The Norröna Project: An International Collaboration for Sustained Studies of the Meridional Overturning Circulation between Denmark, the Faroes and Iceland.

T. Rossby, University of Rhode Island, Kingston, RI 02881 (trossby@uri.edu)
C. Flagg, Stony Brook University, Stony Brook, NY 11794
H. Søiland, Institute of Marine Research, 5817 Bergen, Norway

The presence of and flow of warm salty water across the northern North Atlantic plays a key role in shaping the mild climate of central and northern Europe. This flow is in large measure controlled by enormous heat losses in the Nordic Seas that transform this water into very dense water that eventually spill back out into the deep North Atlantic. Since 2008 we have been measuring the flow of North Atlantic Water into the Nordic Seas where it passes through the Faroe-Shetland Channel (FSC) and over the Iceland-Faroe Ridge (IFR), two natural choke points that greatly facilitate this effort.

The measurements are made with an acoustic Doppler current profiler (ADCP) mounted in the hull of the high-seas ferry Norröna, which operates on a weekly schedule from the Faroe Islands to Denmark and Iceland. Since September 2013 the program has been further strengthened with the addition of an Automated eXpendable Instrument System (AXIS) that enables us to take XBTs at selected sites on a regular schedule without the need for an onboard observer. This combination of current and temperature measurements gives us increasingly quantitative knowledge of Nordic Seas inflow of mass and heat, their annual cycle and inter-annual variability.

Present estimates of volume transport through the FSC and over the IFR are 2.2±0.3 Sv (annual average, T > 4°C) and 4.5±0.7 Sv (net, summer mean), respectively. A ~1.5 Sv annual cycle is present in the FSC with a maximum in winter, principally due to the Slope Current. There are also O(1) Sv interannual variations. The net flow north through these two passages sum to 2.2 (FSC inflow) -1.9 (Faroe Bank overflow) + 4.5 (IFR net) = 4.8 Sv. Our updated estimates for temperature flux through the two passages are 93 and 138 TW with roughly 15% uncertainties. To obtain the net heat flux between Greenland and Scotland we need add the fluxes in Denmark St. This analysis is ongoing and will be reported on at the US AMOC Science Team Meeting.

The Norröna program is ongoing. In addition, a recent workshop was held at the Faroes Marine Research Institute where this and other programs were discussed. Plans are being made to explore how best to use and integrate the Norröna data, which scan the mesoscale eddy field in great detail together with moored data sets that provide for much greater temporal resolution, and altimetry which provides for a larger scale spatial context.