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Air-Sea-Ice Interaction Associated with the 2016 and 2017 Weddell Polynyas

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Maud Rise, a seamount in the Weddell Sea, is a location where polynyas occasionally form. The most dramatic of these events was the ∼300,000km2 polynya that occurred over the 3-year period from 1974-1976. Another smaller polynya developed in 1994 and there is evidence of a persistent halo of reduced ice cover in the region that may be a signature of a Taylor Cap. The presence of a polynya can lead to vigorous air-sea interaction resulting in a densification of the surface waters and a convective overturning of the water column. There is still much that is unknown regarding how they form as well as the characterization of the atmospheric forcing that occurs within them and the oceanic response. In 2016, a polynya developed in late July and persisted for approximately 3 weeks. In September 2017, the polynya returned and has remained open through to the end of the winter. Here we use new high resolution atmospheric, oceanic and cryospheric datasets to examine the air-sea interaction that occurred within the recent polynyas. Observations from SOCCOM under-ice profiling floats show prominent cold, fresh, high-oxygen anomalies to a depth of 1700m after the 2016 event. In addition, there was an intermittency to the area of open water within the polynya in both 2016 and 2017 that was associated with variability in the wind field suggesting that a coupling exists between the atmosphere and ocean in the region.