GAS HYDRATE INVESTIGATIONS IN THE OKHOTSK/JAPAN SEAS

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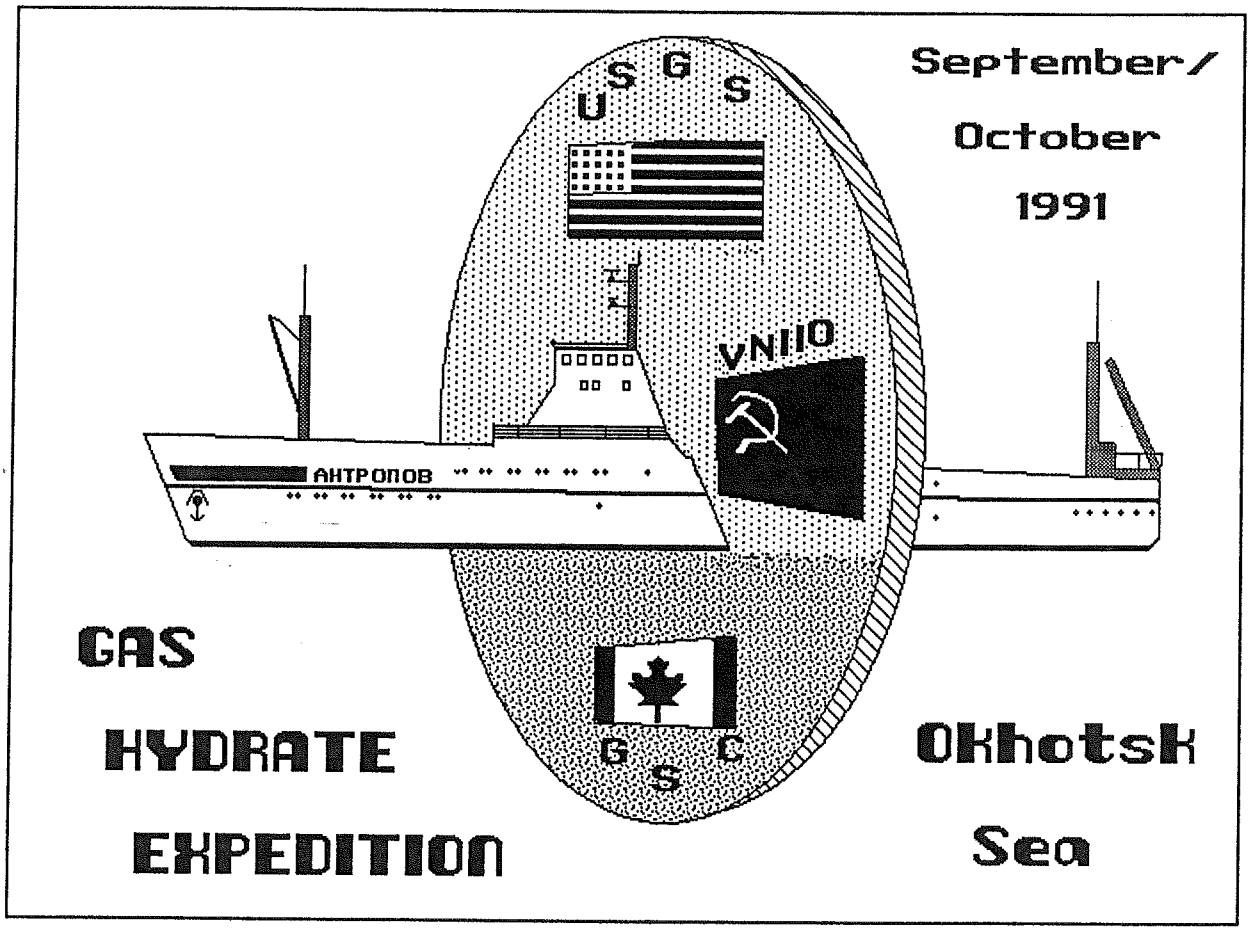

OPEN FILE REPORT (1992)

2446

Geologicay Survey of Canada

Commission geologique du Canada

GAS HYDRATE INVESTIGATIONS IN THE OKHOTSK AND JAPAN SEAS

OPEN FILE - CRUISE REPORT

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SUMMARY

Soviet, American and Canadian scientists carried out a successful gas hydrate investigation in the Okhotsk and Japan Seas, off the east coast of the USSR in October, 1991 onboard a Soviet research vessel. Four study areas were examined for the occurrence of methane gas vents and methane gas hydrate deposits. Seventy four sediment core stations, 50 bottom water stations and 14 heat flow sites were studied.

MAJOR CONCLUSIONS

1. Gas hydrate samples were recovered in 7 cores, while gas disturbed cores, suspected to be associated with nearby hydrates were collected at 4 additional locations. The hydrates appear to form as a result of methane gas that is flowing from subsurface thermogenic deposits. The high pressures (60 to 80 atm) and low temperatures (2 °C), in conjunction with the gaseous methane, are known to be conducive for gas hydrate formation (Sloan, 1990).

2. A total of 10 new active gas vents were discovered, in addition to one vent that was previously documented in 1982 (Zonenshayn et al, 1987). The gas vents are estimated to be on the order of 250 m in diameter. Biogeochemical indicators suggest that outside the vent zone, almost all methane is oxidized in the sediment column before it reaches the overlying seawater. The methane is converted to carbon dioxide, much of which precipitates with dissolved calcium to form carbonate concretions.

3. The flux of methane from the active vents is estimated to equal or exceed many other global methane sources, however it appears that a majority of the vented methane dissolves in the sea and is oxidized before reaching the atmosphere where it would enhance the greenhouse effect.

4. At a site 100 km east of Sakhalin Island, excess chlorinity concentrations appear to be associated with thermogenic sourced hydrocarbons, which suggests fluid migration from salt and hydrocarbon deposits.

INTRODUCTION

An expedition to study the occurrence of gas hydrates deposits was carried out in the Okhotsk and Japan Seas September 27 to October 28, 1991 onboard the *R.V. ANTROPOV*, which is operated by Dalmorgeologia in Nakhodka, Far-East Region of the USSR. Gas hydrates had been recovered at a methane venting site in the Okhotsk Sea in 1986 (Zonenshayn et al, 1987) and the goal was to revisit the site to further evaluate hydrate occurrences.

A group of 35 scientists from the USSR (from Servmorgeologia in St. Petersburg, Dalmorgeologia in Nakhodka, and Pacific Oceanology Institute in Vladivostok) were joined by Tom Lorenson, a geologist/gas geochemist from the USGS - Menlo Park lab and myself, an inorganic geochemist.

The *R/V ANTROPOV* is 104 m long, built in 1984 and similar in design to a fishing trawler, with a large A-frame at the stern, and a 7 m wide rectangular working area extending 30 m from the stern forward. Five laboratories and a drawing office are conveniently located below the working deck, near the stern where sampling was done. Excellent navigation fixes were supplied by a GPS system, with an accuracy of 15 to 25 m. At the highest sampling density site, 8 stations were taken within a ship's length of each other. The GPS antenna was 80 m forward of the stern where samples were collected. When a sampler was on the bottom, a GPS fix and ship's heading were recorded in order to estimate the exact location of the sampler. The ship's propulsion system consisted of a single screw and no bow thruster. It was therefore time consuming to manoeuvre to an exact pre-determined site.

The ship's operation in all areas was very good, with adequate attention to safety. Electrical and water supplies were good, and the living conditions were comfortable. Weather

conditions were favourable, with 2 days out of 30 lost due to a typhoon and a tropical storm.

OPERATIONAL PLAN

Four areas were visited, two in the Okhotsk Sea and two in the Japan Sea (Figure 1). A 20 khz fish finding echo sounder was used to locate gas vents. The vents were not visible on the 12 khz sounder. Core sampling was done using a 10 cm diameter 3 m long gravity corer, fitted with polyethylene liner, which made for easy core splitting, however core disturbance was significant. Water samples were collected 1 m off the sea floor with a stainless steel water bottle, fitted with reversing thermometers and a bottom activated trip arm. Geothermal gradients were measured using a Soviet system with a 2 m probe, deployed from a CTD conducting cable which allowed real-time data logging via an IBM compatible computer on deck. Temperatures and thermal conductivity were recorded at 0.5 m intervals.

CORE HANDLING

Cores were removed from the corer by pulling out the polyethylene liner into a core trough. The plastic was cut with a knife and the cores were inspected for hydrate occurrence, then the trough was carried below to the sediment lab. Hydrate subsamples were immediately selected and placed in pressure containers cooled in liquid nitrogen. Subsampling for pore water, headspace gas and water content were routinely done at 0.5 to 1 m intervals after a brief core description. The remaining sediment was discarded, as they had no D-tubes or cold room to store cores.

ONBOARD ANALYSES

Headspace gas analyses were done on a standard volume of sediment and headspace, held in a 0.5 litre paint can fitted with a septum. Three gas chromatography systems were available to measure methane, ethane, ethene, propane, propene, butane, iso-butane, nitrogen, oxygen, carbon dioxide and helium. Bottom water samples were degassed in a vacuum rack to recover the gases which were then injected into the chromatograph.

Pore water samples were obtained by placing wet sediment in stainless steel containers that could be compressed with a screw-tightening arrangement. The pore water passed through course laboratory filter paper and plastic tubing to sample containers. Three pore water presses were available; pressing time varied from 6 to 12 hours, producing 10 to 50 ml of pore water. Because only 6 to 12 pore water samples could be processed per day, sampling resolution had to be very large (0.5 to 1 m). This severe limitation diminished the quality of the pore water program, since a minimum of 3 samples are needed to determine the quantity and characteristic profile for various measured parameters. If one of the samples was contaminated, the core interpretation was questionable. After some discussion, 4 subsamples were taken from some cores. The quality of the pore water samples appeared to be adequate for the analyses that were done, however temperature and atmosphere control, as well as a 0.4 um final filtration step would have been desirable.

Chlorinity was determined from 1 ml of pore water and bottom water using a silver nitrate titration system, with a precision and accuracy of 1%. Water pH and Eh were determined with combination electrodes, while ammonia and silica were analyzed in 0.1 to 0.2

ml of sample using a standard colorimetric method. No estimate of error was available for pH and Eh, while ammonia and silica were reliable to within 10%. Sulfate was determined in 0.05 ml of sample with a barium sulfate precipitation/turbidity measurement, within an accuracy of 10%.

Water content was determined using a balance beam suspended on a cord, which allowed wet and dried sediment samples to be weighed (water1 in density tables). Sediment density was determined using a metal ring filled with a set volume of wet sediment, which was weighed with wet and dried sediment (water2 in density tables). Weighing errors were estimated to cause random scatter to within 5% relative error of the amount reported.

LAND-BASED STUDIES

Gas samples were collected for detailed analyses at the USGS lab in Menlo Park. Hydrate samples stored in pressurized containers will be studied in St. Petersburg for gas and isotope composition. Carbonate concretions, shell fragments and pore waters will be analyzed for isotopes by Soviet researchers. Sediment samples will be analyzed for total and organic carbon, grain size and a variety of chemical elements at the GSC lab in Dartmouth.

RESULTS

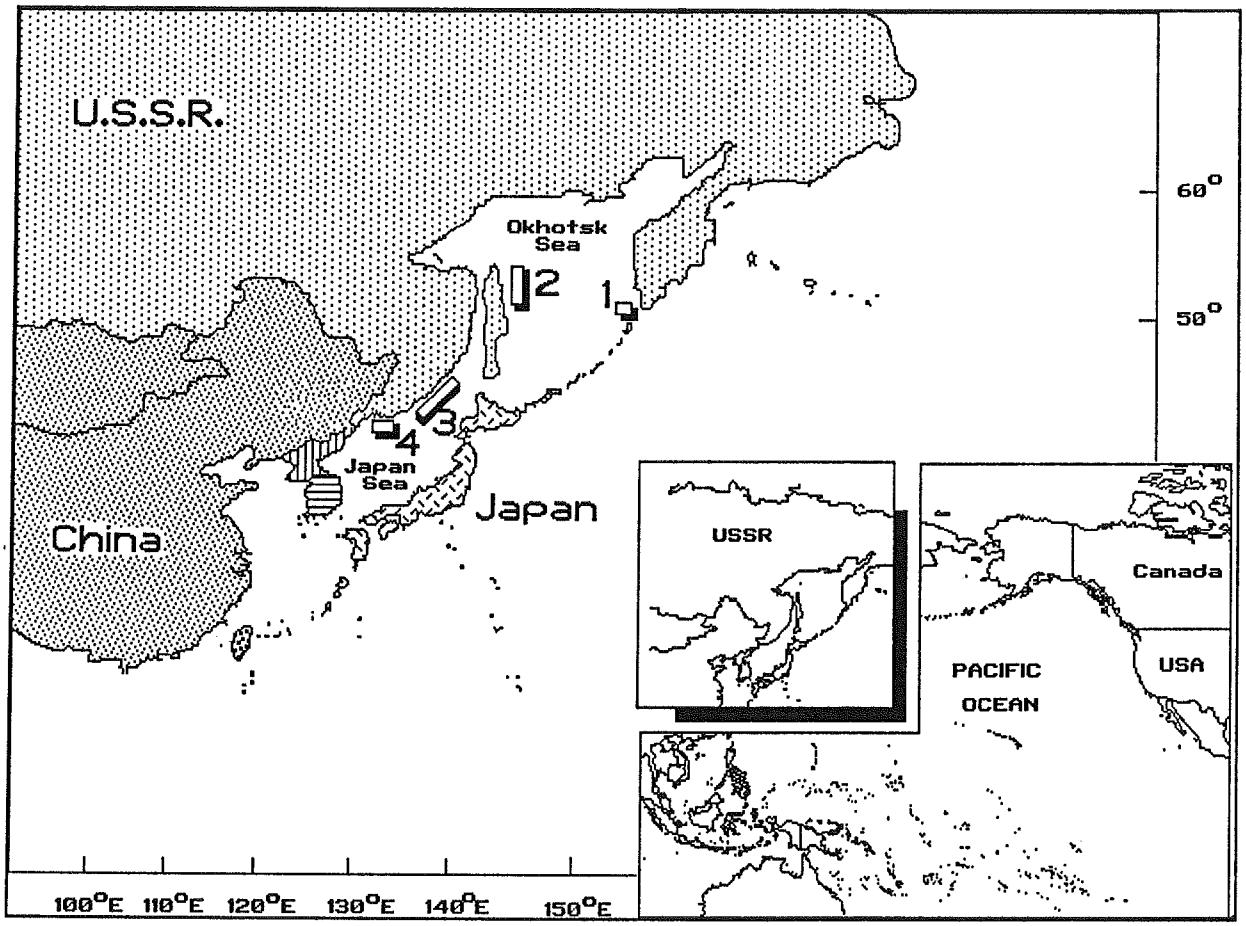
Schematic core logs are presented in Appendix 1. Sampling information is available in the "Location" table, along with pore water, bottom water, density/water content, gas analyses and heat flow tables (Appendix 2). Station identification consists of a 3 component number, e.g. 91 02 56, representing the year, the study area (1 through 4), and the station number. Dates are tabulated in year-month-day format to allow them to be used as a single number in numerical operations in the spreadsheet. Times are reported in GMT (hours.minutes) to enable one number to represent time. The pore water table contains a column labelled "stored - days", which is an approximation of the number of days that lapsed between core collection and pore water extraction. This allows for statistical testing of the effect of sample storage on analytical results. Gas results are presented as microlitres of gas (STP) in one litre of bottom water or wet sediment (ppmv in 'wet' sample). Gas concentration ratios are calculated and labelled methane/ethane, ethane/ethene and propane/propene.

REFERENCES

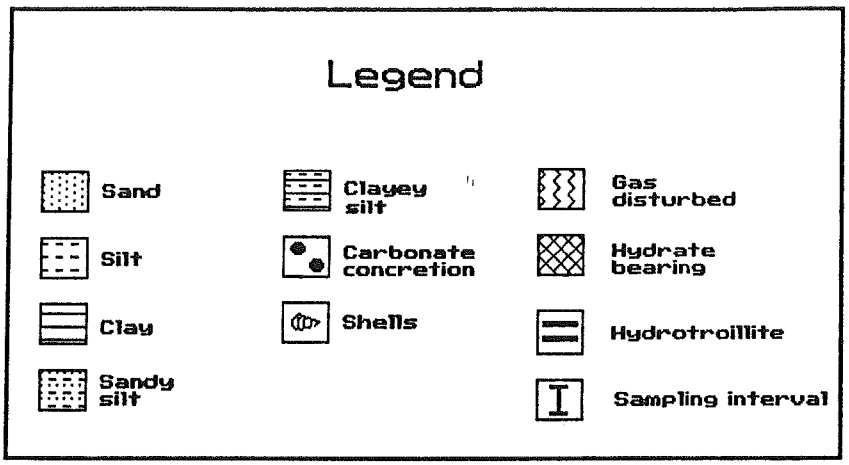
Sloan, E.D. Jr. Clathrate Hydrates of Natural Gases. 1990. Marcel Dekker Inc., 641pp, New York, NY.

Zonenshayn, L.P., Murdmaa, I.O., Baranov, B.V., Koznetsov, A.P., Kurin, V.S., Barash, M.S. Valyashirv, G.M., Demiral, L. 1987. An underwater gas source in the Sea of Okhtsk west of Paramushir Island. Oceanolgy, 27, no. 5, 598-602.

FIGURE 1 Area Location Map



APPENDIX 1 Core Log Diagrams



Sample Types

CC – carbonate concretion

GC – gas hydrate in pressure container

GG – gas from gas hydrate

GH – gas from sediments (headspace)

GK – gas from sediments (vacutainer)

GW – gas from bottom water

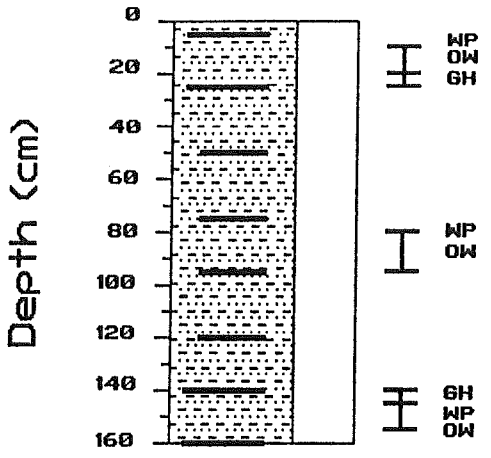
PW – Density / water content

SH – shell

WG – water from melted hydrate

WM – bottom water

WP – pore water, total and organic carbon, etc.



