New Considerations on the Overturning in the Iceland Sea

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Using shipboard data and atmospheric reanalysis fields, we investigate the relationship between the warm inflow to the Iceland Sea via the North Icelandic Irminger Current (NIIC) and the cold outflow transported to Denmark Strait in the North Icelandic Jet (NIJ). The transports of the two currents are comparable, in line with previous notions that there is a local overturning cell in the Iceland Sea that transforms the subtropical-origin water to dense overflow water. As the NIJ and NIIC flow along the north side of Iceland, they appear to "lock" to each other when the bottom topography steers them close together, suggesting a dynamical link between the two. Notably, the interannual variability in salinity of the inflowing NIIC is in phase with that of the outflowing NIJ. It is shown, however, that the former does not dictate the latter. Instead, the combination of liquid and solid freshwater flux from the east Greenland boundary can account for the observed net freshening of the NIIC to the NIJ; but this requires that only half of the overturning occurs in the Iceland Sea. The year-to-year variability in salinity of the NIJ can be explained by the annual anomalies of E-P over the Iceland Sea. These anomalies vary in phase with the wind stress curl over the North Atlantic subpolar gyre, which previous studies have shown drives the interannual variation in salinity of the NIIC.