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Second Report of Joint Russian/German Data Evaluation of Oceanographic Data from ICNAF/NAFO Standard Sections in the Davis Strait/Labrador Region

by

V. A. Borovkov[1] and M. Stein[2]

[1] Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO)
6 Knipovich, Murmansk 183763, Russia

[2] Institut für Seefischerei (ISH), Palmaille 9, D-22767 Hamburg, Germany

A Workshop consisting of V. A. Borovkov (PINRO, Murmansk, Russia), M. Stein (ISH, Hamburg, Germany) and E. Varlamova (PINRO, Murmansk, Interpreter) met at the Knipovich Polar Research Institute of Marine Fisheries and Oceanography (PINRO), Murmansk, Russia during 19-23 February 1996. Terms of references and agenda as formulated during the first meeting in Hamburg, September 1995, formed the basis for the Second Workshop (see Annex I of this report).

Activities between First and Second Workshop

A preliminary analysis of temperature and salinity fields, as performed by V.A. Borovkov, show for an intermediate layer (500 to 1000m) inhomogenous structures. This elucidates the problem of climatic analysis when collating data on a regional basis. Due to the reduced data amount the measurements at Standard Section 8A reveal no clear climatic signals at depths below 1000m.

Further development of retrieval software was performed by M. Stein. The program (Oceanographic Data Information System, ODISys) is able to handle large amounts of data, gives a graphic overview on the regional and depth distribution, and stores the retrieved data by position, time and parameter for further analysis. A transfer software was prepared to handle the World Data Centre A Oceanographic Data as provided in the World Ocean Atlas 1994 on CD-ROM. An analysis was done for the data from the region delimited by: 56°N, 57°N, 50°W, 52°W. This comprises the area of former Ocean Weather Ship Station Bravo (56°30'N, 51°00'W). Deep water horizons were analyzed for the depths of 1000, 1500, 2000, 2500 and 3000m. This formed the basis for further discussions and a thorough analysis of temperature and salinity changes.

Data and Methods

A total of 9884 Russian data sets (vertical profiles of temperature, temperature and salinity) were made available through the assistance of MEDS, Ottawa, Canada. 1848 German data sets were added to the Russian data to form a data base of randomly distributed data and Standard Sections data in the Davis Strait/Labrador Region. The available data cover the period 1958-1995. Major gaps as encountered in the Labrador region for the early 1970's during the First Workshop, could be filled in part.

In addition to the MEDS-data, 5559 Russian data profiles were extracted from the World Ocean Atlas 1994 for WMO-squares 7504, 7505, 7604, 7605. These areas cover most parts of the Labrador Sea (Fig. 1).

A duplicate data control check was performed by a software written

during the workshop by M. Antsiferov, PINRO. This became necessary since the MEDS-data set, the German data set and the World Ocean Atlas 1994 data set contain 2575 equivalent stations for the above annotated WMO-squares.

Preliminary Results

Temperature and Salinity Fields

Objective analyzed temperature and salinity fields for depth layers 500m and 1000m reveal differences between the northern and southern parts of the Labrador Sea. In the northern part and off West Greenland, temperature and salinity fields indicate the existence of Atlantic waters (warmer and more saline than off Labrador). Additionally, the northern part shows larger horizontal gradients than off Labrador (Fig. 2).

