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Oceanographic Conditions at West Greenland, 1992

by

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Abstract

The NAFO standard sections along West Greenland were monitored during a cruise in June 1992. An analysis of the obtained data together with atmospheric temperature observations reveals that throughout the past 3-4 years the West Greenland environment has been influenced by a very cold arctic air mass over the Davis Strait. The result has been negative temperature anomalies in both atmosphere and ocean especially with extreme values during wintertime.

Introduction

In 1992 the Greenland Fisheries Research Institute (GF) and the Royal Danish Administration of Navigation and Hydrography (RDANH) made an agreement of cooperation with respect to monitoring the physical environment in the Greenland waters. According to this agreement of cooperation RDANH has committed itself to perform an annual oceanographic cruise to the NAFO standard sections off West Greenland i.e. from Cape Farewell to Sisimiut (Holsteinsborg). Additionally RDANH will act as datacenter for all oceanographic data collected by the two institutions and be responsible for data quality control and reporting to international datacenters (ICES and MEDS).

RDANH performed its first cruise to the West Greenland standard section during the period 19 - 27 June 1992 onboard the danish naval ship I/S TULUGAQ. Vertical profiles of temperature and salinity were obtained using a Seabird SBE 9-01 CTD. Bottle samples including temperature measurements using reversing thermometers were taken at selected depths for calibration of the CTD.

The present paper describes the physical conditions off West Greenland during the summer 1992 based mainly on the results from the above-mentioned cruise.

Atmospheric conditions.

The climatic conditions over West Greenland has been rather cold during recent years, Fig.1.

After the extremely cold period at the beginning of the decade (1982-84) the climatic conditions normalized; after 1989 the air temperatures have again shown negative anomalies, especially during winter.

Studies of the meteorological circulations over the Greenland area show that the present cold climate is caused by a cold arctic airmass over the Davis Strait, i.e. the same phenomenon as in the early 1980'es.

The cold atmosphere has resulted in a cooling of the oceanic surface-layer along the entire West Greenland coastline which again has resulted in a greater than normal coverage of sea-ice in the Davis Strait during recent winters.

The Fylla Bank mid-June time series

The mean temperature on top of Fylla Bank (Fylla Bank Section St.2, 44 m) medio June has been measured since 1950. It has been taken as an indicator on the climatic conditions in the West Greenland area and used in that respect in fisheries assesment work. In Fig. 2 the time series of actual observations as well as a three year running mean of the temperature on top of Fylla Bank are shown. It is noticed that since 1989 the temperature conditions have been comparable to the conditions observed during the two previous cold periods, i.e. the cold years around 1970 and 1983.

Results from the 1992 cruise

The observed surface temperatures and salinities are shown in Fig. 3 - 4. Water of Atlantic origin ($T > 3^{\circ}\text{C}$) is only observed off Southwest Greenland. The low temperature and salinity measured at st.5 at the northernmost section is due to the fact that this station was very close to the ice-edge at the time of observation.

The vertical distribution of temperature and salinity on the six sections is given in Fig. 5 - 10.

The surface layer at the two southernmost sections is dominated by the front between the cold, relatively fresh polar water near the coast and the varm, saline Atlantic water further offshore. At the remaining sections the surface layer is relatively homogeneous as a consequence of the above mentioned atmospheric cooling while the core of the inflowing Polar water ($T < 0 - 1^{\circ}\text{C}$) is situated at a depth of 75 - 150 m.

At greater depths, where water of Atlantic origin is found, the oceanographic conditions are close to normal, i.e. temperatures in the interval $3.5 - 4.5^{\circ}\text{C}$ and salinities above 34.85. It shall however be noted that Irminger Water ($S > 34.92$) was observed in great quantities as far north as at the Sukkertop section which is unusual at this time of the year.

