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Hydrographic Conditions on Flemish Cap in July 2002

by

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Abstract

Hydrographic conditions on Flemish Cap in July 2001 are described after a survey with 120 CTD stations. Current conditions over Flemish Cap are described and compared with those observed in previous years.

Temperatures have been increasing since middle-1990s until 1999. Superficial waters (<100 m) in 2001 were warmer (+1ºC) and saltier (+0.5) that the mean of the 25 past years. Temperatures in that layer in 2002 decreased to values closer to the long-term mean.

Introduction

The Flemish Cap is an isolated bank located East of the Newfoundland Grand Banks, with average water depths of 280 m and 28 000 km^2 surface (Fig. 1). To the West, the Flemish Pass with maximum water depths of about 1 100 m separates the Cap from the Grand Bank. The water mass over the Flemish Cap is a mixture of Labrador Current and North Atlantic Current water. The general circulation of water masses in the area is determined by the confluence of Labrador Current (LC, waters with 3-4ºC and 34-35 salinity), and the North Atlantic Current (NAC, >4ºC and >34.8).

The anticyclonic motion of the water mass around the Flemish Cap was described by Kudlo and Burmakin (1972) and Kudlo *et al.* (1984), using geostrophic currents estimated from density measurements. The dynamic height calculated from the thermohaline field in July of 2002 are shown in Fig. 6. These estimates, referenced to 200-m depth, show some of the well-known features of the circulation over the Cap showing evidences of anticyclonic circulation in summer 1996 (Colbourne, 1997), summer 1998 (Gil *et al*., 1999), summer 1999 and 2000 (Colbourne, 2000), and summer 2001 (Cabanas, 2002).

Materials and Methods

A stratified random bottom-trawl survey was carried out on Flemish Cap on board of R/V *Cornide de Saavedra* in July 2002. The survey was performed from June 30th to July 17th following the same method that has been used since 1988 (Vázquez, 2002). A total of 120 CTD station was established to cover all the survey area (Fig. 1).

The CTD probe used was a Sea Bird, SBE 25, provided with pressure, temperature and conductivity sensors. It was dropped at a speed of 1m/s and it was configured to acquire two samples per second, down to a maximum depth of 410 m. Its calibration parameters had been checked before the cruise and data were processed according to standard techniques (Unesco, 1991).

Results

Temperature and salinity distribution charts at different depths: 10, 50, 100 and 200 m (Fig. 2 and 3); vertical temperature and salinity distribution along two transects; one in N-S direction near the 45º W meridian and the other in W-E direction near the 47ºN parallel (Fig. 4); TS diagram (Fig. 5) and Dynamic Height relative to 100 and 200 m depth (Fig. 6) where built.

Horizontal temperature distribution at different depths (Fig. 2) show that near the surface (10 m) temperature reaches 10ºC in the central part of the bank and decreases northwards with values below 2ºC. At 50 m, temperature ranges between 3ºC and 5 ºC. At 100 m depth, temperature ranges from 3.5ºC in the North to 5ºC in the South. At 200 m depth, with the same pattern as 100 m, temperature ranges between 3.5ºC and 4.5ºC.

Horizontal salinity distribution (Fig. 3) at 10 m depth that salinity ranges between 33.4 in the Southwest and 34.2 at the East; at 50 m depth it ranges between 34.0 in the Southeast and 34.5 in the West; at 100 m ranges between 34.4 in the centre of the Cap and 34.6 in the border; at 200 m salinity as 34.7-34.8. In general, it was observed that at surface, fresher water (33.7) comes from the East and salinity increases with depth reaching 34.8 at 200 m.

Vertical distribution of temperature and salinity (Fig. 4), show in the S-N transect a strong gradient in the upper 30 m. Temperature decreases towards deeper waters getting 3.5ºC in the North, but being warmer in the South. Salinity increases progressively from 33.8 in surface to about 34.8 at the bottom. In the W-E transect, a weak tongue of cold water (t<3.5ºC) was observed in both sides of the bank.

