



Direct observation of 1000m deep convection in the Irminger Sea by Argo-02 floats

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Deep convection is an important process for intermediate and deep-water masses formation and for deep ocean ventilation. Deep convection is particularly important in the North Atlantic Ocean because it contributes at setting the density of the lower limb of the Meridional Overturning Circulation. The Labrador Sea is the most famous place in the North Atlantic Ocean where deep convection occurs, forming the intermediate Labrador Sea Water (LSW).

Recent studies have suggested that the Irminger Sea is also a convection site where LSW could also be formed locally. Argo floats provide a regular sampling of the Irminger Sea since the early 2000s, in particular during the winter season. Thus, the Argo dataset provides opportunities to investigate, through a study of the winter mixed layers, whether deep convection in the Irminger Sea is isolated or occurs at a broad spatial scale firstly and to investigate local formation of LSW in the Irminger Sea secondly.

The present analysis of Argo data highlights a deep convection event occurring in the Irminger Sea during winter 2011-2012. Intense convective activity at basin scale has been observed for the first time in the Irminger Sea. From mid-January to mid-March, 31 Argo profiles exhibited a mixed layer depth exceeding 700m over a wide area located east of the southern tip of Greenland. Over the period 2002-2010, the deepest observed mixed layers in the Irminger Sea did not exceed 600m, except for the winters 2007-2008 and 2008-2009 during which a few localized mixed layer depths reached 1000m. Among those 31 profiles, the mixed layer depth recorded by 4 different floats reached about 1000m, which is deep enough to feed the pool of LSW located in the Irminger Sea. A lagrangian study along the trajectory of those 4 floats, shows that there is a good agreement between heat loss at the air-sea interface and the heat content variations in the mixed layer. Those results clearly demonstrate that LSW was formed in the Irminger Sea in winter 2011-2012, which is further confirmed by oxygen data provided by one Argo float equipped with an oxygen sensor.

Finally, the properties of the 2011-2012 LSW formed in the Irminger Sea are compared to those formed in the Labrador Sea.