Core 91-01-01

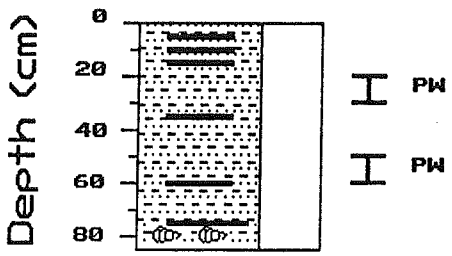
Latitude 50° 30.912′

Longitude 155° 18.241′

Water depth (m) 800

Date 911002

Time (GMT) 08:20



Core 91-01-02

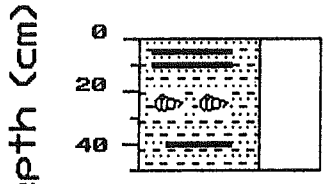
Latitude 50° 30.975′

Longitude 155° 18.310′

Water depth (m) 796

Date 911002

Time (GMT) 12:34



Core 91-01-03

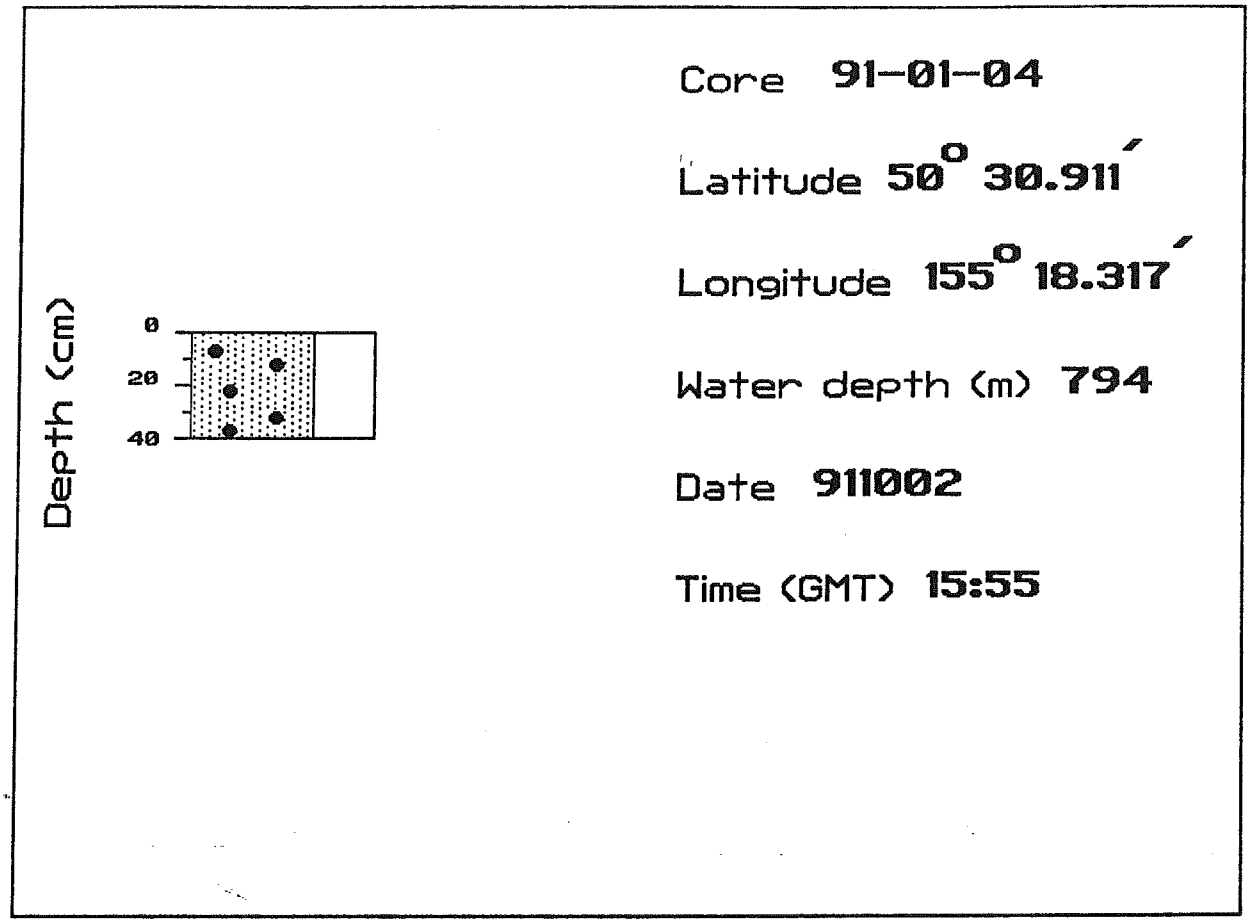
Latitude 50° 30.830′

Longitude 155° 18.272′

Water depth (m) 800

Date 911002

Time (GMT) 14:06


Depth (cm)
0
20
40
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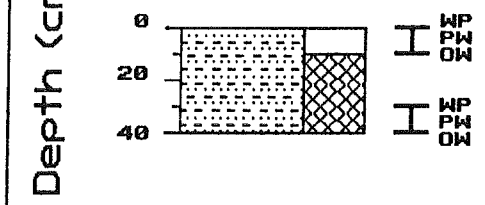
Latitude 50° 30.911'
Longitude 155° 18.317'
Water depth (m) 794
Date 911002
Time (GMT) 15:55



Core 91-01-05

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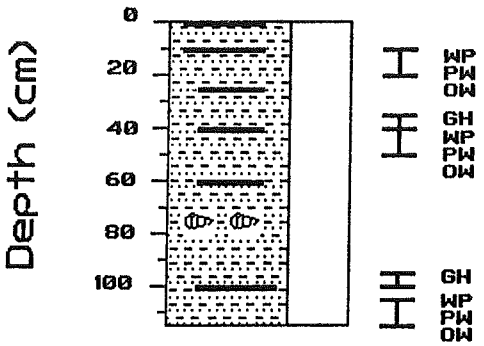
Longitude 155° 18.286′

Water depth (m) 798

Date 911003

Time (GMT) 06:26



Core 91-01-06

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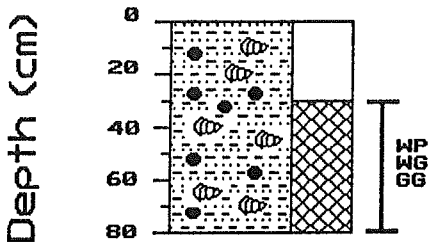
Longitude 155° 18.298′

Water depth (m) 798

Date 911003

Time (GMT) 07:55



Core 91-01-07

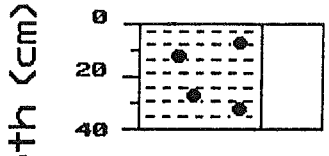
Latitude 50° 30.909′

Longitude 155° 18.171′

Water depth (m) 802

Date 91-10-03

Time (GMT) 9:10



Core **91-01-08**

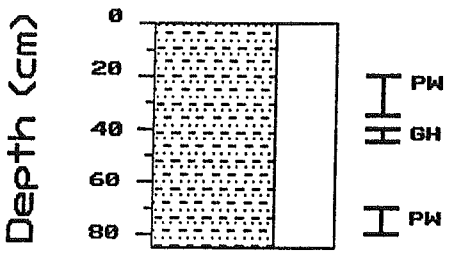
Latitude **50° 30.841′**

Longitude **155° 18.249′**

Water depth (m) **802**

Date **911003**

Time (GMT) **10:31**



Core 91-01-09

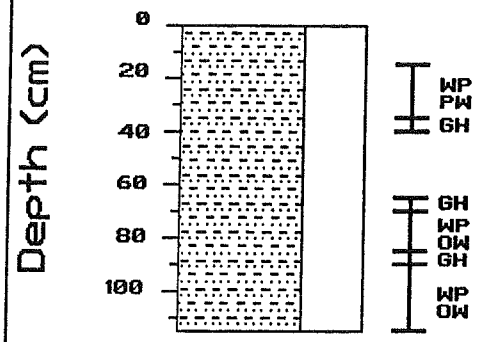
Latitude 50° 30.996′

Longitude 155° 18.129′

Water depth (m) 802

Date 911003

Time (GMT) 12:10



Core **91-01-10**

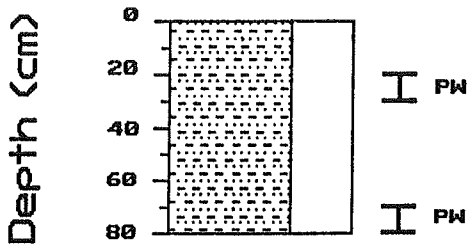
Latitude **50° 30.893′**

Longitude **155° 18.217′**

Water depth (m) **800**

Date **911003**

Time (GMT) **14:16**



Core 91-01-15

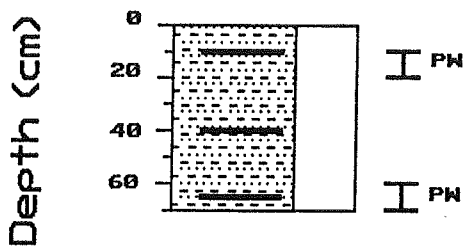
Latitude 50° 30.883′

Longitude 155° 18.691′

Water depth (m) 795

Date 911004

Time (GMT) 02:49



Core 91-01-16

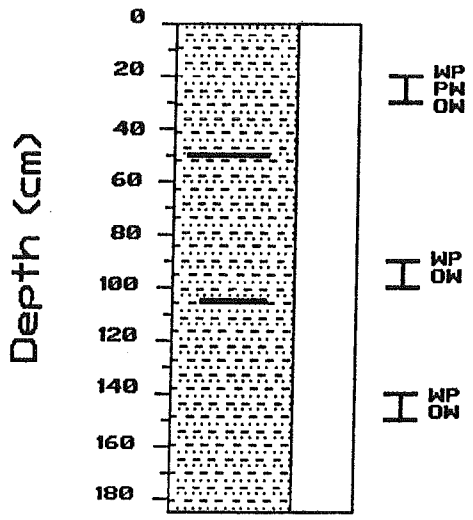
Latitude 50° 30.859′

Longitude 155° 18.317′

Water depth (m) 798

Date 911004

Time (GMT) 04:02



Core 91-01-17

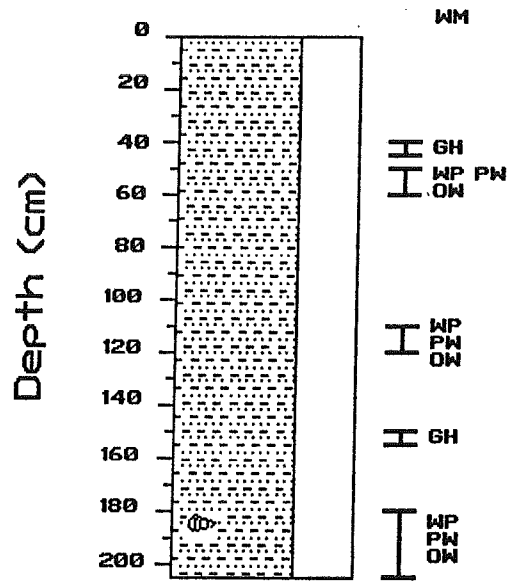
Latitude 50° 30.838′

Longitude 155° 18.773′

Water depth (m) 800

Date 911004

Time (GMT) 04:52



Core 91-01-18

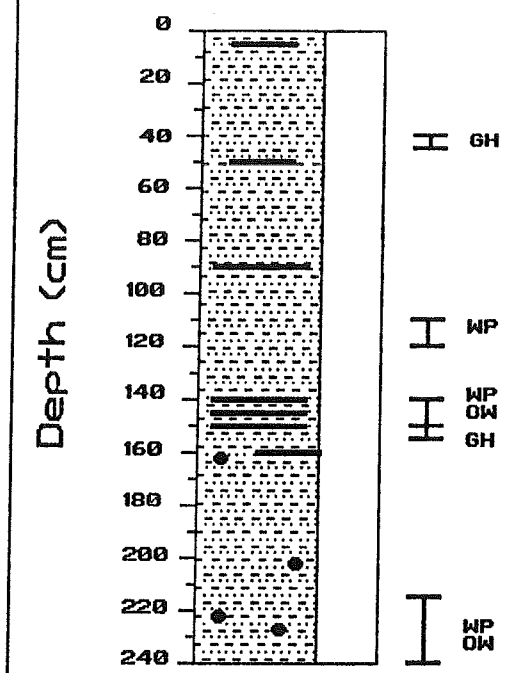
Latitude 50° 31.005′

Longitude 155° 18.165′

Water depth (m) 804

Date 911004

Time (GMT) 05:47



Core 91-01-19

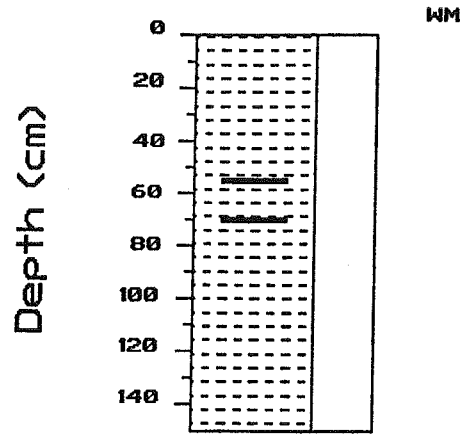
Latitude 50° 30.929′

Longitude 155° 18.210′

Water depth (m) 800

Date 911004

Time (GMT) 06:46



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Longitude 155° 18.222′

Water depth (m) 800

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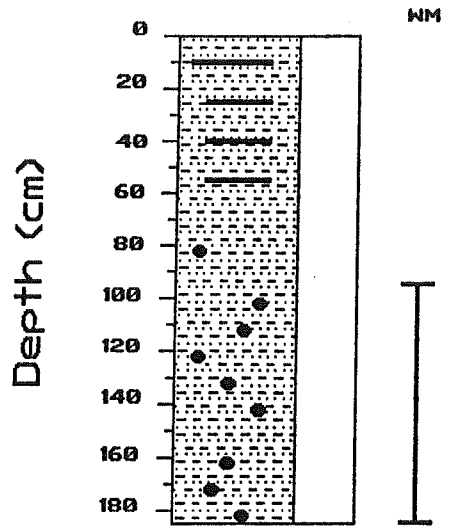
Time (GMT) 08:37



Core **91-01-22**

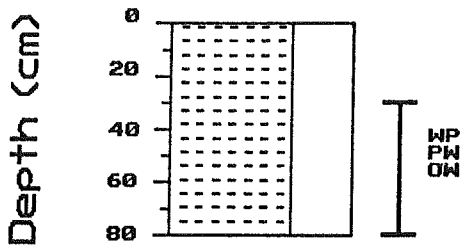
Latitude **50° 30.918′**

Longitude **155° 18.253′**

Water depth (m) **800**

Date **911004**

Time (GMT) **10:46**



Core 91-01-23

Latitude 50° 30.884′

Longitude 155° 18.237′

Water depth (m) 800

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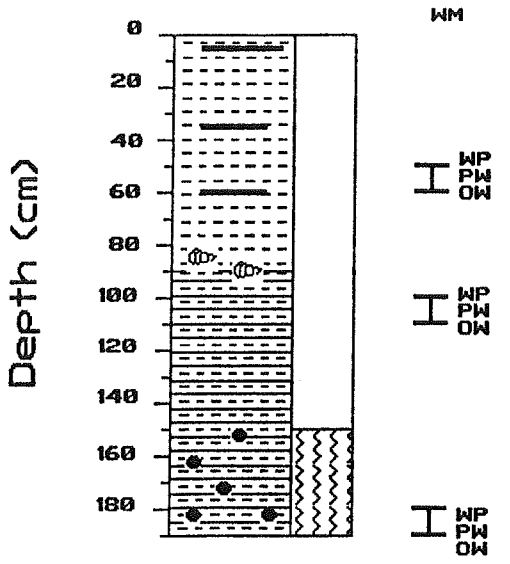
Time (GMT) 11:47



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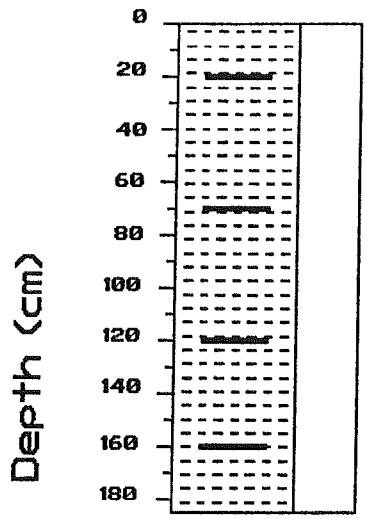
Longitude 155° 18.235′

Water depth (m) 800

Date 911004

Time (GMT) 23:36



Core **91-01-30**

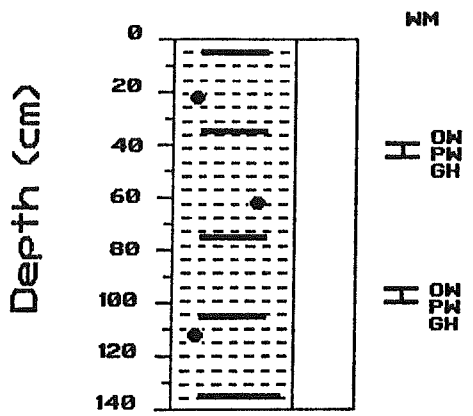
Latitude **50° 30.900′**

Longitude **155° 18.323′**

Water depth (m) **795**

Date **911005**

Time (GMT) **02:47**



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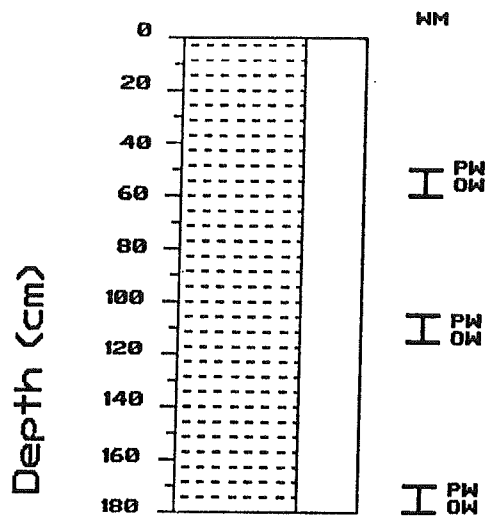
Longitude 155° 18.228′

Water depth (m) 802

Date 911005

Time (GMT) 03:39



Core **91-01-32**

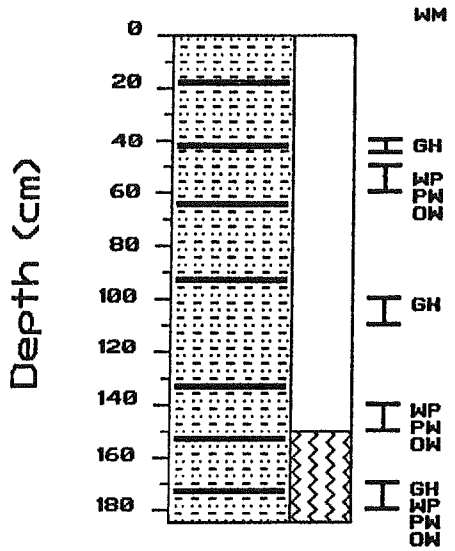
Latitude **50° 30.926′**

Longitude **155° 18.325′**

Water depth (m) **796**

Date **911005**

Time (GMT) **07:52**



Core 91-01-33

Latitude 50° 31.025′

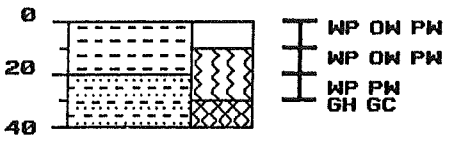
Longitude 155° 18.337′

Water depth (m) 798

Date 91-10-05

Time (GMT) 08:51

Depth (cm)



Core 91-02-39

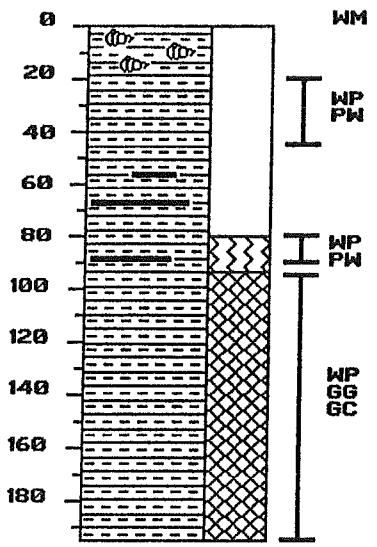
Latitude 54° 26.856′

Longitude 144° 5.002′

Water depth (m) 714

Date 911007

Time (GMT) 22:28



Core 91-02-40

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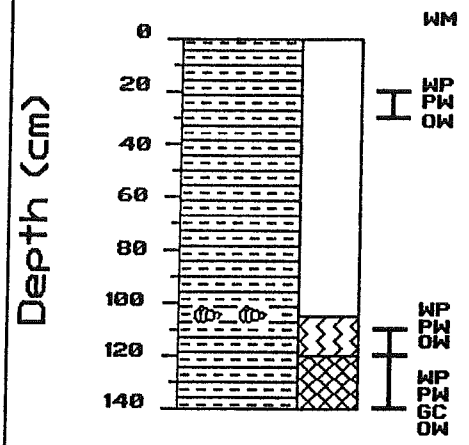
Longitude 144° 4.911′

Water depth (m) 708

Date 91-10-07

Time (GMT) 23:35



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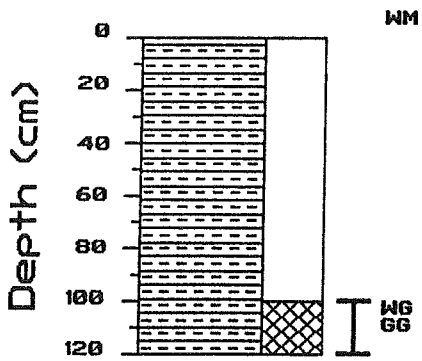
Water depth (m) 708