TS properties of the waters over the Cap in 2002 are shown in Fig. 5. The typical Labrador Water, with less than 4ºC and about to 34.85 salinity, are dominant in waters deeper than 100 m, where also North Atlantic Water (t>4ºC) was detected.

The Dynamic Height in surface respect to the 100 and 200 m level are shown in Fig. 6. The highest values in the western part of the Cap and the low values in the eastern part must induce an anticyclonic circulation over the Cap centered in the western part.

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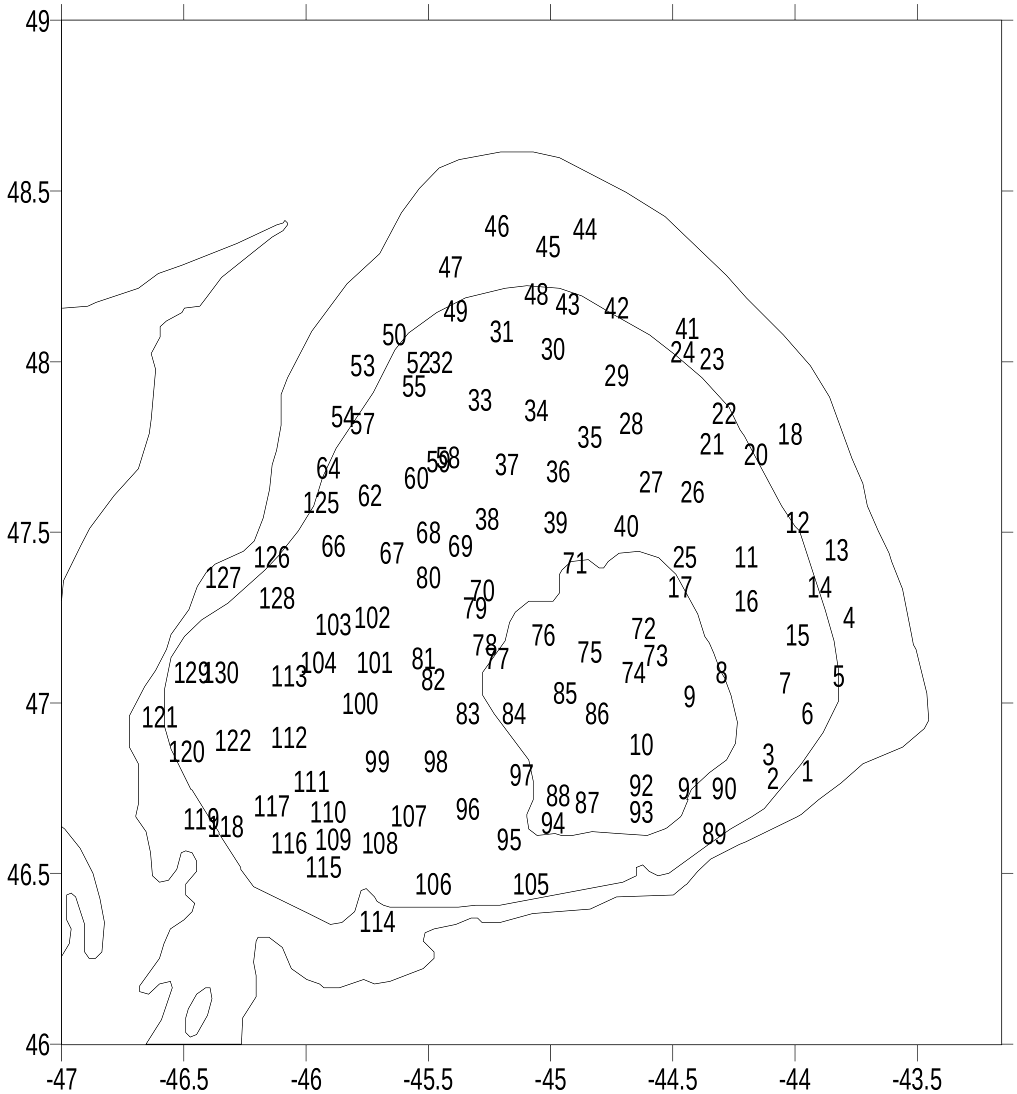


Fig. 1. Location of CTD stations.

