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Water Column Structure and Statistics of Denmark Strait Overflow Water Cyclones

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It has long been known that the dense water flowing through Denmark Strait forms eddies that propagate equatorward along the East Greenland continental slope. However, the lack of in-situ measurements to date has made it difficult to assess their role in the North Atlantic Meridional Overturning Circulation. Using data from a high-resolution mooring array deployed 280 km downstream of Denmark Strait, we investigate the occurrence, structure, and dynamics of the Denmark Strait Overflow Water cyclones. The cyclones pass the array roughly every two days and are most often found near the 900 m isobath. There is no seasonality to either their frequency or their location on the slope. A composite cyclone was constructed using the year-long data set. This revealed that, on average, the features self-propagate at 0.45 m/s and are also advected by the depth-mean background flow of 0.27 m/s, leading to a total propagation speed of 0.72 m/s. The velocity field of a typical cyclone has a Gaussian structure with a radius of 7.8 km and a peak azimuthal speed of 0.22 m/s. A 300 m-thick lens of Denmark Strait Overflow Water (denser than 27.8 kg/m^3) is contained within the bottom of the feature, situated below the peak azimuthal speed. The influence of the cyclones on the sea surface temperature (SST) field is investigated using concurrent satellite data. We find that disturbances to the shelfbreak SST front propagate significantly slower than the underlying cyclones, suggesting that SST imagery may be unsuitable for accurately tracking the subsurface eddies.