Date 91-10-08

Time (GMT) 00:42



Core 91-02-42

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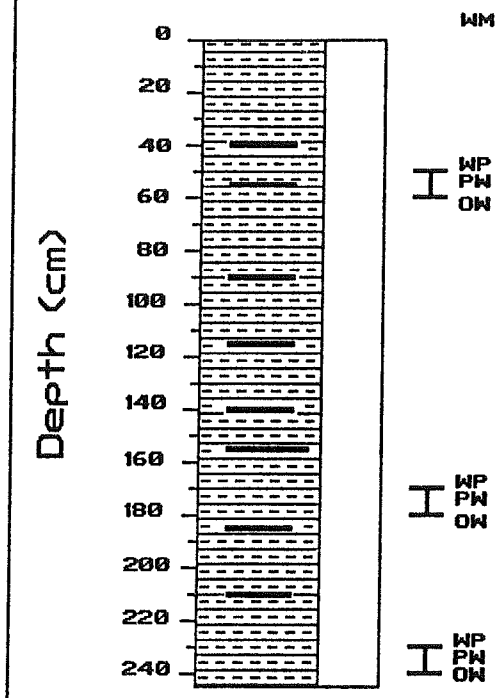
Water depth (m) 710

Date 91-10-08

Time (GMT) 02:23



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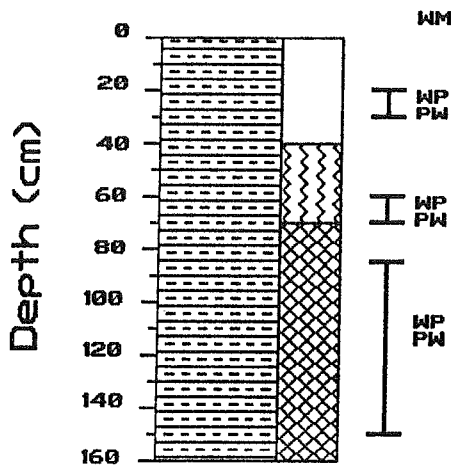
Longitude 144° 5.384′

Water depth (m) 725

Date 91-10-08

Time (GMT) 03:22



Core 91-02-44

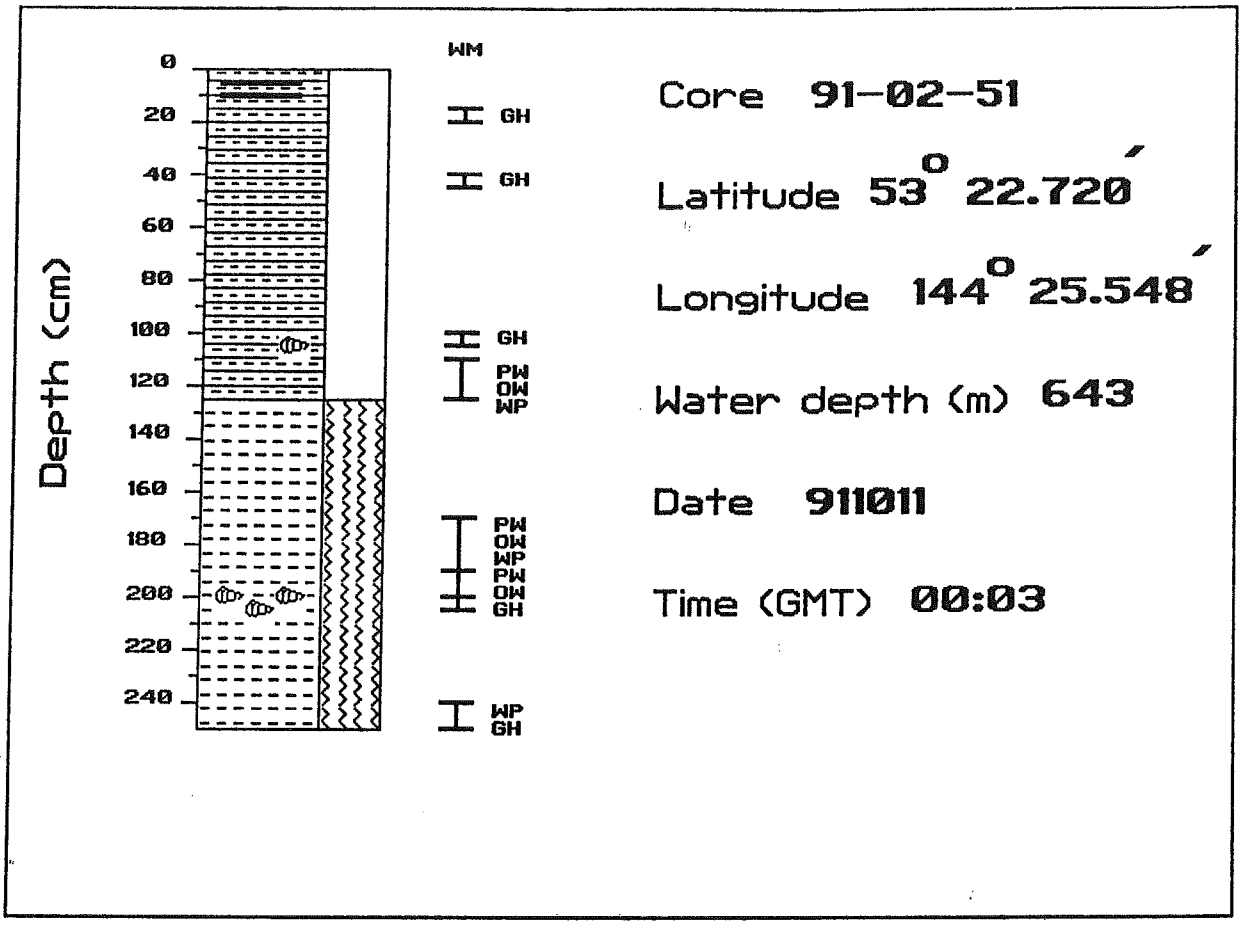
Latitude 54° 26.790′

Longitude 144° 4.916′

Water depth (m) 708

Date 91-10-08

Time (GMT) 04:47


Depth (cm)
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200
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240
WM
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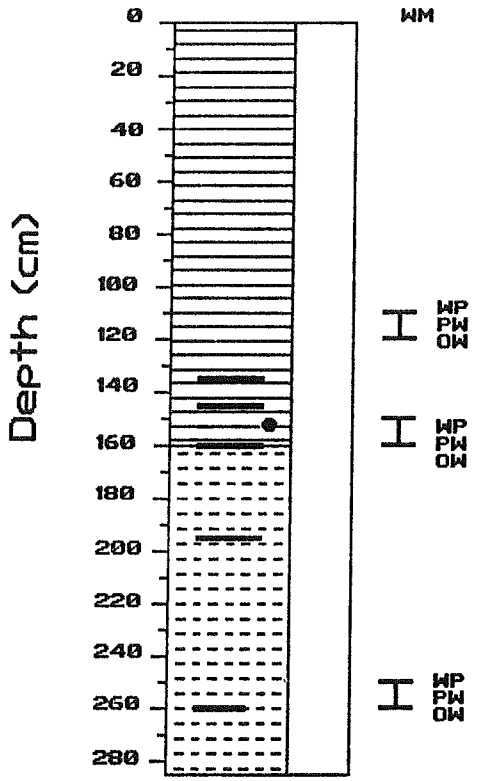
GH
Core 91-02-51
Latitude 53° 22.720'
Longitude 144° 25.548'
Water depth (m) 643
Date 911011
Time (GMT) 00:03



Core 91-02-52

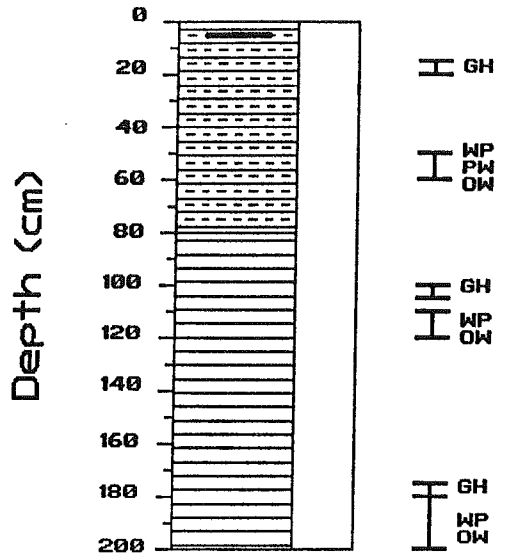
Latitude 53° 22.728′

Longitude 144° 25.497′

Water depth (m) 642

Date 911011

Time (GMT) 01:22



Core 91-02-53

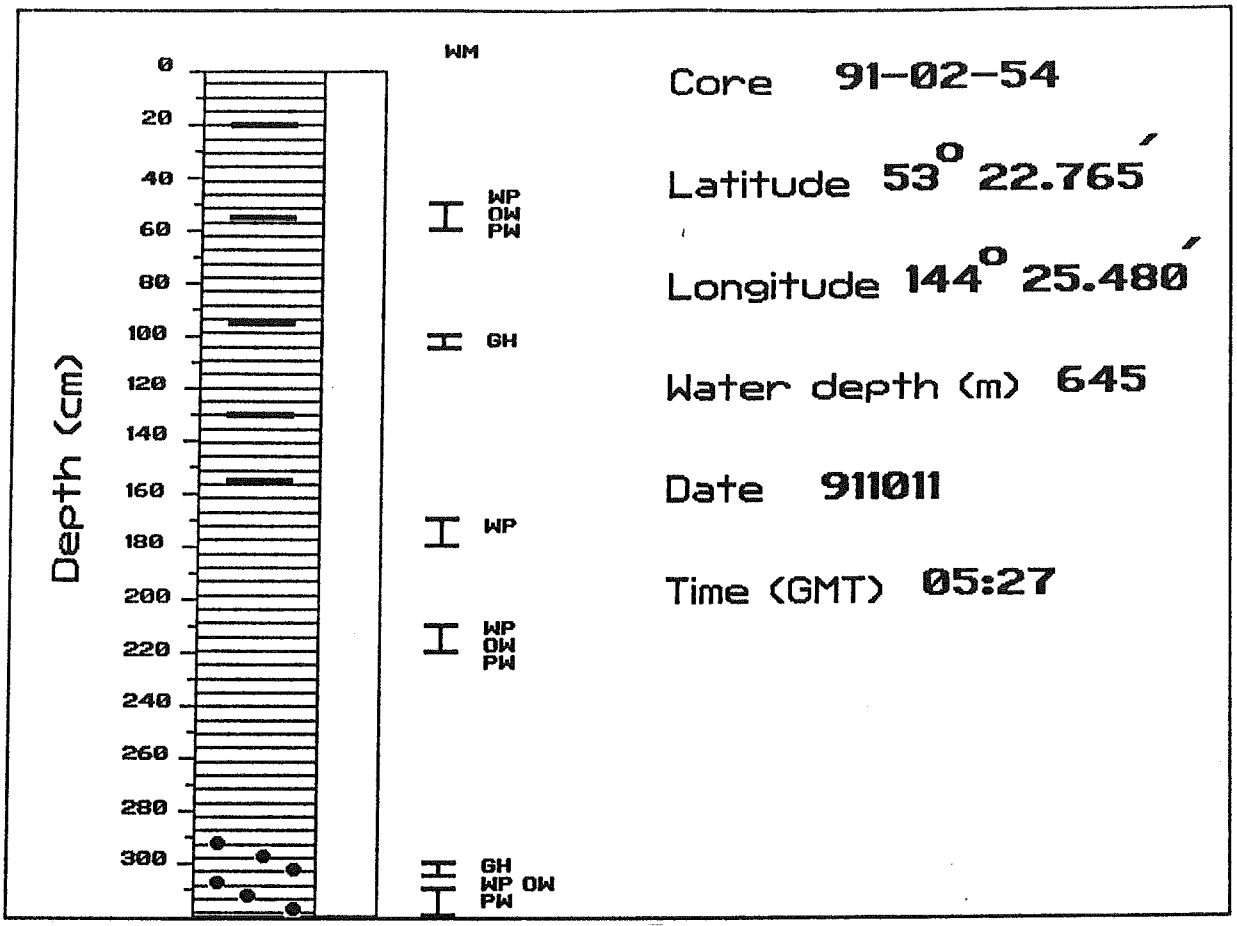
Latitude 53° 22.701′

Longitude 144° 25.352′

Water depth (m) 646

Date 911011

Time (GMT) 04:13


Depth (cm)
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260
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300
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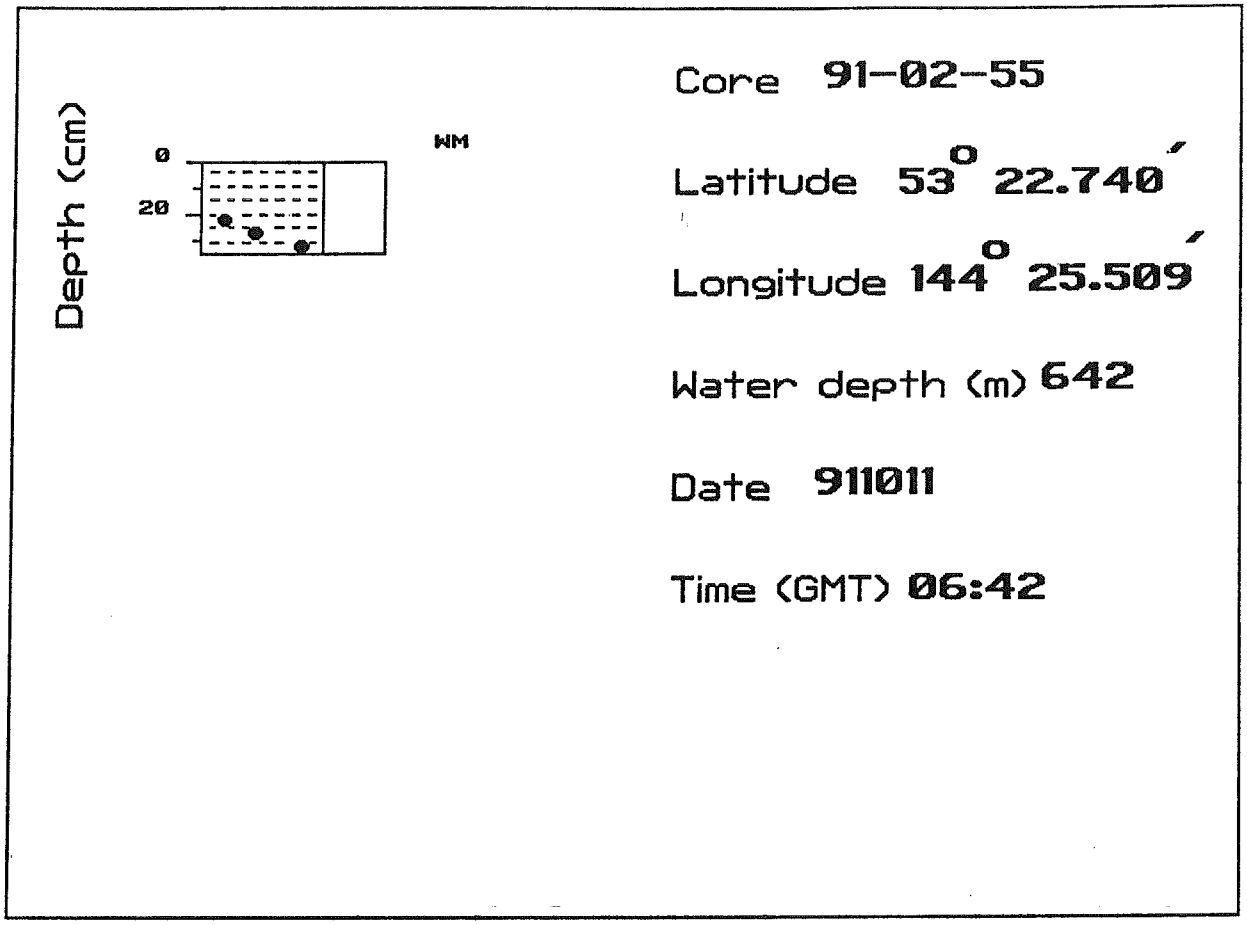
GH
WP OW
PW
Core 91-02-54
Latitude 53° 22.765'
Longitude 144° 25.480'
Water depth (m) 645
Date 911011
Time (GMT) 05:27


Depth (cm)
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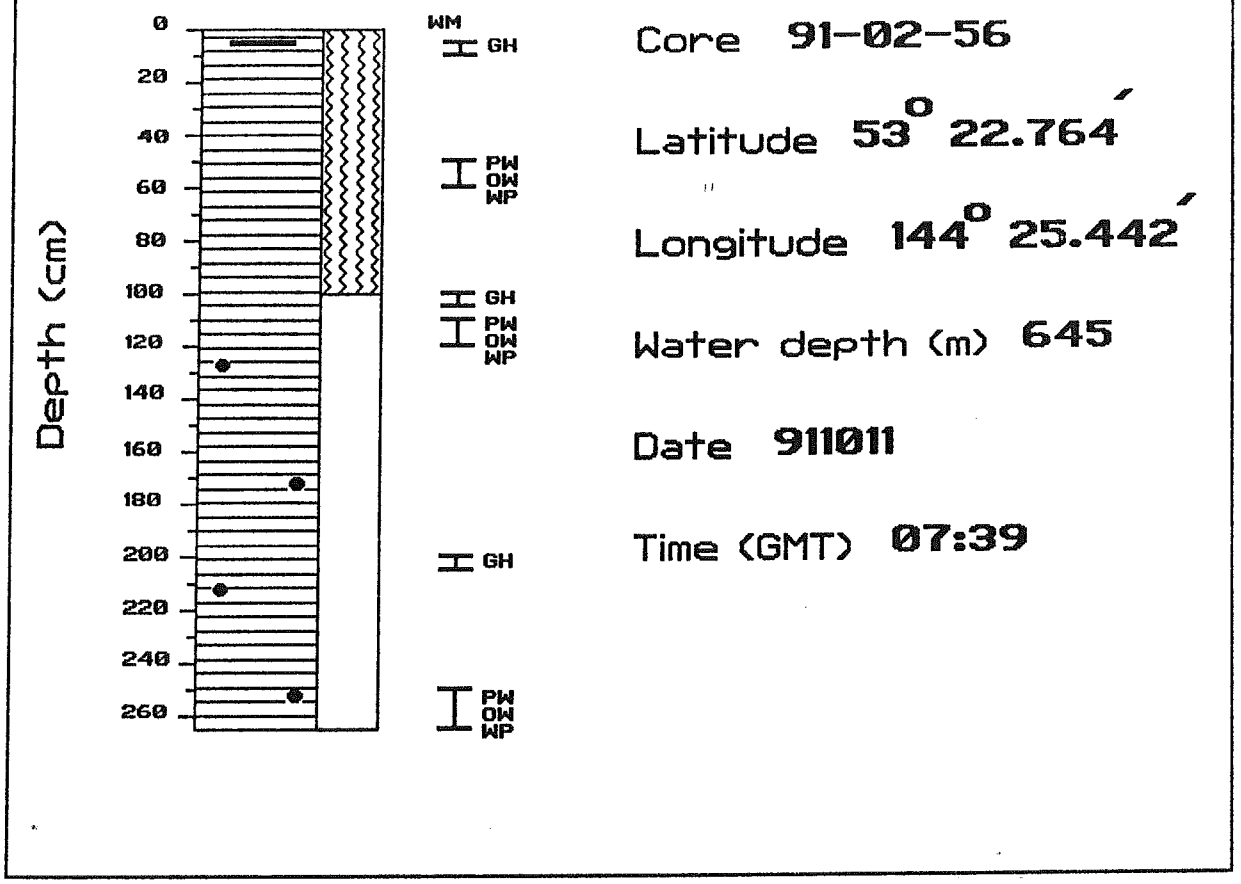
Core 91-02-55
Latitude 53° 22.740'
Longitude 144° 25.509'
Water depth (m) 642
Date 911011
Time (GMT) 06:42


Depth (cm)
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WM
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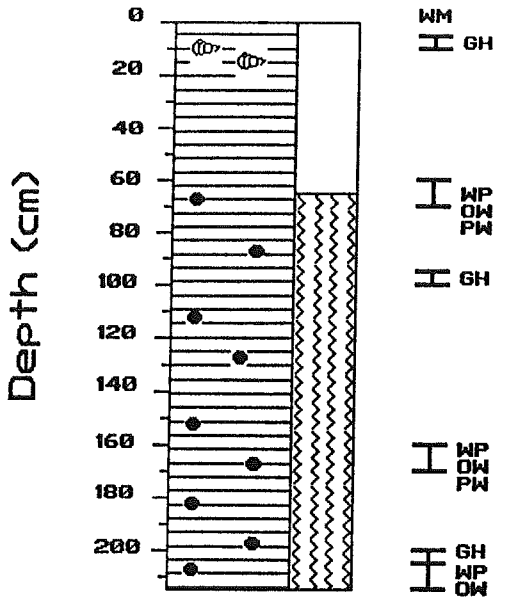
PW
OW
WP
GH
PW
OW
WP
Core 91-02-56
Latitude 53° 22.764'
Longitude 144° 25.442'
Water depth (m) 645
Date 911011
Time (GMT) 07:39