Position OWS Bravo

Figs. 3 to 5 contain time series analysis of WOA94 data. It should be mentioned here that the time axis is not continously. Most of the data originate from the 1960s. From 1952 to 1974 there are measurements for each year. Fig. 3 reveals a trend of warming at 1500m depth which abruptly ends around 1972. Salinity at the same depth yields a week increase until 1972 when haline conditions became more diluted. Similar trends are detectable between 500m and 1500m depths.
At 2000m depth (Fig. 4) the warming trend is maintained throughout the period of observation (1928 to 1974). There is **no** abrupt change as given in Fig. 3. Salinity reveals periods of lower salinity (around 34.88 PSU), and of more saline conditions from the 1960s onwards (around 34.93 PSU). Climatic variations at depths greater than those considered here, will be presented by STEIN & BOROVKOV in a separate publication. Fig. 5 displays vertical gradients of temperature (dT/dz) and salinity (dS/dz) for the boundary layers separating water column domains of different climatic regimes. Generally, thermal conditions were homogenous during most of the observation period. However, excursions from dT/dz=0 to negative values (1930s to mid 1960s), and positive values (mid 1960s to beginning of 1970s) indicate the thermal influence on the density stratification: With nearly homogenous haline conditions during the 1960s, the increase in temperature led to stable stratification, developping throughout the second part of the 1960s. It was followed by an abrupt breakdown of gradients (both in temperature and salinity). This points probably at deep reaching convection which was concurrent with extreme winter conditions in the Labrador Sea. Additionally to the extreme winter conditions, a strong salinity anomaly must have been present in upper layers during those years.

Future Activities

The next workshop within the frame of this joint project will be held in Hamburg during 22-26 April 1996. Data which have not yet been implemented to the joint Russian/German database should be prepared for the next workshop meeting to be added to the database. V.A. Borovkov will supply the next workshop with a duplicate checked Russian/German data set. Subject to renovation activities in PINRO bottle-data from the 1970s might be included.

Acknowledgements

The members of the workshop appreciate the administrative help given by

the director of PINRO, Dr. F. M. Troyanovsky, and his staff. We also should like to thank Mrs. and Mr. Nesvetov for arraging a wonderful excursion to the salmon farm in Verchnetulomski.

Abbreviations:

CTD-data	Conductivity, Temperature, Depth-data
ICNAF	International Commission for Northwest Atlantic Fisheries
ISH	Institut für Seefischerei
MEDS	Marine Environmental Data Service
NAFO	Northwest Atlantic Fisheries Organisation
OWS	Ocean Weather Ship
PINRO	Polar Research Institute of Marine Fisheries and Oceanography
WOA94	World Ocean Atlas 1994, CD-ROM Data Sets (supplied by: U.S. Department of Commerce, National Oceanic and Atmospheric Administration)

Annex 1

Joint Russian/German Data Evaluation of Oceanographic Data from ICNAF/NAFO Standard Sections in the Davis Strait/Labrador Region

Provisional agenda

second meeting in Murmansk, 19 - 23 February 1996

i) definition of terms of references
   a) detection of variability on different time-scales
   b) parameters to be analyzed
   c) regional/basin-wide coherence of events