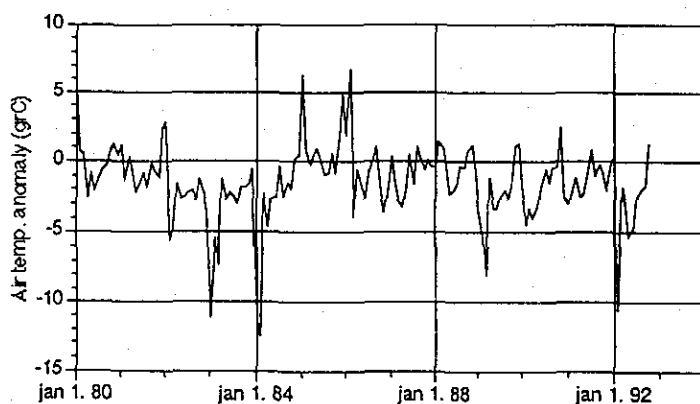


Fig.1. Monthly mean air temperature anomalies from Nuuk/ Godthaab, 1980 - 1992.

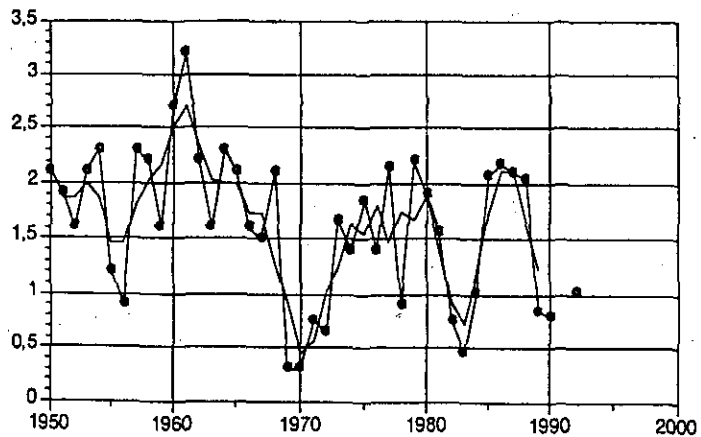


Fig.2. Mean temperature on top of Fylla Bank medio June 1950 -92.

— Observed values
— 3 years running mean

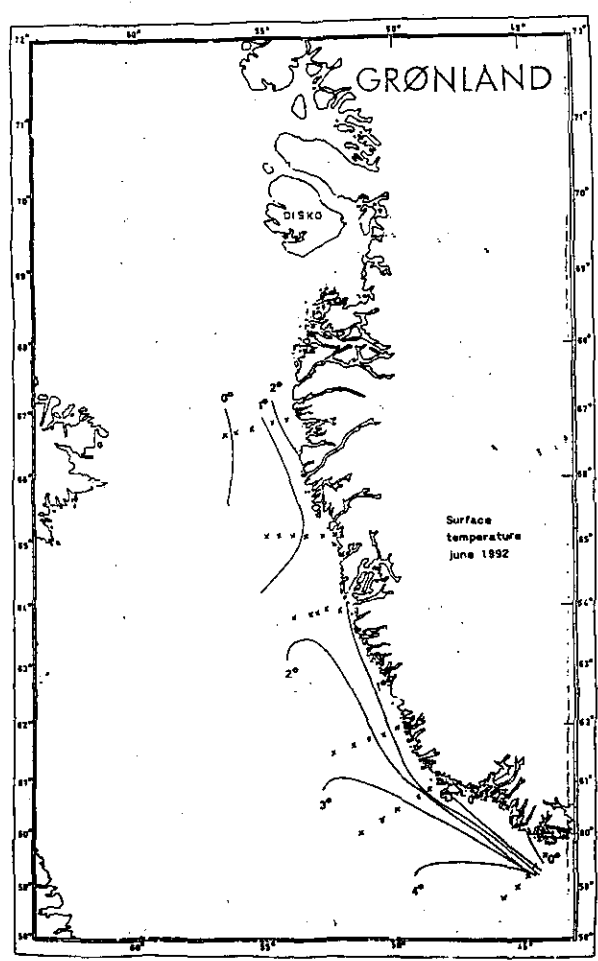


Fig. 3. Surface temperatures, June 1992.