Core 91-02-57

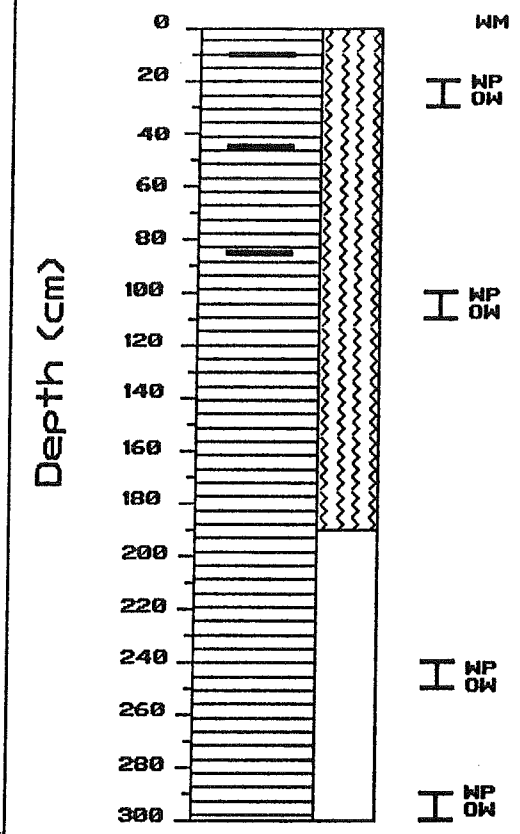
Latitude 53° 22.387′

Longitude 144° 25.176′

Water depth (m) 628

Date 911011

Time (GMT) 08:20



Core 91-02-67

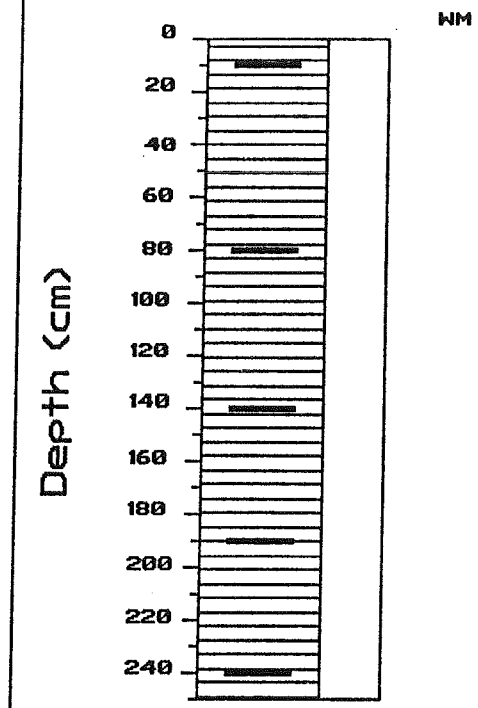
Latitude 53° 10.341′

Longitude 144° 25.847′

Water depth (m) 601

Date 911112

Time (GMT) 01:00



Core 91-02-68

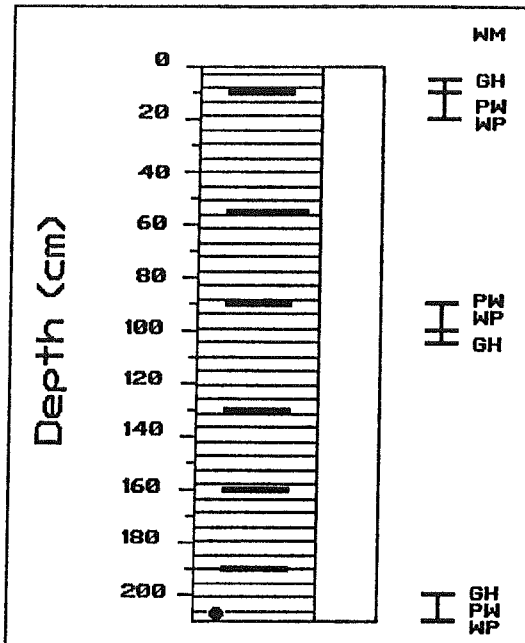
Latitude 52° 48.776′

Longitude 144° 44.584′

Water depth (m) 817

Date 911012

Time (GMT) 05:31



Core 91-02-69

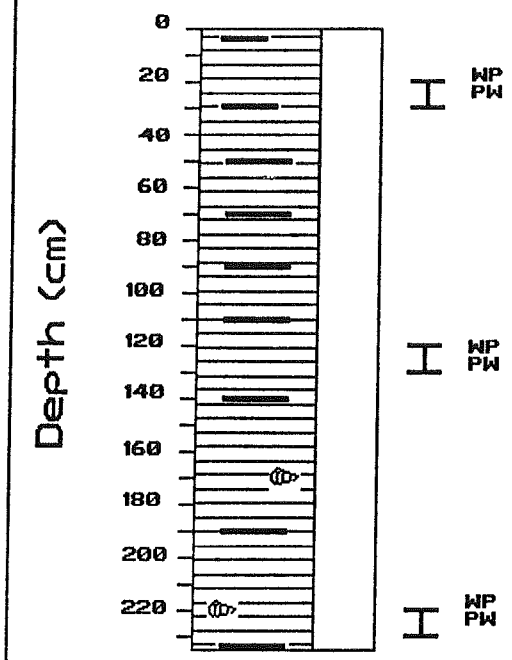
Latitude 52° 48.782′

Longitude 144° 44.990′

Water depth (m) 822

Date 911012

Time (GMT) 07:04



Core 91-02-70

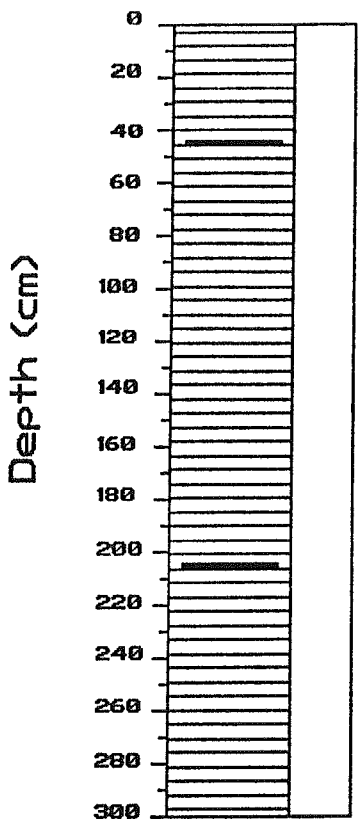
Latitude 52° 38.018′

Longitude 144° 52.941′

Water depth (m) 833

Date 911012

Time (GMT) 09:35



Core 91-03-71

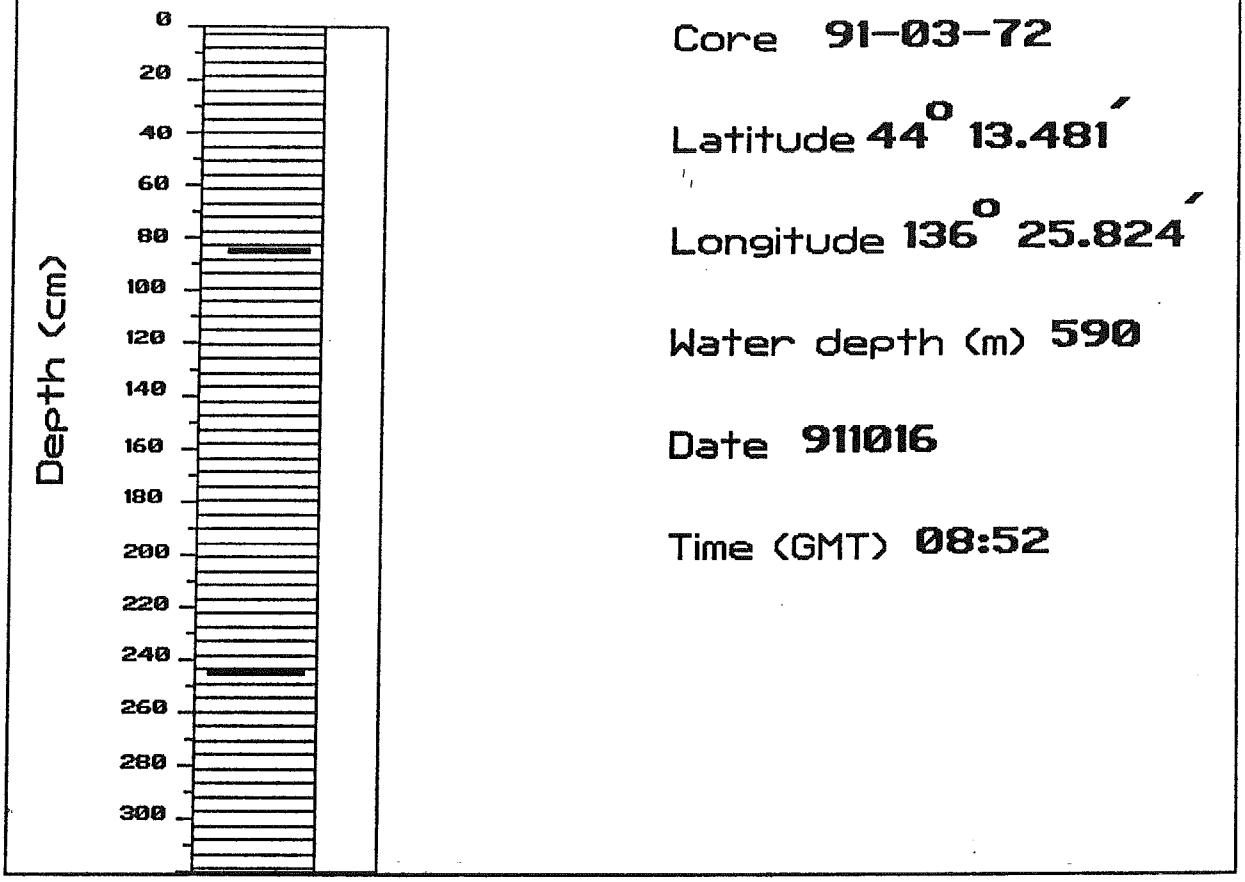
Latitude 44° 13.497′

Longitude 136° 25.859′

Water depth (m) 599

Date 911016

Time (GMT) 07:44


Depth (cm)
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240
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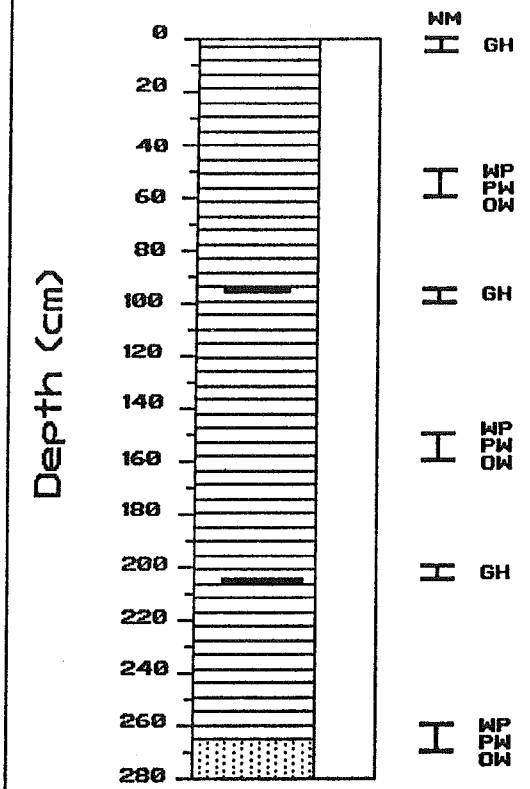
300
Core 91-03-72
Latitude 44° 13.481'
Longitude 136° 25.824'
Water depth (m) 590
Date 911016
Time (GMT) 08:52



Core 91-03-73

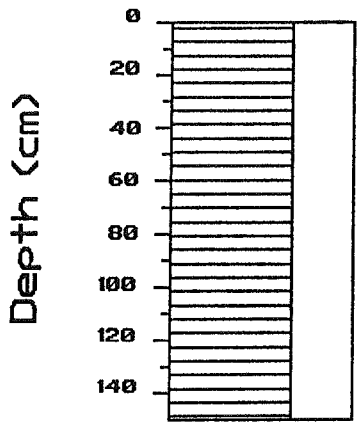
Latitude 44° 13.600′

Longitude 136° 25.907′

Water depth (m) 600

Date 911016

Time (GMT) 12:10



Core **91-03-82**

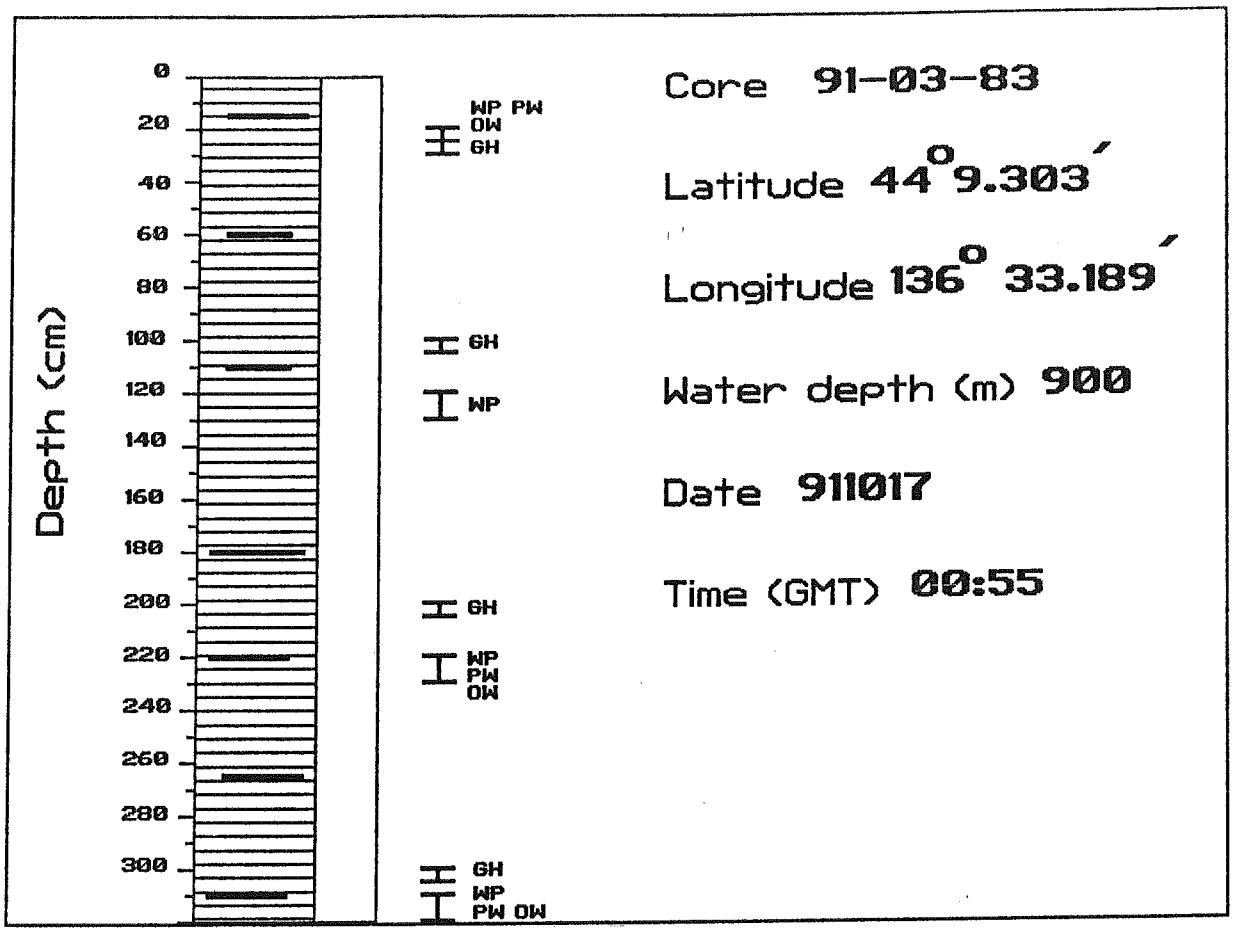
Latitude **44° 12.322′**

Longitude **136° 26.433′**

Water depth (m) **708**

Date **911016**

Time (GMT) **23:47**


Depth (cm)
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WP PW
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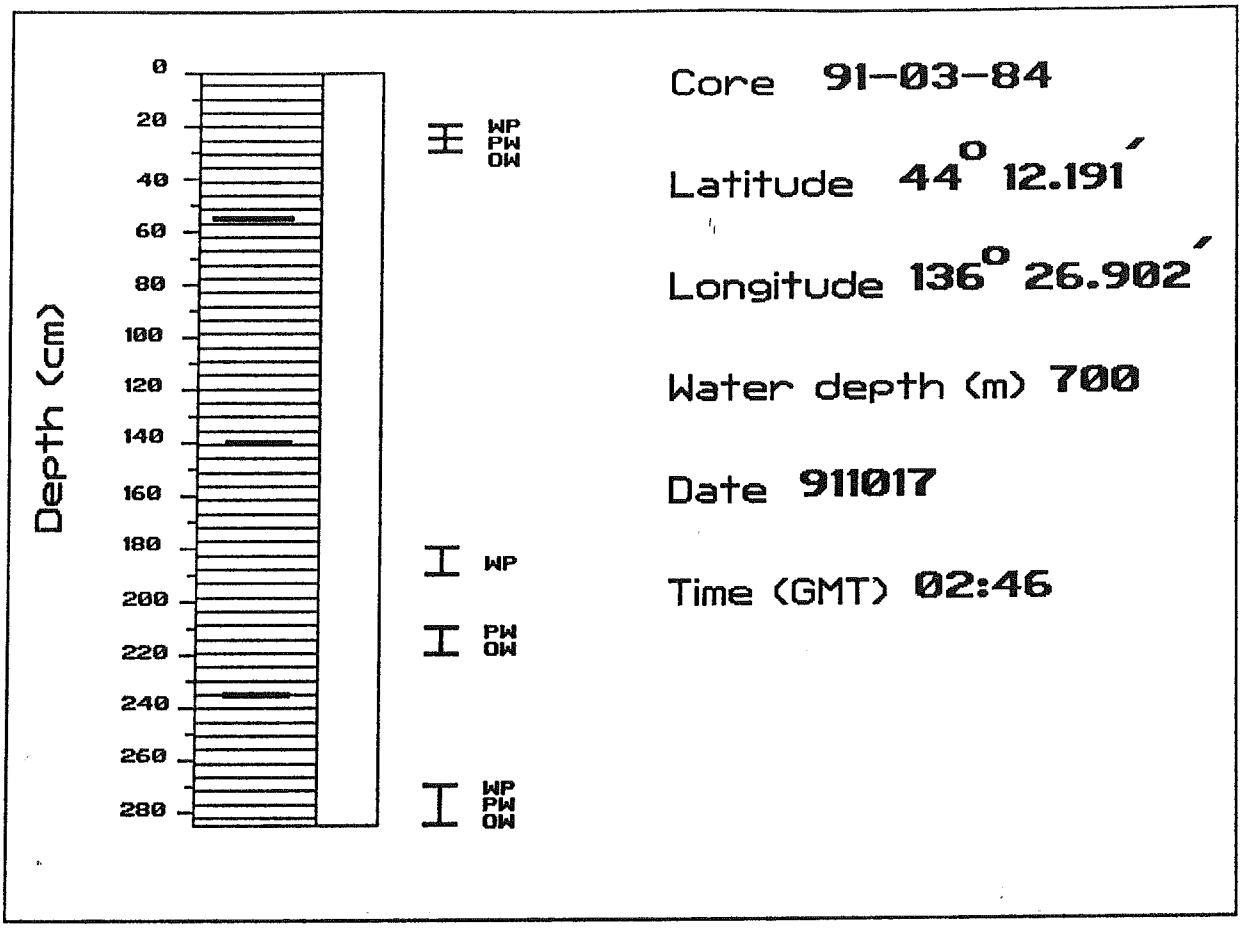
PW OW
Core 91-03-83
Latitude 44° 9.303'
Longitude 136° 33.189'
Water depth (m) 900
Date 911017
Time (GMT) 00:55