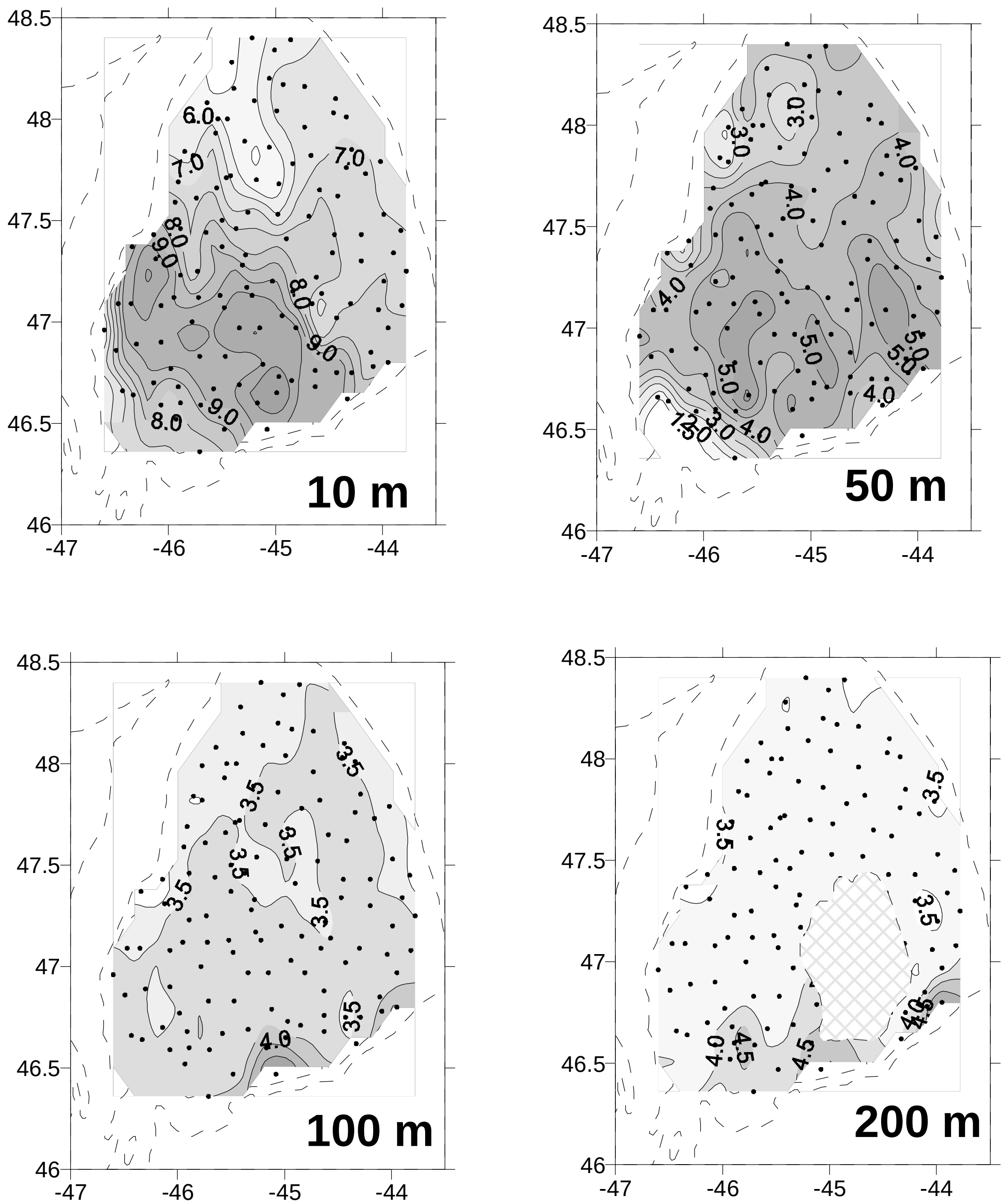


Fig. 2.   Distribution of temperature at several depth.

