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New Insight Into the Formation and Evolution of the East Reykjanes Ridge Current and Irminger Current

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The Reykjanes Ridge strongly influences the circulation of the North Atlantic Subpolar Gyre as it flows to the Irminger Sea from the Iceland Basin. The circulation is composed of two main along-ridge currents: the southwestward East Reykjanes Ridge Current (ERRC) in the Iceland Basin and the northeastward Irminger Current (IC) in the Irminger Sea. To study their interconnection through the ridge, as well as their connections with the interior of each basin, velocity and hydrological measurements were carried out along and perpendicular to the crest of the Reykjanes Ridge in June–July 2015 as part of the Reykjanes Ridge Experiment project. This new data set changes our view of the ERRC and IC as it reveals undocumented along-stream evolutions of their hydrological properties, structures, and transports. These evolutions are due to flows connecting the ERRC and IC branches at specific locations set by the bathymetry of the ridge and to significant connections with the interiors of the basins. Overall, the ERRC transport increases by 3.2 Sv between 63°N and 59.5°N and remains almost constantly southward. In the Irminger Sea, the increase in IC transport of 13.7 Sv between 56°N and 59.5°N, and the evolution of its properties are explained by both cross-ridge flows and inflows from the Irminger Sea. Further north, bathymetry steers the IC northwestward into the Irminger Sea. At 63°N, the IC water masses are mostly issued from the cross-ridge flow.