5.3 Physical Processes

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Objectives

The aims of the ARKTIEF 2 project are to estimate the contribution of various processes to the modification of deep water masses in the Arctic, to understand the dynamics of these processes, and to assess their effect on the conditions for marine life. The acquired data and results should serve to improve the basis of physical and ecological modelling.

In the past, water mass modification in the Greenland Sea took place mainly through deep-reaching convection, which is presently absent. However, the changes presently observed in the deep and bottom waters of the Greenland Sea indicate that other processes play a role in deep water modification. Shelf drainage via channels that extend down the continental slope of east Greenland into the deep sea is a potential process of deep water formation. Currents trapped in narrow channels could stimulate energetic flows in otherwise quiet regions, which has considerable impact on the sedimentation and living conditions in the deep sea.

Work at sea

To measure bottom current events three moorings are presently deployed in the ARKTIEF channel and will be replaced by LANCE in autumn 2001. During the present cruise oblique CTD-profiles with an attenuation sensor were measured across the channel to detect, if an elevated load of suspended matter would indicate enhanced currents (Figs 2 and 11). To obtain sufficient horizontal resolution the CTD was towed with 1 kn when hoisted and lowered within 500 m from the bottom. By this procedure the foot points of the profiles are 600 m apart and the profiles were in an angle of 35° to the vertical. Due to the wire angle the CTD was about 2 km behind the ship.

Preliminary results

The measurements with the CTD towed across the channel while hoisted and lowered should provide information if the water mass properties reflect the flow conditions in the channel. It is of interest if currents in the channel transport water masses from shallower depths into the deep sea and if the flow in the channel could be the origin of benthic storms. Those current events were observed with moored instruments from 1993 to 1995. It appeared that the moorings in that time had been deployed 5 km north of the channel since it was not yet known. The water mass properties measured with the towed CTD, in particular the attenuation, showed weak indications to follow the channel bottom profile (Fig. 11). However the signal is too weak to be indicative for intensive currents. On the other hand such weak signals have to be treated with special care when the data are still in a rather raw status and time variability might disguise the effect.

