



Analysis of Labrador Sea Water in the subpolar North Atlantic by using sulphurhexafluoride as a transient tracer

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In this study we investigate two different modes of Labrador Sea Water (upper and deep LSW) by means of combined measurements of sulphurhexafluoride (SF₆) and chlorofluorocarbon (component CFC-12). In 2008 and 2009, two basin-wide surveys including hydrographic and tracer measurements have been conducted in the western subpolar North Atlantic. Both surveys aimed at estimating the recent formation and describing subsequent spreading of these two LSW types in the subpolar gyre. The SF₆ signal observed in the water column of the subpolar gyre, basically, has two sources. On the one hand side, SF₆ has been artificially added to the ocean in the framework of a deliberate tracer release experiment conducted in the Nordic Seas back in 1996. While leaving the Greenland Sea parts of this signal entered the Denmark Strait Overflow Water (DSOW) which represents the bottom layer in the subpolar gyre. Away from the overflow regions LSW is well separated from the bottom layer by Iceland Scotland Overflow Water that originates in the eastern basin and has a tracer minimum. The tracer load in the LSW layers stems from atmosphere-ocean interaction. This transient signal has a well known atmospheric time history with an linearly increasing trend, whereas tracers chlorofluorocarbons meanwhile have a stagnant or even declining atmospheric history. SF₆ is therefore much more appropriate to clearly allocate any gain of SF₆ in the LSW layers to water mass formation during winter time. In this study we will present first basin-wide inventories from combined SF₆ and CFC-12 measurement and analyze and compare the different fingerprints of LSW formation and spreading. Respective results will be compared to a large-scale survey conducted in 2003 that also yielded SF₆ and CFC-12 data.