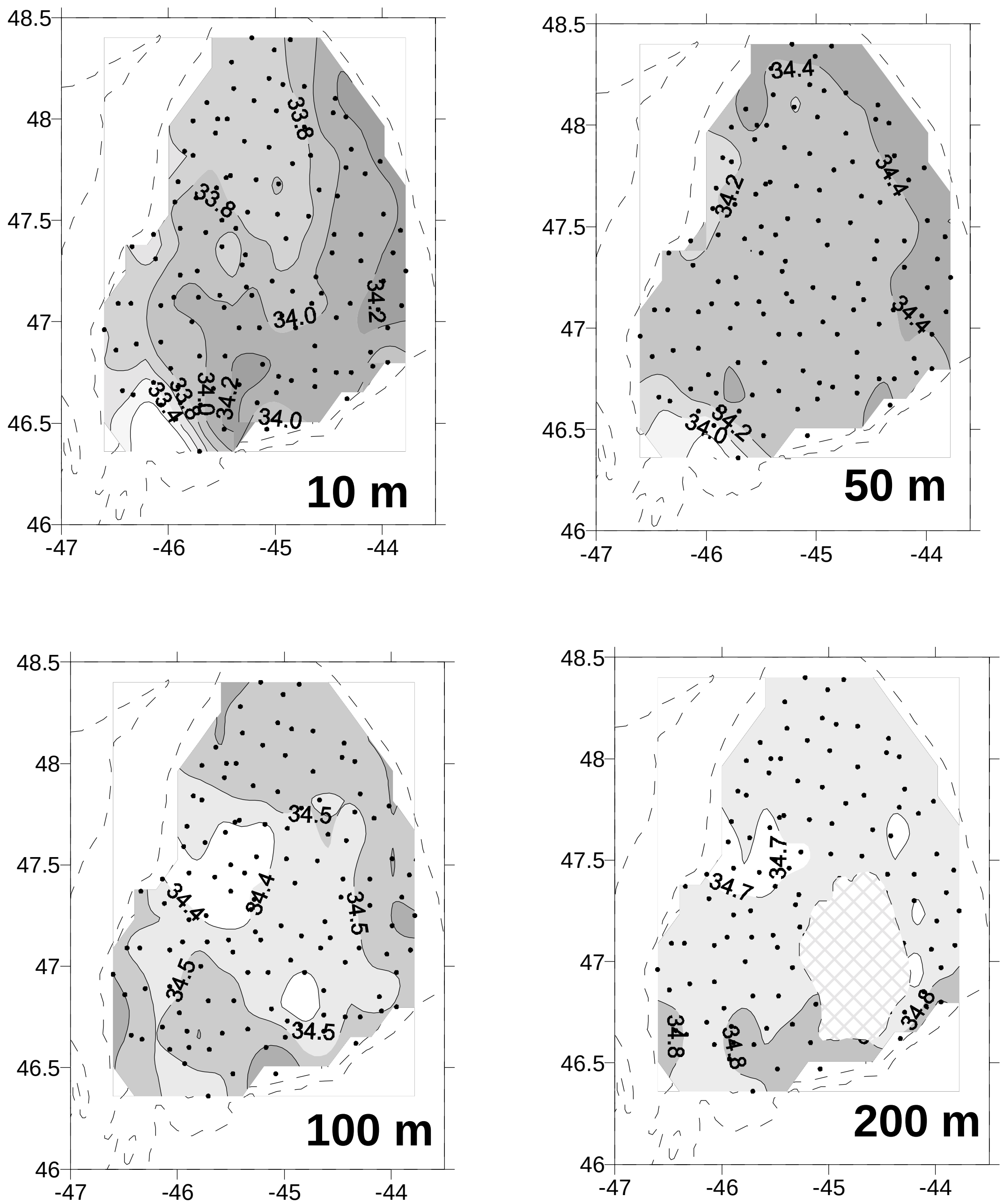


Fig. 3. Distribution of salinity at several depths.