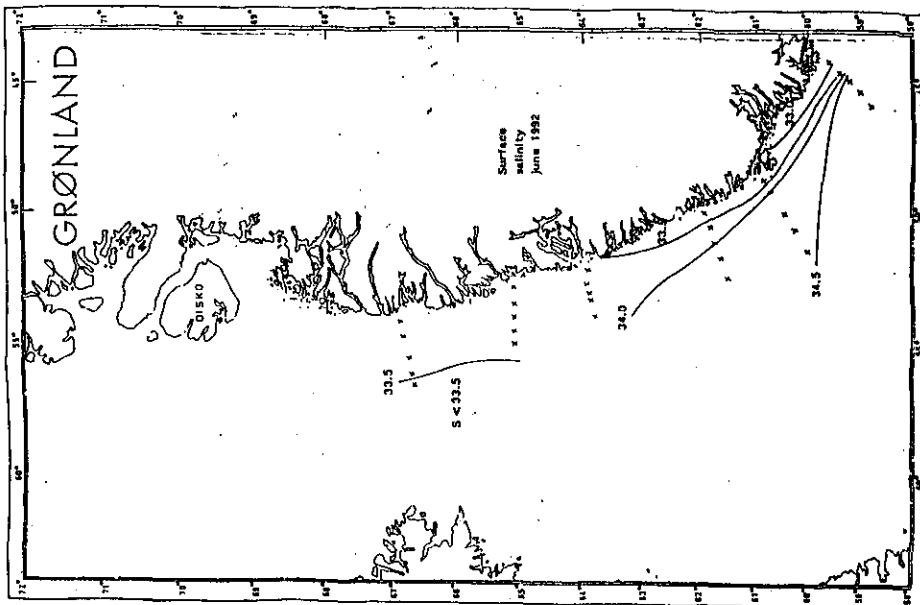


Fig. 4. Surface salinities, June 1992.

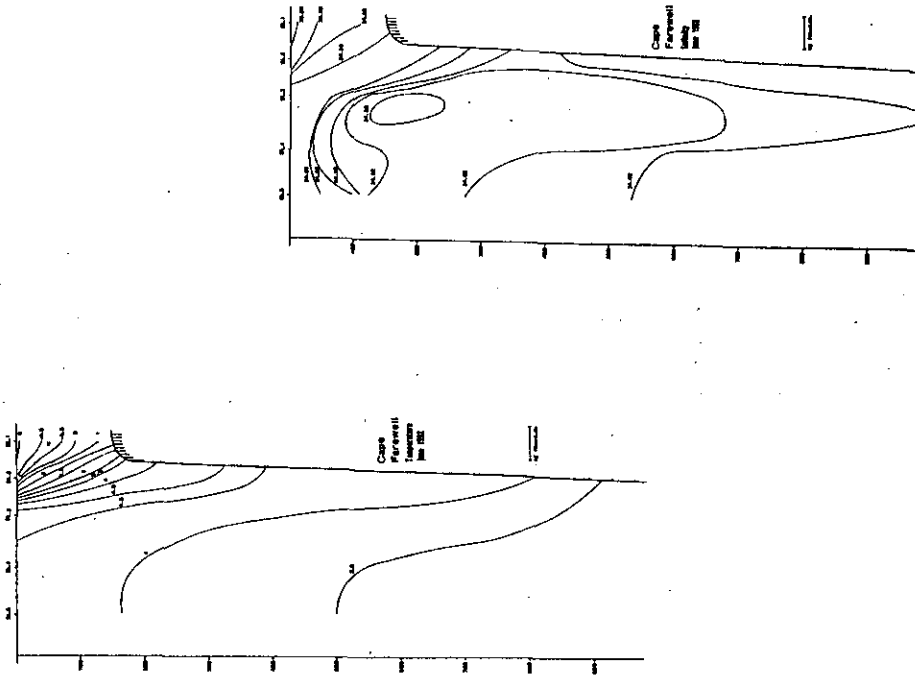


Fig. 5. Vertical distribution of temperature and salinity at the Cape Farewell section, June 1992.

