Geophysical Research Abstracts, Vol. 7, 09889, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09889

The Labrador Sea in the first pentad of the XXI century: Returning to warmer and saltier conditions.

Igor Yashayaev and Allyn Clarke

Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada,
[yashayaevi@mar.dfo-mpo.gc.ca / fax: (902) 426-3711 / ph: (902) 426-2558]

Over the past 15 years, the Bedford Institute of Oceanography (BIO) conducted annual occupations of a hydrographic section across the Labrador Sea. These observations, particularly when combined with the earlier OWS Bravo time series, document some prominent changes through the whole water column on the interannual to decadal time scales. In this present report, we discuss the recent developments in the Labrador Sea hydrography. In contrast with the early 1990s when a vigorous winter convection in the Labrador Sea contributed to the cooling and freshening of the intermediate and deep waters of the North Atlantic sub-tropical gyre, since 1995 the Labrador Sea has played a less active role.

The most recent significant winter convection event occurred in the Labrador Sea in 2000. Convection in 2000 reached the depth of 1600 m. and was extensive enough to produce a distinct LSW class still seen in the Labrador and Irminger Seas. The density of the 2000 LSW class was in the upper range of LSW densities, unlike the anomalously dense class of 1994; it was also fresher than the 1994 LSW. During the subsequent years, this 2000 LSW was isolated from winter convection which was mostly restricted to the upper 500 metres. This LSW class became saltier and warmer. By our most recent occupation in late May of 2004,the upper 1500 metres of the Labrador Sea was the warmest since we began occupying this section in 1990. The warming of the upper 1000 between 2003 and 2004, was not simply a consequence of the warming in the cores of the intermediate water masses. The major change was caused by appearance of a large volume of the warm and salty water from the Irminger Sea. This Irminger water spread westward from its usual location along the eastern boundary, reaching the midpoint of the Labrador Basin and filling the whole eastern part of the basin between 100 m and 800 m. Due to this expansion of the Irminger

water, the water at 700 m in the eastern part of the Labrador Sea just in 2004 was about 0.6 warmer and 0.05 saltier than in 2003. The 2004 distribution of hydrographic properties in the Labrador Sea is similar to that observed by the major Labrador Sea winter survey of 1966.

These changes in temperature and salinity are not restricted to the upper layers. The deep salinity maximum (2500-3200 m) in the Labrador Sea marks the Northeast Atlantic Deep Water (NEADW). This water mass originates from the cold and dense overflow from the Arctic to the North Atlantic through the deep channels in the Iceland-Scotland Ridge. In 2000, NEADW was the freshest in its history; since then, the tendency of NEADW salinity change has reversed. In 2003, NEADW was saltier than 34.90 only by Greenland; a year later this more saline water was seen across the whole section. We were also able to identify and track westward propagation of temperature and salinity anomalies in the bottom layer of the Labrador Sea (mostly occupied by the Denmark Strait Overflow Water).