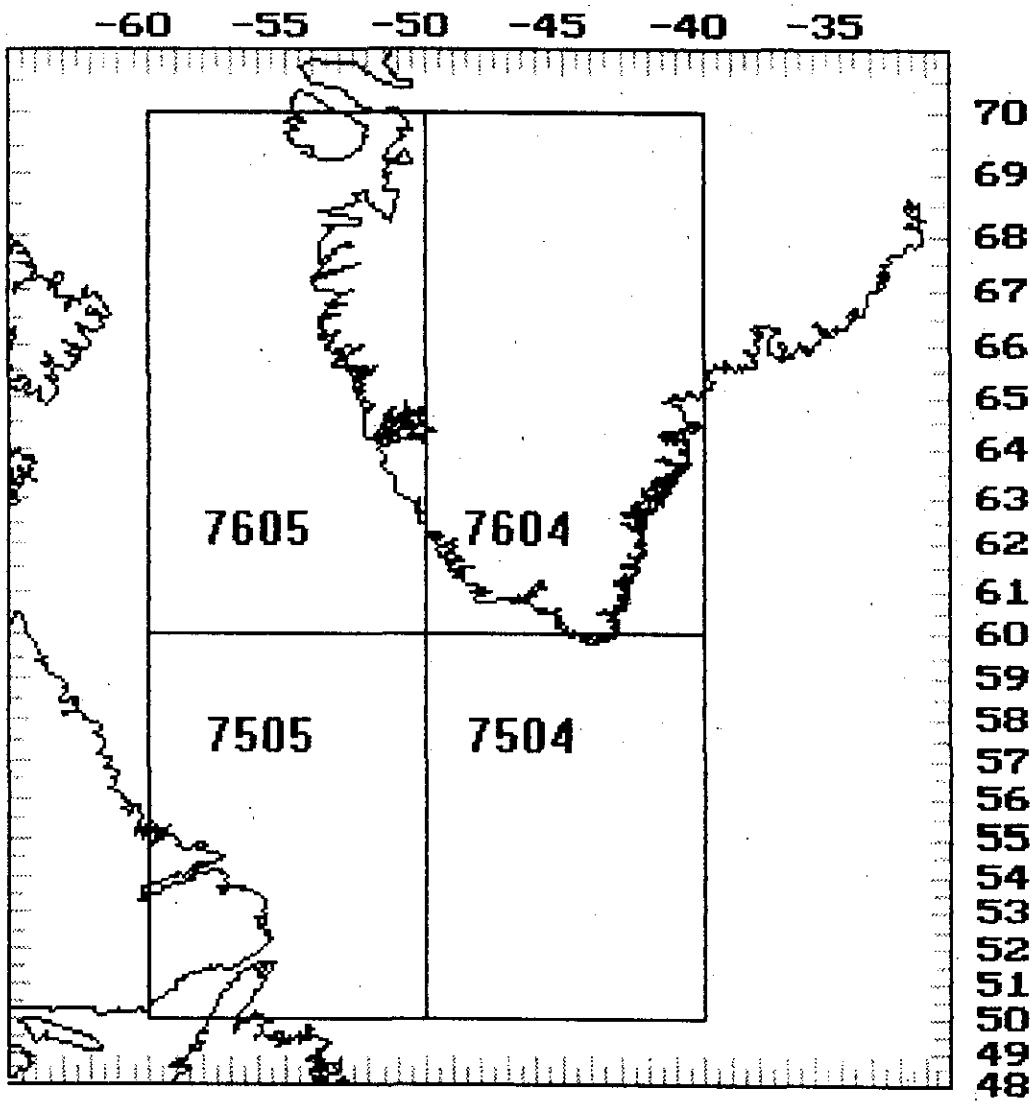
ii) availability of data on Russian/German databases
   a) data formats
   b) time requirements to get access to manuscript-based data

iii) possible use of other data sources (NODC, WDC, others)

iv) presentation of available software for data analysis (PC-system based)
   a) software as developped in the Institut für Seefischerei
   b) software as used in PINRO

v) required data format to suit the available software

vi) publication of results (Report, NAFO, primary literature)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7504

Fig. 1

Mean annual temperature (°C) at the level 500 m (due to WOA94)

