Variability in Irminger Sea convection and hydrography

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Results from the OSNAP (Overturning in the Subpolar North Atlantic Program) moored array show that the largest contribution to both the total overturning and its variability originates from the Irminger Sea and Iceland Basin. Deep convection in the Irminger Sea strongly impacts the transformation of buoyant to dense waters. Additionally, its localization in the center of the basin directly affects the basin's horizontal density gradients that drive transport. We here present a detailed record of nearly two decades of Irminger convection from the LOCO (Long-term Ocean Circulation Observations) and OOI moorings, supplemented by Argo. This record includes the deepest (>1600 m) directly observed convection observed in the basin, forced by the exceptionally strong winter of 2014-2015, as well as several winters (in 2010-2011 and 2019-2020) where convection was inhibited by strong upper ocean stratification. It also shows prominent changes in the depth of the isopycnals associated with OSNAP East overturning, which we put into context using the hydrographic record collected since the 1950s. The long record of the Irminger Sea hydrography shows the respective influence of atmospheric buoyancy forcing versus stratification on deep convection. In terms of stratification, we see the effects of both ocean memory in the upper 1500 m of the water column, during prolonged periods of weak or strong convection, and more sudden changes in the uppermost (~100 m) ocean. These insights will help to better predict how Irminger Sea convection will respond to future stratification changes.