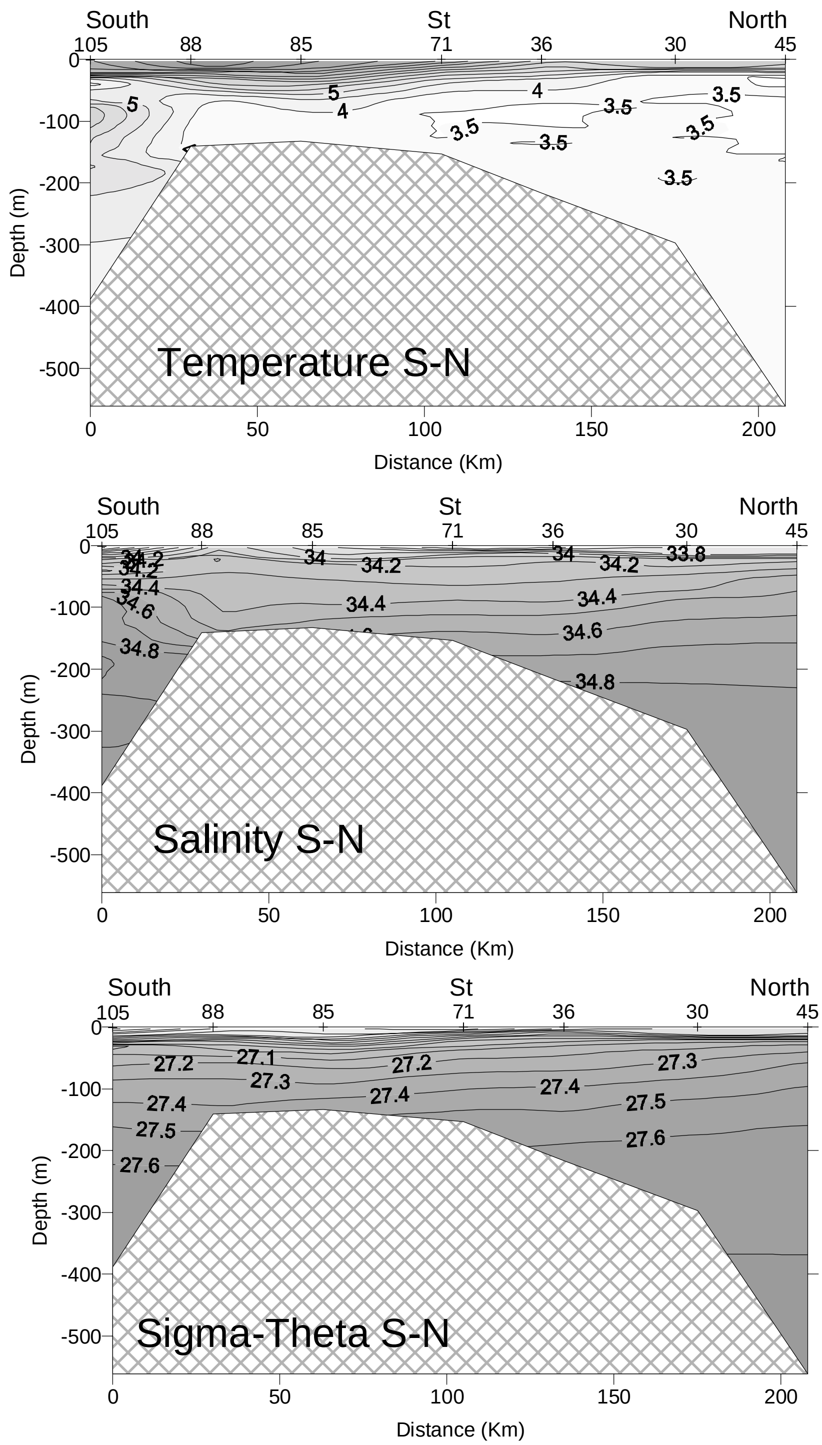


Fig. 4a. Distribution of temperature and salinity in a N-S transect.