Analyzed Values for depth level 14 T00.DOC

	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	N
158	1.19	1.26	1.14	.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.5
157	0.00	1.32	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	67.5
156	0.00	0.00	0.00	3.77	3.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	66.5
155	0.00	0.00	0.00	3.68	3.82	3.72	3.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	65.5
154	0.00	4.03	4.06	3.98	4.00	3.99	4.02	4.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.5
153	4.12	4.09	4.10	4.10	4.12	4.13	4.14	4.17	4.24	4.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	63.5
152	4.07	4.08	4.09	4.10	4.11	4.11	4.11	4.12	4.13	4.14	4.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62.5
151	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.03	3.93	3.95	0.00	0.00	0.00	0.00	0.00	0.00	4.20	61.5
150	4.11	3.98	3.94	3.93	3.93	3.92	3.92	3.91	3.91	3.92	3.92	3.91	3.95	4.12	4.15	4.18	4.21	4.25	4.29	4.21	60.5
149	3.82	3.85	3.86	3.84	3.83	3.82	3.81	3.81	3.81	3.81	3.83	3.84	3.86	3.91	3.93	3.96	3.99	4.03	4.08	4.11	59.5
148	0.00	3.75	3.77	3.75	3.74	3.72	3.72	3.71	3.71	3.72	3.73	3.74	3.76	3.78	3.80	3.83	3.86	3.89	3.94	4.01	58.5
147	0.00	0.00	3.74	3.72	3.70	3.69	3.68	3.68	3.68	3.69	3.70	3.71	3.72	3.74	3.76	3.79	3.82	3.86	3.91	3.98	57.5
146	0.00	0.00	0.00	3.71	3.70	3.69	3.70	3.70	3.67	3.68	3.68	3.70	3.71	3.73	3.75	3.78	3.81	3.85	3.91	3.98	56.5
145	0.00	0.00	0.00	0.00	0.00	0.00	3.75	3.74	3.59	3.61	3.62	3.63	3.65	3.67	3.70	3.73	3.77	3.82	3.88	3.95	55.5
144	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.34	3.54	3.59	3.61	3.63	3.66	3.70	3.75	3.81	3.88	3.95	4.03	54.5
143	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.59	3.65	3.63	3.64	3.67	3.72	3.78	3.85	3.94	4.04	4.14	4.24	53.5
142	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.87	3.75	3.74	3.77	3.82	3.90	4.01	4.14	4.29	4.45	4.59	52.5
141	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.68	3.85	3.85	3.86	3.90	3.96	4.06	4.21	4.40	4.62	4.84	5.06	51.5
140	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.99	3.97	4.04	4.08	4.15	4.32	4.51	4.74	5.07	5.38	5.69	50.5
139	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.35	4.37	4.45	4.80	5.05	5.19	5.77	6.17	6.56	49.5
W	60.5	59.5	58.5	57.5	56.5	55.5	54.5	53.5	52.5	51.5	50.5	49.5	48.5	47.5	46.5	45.5	44.5	43.5	42.5	41.5	W\N