Depth (cm)
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160
180
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240
260
280
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WP
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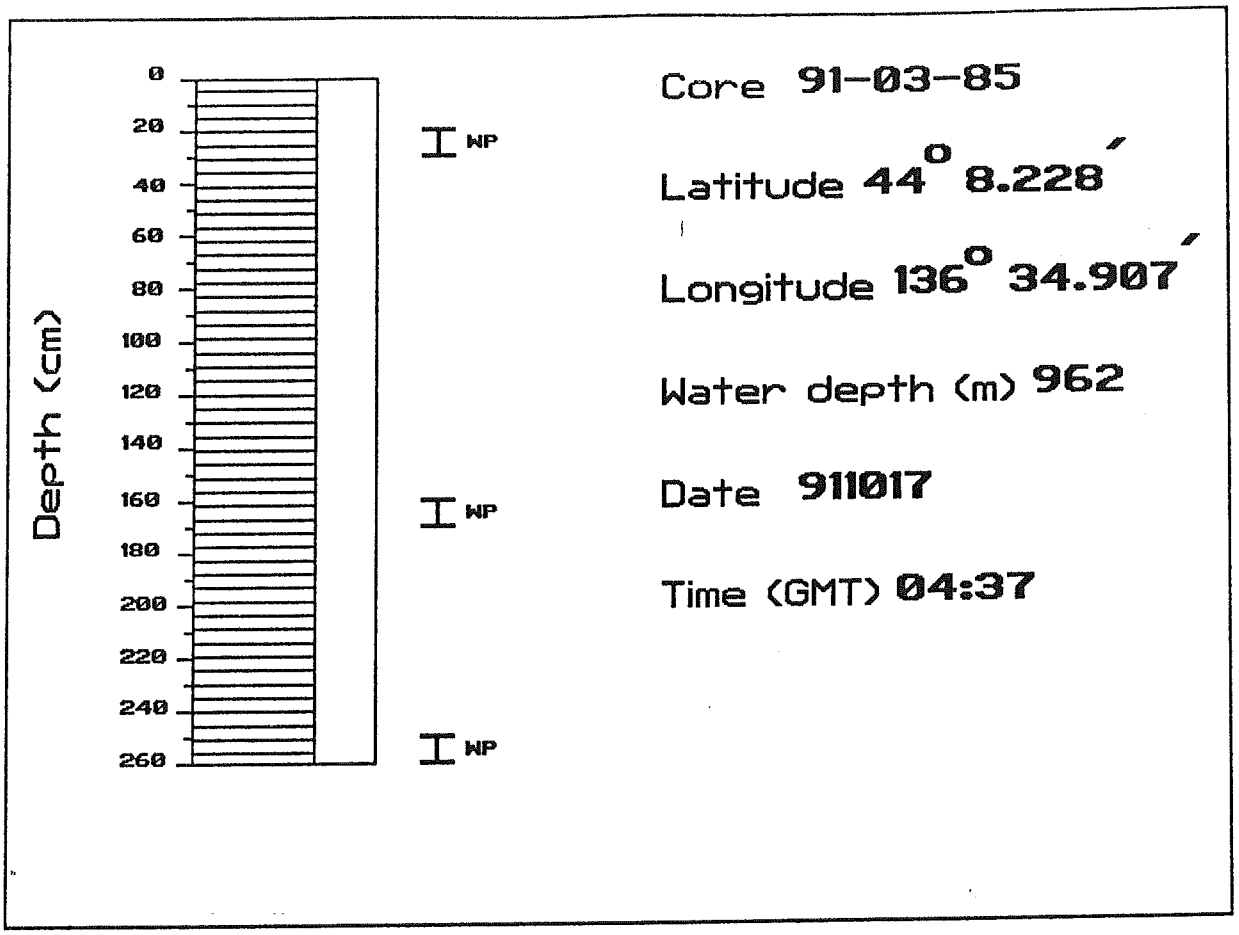
OW
Core 91-03-84
Latitude 44° 12.191'
Longitude 136° 26.902'
Water depth (m) 700
Date 911017
Time (GMT) 02:46


Depth (cm)
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160
180
200
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240
260
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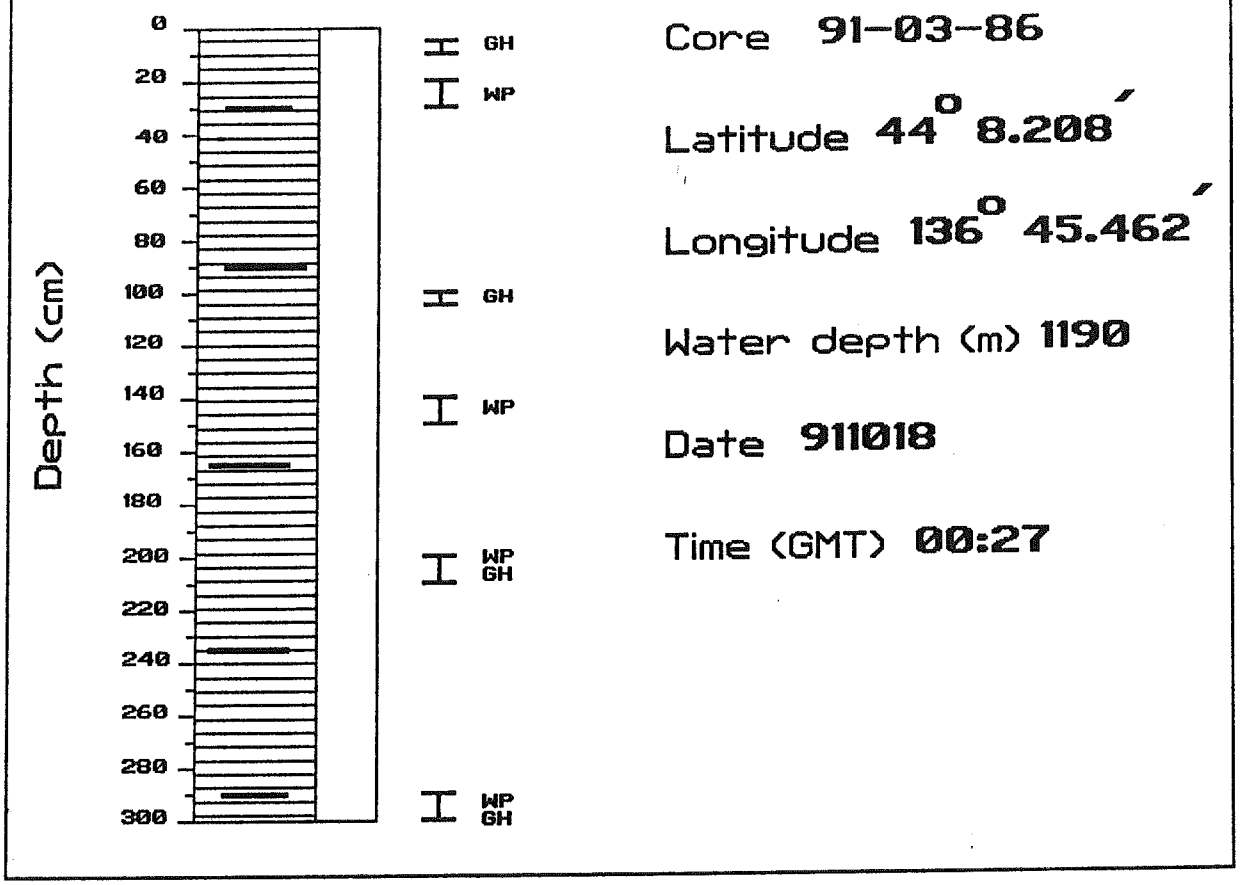
Core 91-03-85
Latitude 44° 8.228′
Longitude 136° 34.907′
Water depth (m) 962
Date 911017
Time (GMT) 04:37


Depth (cm)
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80
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120
140
160
180
200
220
240
260
280
300
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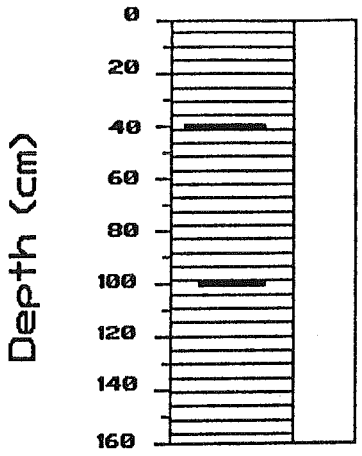
GH
Core 91-03-86
Latitude 44° 8.208′
Longitude 136° 45.462′
Water depth (m) 1190
Date 911018
Time (GMT) 00:27



Core 91-03-87

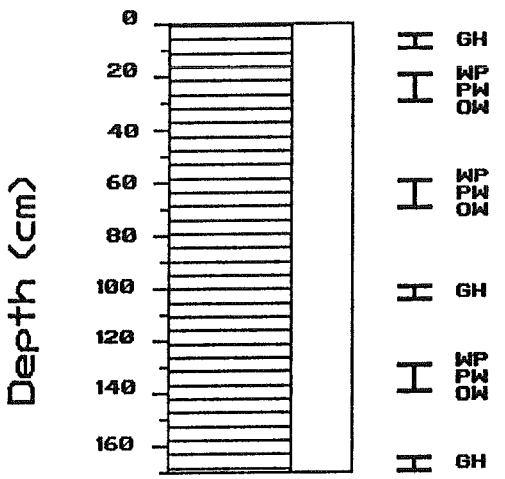
Latitude 44° 3.520′

Longitude 136° 53.810′

Water depth (m) 1565

Date 911018

Time (GMT) 02:22



Core **91-03-88**

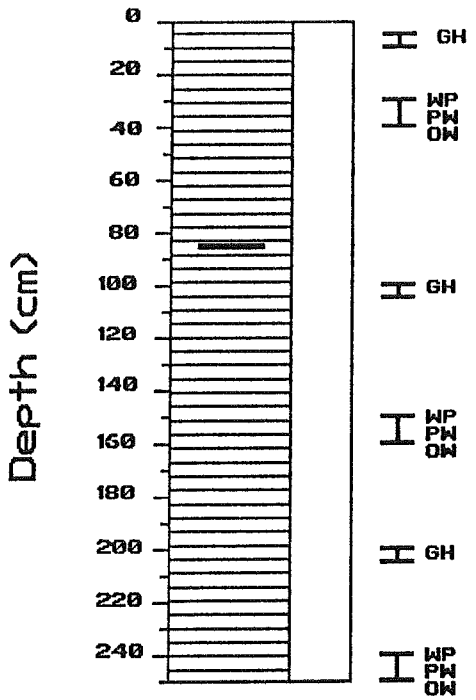
Latitude **44° 4.152′**

Longitude **136° 53.987′**

Water depth (m) **1500**

Date **911018**

Time (GMT) **03:48**



Core 91-03-89

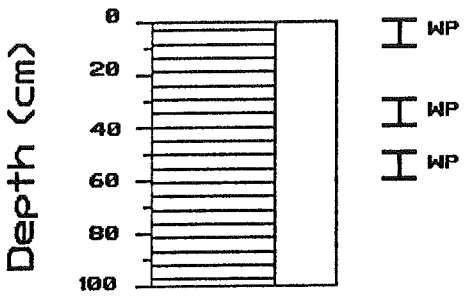
Latitude 44° 1.511′

Longitude 136° 57.749′

Water depth (m) 1815

Date 911018

Time (GMT) 05:20



Core **91-03-90**

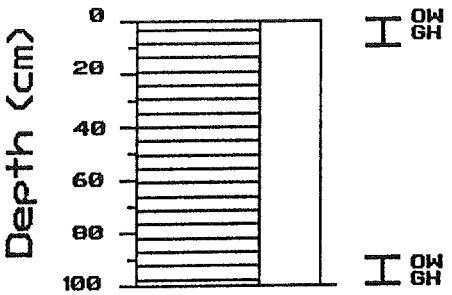
Latitude **44° 1.298′**

Longitude **136° 58.570′**

Water depth (m) **1825**

Date **911018**

Time (GMT) **06:35**



Core **91-03-91**

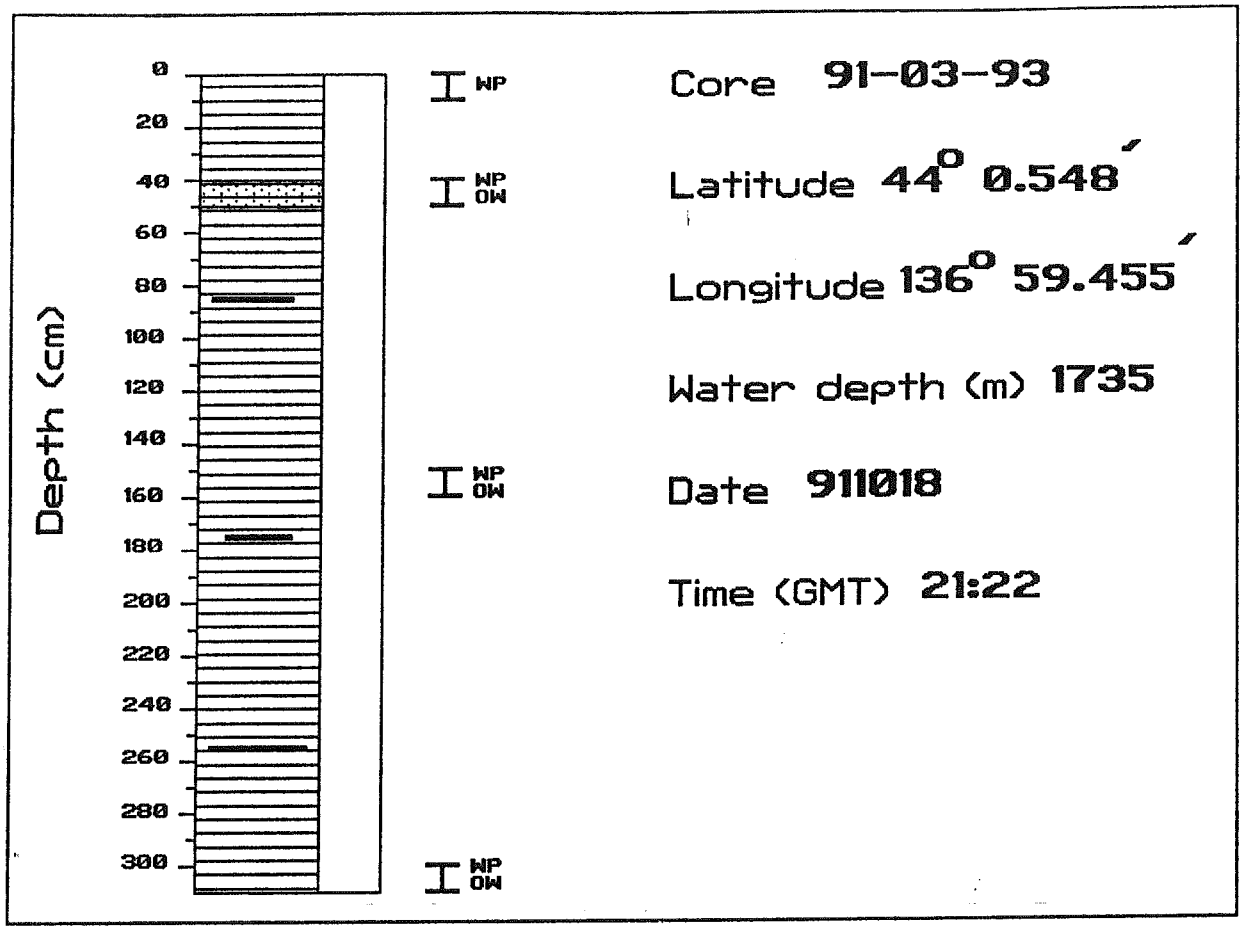
Latitude **44° 0.933′**

Longitude **136° 58.244′**

Water depth (m) **1878**

Date **911018**

Time (GMT) **07:45**


Depth (cm)
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260
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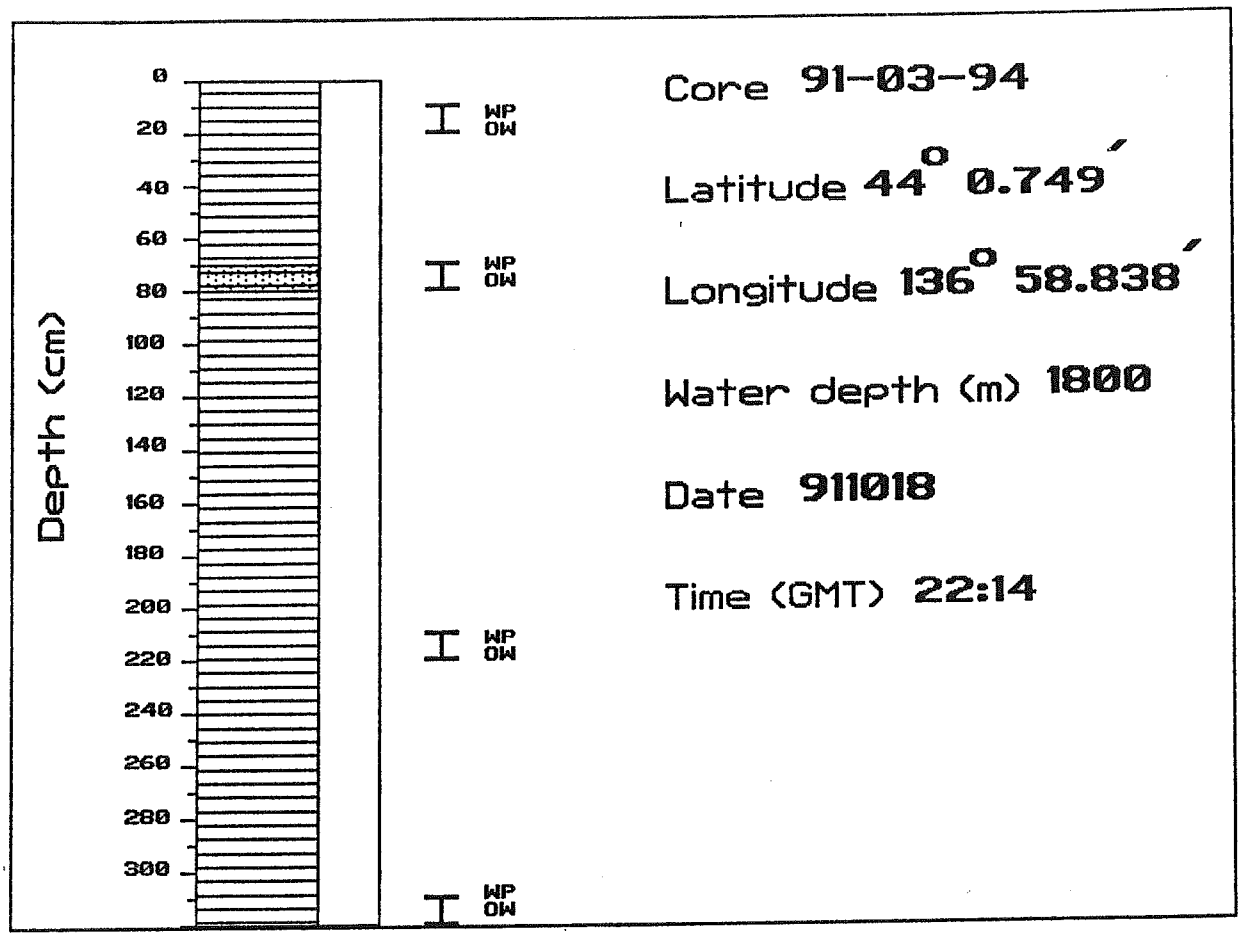
300
WP
WP
OW
WP
OW
WP
OW
Core 91-03-93
Latitude 44° 0.548'
Longitude 136° 59.455'
Water depth (m) 1735
Date 911018
Time (GMT) 21:22