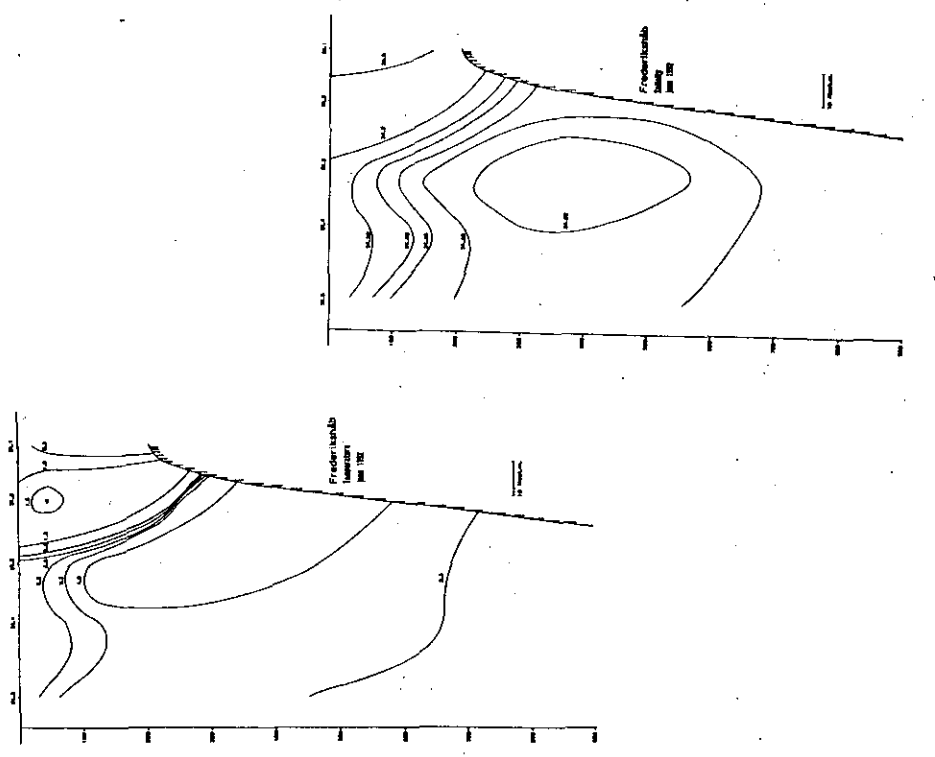


Fig. 7. Vertical distribution of temperature and salinity at the Frederikshaab section, June 1992.

