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Overflow Water Pathways in the Subpolar North Atlantic Observed with Deep Floats

Amy Bower (1), Heather Furey (1), and Susan Lozier (2)

(1) Woods Hole Oceanographic Institution, Physical Oceanography, Woods Hole, MA, United States (abower@whoi.edu), (2) Duke University, Earth and Ocean Sciences, Nicholas School, Durham, NC, United States

As part of the Overturning in the Subpolar North Atlantic Program (OSNAP), a total of 135 acoustically tracked RAFOS floats have been deployed in the deep boundary currents of the Iceland, Irminger and Labrador Basins, and in the Charlie-Gibbs Fracture Zone, to investigate the pathways of Iceland-Scotland Overflow Water (ISOW) and Denmark Strait Overflow Water (DSOW). Floats were released annually in 2014, 2015 and 2016 at depths between 1800 and 2800 m for two-year missions. The array of sound sources used for tracking was expanded from 10 to 13 moorings in 2016 when it was discovered that wintertime surface roughness was negatively impacting acoustic ranges. The floats from the first setting reveal several examples of persistent , deep coherent eddy motion, including a cyclonic eddy spinning off the tip of Eirik Ridge (southwest of Cape Farewell), a cyclonic eddy in the northeastern Labrador Basin near where anticyclonic Irminger Rings are formed, and an anticyclonic eddy under the North Atlantic Current (NAC) in the central Iceland Basin. A consistent region of boundary-interior exchange was observed near Hamilton Bank on the western boundary of the Labrador Sea. Deep cyclonic recirculation gyres are revealed in all three basins. Floats released in the southward-flowing deep boundary current over the eastern flank of the Reykjanes Ridge show that shallower layers of ISOW peel off to the west and cross the Ridge into the Irminger Basin through various gaps south of 60°N, including the Bight Fracture Zone. These floats tend to turn northward and continue along the slope in the Irminger Basin. Interestingly, floats released at the ISOW level in the CGFZ did not turn into the Irminger Basin as often depicted in deep circulation schematics, but rather drifted west-northwestward toward the Labrador Sea, or eddied around west of the CGFZ and (in some cases) turned southward. This result is consistent with some previous hydrographic and high-resolution model results which indicate ISOW spreading more westward than northward from the CGFZ. The NAC may play an important role in setting the pathways of ISOW coming through the CGFZ.