Depth (cm)
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180
200
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240
260
280
300
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OW
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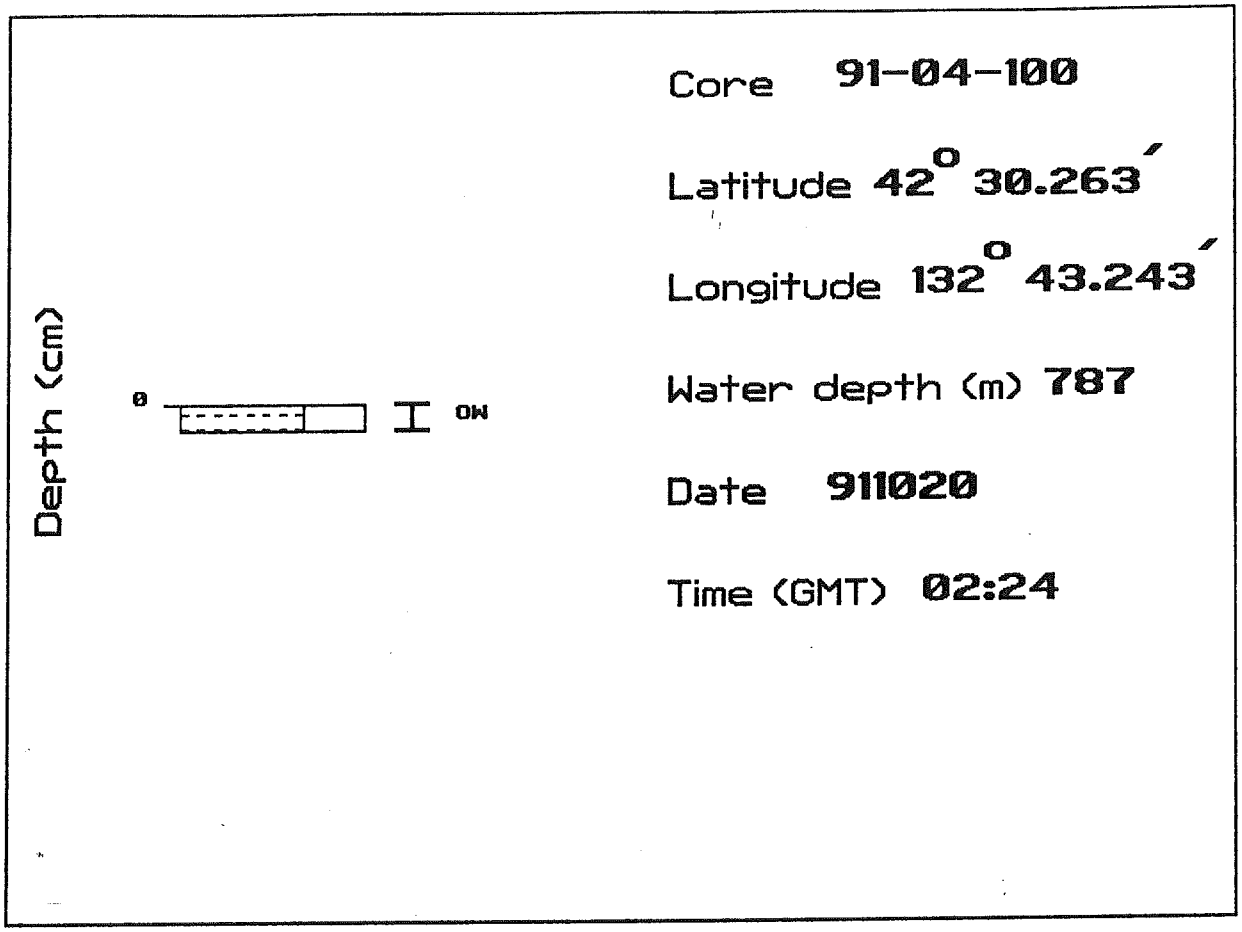
OW
WP
OW
WP
OW
Core 91-03-94
Latitude 44° 0.749′
Longitude 136° 58.838′
Water depth (m) 1800
Date 911018
Time (GMT) 22:14


Depth (cm)
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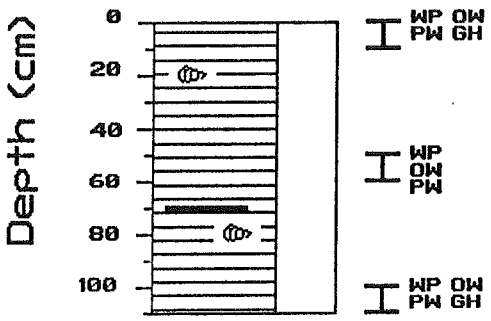
Core 91-04-100
Latitude 42° 30.263'
Longitude 132° 43.243'
Water depth (m) 787
Date 911020
Time (GMT) 02:24



Core 91-04-101

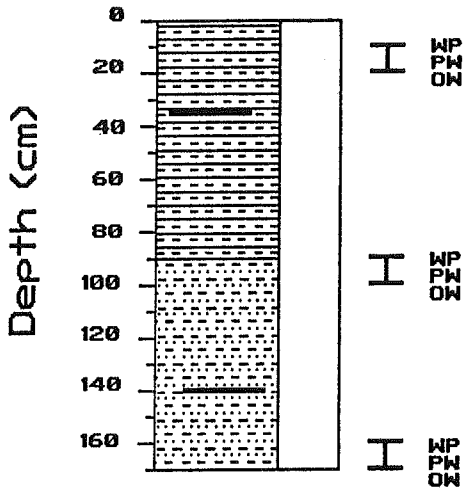
Latitude 42°29.825′

Longitude 132° 43.363′

Water depth (m) 868

Date 911020

Time (GMT) 03:22



Core 91-04-102

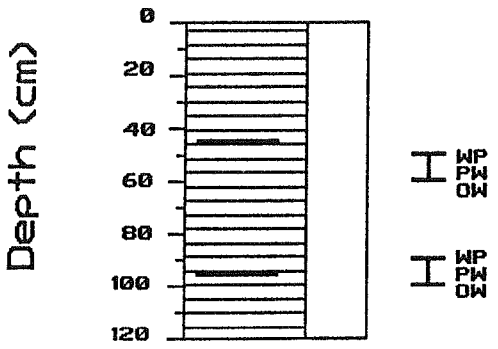
Latitude 42° 30.262′

Longitude 132° 43.234′

Water depth (m) 780

Date 911020

Time (GMT) 05:17



Core 91-04-103

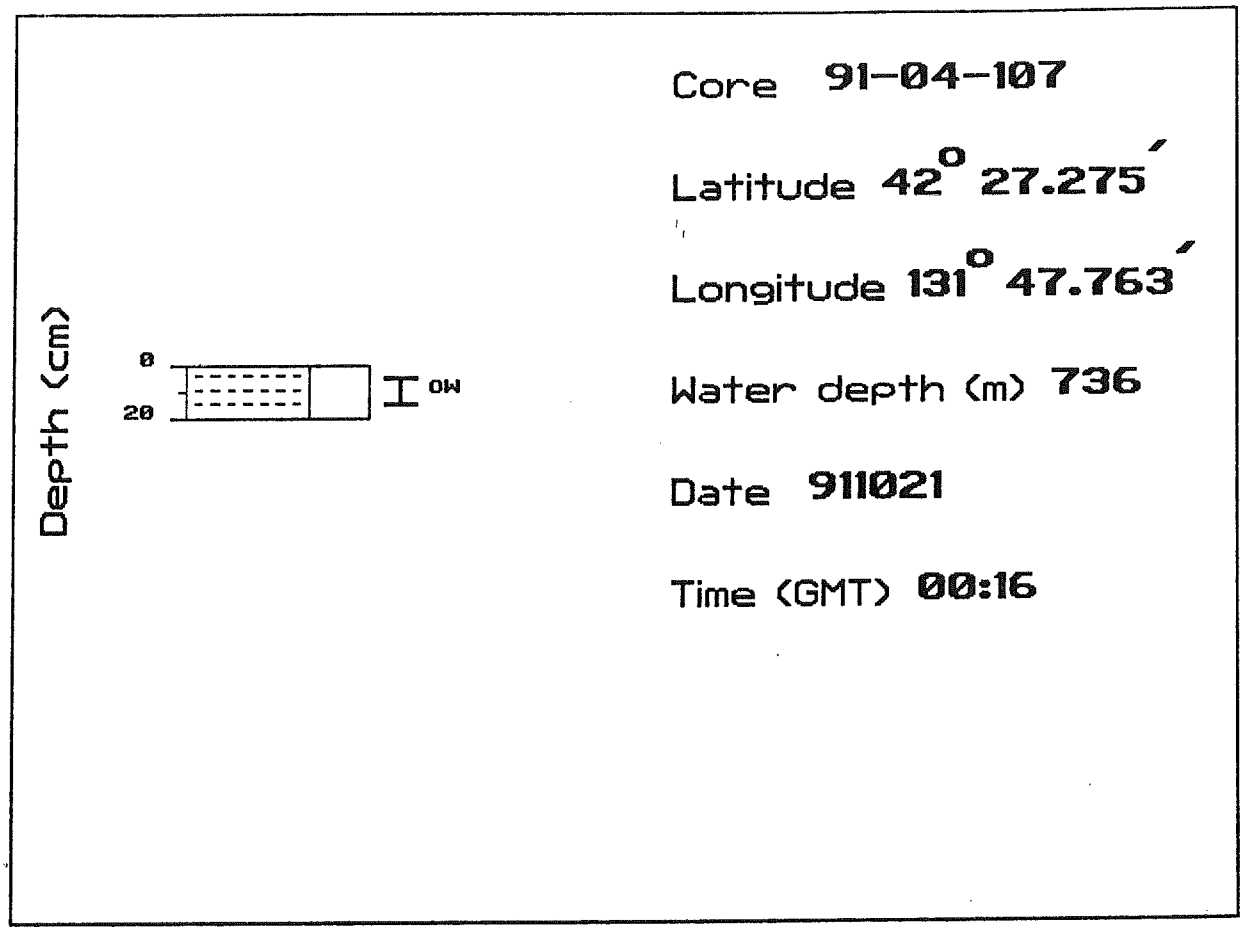
Latitude 42° 29.966′

Longitude 132° 43.433′

Water depth (m) 723

Date 911020

Time (GMT) 06:04


Depth (cm)
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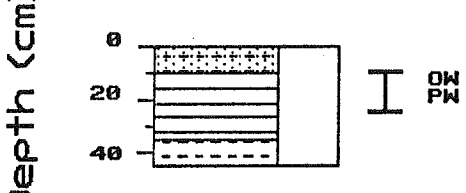
20
OW
Core 91-04-107
Latitude 42° 27.275'
Longitude 131° 47.763'
Water depth (m) 736
Date 911021
Time (GMT) 00:16



Core 91-04-108

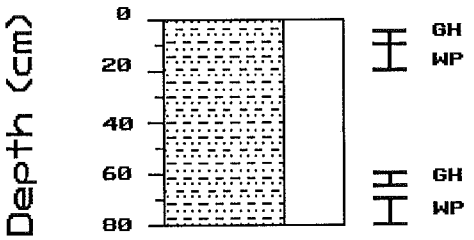
Latitude 42° 26.121′

Longitude 131° 47.766′

Water depth (m) 860

Date 911021

Time (GMT) 01:31



Core 91-04-109

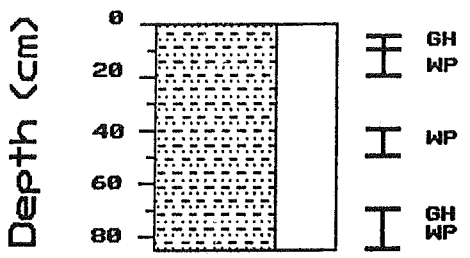
Latitude 42° 25.576′

Longitude 131° 47.115′

Water depth (m) 1015

Date 911021

Time (GMT) 03:02



Core 91-04-110

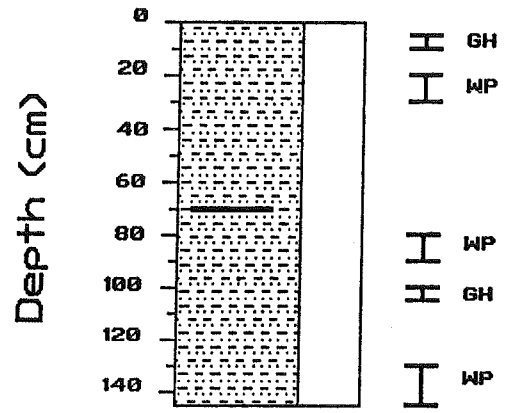
Latitude 42° 25.602′

Longitude 131° 47.767′

Water depth (m) 900

Date 911021

Time (GMT) 03:52



Core **91-04-111**

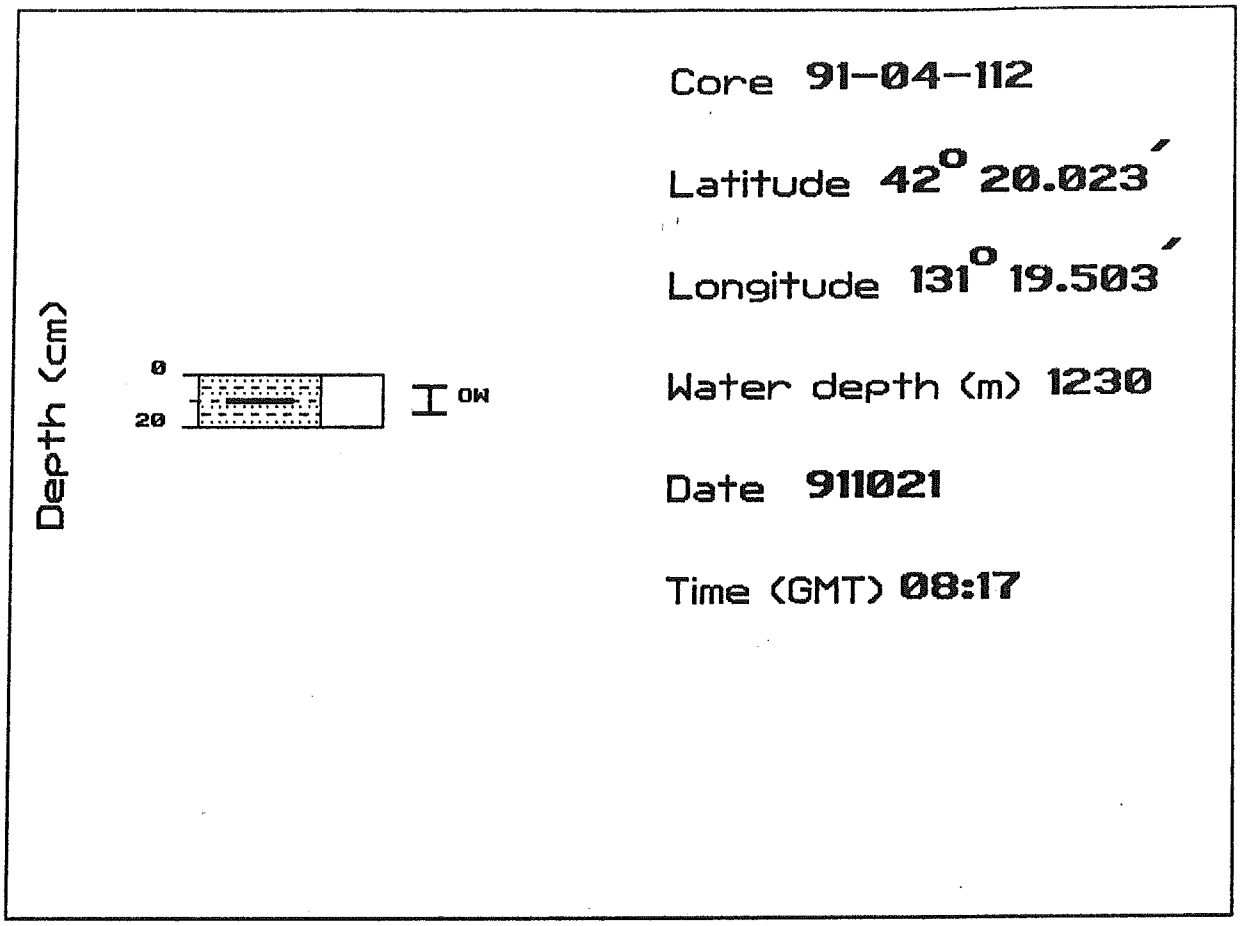
Latitude **42° 25.214′**

Longitude **131° 47.625′**

Water depth (m) **1150**

Date **911021**

Time (GMT) **05:07**


Depth (cm)
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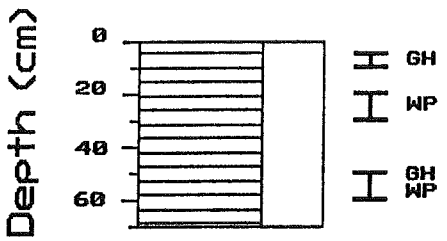
20
OW
Core 91-04-112
Latitude 42° 20.023'
Longitude 131° 19.503'
Water depth (m) 1230
Date 911021
Time (GMT) 08:17



Core **91-04-113**

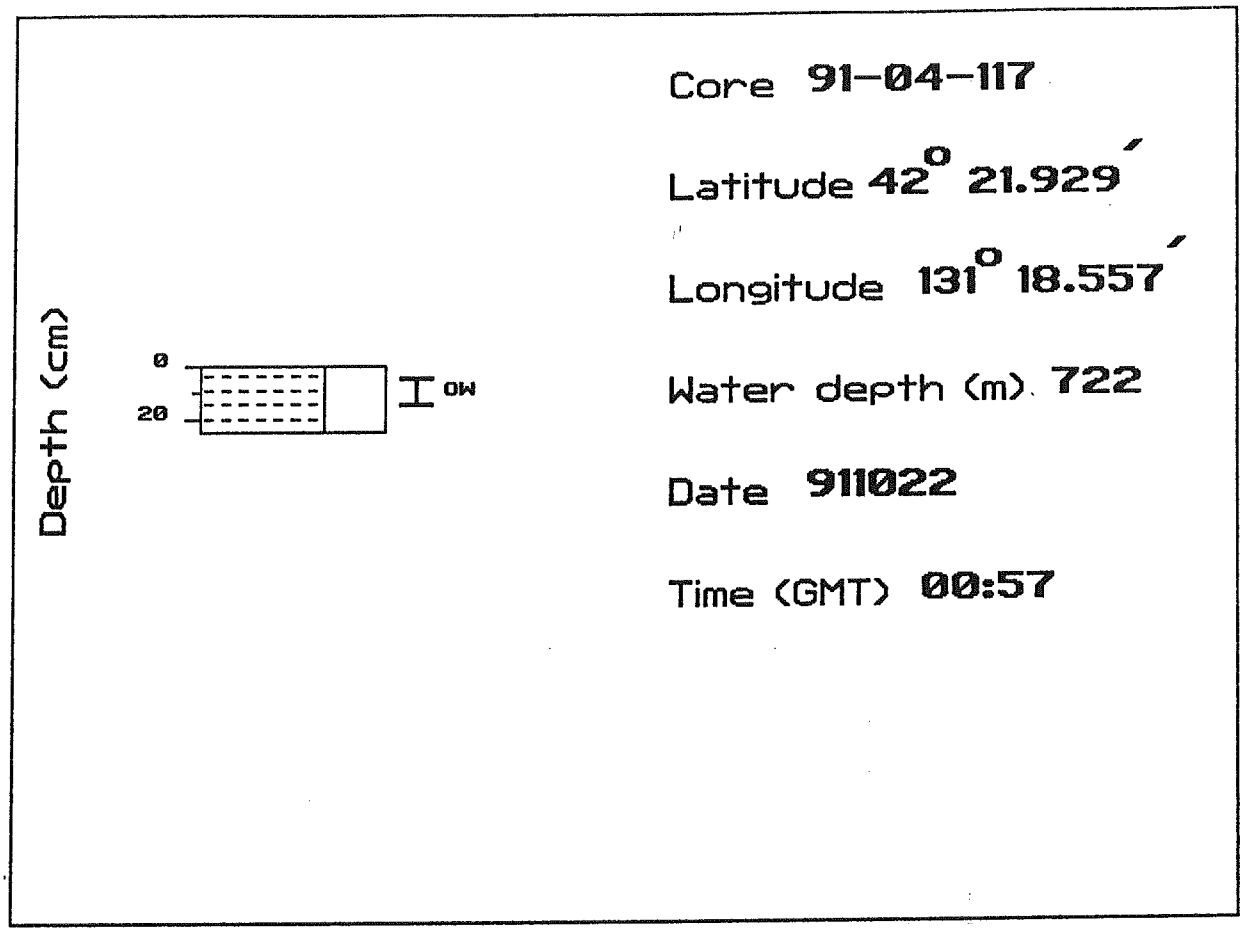
Latitude **42° 20.958′**

Longitude **131° 19.920′**

Water depth (m) **863**

Date **911021**

Time (GMT) **09:04**


Depth (cm)
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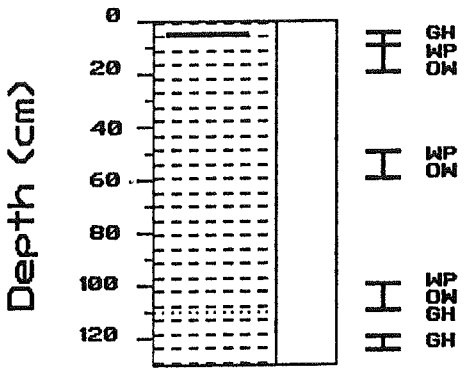
20
OW
Core 91-04-117
Latitude 42° 21.929'
Longitude 131° 18.557'
Water depth (m) 722
Date 911022
Time (GMT) 00:57



Core 91-04-118

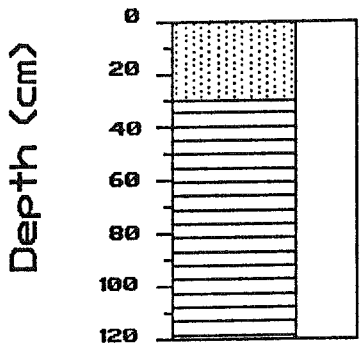
Latitude 42° 23.128′

Longitude 131° 17.885′

Water depth (m) 592

Date 911022

Time (GMT) 01:52



Core 91-04-119

Latitude 42° 24.341′

Longitude 131° 17.687′

Water depth (m) 397

Date 911022

Time (GMT) 02:35

Legend


Sand


Silt


Clay


Sandy silt


Clayey silt


Carbonate concretion


Shells


Gas disturbed


Hydrate bearing


Hydrotroillite


Sampling interval

Sample Types

CC – carbonate concretion

GC – gas hydrate in pressure container

GG – gas from gas hydrate

GH – gas from sediments (headspace)

GK – gas from sediments (vacutainer)

GW – gas from bottom water

PW – Density / water content

SH – shell

WG – water from melted hydrate

WM – bottom water

WP – pore water, total and organic carbon, etc.

