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Seasonal and Mesoscale Variability of the Two Atlantic Water Recirculation Pathways in Fram Strait

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Atlantic Water, which is transported northward by the West Spitsbergen Current, partly recirculates (i.e. turns westward) in Fram Strait. This determines how much heat and salt reaches the Arctic Ocean, and how much joins the East Greenland Current on its southward path. We describe the Atlantic Water recirculation's location, seasonality, and mesoscale variability by analyzing the first observations from moored instruments at five latitudes in central Fram Strait, spanning a period from August 2016 to July 2018. We observe recirculation on the prime meridian at 78°50'N and 80°10'N, respectively south and north of the Molly Hole, and no recirculation further south at 78°10'N and further north at 80°50'N. At a fifth mooring location at 79°30'N, we observe some influence of the two recirculation branches. The southern recirculation is observed as a continuous westward flow that carries Atlantic Water throughout the year, though it may be subject to broadening and narrowing. It is affected by eddies in spring, likely due to the seasonality of mesoscale instability in the West Spitsbergen Current. The northern recirculation is observed solely as passing eddies on the prime meridian, which are strongest during late autumn and winter, and absent during summer. This seasonality is likely affected both by the conditions set by the West Spitsbergen Current and by the sea ice. Open ocean eddies originating from the West Spitsbergen Current interact with the sea ice edge when they subduct below the fresher, colder water. Additionally the stratification set up by sea ice presence may inhibit recirculation.