Transport variability of the Irminger Current: first year-round results from a mooring array on the Reykjanes Ridge

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Background
An oceanographic mooring array was deployed in the Irminger Current (IC) on the Reykjanes Ridge in July 2014 as part of the OVERTURBING in the Subpolar North Atlantic Program (OSNAP). The IC and the subpolar gyre were subject to large changes between the early 1990s to the 2000s. Here, first results from this new full-depth array are presented. These new measurements will provide detail of the present-day northward heat, volume transport, and variability within the subpolar gyre and the AMOC.

Seasonal variability
Cross sections of velocity perpendicular to the mooring line and of temperature obtained from the moorings show a distinct difference between summer 2014 and winter 2015. The northward flow of the IC is prominent on the ridge in summer/autumn while a strong southward flow is present in winter/spring. Temperature of the IC was subject to strong cooling in winter 2015 (see also Poster P054B-3241 (De Jong & De Steur)).

Volume transport
Daily mean transport show large variability. The annual mean transport obtained from the moorings is 8.44 Sv. The transport obtained from absolute geostrophic velocity on the section in July 2015 was 12.5 Sv. Compared to estimates from summer sections from the early 1990s and 2000s show that the year-round transport ... and ... The resolution of the moorings is likely too coarse. Estimate of total volume transport will be improved by including e.g. absolute dynamic topography.

Absolute Dynamic Topography (ADT)
Maps of 4-month mean ADT are compared for summer 2014 and winter 2015. ADT in the gyre is significantly more negative in winter associated with cooling of the subpolar gyre. Inspection of the absolute geostrophic velocities near the mooring array shows that the IC was stronger in summer and weaker in winter. Substantial northward flow, however, was presented west of the array. This flow was not captured by the moorings, and hence the transport is underestimated.

Preliminary conclusions
The first year-round mooring data from the IC shows clear differences in the location and shape of the IC from summer to winter. From just this one year instrument data it is unclear if this is a seasonal cycle or if this is related to the anomalous strong winter in 2015 that resulted in deep convection in the central Irminger gyre.

Data
High-resolution data (15 min or hourly) from point current meters, ADCPs, and SBE37 Microcats from July 2014 and July 2015 were detided and daily averaged. These were then interpolated on a 2 km x 50 m bottom-following grid below 200 m, and 15 m in the upper 200 m. In addition, absolute geostrophic velocity was derived from a basin-wide CTD section and referenced to 2000 m averaged LADCP profiles obtained in July 2015.

Figure 1: The currents in the Subpolar Gym. The mooring array in the IC is marked by the pink line. The joint OSNAP network array extends from Canada to Greenland to Scotland (black line).

Figure 2: Absolute geostrophic velocity obtained from the CTD and LADCP section in July 2015 across the Irminger Sea. The IC is marked by the pink box. The four moorings are indicated by black lines.

Figure 3: Mean velocity across array (top panels), and mean temperature (bottom panels).

Figure 4: Daily volume transport estimates for the IC based the mooring data compared with various other/earlier estimates. (1990s/2000s obtained from Våge et al, 2011 for the same width of the mooring section).

Figure 5: Mean ADT subpolar gyre (top panels), and close up of ADT at the array (bottom panels).