APPENDIX 2 - Station Locations and Onboard Analytical Results

Notes:

1. Station identification consists of a 3 component number, e.g. 91 02 56, representing the year, the study area (1 through 4), and the station number.

2. Dates are tabulated in year-month-day format to allow them to be used as a single number in numerical operations in the spreadsheet. Times are reported in GMT (hours.minutes) to enable one number to represent time.

3. The pore water table contains a column labelled "stored - days", which is an approximation of the number of days that lapsed between core collection and pore water extraction. This allows for statistical testing of the effect of sample storage on analytical results.

4. Gas results are presented as microlitres of gas (STP) in one litre of bottom water or wet sediment (ppmv in 'wet' sample). Gas concentration ratios are calculated and labelled as methane/ethane, ethane/ethene and propane/propene.

LOCATIONS AREA 1

STATION	WATER DEPTH m	LATITUDE		LONGITUDE		DATE yrmoda	TIME GMT
910101	800	50	30.912	155	18.241	911002	8.20
910102	796	50	30.975	155	18.310	911002	12.34
910103	800	50	30.830	155	18.272	911002	14.06
910104	794	50	30.911	155	18.317	911002	15.55
910105	798	50	30.905	155	18.286	911003	6.26
910106	798	50	30.868	155	18.298	911003	7.55
910107	802	50	30.909	155	18.171	911003	9.10
910108	802	50	30.841	155	18.249	911003	10.31
910109	802	50	30.996	155	18.129	911003	12.10
910110	800	50	30.893	155	18.217	911003	14.16
910111	795	50	31.208	155	18.788	911003	15.23
910112	814	50	30.711	155	17.710	911003	17.50
910113	800	50	30.822	155	18.331	911003	20.33
910115	795	50	30.883	155	18.691	911004	2.49
910116	798	50	30.859	155	18.317	911004	4.02
910117	800	50	30.838	155	18.773	911004	4.52
910118	804	50	31.005	155	18.165	911004	5.47
910119	800	50	30.929	155	18.210	911004	6.46
910120	800	50	30.898	155	18.244	911004	7.42
910121	800	50	30.927	155	18.222	911004	8.37
910122	800	50	30.918	155	18.253	911004	10.46
910123	800	50	30.884	155	18.237	911004	11.47
910124	790	50	31.019	155	18.602	911004	13.55
910125	790	50	30.945	155	18.631	911004	16.15
910126	798	50	30.899	155	18.245	911004	18.42
910127	816	50	30.737	155	17.939	911004	21.50
910128	800	50	30.877	155	18.235	911004	23.36
910129	802	50	30.854	155	18.242	911005	.56
910130	795	50	30.900	155	18.323	911005	2.47
910131	802	50	30.854	155	18.228	911005	3.39
910132	796	50	30.926	155	18.325	911005	7.52
910133	798	50	31.025	155	18.337	911005	8.51

LOCATIONS AREA 2

STATION	WATER DEPTH m	LATITUDE		LONGITUDE		DATE yrmoda	TIME GMT
910234	732	54	26.695	144	5.765	911007	15.11
910235	728	54	26.435	144	5.616	911007	16.53
910236	721	54	26.698	144	5.234	911007	18.20
910237	709	54	26.781	144	4.892	911007	19.53
910238	700	54	26.671	144	4.496	911007	21.31
910239	719	54	26.856	144	5.002	911007	22.28
910240	708	54	26.738	144	4.911	911007	23.35
910241	708	54	26.777	144	4.859	911008	.42
910242	710	54	26.773	144	5.013	911008	2.23
910243	725	54	26.628	144	5.384	911008	3.20
910244	708	54	26.790	144	4.916	911008	4.47
910245	701	54	26.752	144	4.563	911008	6.41
910246	718	54	26.773	144	5.170	911008	7.56
910247	708	54	26.769	144	4.845	911008	10.14
910248	708	54	26.771	144	4.933	911008	11.31
910249	612	53	23.152	144	24.254	911010	21.27
910250	635	53	22.601	144	25.234	911010	22.44
910251	643	53	22.720	144	25.548	911011	.03
910252	642	53	22.728	144	25.497	911011	1.22
910253	646	53	22.701	144	25.352	911011	4.13
910254	645	53	22.765	144	25.480	911011	5.27
910255	642	53	22.740	144	25.509	911011	6.42
910256	645	53	22.764	144	25.442	911011	7.39
910257	628	53	22.387	144	25.176	911011	8.20
910258	627	53	22.425	144	24.825	911011	9.33
910259	620	53	21.936	144	24.692	911011	10.43
910260	664	53	22.257	144	26.635	911011	11.50
910261	658	53	22.859	144	26.281	911011	13.27
910262	657	53	22.862	144	26.259	911011	14.59
910263	642	53	22.714	144	25.452	911011	16.22
910264	728	53	22.322	144	25.029	911011	17.38
910265	611	53	21.950	144	24.449	911011	18.54
910266	641	53	22.680	144	25.505	911011	19.43
910267	601	53	10.341	144	25.847	911012	1.00
910268	817	52	48.776	144	44.584	911012	5.31
910269	822	52	48.782	144	44.990	911012	7.04
910270	833	52	38.018	144	52.941	911012	9.35

LOCATIONS AREA 3

STATION	WATER DEPTH m	LATITUDE		LONGITUDE		DATE yrmoda	TIME GMT
910371	599	44	13.497	136	25.859	911016	7.44
910372	590	44	13.481	136	25.824	911016	8.52
910373	600	44	13.600	136	25.907	911016	12.10
910374	610	44	13.671	136	26.034	911016	13.40
910375	595	44	13.841	136	25.869	911016	14.58
910376	650	44	12.981	136	25.527	911016	16.13
910377	685	44	12.736	136	26.301	911016	17.23
910378	885	44	9.647	136	32.584	911016	19.11
910379	888	44	9.463	136	32.750	911016	20.29
910380	960	44	8.245	136	34.746	911016	21.25
910381	948	44	8.559	136	34.117	911016	21.56
910382	708	44	12.322	136	26.433	911016	23.47
910383	900	44	9.303	136	33.189	911017	.55
910384	700	44	12.191	136	26.902	911017	2.46
910385	962	44	8.228	136	34.907	911017	4.37
910386	1190	44	8.208	136	45.462	911018	.27
910387	1565	44	3.520	136	53.810	911018	2.22
910388	1500	44	4.152	136	53.987	911018	3.48
910389	1815	44	1.511	136	57.749	911018	5.20
910390	1825	44	1.298	136	58.570	911018	6.35
910391	1878	44	.933	136	58.244	911018	7.45
910392	1840	44	1.166	136	58.516	911018	9.45
910393	1735	44	.548	136	59.455	911018	21.22
910394	1800	44	.749	136	58.838	911018	22.14
910395	1853	44	1.231	136	57.618	911019	.24
910396	1845	44	.009	137	.135	911019	1.40
910397	2380	43	56.212	137	6.039	911019	3.16
910398	2420	43	55.905	137	6.303	911019	4.51

PORE WATER RESULTS AREA 1

STATION	ID NUM	TOP INT cm	BOT INT cm	Eh mv	pH	Si mM	SO_4 mM	NH_4 mM	Cl g/L	STORED days
910101	105201	10	25	195	7.10	.87	28	.23	19.0	2
910101	105202	80	95	175	7.40	.68	28	.26	19.0	2
910101	105203	140	155	156	7.82	.68	28	.51	18.5	2
910106	105209	10	20	160	8.46	.87	28	.47	19.0	1
910106	105210	40	50	160	8.20	.70	28	.43	18.2	1
910106	105211	100	110	150	8.40	.75	28	.43	19.0	1
910107	105212	30	80	-340	8.05	.72	18	.85	15.6	1
910110	105213	15	40	172	7.60	.72	28	.60	19.2	2
910110	105214	65	85	138	8.39	.63	28	.96	18.5	2
910110	105215	85	115	130	8.78	.60	28	1.00	19.0	2
910117	105216	20	30	165	7.75	.80	28	.50	18.8	4
910117	105217	90	100	175	8.16	.80	28	1.10	19.0	4
910117	105218	140	150	180	8.06	.74	28	1.20	19.0	4
910118	105219	50	60	200	7.30	.82	28	.50	19.0	4
910118	105220	110	120	164	7.75	.80	21	.85	18.8	4
910118	105221	180	205	164	7.84	.68	12	1.40	18.6	4
910119	105222	110	120	100	8.62	.80	15	1.10	19.0	1
910119	105223	140	150	100	8.62	.71	9	.87	17.3	1
910119	105224	230	240	120	8.58	.77	3	1.30	19.0	1
910123	105228	30	80	-50	8.75	.74	12	.36	15.6	1
910128	105225	50	60	143	8.60	.81	28	.59	19.3	3
910128	105226	100	110	124	8.44	.73	28	.74	18.1	3
910128	105227	180	190	118	8.58	.63	16	.78	17.9	3
910133	105229	50	60	158	8.10	.72	23	.75	18.6	1
910133	105230	140	150	142	8.40	.61	1	1.40	17.3	1
910133	105231	170	180	150	8.36	.76	0	1.60	18.3	1

PORE WATER RESULTS AREA 2

STATION	ID NUM	TOP INT cm	BOT INT cm	Eh mv	pH	Si mM	SO_4 mM	NH_4 mM	Cl g/L	STORED days
910239	105232	0	10	160	7.25	.38	28	.49	17.9	2
910239	105233	10	20	140	8.15	.43	28	.54	18.6	2
910240	105235	20	45	-350	8.15	1.00	0	.29	18.6	1
910240	105236	80	90	-340	8.09	1.10	0	.35	19.0	1
910240	105237	95	195	-387	8.00	.73	0	.55	12.6	1
910241	105238	20	30	80	7.92	.64	26	.14	19.0	0
910241	105239	110	120	130	8.55	.84	0	.44	18.6	0
910241	105240	120	140	-280	8.06	.47	0	.61	7.0	0
910242	105247	100	120	-330	8.32	.44	4	.24	11.2	0
910243	105241	50	60	-120	7.88	.90	23	1.10	18.1	1
910243	105242	170	180	-50	7.97	.86	0	2.80	18.3	1
910243	105243	230	240	80	7.93	.90	0	3.40	18.0	1
910244	105244	20	30	-348	8.25	.94	0	.46	17.8	0
910244	105245	60	70	-340	8.22	.90	0	.46	18.1	0
910244	105246	70	160	-290	8.20	1.00	0	2.00	15.9	2
910251	105248	110	125	70	8.28	.73	12	.70	19.7	0
910251	105249	170	190	75	7.85	.69	0	1.10	20.0	0
910251	105250	240	250	110	7.85	.60	0	1.50	22.5	0
910252	105251	110	120	50	8.10	.55	28	.56	19.7	1
910252	105252	150	160	140	7.84	.43	18	1.10	20.0	1
910252	105253	250	260	136	7.63	.49	0	1.60	19.9	1
910253	105254	50	60	130	7.10	.51	28	.26	19.0	1
910253	105255	110	120	134	7.52	.62	28	.61	18.9	1
910253	105256	180	200	140	7.40	.72	0	1.90	18.2	1
910254	105259	50	60	196	7.75	.59	26	.22	19.0	2
910254	105258	170	180	145	7.67	.80	19	1.10	19.2	2
910254	105257	210	220	156	7.75	.64	11	1.20	19.0	2
910254	105260	310	320	156	7.25	.70	0	1.40	19.0	2
910256	105261	50	60	146	7.68	.54	28	.26	18.8	2
910256	105262	110	120	156	7.50	.52	28	.41	19.0	2
910256	105263	250	265	143	7.62	.55	24	.91	20.3	2
910257	105264	60	70	175	7.64	.49	0	.63	19.0	2
910257	105265	160	170	146	7.68	.52	0	1.00	19.3	2
910257	105266	205	215	125	7.68	.43	0	1.30	21.2	2
910267	105267	20	30	176	7.43	.70	28	.42	19.3	2
910267	105268	140	150	154	7.46	.81	17	1.20	19.9	2
910267	105269	240	250	144	7.64	.87	7	1.40	19.5	2
910267	105270	290	300	156	7.70	.90	0	1.80	20.6	2
910269	105271	10	20	136	7.38	.87	28	.42	20.7	2
910269	105272	90	100	136	7.50	.86	28	1.20	19.9	2
910269	105273	200	210	152	7.40	.98	19	2.00	20.7	2
910270	105274	20	30	180	7.38	.87	28	.78	20.0	2
910270	105275	120	130	171	7.44	.87	28	1.30	19.6	2
910270	105276	220	235	152	7.56	.90	18	1.80	20.0	2

PORE WATER RESULTS AREA 3

STATION	ID NUM	TOP INT cm	BOT INT cm	Eh mv	pH	Si mM	SO_4 mM	NH_4 mM	Cl g/L	STORED days
910373	105277	50	60	258	8.02	.58	28	.13	19.2	2
910373	105278	150	160	254	7.94	.43	28	.19	19.0	2
910373	105279	260	270	252	8.33	.34	28	1.50	18.2	2
910383	105283	20	30	263	8.05	.36	28	.35	19.0	1
910383	105280	120	130	272	7.98	.47	28	.47	19.5	1
910383	105281	220	230	272	7.96	.45	28	.49	19.2	1
910383	105282	310	320	266	7.95	.49	21	.67	19.3	1
910384	105284	20	30	266	7.79	.47	28	.01	19.0	1
910384	105285	180	190	264	7.88	.48	24	.43	18.5	1
910384	105286	270	280	256	7.87	.47	21	.51	18.0	1
910385	105287	20	30	264	7.71	.40	28	.24	19.2	1
910385	105288	160	170	254	7.93	.50	26	.43	19.0	1
910385	105289	250	260	254	8.06	.60	22	.72	19.0	1
910386	105290	20	30	156	7.52	.53	28	.35	18.2	1
910386	105291	140	150	144	8.09	.62	28	.54	18.8	1
910386	105292	200	210	145	8.16	.47	28	.86	18.2	2
910386	105293	220	300	167	8.21	.40	22	1.00	19.3	2
910388	105294	20	30	262	7.72	.68	28	.21	19.6	1
910388	105295	60	70	262	7.95	.51	28	.36	19.6	1
910388	105296	130	140	135	8.18	.42	28	.45	18.2	1
910389	105297	30	40	260	7.90	.37	28	.26	19.5	1
910389	105298	150	160	260	8.07	.37	28	.36	18.8	1
910389	105299	240	250	150	7.86	.34	28	.67	19.3	1
910390	105300	0	10	170	7.75	.51	28	.48	18.8	2
910390	105301	30	40	173	7.56	.27	28	.26	19.0	3
910390	105302	50	60	184	7.40	.38	28	.93	18.5	3
910393	105303	0	10	165	7.50	.41	28	.82	18.6	3
910393	105304	40	50	200	7.75	.29	28	.51	18.5	3
910393	105305	150	160	194	7.70	.25	25	.52	18.2	3
910393	105306	300	310	177	7.78	.34	15	.71	17.9	3
910394	105307	10	20	216	7.28	.46	28	.52	19.2	5
910394	105308	70	80	203	7.37	.33	21	.56	19.3	5
910394	105309	210	220	198	7.58	.57	14	.56	19.5	5
910394	105310	310	320	194	7.44	.55	14	.88	18.8	5
910395	105311	50	60	175	7.90	.33	28	.48	18.6	3
910395	105312	150	160	162	8.00	.39	28	.38	19.2	3
910395	105313	250	260	155	7.68	.23	28	.67	19.5	3
910396	105314	20	30	165	7.64	.56	28	.37	18.5	2
910396	105315	150	160	180	7.80	.31	28	.38	18.8	2
910396	105316	250	260	174	7.46	.31	28	.28	18.6	2

HEADSPACE GAS RESULTS AREA 1

STATION	TOP INT cm	BOT INT cm	Methane	Ethane	Ethene	Propane	Propene	Ratio methane/ethane	Ratio E-ane/E-ene	Ratio P-ane/P-ene	CO_2 ppmv in wet sediment
			ppmv in wet sediment								
910101	20	25	9.1	.18	.07	.12	.05	51	2.6	2.4	
910101	142	146	652.0	.61		.17	.05	1069		3.4	
910105	40	43	1220.0	3.01	.87	.17	.05	405	3.5	3.4	
910106	39	44	1470.0	2.61	1.00	.18		563	2.6		
910106	95	100	474.0	1.67	3.63	.10		284	.5		
910109	40	44	2.6	.08	.12	.05	.05	33	.7	1.0	
910118	40	45	980.0	.05	.06	.05		19600	.8		
910118	150	155	59.9	.11	.09	.07	.05	545	1.2	1.4	
910119	40	45	4600.0			.17					4500
910119	150	155	718.0	1.21	.05	.05	.05	593	24.2	1.0	
910131	40	44	73.1	.35	.10	.15	.07	209	3.5	2.1	
910131	100	105	237.0	1.71	.09	.13	.05	139	19.0	2.6	
910133	4	7	1620.0	.13	.14	.10	.06	12462	.9	1.7	
910133	40	45	94.8	.35	.13	.15	.07	271	2.7	2.1	
910133	100	105	2.7		.11	.11	.05			2.2	102000
910133	175	180	72100.0			.25					

HEADSPACE GAS RESULTS AREA 2

STATION	TOP INT cm	BOT INT cm	Methane	Ethane	Ethene	Propane	Propene	RATIO methane/ethane	RATIO E-ane/E-ene	RATIO P-ane/P-ene	CO_2 ppmv in wet sediment
			----------ppmv in wet sediment-------								
910239	25	27	1000.0			.05					
910243	40	45	35.5	.15	.17	.11		237	.9		
910243	100	105	77.4	.05	.05	.04		1548	1.0		
910243	200	205	3450.0			.05					
910251	7	11	123.0	.27	.21	.28	.10	456	1.3	2.8	
910251	40	45	128.0	.39	.21	.29	.05	328	1.9	5.8	
910251	100	105	3020.0			.46	.06			7.7	
910251	200	205	24600.0			.97	.06			16.2	6400
910251	250	255	19800.0			1.19	.05			23.8	27000
910252	120	125	121.0	.35	.19	.18		346	1.8		
910253	5	10	9.2	.09	.10	.10		102	.9		
910253	100	105	239.0	.16	.15	.15	.05	1494	1.1	3.0	
910253	175	180	41800.0		.54	.54	.07			7.7	40000
910254	100	105	100.0	.74	.13	.11	.05	135	5.7	2.2	
910254	300	305	38000.0			.44	.05			8.8	90400
910256	5	10	13.1	.22	.16	.22	.05	60	1.4	4.4	
910256	100	105	231.0	1.00	.12	.20	.05	231	8.3	4.0	
910256	200	205	173.0	2.25	.08	.15		77	28.1		
910257	5	10	181.0	.75	.07	.08	.05	241	10.7	1.6	
910257	100	105	51800.0			2.44					119000
910257	200	205	21600.0			1.11	.05			22.2	11000
910269	5	10	21.6	.05	.07	.05		432	.7		
910269	100	105	135.0	.21	.07	.07		643	3.0	1.4	
910269	200	205	462.0	.41	.16	.10		1127	2.6	2.0	
910270	5	10	34.7	.29	.30	.29	.08	120	1.0	3.6	
910270	100	105	165.5	.15	.26	.26	.06	1103	.6	4.3	
910270	200	205	337.2	.36	.19	.17	.06	937	1.9	2.8	