Fig. 2

Salinity, Temperature Bravo

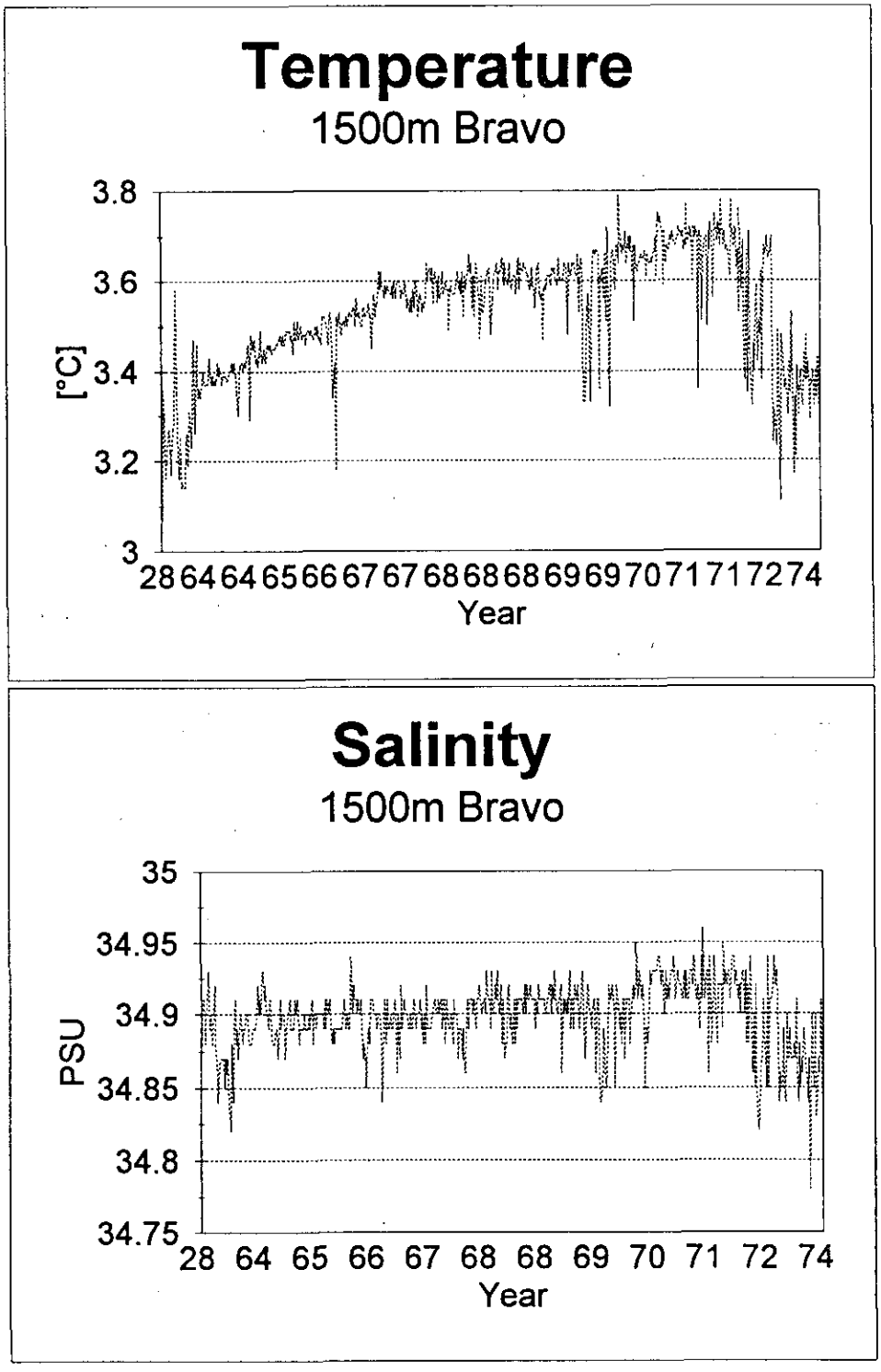
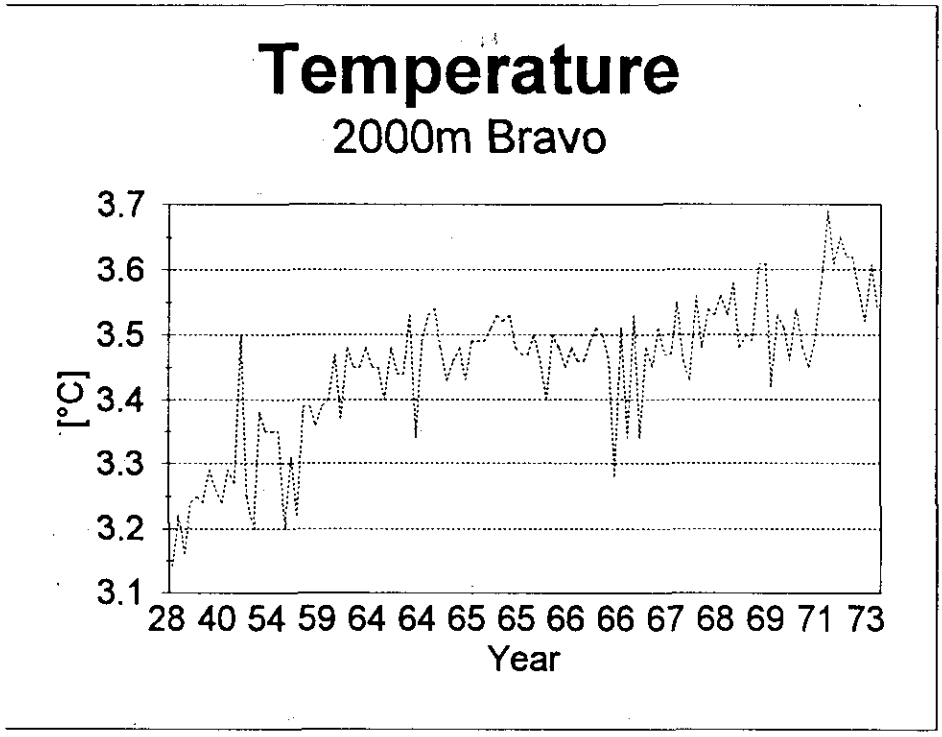