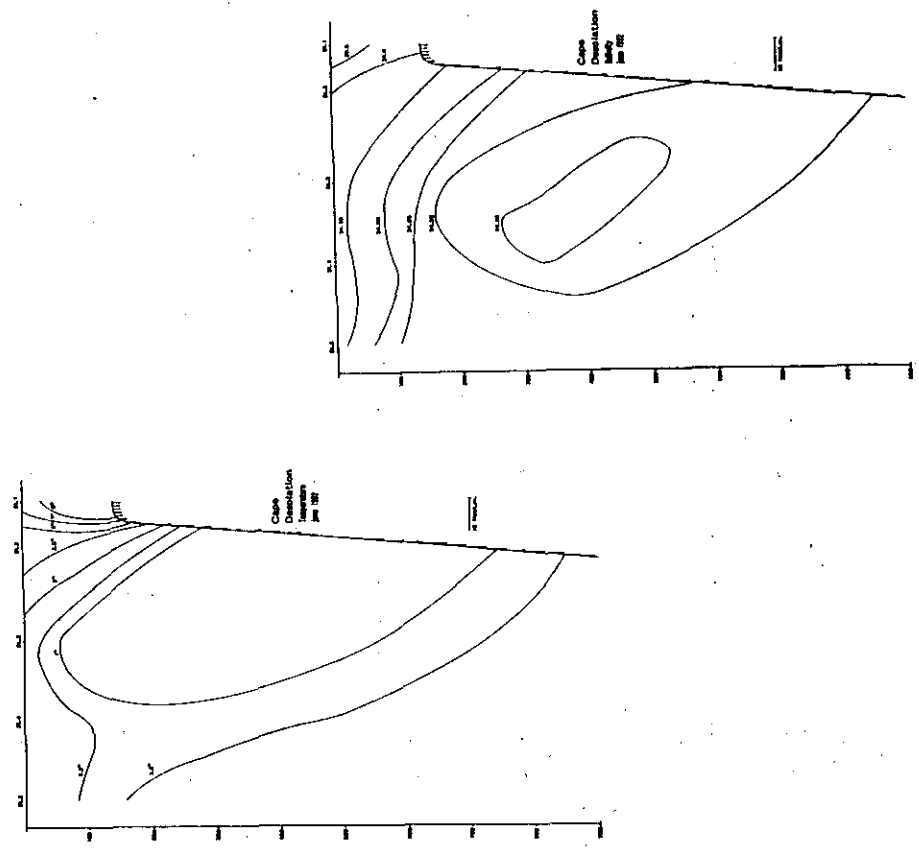


Fig. 6. Vertical distribution of temperature and salinity at the Cape Desolation section, June 1992.