HEADSPACE GAS RESULTS AREA 3

STATION	TOP INT cm	BOT INT cm	Methane	Ethane	Ethene	Propane	Propene	RATIO methane/ethane	RATIO E-ane/E-ene	RATIO P-ane/P-ene	CO_2 ppmv in wet sediment
			ppmv in wet sediment								
910373	5	10	2.0	.08	.28	.07	.08	25	.3	.9	
910373	100	105	2.7	.05	.19	.05	.05	54	.3	1.0	
910373	200	205	3.8	.08	.17	.07	.05	48	.5	1.4	
910383	25	30	4.8	.12	.19	.11	.05	40	.6	2.2	
910383	100	105	13.8	.20	.13	.08	.05	69	1.5	1.6	
910383	200	205	34.7	.40	.10	.09	.05	87	4.0	1.8	
910383	300	305	62.4	.96	.11	.11	.06	65	8.7	1.8	
910386	5	10	3.9	.05	.19	.05		78	.3		
910386	100	105	14.1	.12	.28	.10	.05	118	.4	2.0	
910386	200	205	33.1	.38	.23	.12	.05	87	1.7	2.4	
910386	290	295	6.3	.88	.12	.10	.05	7	7.3	2.0	
910388	5	10	5.0	.17	.28	.14	.05	29	.6	2.8	
910388	100	105	16.6	.32	.34	.19	.05	52	.9	3.8	
910388	170	175	35.4	.38	.14	.09	.05	93	2.7	1.8	
910389	5	10	1.4	.05	.05	.05	.05	28	1.0	1.0	
910389	100	105	6.9	.19	.23	.09	.05	36	.8	1.8	
910389	200	205	7.4	.15	.14	.05	.05	49	1.1	1.0	
910391	5	10	1.1	.05	.05	.05		22	1.0		
910391	95	100	1.9	.04	.15	.06	.05	48	.3	1.2	

HEADSPACE GAS RESULTS AREA 4

STATION	TOP INT cm	BOT INT cm	Methane	Ethane	Ethene	Propane	Propene	RATIO methane/ethane	RATIO E-ane/E-ene	RATIO P-ane/P-ene	CO_2 ppmv in wet sediment
			ppmv in wet sediment								
9104101	0	5	1.6	.07	.15	.05	.05	23	.5	1.0	
9104101	100	105	1.7	.05	.06			43	.7		
9104102	5	10	1.9	.05	.14	.05		48	.3		
9104102	100	105	3.1	.05	.09	.05		62	.6		
9104102	155	160	3.1	.24	.05	.05		13	4.8		
9104103	5	10	1.4	.08	.14	.06		18	.6		
9104103	100	105	1.7	.08	.08	.06		21	1.0		
9104109	5	10	1.8	.10	.09	.09	.05	18	1.1	1.8	
9104109	60	70	9.2	.15	.06	.05	.05	61	2.5	1.0	
9104110	5	10	1.7	.07	.15	.09	.05	24	.5	1.8	
9104110	80	85	2.9	.05	.09	.08	.05	58	.6	1.6	
9104111	5	10	2.1	.05	.08	.05	.05	70	.4	1.0	
9104111	100	105	10.5	.08	.09	.07	.05	131	.9	1.4	
9104111	140	145	11.2	.13	.08	.05		86	1.6		
9104113	5	10	4.1	.18	.21	.17	.07	23	.9	2.4	
9104113	50	55	24.6	.09	.08	.05		273	1.1		
9104118	5	10	3.7	.05	.10	.05		74	.5		
9104118	100	105	10.8	.08	.05	.09		135	1.6		
9104118	120	125	11.0	.10	.08	.10		110	1.3		

BOTTOM WATER RESULTS AREA 1

STATION	WATER DEPTH m	Eh mv	pH	Si mM	SO_4 mM	NH_4 mM	Cl g/L	He	Methane	Ethane	Ethene	Propane	Propene	CO_2	Temp °C
								----------	ppmv in seawater						
910111	795	118	6.58	.17	28	.02	18.9		3.00	.003	.007			1800	2.28
910112	814	118	7.15	.15	28	.05	18.6		3.00	.003	.004	.003	.003	2100	2.31
910113	800			.14	28	.03	19.0		2.80	.003	.005			3000	2.20
910118	804	151	7.80	.04	28	.01	18.9								
910121	800	160	7.95	.08	28	.01	18.9								
910122	800	160	8.00	.04	28	.01	18.6								
910128	800	160	7.95	.06	28	.01	18.5								
910132	796	168	7.72	.13	28	.01	18.6								
910133	798	173	7.68	.12	28	.01	18.5								

BOTTOM WATER RESULTS AREA 2

STATION	WATER DEPTH m	Eh mv	pH	Si mM	SO_4 mM	NH_4 mM	Cl g/L	He	Methane	Ethane	Ethene	Propane	Propene	CO_2	Temp °C
								ppmv in seawater							
910235	728	78	7.50	.16	28	.00	18.6	.042	4.25	.003	.003				2.16
910236	721	100	7.57	.13	28	.00	18.6	.054	3.85	.003	.003				2.15
910237	709	98	7.36	.16	28	.02	18.8	.042	282.00					2000	2.09
910238	700	98	7.50	.15	28	.02	18.5	.042	56.00	.003	.070	.003		3000	1.90
910240	708	-320	6.78	.17	28	.04	18.5								
910241	708	-310	6.85	.12	28	.01	18.4								
910242	710	-320	6.78	.54	28	.02	18.5								
910243	725	-130	7.56	.39	28	.01	18.4								
910244	708	-320	6.72	.18	28	.03	18.4								
910249	612	194	6.80	.14	28	.02	19.2		6.70	.010	.040	.003	.003		1.66
910250	635	205	6.80	.14	28	.01	19.3	.061	7.50	.007	.020	.003	.010		1.81
910251	643	238	6.82	.11	28	.07	19.0								
910252	642	210	6.60	.14	28	.03	19.0								
910254	645	200	6.85	.17	28	.03	18.7								
910255	642	200	6.84	.11	28	.00	19.3	.056							
910256	645	210	6.80	.18	28	.00	19.0	.032							
910257	628	180	6.98	.18	28	.04	19.2	.039							
910258	627	230	6.65	.17	28	.00	19.8	.056	8.10	.003	.003				1.94
910259	620	210	7.15	.17	28	.00	20.7	.061	8.80	.003	.003				1.93
910260	664	210	6.82	.17	28	.00	20.9	.056	7.40	.003	.040				2.04
910261	658	200	7.05	.18	28	.04	20.3	.058	11.30	.003	.009				2.06
910267	601	190	6.80	.14	28	.01	20.1								
910268	817	195	6.90	.13	28	.06	20.1								
910269	822	200	7.02	.16	28	.02	20.3	.058							

BOTTOM WATER RESULTS AREA 3

STATION	WATER DEPTH m	Eh mv	pH	Si mM	SO_4 mM	NH_4 mM	Cl g/L	He	Methane	Ethane	Ethene	Propane	Propene	CO_2	Temp °C
									----------ppmv in seawater----------						
910374	610	268	7.40	.08	28	.00	19.3		.40	.004	.007	.005	.003	7500	.31
910375	595	270	7.58	.08	28	.00	19.3	.054	.40	.003	.005	.005	.003	6400	.40
910276	650	270	7.58	.08	28	.00	19.3	.051	.40	.003	.005	.003	.003	6200	.25
910377	655	272	7.62	.10	28	.00	21.8	.054	.35	.003	.004	.003	.003	5700	.19
910378	885	271	7.54	.08	28	.00	19.8	.051	.45	.003	.007	.003	.003	7700	.15
910379	888	282	7.62	.08	28	.00	20.2	.049	.50		.005	.003	.003	9700	.16
910380	960	275	7.62	.07	28	.00	20.5	.047	.80					4000	.15
910381	948	276	7.45	.07	28	.00	20.2	.039	.55	.006	.010	.003	.003	8800	.15
910392	1840								.32	.003	.004				.11

BOTTOM WATER RESULTS AREA 4

STATION	WATER DEPTH m	Eh mv	pH	Si mM	SO_4 mM	NH_4 mM	Cl g/L	He	Methane	Ethane	Ethene	Propane	Propene	CO_2	Temp °C
								----------ppmv in seawater----------							
910499	652	178	6.85	.06	28	.00	19.2								
9104100	787	170	7.15	.04	28	.00	19.6								
9104101	868	165	6.75	.03	28	.00	20.2								
9104102	780	172	7.28	.11	28	.01	19.2								
9104104	768								.40	.003	.010	.003			
9104105	215								.70	.003	.009				
9104106	380								.50	.003	.009	.003			
9104110	900	172	7.36	.03	28	.00	19.5	.047							

DENSITY RESULTS AREA 1

STATION	TOP cm	BOT cm	WATER1 %	WATER2 %	DENSITY g/cc
910101	10	25	53.75		
910101	80	95	40.26		
910101	140	155	44.38		
910102	30	35		41.04	1.47
910102	60	65		43.85	1.66
910105	0	5	50.16		
910105	35	40	39.83		
910106	10	20	52.68	53.76	1.59
910106	40	50	44.74	42.72	1.60
910106	100	110	38.20	44.56	1.55
910109	20	30	46.05	46.69	1.55
910109	70	80	39.30	39.38	1.63
910110	15	40	52.40		
910110	65	85	44.57		
910110	85	115	46.29		
910115	20	30	52.20	51.57	1.50
910115	70	80		48.78	1.52
910116	10	20		51.65	1.50
910116	60	70		53.32	1.50
910117	20	30	50.25		
910117	90	100	43.51		
910117	140	150	41.71		
910119	140	150	41.91		
910119	225	230	40.41		
910128	50	60	50.17	51.60	1.54
910128	100	110	37.68	39.51	1.71
910128	180	190	36.84	38.42	1.70
910131	40	45		50.79	1.52
910131	95	100		37.96	1.69
910132	50	60		41.93	1.57
910132	105	115		37.20	1.75
910132	170	180		37.91	1.68
910133	50	60		49.96	1.54
910133	140	150		41.04	1.54
910133	170	180		41.66	1.50

DENSITY RESULTS AREA 2

STATION	TOP cm	BOT cm	WATER1 %	WATER2 %	DENSITY g/cc
910239	0	10	62.19		
910239	10	20	58.05		
910239	20	30	47.58		
910240	20	45	60.84		
910240	45	55	57.12		
910240	95	195	66.20		
910241	20	30		58.77	1.44
910241	110	120		60.05	1.41
910241	120	140	66.32		
910243	50	60		64.89	1.33
910243	170	180		62.46	1.38
910243	230	240		62.59	1.37
910244	20	30	57.10		
910244	60	70	58.60		
910244	70	160	64.72		
910251	110	125		49.17	1.53
910251	170	190		49.60	1.38
910251	190	200		50.20	1.24
910252	110	120		50.41	1.53
910252	150	160		44.78	1.55
910252	250	260		44.09	1.55
910253	50	60	45.62		
910253	110	115	49.44		
910253	170	180	52.53		
910254	50	60		52.58	1.43
910254	210	220		46.63	1.50
910254	310	320		52.00	1.42
910256	50	60		54.40	1.44
910256	120	130		51.62	1.43
910256	250	265		51.77	1.51
910257	60	70	48.48	46.29	1.54
910257	160	170	41.29	44.26	1.40
910257	205	215	43.41		
910267	20	30	48.52		
910267	140	150	56.83		
910267	240	250	49.29		
910267	290	300	48.84		
910269	10	20		70.93	1.23
910269	90	100		70.54	1.25
910269	200	210		67.96	1.31
910270	20	30		68.96	1.31
910270	120	130		65.99	1.24
910270	220	235		64.44	1.34

DENSITY RESULTS AREA 3

STATION	TOP cm	BOT cm	WATER1 %	WATER2 %	DENSITY g/cc
910373	50	60	41.19	40.25	1.65
910373	150	160	35.91	41.81	1.64
910373	260	270	30.41	33.95	1.71
910383	25	30		50.10	1.54
910383	220	230		52.82	1.49
910383	310	320		55.98	1.42
910384	30	40		37.74	1.78
910384	210	220		45.00	1.63
910384	280	285		53.09	1.58
910385	20	30	51.12		
910385	160	170	52.99		
910385	250	260	52.83		
910386	20	30		63.66	1.32
910386	140	150		60.08	1.34
910386	200	210		48.74	1.45
910386	290	300		52.28	1.44
910388	20	30		61.74	1.36
910388	60	70		52.87	1.49
910388	130	140		49.48	1.53
910389	30	40		49.39	1.49
910389	160	170		57.78	1.43
910389	250	260		53.25	1.48
910390	0	10		56.80	1.45
910390	30	40		49.99	1.48
910390	90	100		65.74	1.27
910391	0	10	44.57		
910391	90	100	65.72		
910393	40	50	46.25		
910393	150	160	57.85		
910393	310	320	56.36		
910394	10	20		41.94	1.60
910394	70	80		40.15	1.58
910394	210	220		61.25	1.33
910394	310	320	53.05		
910395	50	60	45.45		
910395	150	160	56.04		
910395	250	260	52.92		
910396	20	30	59.44		
910396	150	160	52.17		
910396	250	260	49.30		

DENSITY RESULTS AREA 4

STATION	TOP cm	BOT cm	WATER1 %	WATER2 %	DENSITY g/cc
9104100	0	10	25.00		
9104101	0	10		34.74	1.73
9104101	50	60		36.57	1.65
9104101	100	110		33.58	1.68
9104102	10	20		38.57	1.66
9104102	90	100		40.62	1.84
9104102	160	170		30.17	1.87
9104103	50	60		34.93	1.72
9104103	90	100		39.12	1.62
9104107	7	10	23.88		
9104108	10	25		41.13	1.57
9104109	10	20		23.76	1.77
9104109	70	80		39.53	1.72
9104110	10	20	48.24		
9104110	40	50	36.73		
9104110	70	85	29.21		
9104111	20	30	35.84		
9104111	80	90	30.67		
9104111	130	145	32.57		
9104112	5	15	30.77		
9104113	20	25	39.60		
9104113	60	70	25.56		
9104117	0	5	40.95		
9104118	10	20	35.56		
9104118	50	60	37.52		
9104118	100	110	34.80		

MELTED HYDRATE GAS RESULTS

STATION	Methane %	Ethane %	N_2 %	CO_2 %	He ppmv
910107	82.0	.03	17.9	.1	5.0
910240	97.2	.03	2.2	.6	5.0
910242	97.0	.03	.0	3.0	5.0

HEAT FLOW RESULTS

CORE	WATER DEPTH m	BOTTOM TEMP °C	DEPTH INTERVAL m	THERMAL CONDUCTIVITY W/m/°K	TEMP GRADIENT °C/100 m	HEAT FLOW W/m²
910124	790	2.6	0.0-0.5	0.82	5.4	0.044
			0.5-1.0	0.75	11.3	0.085
			1.0-1.5	0.79	12.2	0.096
910125	790	2.5	0.0-0.5	0.74	5.1	0.038
			0.5-1.0	0.77	11.0	0.085
			1.0-1.5	0.77	11.4	0.088
910126	798	2.5	0.0-0.5	0.79	19.1	0.151
910127	816	2.5	0.0-0.5	0.80	9.0	0.072
			0.5-1.0	0.84	13.3	0.112
910234	732	2.3	0.0-0.5	0.69		
			0.5-1.0	0.69		
			1.0-1.5	0.70		
			1.5-2.0	0.71		
910245	701	2.2	0.0-0.5	0.79	2.4	0.019
			0.5-1.0	0.88	2.8	0.025
			1.0-1.5	0.87	3.7	0.032
910246	718	2.2	0.0-0.5	0.69		
			0.5-1.0	0.66		
			1.0-1.5	0.75	2.5	0.019
			1.5-2.0	0.82	2.8	0.023
910247	708	2.2	0.0-0.5	0.69	1.3	0.009
			0.5-1.0	0.61		
			1.0-1.5	0.75		
			1.5-2.0	0.74	1.5	0.011
910248	708	2.2	0.0-0.5	0.72		
			0.5-1.0	0.77		
			1.0-1.5	0.75		
			1.5-2.0	0.74	2.7	0.020
910262	657	3.6	0.5-1.0		0.4	0.003 *
			1.0-1.5		1.6	0.012 *
			1.5-2.0		4.0	0.030 *
			2.0-2.5		3.8	0.029 *
910264	728	3.5	1.5-2.0		3.8	0.029 *
910265	611	3.4	1.5-2.0		0.4	0.003 *
910266	641	3.5	1.0-1.5		1.0	0.008 *

* Heat flow estimated using theoretical thermal conductivity value of 0.75 W/m°K.

PORE WATER RESULTS AREA 4

STATION	ID NUM	TOP INT cm	BOT INT cm	Eh mv	pH	Si mM	SO_4 mM	NH_4 mM	Cl g/L	STORED days
9104100	105317	0	10							
9104101	105318	0	10	200	7.81	.62	28	.24	19.2	1
9104101	105319	50	60	200	7.70	.68	28	.46	18.8	1
9104101	105320	100	110	200	7.75	.54	28	.79	19.2	1
9104102	105321	10	20	170	7.73	.63	28	.51	19.5	0
9104102	105322	90	100	166	7.65	.58	28	.62	18.5	0
9104102	105323	160	170	191	7.72	.49	28	.85	19.3	0
9104103	105324	50	60			.66	28	.89		3
9104103	105325	90	100			.58	28	1.20		3
9104107	105326	0	10							
9104108	105327	10	25							
9104109	105328	10	20			.71	28	.75		2
9104109	105329	70	80			.62	28	1.00		2
9104110	105330	10	20	190	7.50	.69	28	.45	16.4	2
9104110	105331	40	50	195	7.68	.57	28	.63	16.0	2
9104110	105332	70	85	195	7.75	.36	28	.66	18.3	2
9104111	105333	20	30	182	7.58	.55	28	.53	18.3	2
9104111	105334	80	90	183	7.85	.54	28	1.00	17.9	2
9104111	105335	130	140	190	7.85	.54	28	1.10	17.5	2
9104113	105336	20	25	198	7.26	.63	28	.44	18.5	2
9104113	105337	50	60	163	7.82	.53	28	.74	18.2	2
9104118	105338	10	20	218	7.68	.82	28	.45	17.3	1
9104118	105339	50	60	203	7.55	.61	28	.54	18.5	1
9104118	105340	100	110	195	7.50	.60	28	.89	19.4	1

LOCATIONS AREA 4

STATION	WATER DEPTH m	LATITUDE		LONGITUDE		DATE yrmoda	TIME GMT
910499	652	42	30.272	132	43.080	911020	1.11
9104100	787	42	30.263	132	43.243	911020	2.24
9104101	868	42	29.825	132	43.363	911020	3.22
9104102	780	42	30.262	132	43.234	911020	5.17
9104103	723	42	29.966	132	43.433	911020	6.04
9104104	768	42	26.832	131	48.088	911020	14.00
9104105	215	42	27.034	131	49.688	911020	15.57
9104106	380	42	26.966	131	46.151	911020	16.50
9104107	736	42	27.275	131	47.763	911021	.16
9104108	860	42	26.121	131	47.766	911021	1.31
9104109	1015	42	25.576	131	47.115	911021	3.02
9104110	900	42	25.602	131	47.767	911021	3.52
9104111	1150	42	25.214	131	47.625	911021	5.07
9104112	1230	42	20.023	131	19.503	911021	8.17
9104113	863	42	20.958	131	19.920	911021	9.04
9104114	210	42	22.357	131	17.054	911021	12.29
9104115	648	42	22.645	131	18.038	911021	13.29
9104116	330	42	22.529	131	19.268	911021	14.51
9104117	722	42	21.929	131	18.557	911022	.57
9104118	592	42	23.128	131	17.885	911022	1.52
9104119	397	42	24.341	131	17.687	911023	2.35