:	5000
7.	Reverse rec.:	Off
*8.	Reset initialize:	1
9.	Power fail restart:	0
10.	Power SW. off mode:	2
11.	Cal. switch mode:	0
12.	Tape remain:	min
13.	Beep tone:	on

Bandwidth for DR mode is 100 Hz to 4.69 kHz - S/N = 28db Bandwidth for FM mode on high band is: DC to 2.5 kHz - 5N = 33db
Carrier frequency = 259.2 kHz

TABLE 1

LINE NUMBER START/STOPS

LINE NUMBER	START DAY/TIME	STOP DAY/TIME
1	305/1443	305/1515
2	305/1517	305/1700
3	305/1715	305/2104
4	305/2105	305/2203
5	307/0118	307/0137
6	307/0138	307/0246
7	307/0251	307/0436
8	307/0447	307/0548
9	307/0549	307/0702
10	307/0703	307/0817
11	307/0825	307/1300
12	307/2332	308/0455
13	308/0457	308/1219
14	308/1220	308/1320
15	309/0005	309/0446
16	309/0519	309/1050
17	310/0128	310/0642
18	310/0643	310/1243
19	310/1615	310/1725
20	310/2224	311/0151
21	311/0200	311/0351
22	311/0409	311/0635
23	311/0640	311/1145
24	311/1151	311/1650
25	312/0740	312/1432
26	312/1441	312/1645
27	312/2347	313/1630
28	THERE IS NO LINE NO. 28	
29	314/0241	314/0539
30	314/0545	314/1129
31	314/0930	314/1129
32	315/0440	315/0702
33	315/0710	315/0922
34	315/0930	315/1137
35	319/0442	319/0732
36	319/0736	319/0840
37	319/0903	319/0958
38	319/1005	319/1111
39	319/1123	319/1210
40	320/0104	320/0257
41	320/0309	320/0411
42	320/0426	320/0543
43	320/0558	320/0622

TABLE 1

LINE NUMBER START/STOPS

LINE NUMBER	START DAY/TIME	STOP DAY/TIME
44	320/0630	320/0642
45	320/0648	320/0700
46	320/0705	320/0731
47	320/0742	320/0821
48	320/0834	320/0916
49	320/0927	320/1006
50	320/1020	320/1106
51a	320/1207	320/1239
51b	320/1830	320/1937
52	321/0520	321/0803

TABLE 2

LINE NUMBER PARAMETER OCCURANCE

LINE NUMBER	BIO SIDESCAN	HUNTEC SIDESCAN	KLEIN SIDESCAN	SLEEVEGUN SEISMICS	HUNTEC DTS	3.5 KHZ
1		1		1	1	1
2		2		2	2	2
3		3		3	3	3
4		4		4	4	4
5		5		5	5	5
6		6		6	6	6
7		7		7	7	7
8				8	8	8
9				9	9	9
10				10	10	10
11				11	11	11
12		12		12	12	12
13		13		13	13	13
14		14		14	14	14
15		15		15	15	15
16		16		16	16	16
17		17		17	17	17
18				18	18	18
19					19	19
20		20		20	20	20
21		21		21	21	21
22		22		22	22	22
23		23		23	23	23
24		24		24	24	24
25				25	25	25
26				26	26	26
27				27	27	27
28						
29	29		29			29
30	30		30			30
31	31		31			31
32				32	32	32
33				33	33	33
34				34	34	34
35	35			35		35
36	36			36		36
37	37			37		37
38	38			38		38
39	39			39		39
40	40			40		40
41	41			41		41
42	42			42		42
43	43			43		43

TABLE 2

LINE NUMBER PARAMETER OCCURANCE

LINE NUMBER	BIO SIDESCAN	HUNTEC SIDESCAN	KLEIN SIDESCAN	SLEEVEGUN SEISMICS	HUNTEC DTS	3.5 KHZ
44	44			44		44
45	45			45		45
46	46			46		46
47	47			47		47
48	48			48		48
49	49			49		49
50	50			50		50
51a	51a					51a
51b						51b
52	52			52		52

TABLE 3

PARAMETER START/STOP TIMES

3.5 KHZ BATHYMETRY

305/1443	305/2212
307/0109	307/1300
307/2310	308/1320
308/1320	308/1430
308/1600	308/1744
308/1840	308/1940
309/0000	309/1050
309/2235	309/2359
310/0000	310/1240
310/1510	310/1736
310/2230	310/2359
311/0000	311/1740
311/1845	311/2015
312/0000	312/1745
312/1904	312/2359
313/0000	313/1444
313/2330	313/2359
314/0000	314/1720
314/2110	314/2359
315/0000	315/1230
315/1530	315/2359
316/0000	316/1906
318/0530	318/1328
318/1935	318/2358
319/0000	319/0305
319/0405	319/1305
319/2050	319/2358
320/0000	320/1310
320/1820	320/1910
320/2040	320/2140
320/2340	321/1137

SLEEVEGUN SEISMICS

305/1443	305/2212
307/0109	307/1300
307/2310	308/1320
309/0000	309/1050
310/0118	310/1243
310/2302	311/1649
312/0735	312/1645
312/2332	313/1630
315/0425	315/1137
318/0530	318/1205
318/2105	318/2135
318/2225	319/0241
319/0427	319/1210
320/0117	319/1106
321/0525	321/0800

TABLE 3

PARAMETER START/STOP TIMES

HUNTEC (DTS)

305/1443	305/2212
307/0109	307/1300
307/2310	308/1320
309/0000	309/1050
310/0131	310/1243
310/1615	310/1735
310/2215	311/1649
312/0911	312/1645
312/2343	313/0610
313/1216	313/1630
315/0425	315/1137

50 KHZ KLEIN SS (HUNTEC)

305/1440	305/2205
307/0115	307/0328
307/2310	308/1324
309/0005	309/1048
310/0125	310/0520
310/2224	311/0346
311/0430	311/0735
311/1450	311/1649
315/0425	315/1137

TABLE 3

PARAMETER START/STOP TIMES

75 KHZ BIO SIDESCAN		100/500 KHZ KLEIN SIDESCAN	
314/0250	314/1130	314/0245	314/1130
318/0530	318/1205		
318/2105	318/2135		
318/2235	319/0241		
319/0427	319/1210		
320/0053	320/1106		
320/1210	320/1239		
321/0525	321/0800		

TABLE 3

PARAMETER START/STOP TIMES

12 KHZ BATHYMETRY

313/0014 313/0530