Increasing transport of volume, heat and salt in two high-latitude branches of the AMOC during the last two decades

Bogi Hansen[1*], Karin M. H. Larsen[1], Hjálmar Hátún[1], Svein Østerhus[2]

** Presenting author*

1) Faroe Marine Research Institute, Faroe Islands
2) Uni Research Climate, Bergen,

The northernmost extension of the AMOC is formed by the exchanges across the Greenland-Scotland Ridge. Through the deep channels of the ridge, the overflow carries cold and dense water from the Nordic Seas into the Atlantic, which together with entrained water contributes the main part of the lower limb of the AMOC. In the top layers, the loop is closed by the inflow of Atlantic water to the Nordic Seas. Both the overflow and the Atlantic inflow are split into branches and two of these branches pass close to the Faroes. One is the Faroe Bank Channel (FBC) overflow, which transports about one third of the total overflow, and which before entrainment is the densest overflow branch. The other branch is the Faroe Current, which transports about half of the total Atlantic inflow. Since the mid-1990s, hydrographic properties and current velocity have been monitored regularly on sections crossing both branches. Combining the in situ measurements of the Faroe Current with altimetry, new time series for volume, heat, and salt transport in this Atlantic inflow branch have been generated for the period 1993-2013. In this period, the volume transport of the Faroe Current increased by 9±8% (95% confidence interval) while the heat transport (relative to 0°C) increased by 18±9%, partly due to the increased volume transport and partly due to a warming of about 1°C of the Atlantic water. At the same time, the Atlantic water in the Faroe Current became about 0.1 psu more saline. In the FBC-overflow, the bottom waters have also warmed, although only about one tenth of the Atlantic water warming, but the salinity has increased, as well, so that the density of the FBC-overflow increased rather than decreased. This is consistent with increased salt transport into the Nordic Seas by the Atlantic inflow. Relative to the average salinity of the FBC-overflow (34.93 psu), the salt transport of the Faroe Current more than doubled from 1993 to 2013 and the volume transport of the FBC-overflow seems to have increased by 9% since the start of monitoring in 1995, although the statistical significance is marginal. These results are consistent with measurements in other exchanges across the GSR, which show no indication of weakening, in contrast to reports from the Labrador Sea. The Faroese AMOC branches rather strengthened and have induced a considerable increase in the oceanic heat transport towards the Arctic.

Theme 1 Oral presentation