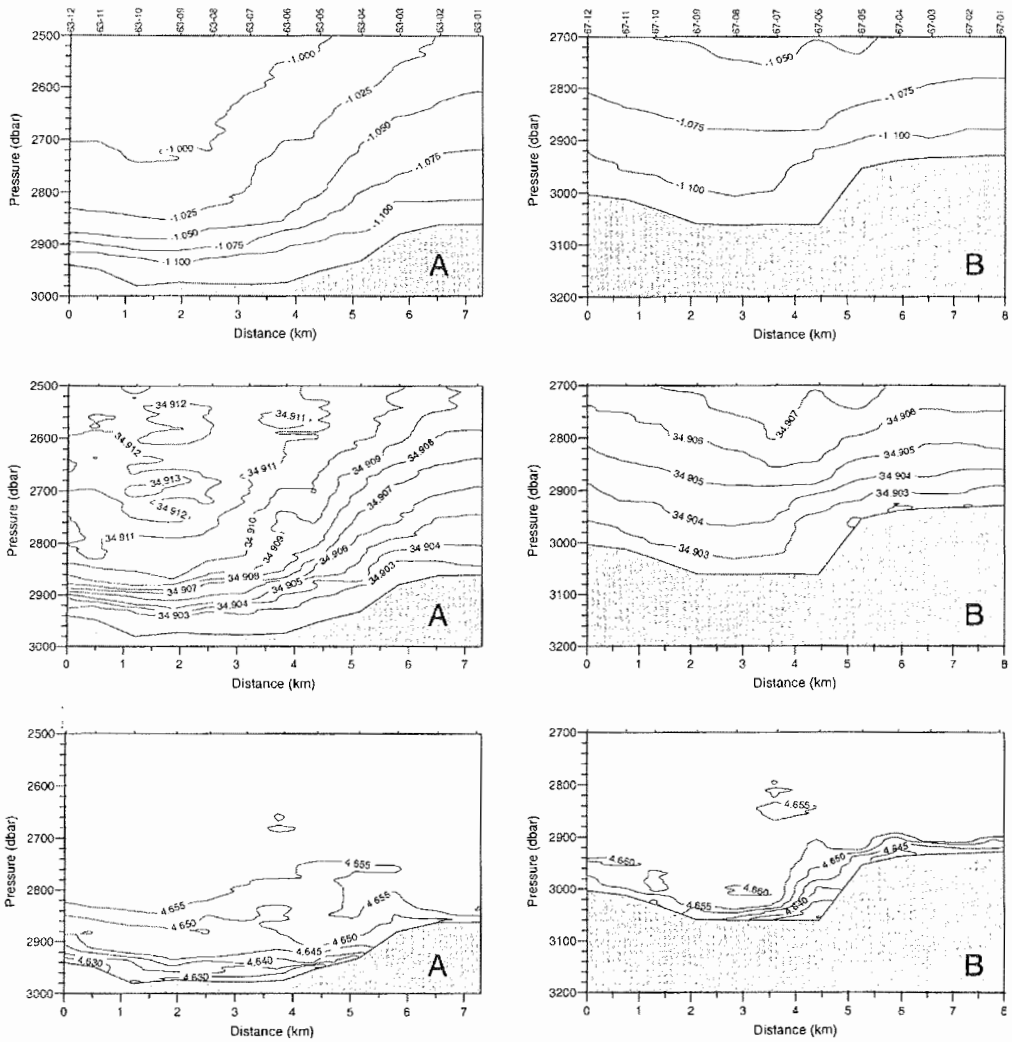

Fig. 11a: Transect of potential temperature, salinity and attenuation across the ARKTIEF channel obtained by towing the CTD when hoisted and lowered within 500 m from the bottom. A channel west 1 St. 63, B channel west 2 St. 67.
Abb. 11a: Vertikalschnitt der potentiellen Temperatur, des Salzgehalts und der Licht-Attenuation quer zur ARKTIEF-Rinne, gemessen in den unteren 500 m der Wassersäule mit einem beim Hieven und Fieren geschleppten CTD. A Rinne West 1 St. 63, B Rinne West 2 St. 67.

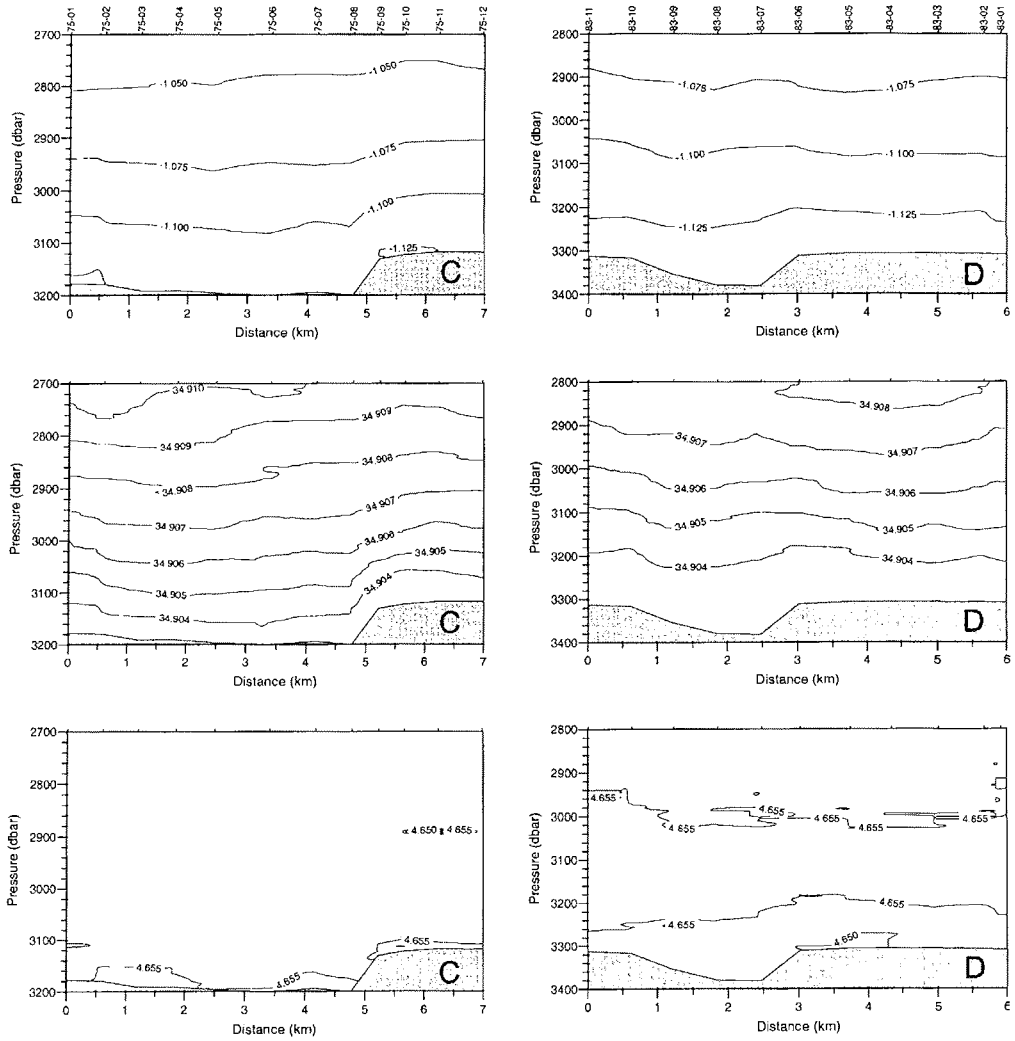

Fig. 11b: Transect of potential temperature, salinity and attenuation across the ARK-TIEF channel obtained by towing the CTD when hoisted and lowered within 500 m from the bottom. C central channel St. 75 and D channel east St 84.
Abb. 11b: Vertikalschnitt der potentiellen Temperatur, des Salzgehalts und der Licht-Attenuation quer zur ARKTIEF-Rinne, gemessen in den unteren 500 m der Wassersäule mit einem beim Hieven und Fieren geschleppten CTD. C Rinne Mitte St. 75 und D Rinne Ost St. 84.