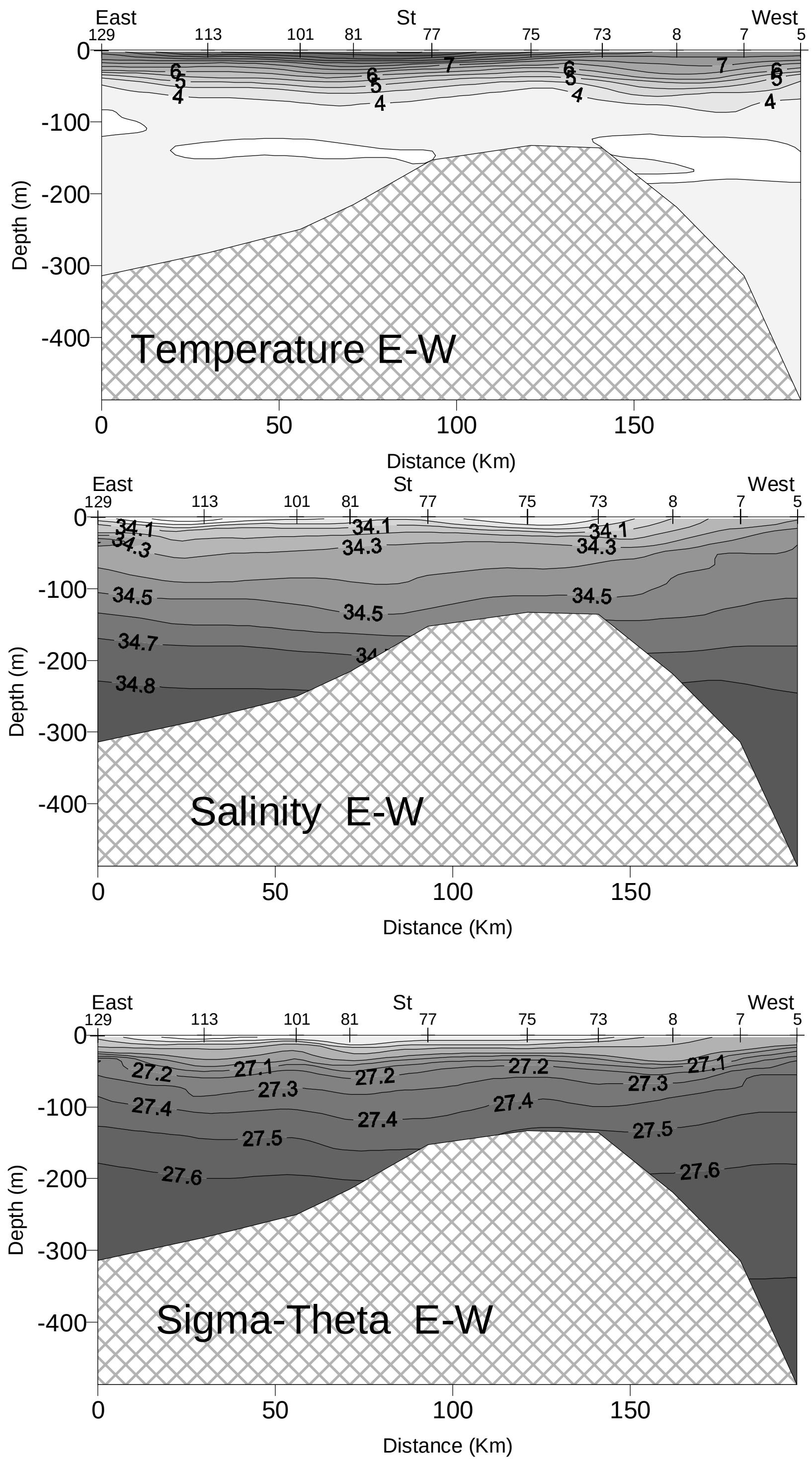


Fig. 4b. Distribution of temperature and salinity in an E-W transect.