Fig. 3

Salinity, Temperature Bravo



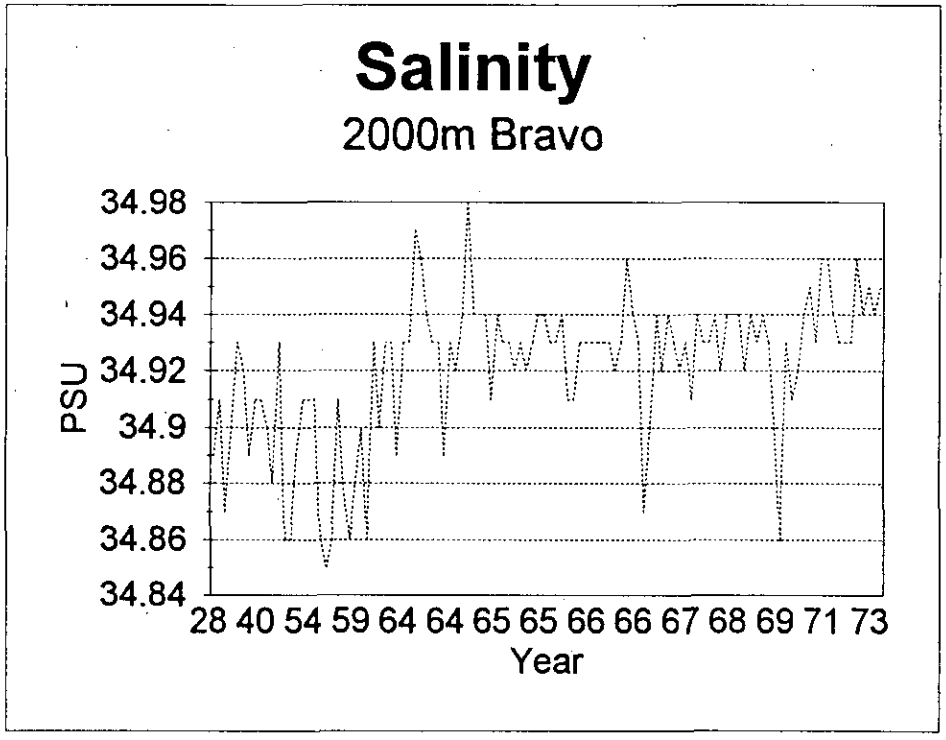
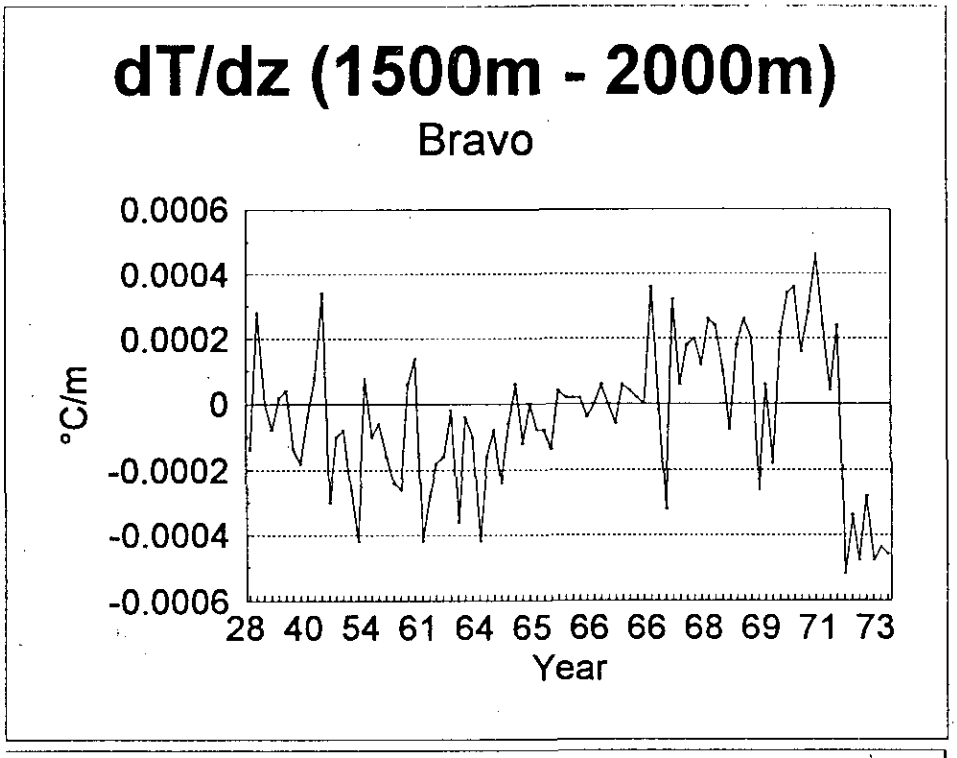