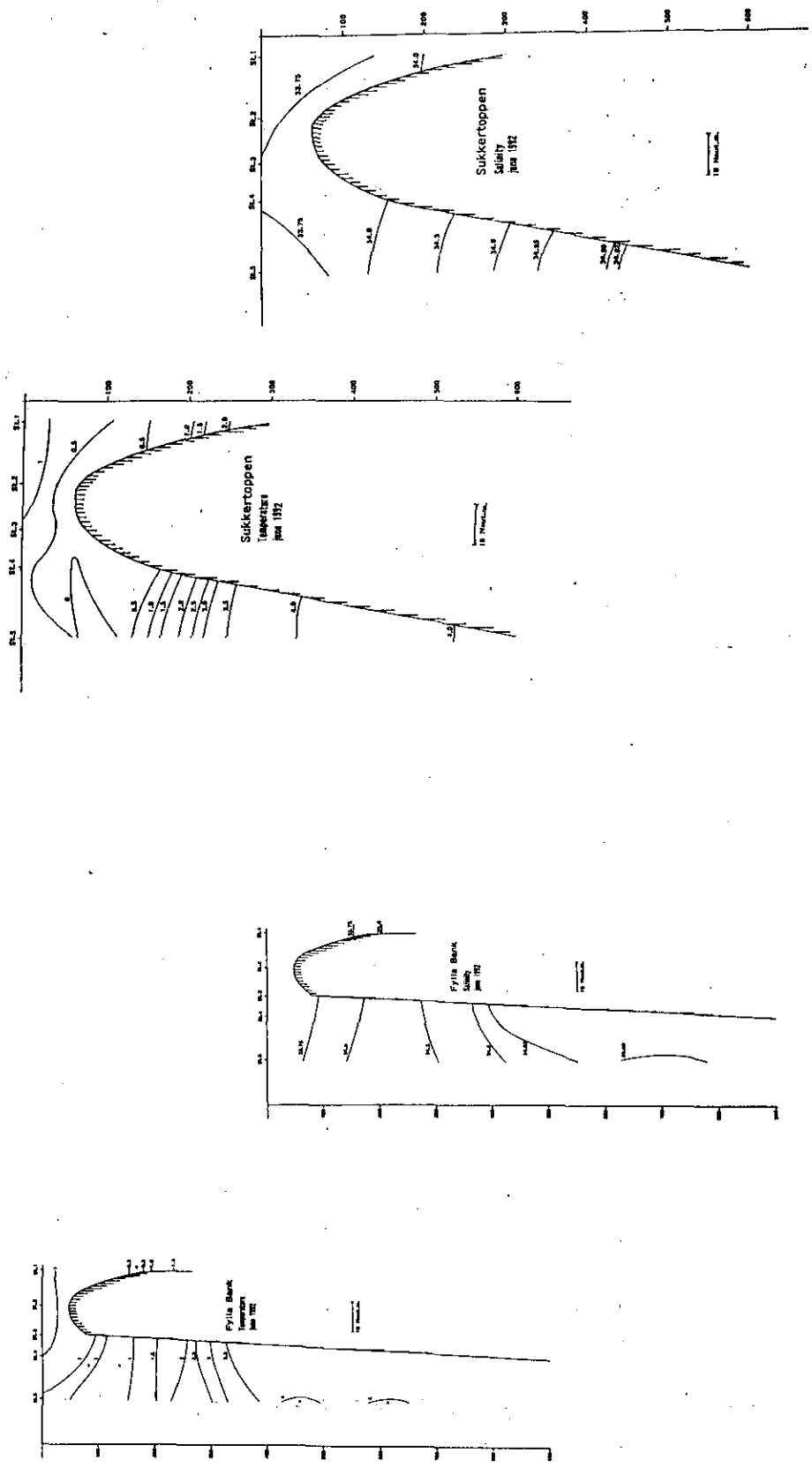


Fig. 9. Vertical distribution of temperature and salinity at the Sukkertoppen section, June 1992.

Fig. 8. Vertical distribution of temperature and salinity at the Fylla Bank section, June 1992.

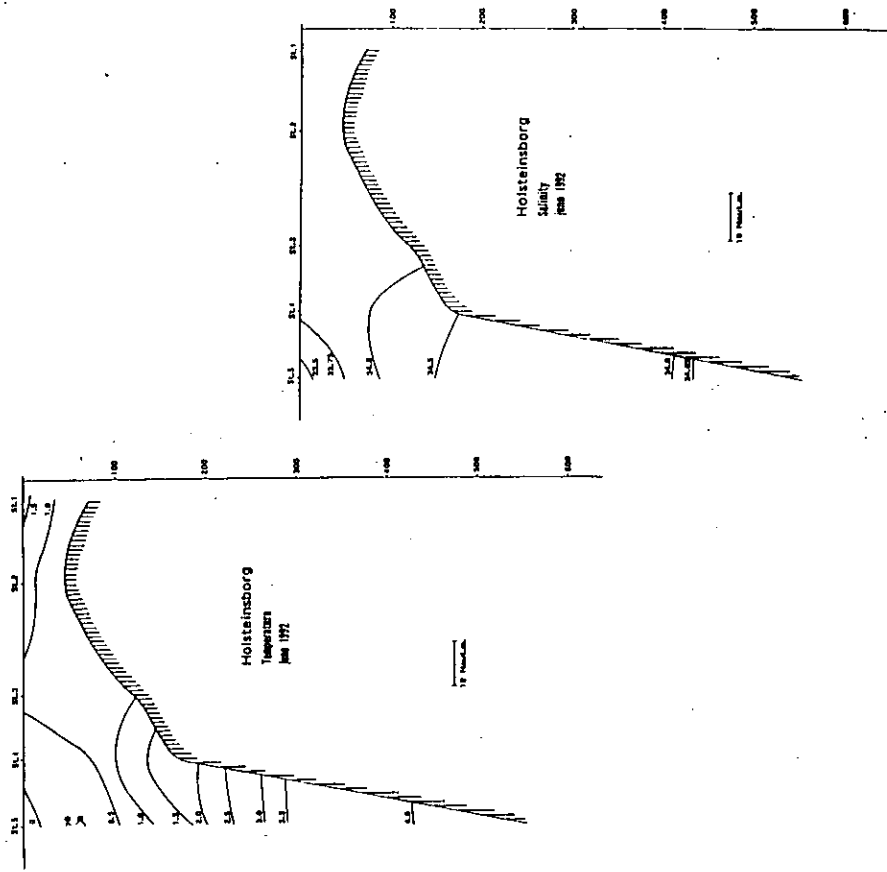


Fig.10. Vertical distribution of temperature and salinity at the Holsteinsborg section, June 1992.