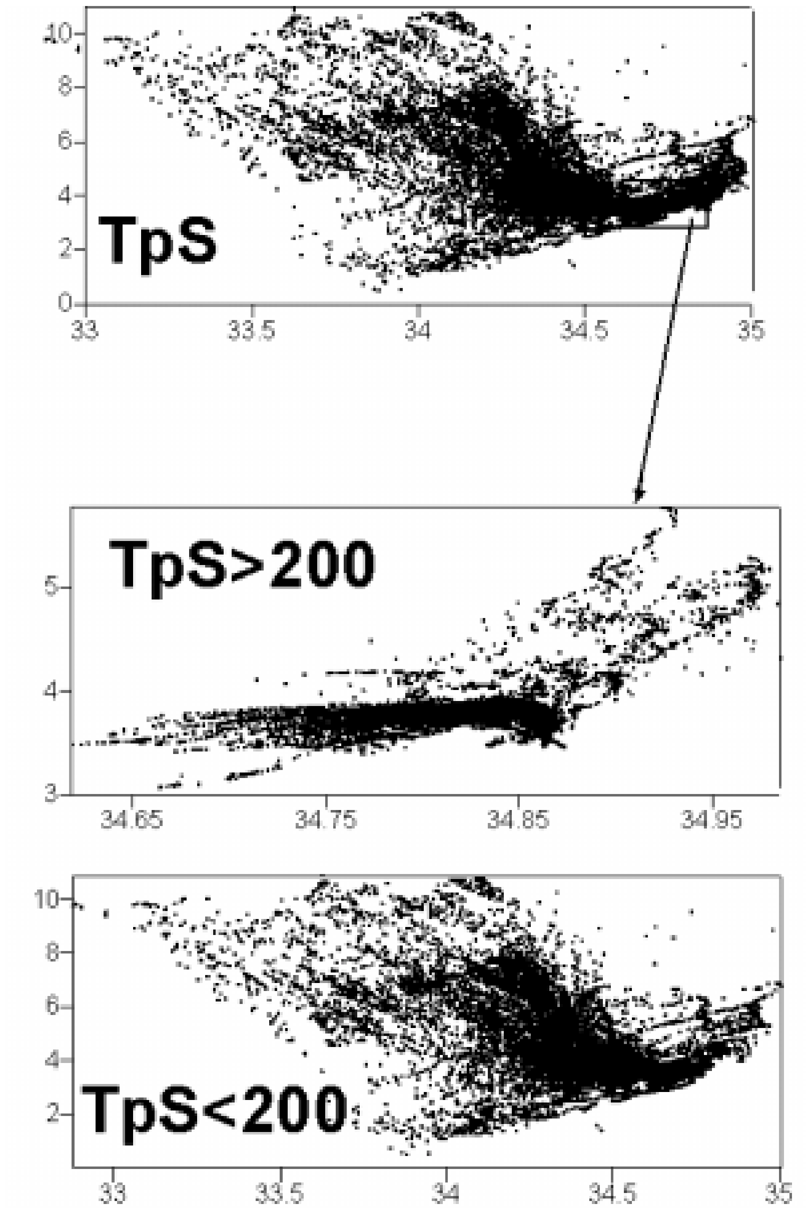
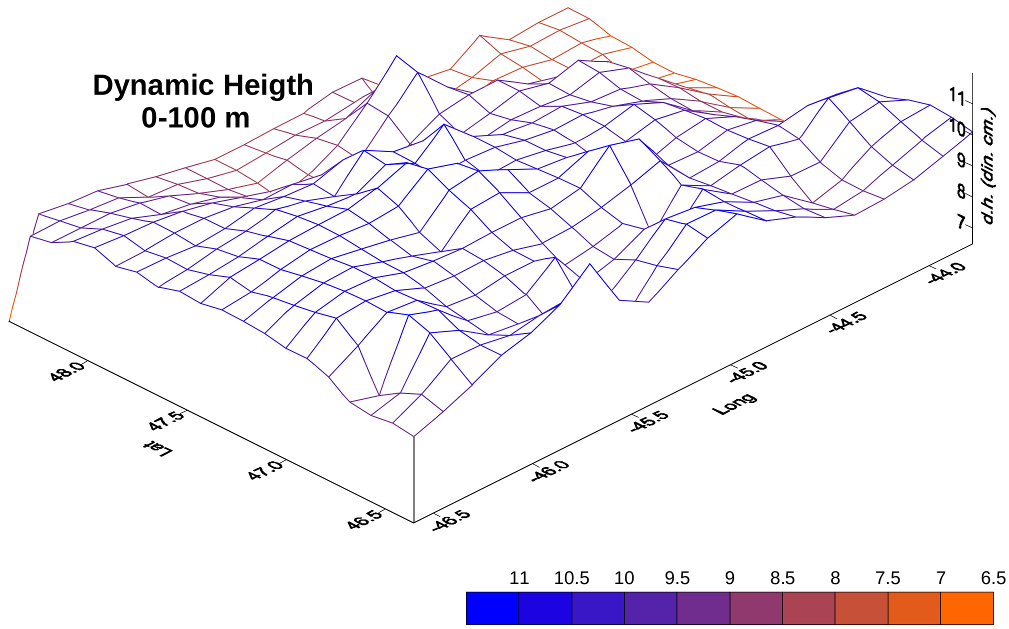