Fig. 4

Deep Water Gradient



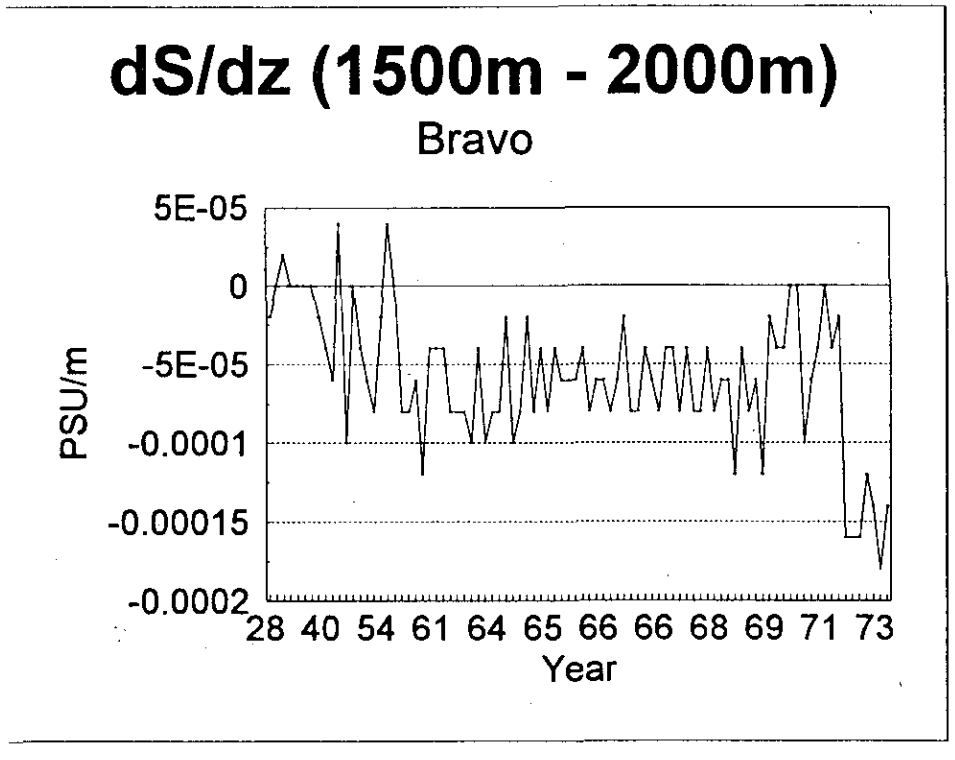


Fig. 5