Monitoring the Atlantic inflow through Svinøy Section

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The variation of the warm Atlantic water inflow to the Arctic Mediterranean may have a great impact on the Arctic warming. The geophysical Institute has been monitoring the Atlantic current along the Norwegian coast since 1995 at the Svinøy Section, which is located in the southern Norwegian Sea, and thus it is an ideal section to monitor the Atlantic water inflow to the Nordic Seas (Fig.1). The Atlantic inflow appears to be split into two branches; an inner branch along the Norwegian coast and an outer branch along the Arctic Front, which separates the warm Atlantic water from the cold water in the ocean interior. The monitoring effort so far has been rather limited to the inner branch, and we extended measurements to the outer branch during the International Polar Year.

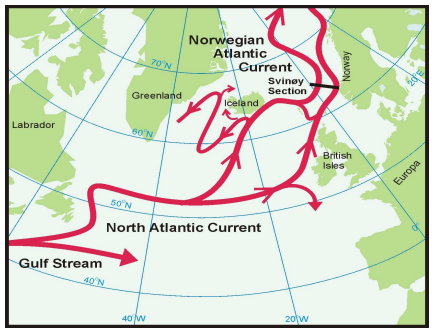


Figure 1 Schematic figure of the Atlantic inflow and the location of the Svinøy Section (Orvik and Skagseth, 2003).

Two branches of Atlantic inflow

The inner branch is classified as 'barotoropic slope current'. The current is rather uniform in space and its location is confined to the shelf slope. The outer branch is described by a 'frontal jet'. The horizontal density gradient plays an important role in this current and its strength and location varies with time.

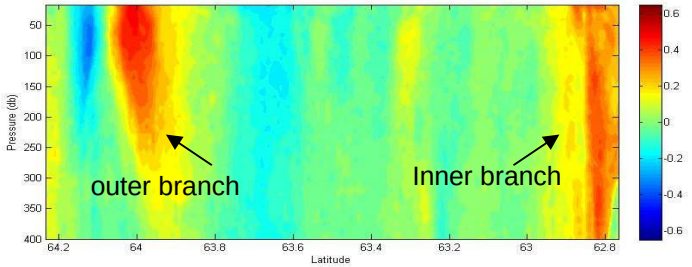


Figure 2 : Vessel-mounted ADCP measurements in 2002. The velocity of the current is about 30 cm/s.

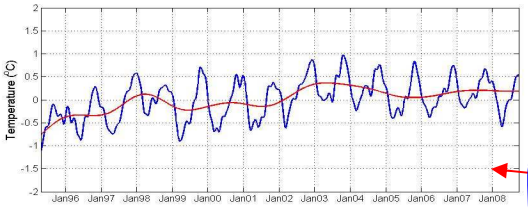


Figure 4 : Temperature on the inner branch tends to increase about 1 degree over 10 years.

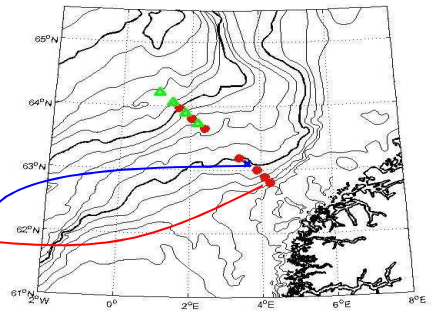


Figure 3 : Positions of instruments. Red is RCM, blue is MMP and green is PIES.

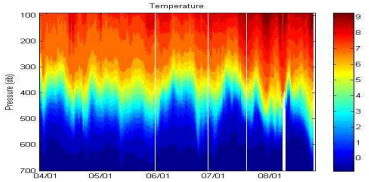
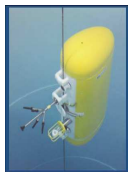


Figure 5 :Temperature time series by MMP



MMP

PIES

Research vessel 'Håkon Mosby'

Instrumentation

The monitoring of the inner branch has been performed by a point measurement by Recording Current Meters (RCM), which gives a good estimate of the transport by a uniform flow.

On the other hand, monitoring the outer branch using RCM is not practical because of its high variability. In order to measure the outer branch, we deployed Pressure Inverted Echo Sounders (PIES) on the western edge of the section (Fig.3). PIES sits at the ocean bottom and emits the acoustic pulses (12kHz) to measure the round trip travel time. The travel time can be used as a proxy for hydrography since the sound speed is a function of temperature and salinity.

McLane Moored Profiler (MMP) profiles temperature and salinity in a certain depth range periodically. It monitors the thickness of the Atlantic layer and the data is used to investigate the dynamics between two branches.