Fig. 5. TS diagram for all stations and depths (top), 0-200 m (middle), and 200-400 m (bottom).



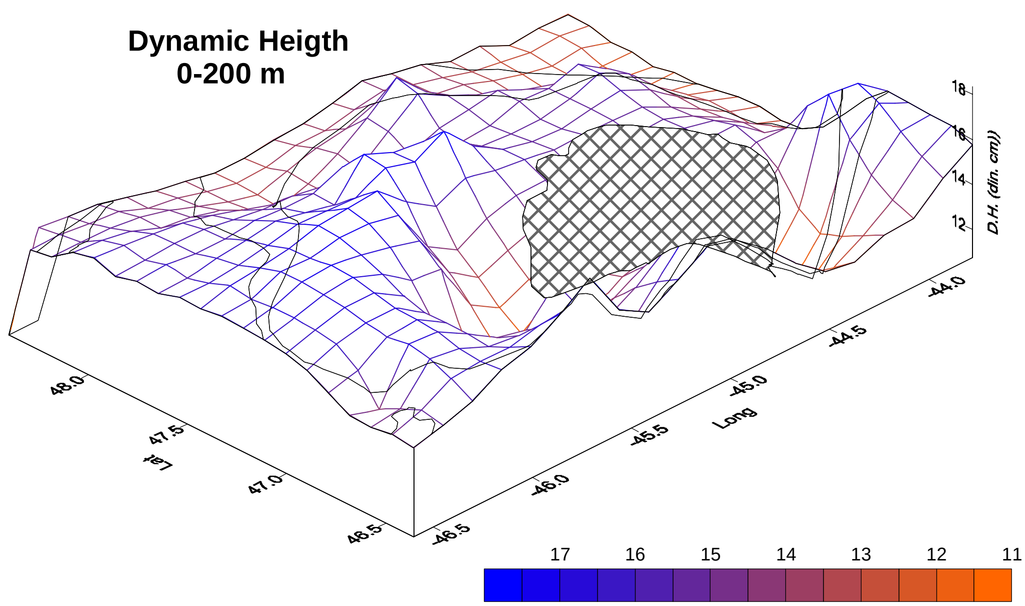


Fig. 6. Dynamic height 0-100 m and 0-200 m.