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Oceanographic Conditions in the Labrador Sea in the 1990s and in the Context of Interdecadal Variability<sup>1</sup>

by

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**Abstract**

The Labrador Sea is the key location for the circulation and climate change in the North Atlantic. It has the freshest and coldest conditions relative to the zonal means of temperature and salinity and serves as the source of the major intermediate water mass of the North Atlantic, referred to as the Labrador Sea Water (LSW). The water masses, which descend from the Nordic Seas into the North Atlantic across the Greenland Scotland Ridge, fill the deep and abyssal layers of the North Atlantic below LSW carry the signals from their sources and also respond to significant climatic variations in the Labrador Sea. In the 1990s the Labrador Sea experienced the largest full-depth change ever observed in the modern instrumental oceanographic record becoming 0.6 C colder and 0.05 fresher (relative to the late-1960s), which is an equivalent of mixing extra 6 to 7 m of fresh water into the water column. We used hydrographic and profiling float data to identify seasonal cycle and long term variations in the upper layer of the Labrador Sea. The magnitude of seasonal variation in temperature in the central region of the Labrador Sea is between 6 C (10 m) and 1.5 C (100 m). The seasonal change in fresh water content is 0.55 m - which is an order less than the reported accumulation of fresh water between 1960s and 1970s. We report a long-term cooling of the upper 300 m of the central Labrador Sea between 1930s and 1980s by about 1 C. Between 1984 and 1999 the Labrador Sea became warmer. This warming trend was interrupted by a period of cooling between 1988 and 1994. Between 1999 and 2001 the upper layer cooled by about 0.3 C. In the early-1970s and 1980s the upper 300 m layer experienced freshening evens lowering salinity b 0.2. However the cold anomaly of early-1990s was not accompanied by lower salinity, which resulted in the highest in the record density of the upper layer, which was also coupled with the deepest convection ever observed in the Labrador Sea (in 1993-1994 it reached 2 300 m).

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<sup>1</sup> Mini Symposium on "Environmental Conditions in the NAFO Water of the Northwest Atlantic during the Decade of the 1990s".