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Relationship between Development of the Terra Nova Bay Polynya and Distributions of Water Masses during the austral Summer seasons in 2014-2016

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Antarctic Bottom Water (AABW) is largely formed in the Weddell and Ross Seas and is considered a pivotal component for ventilation of the deeper ocean. It is known that the Terra Nova Bay (TNB) polynya, a latent heat polynya, plays an important role in the formation of High Salinity Shelf Water (HSSW), which is a source water for AABW. However, it remains partly understood how the development of the TNB polynya determines thermohaline structures in the TNB. In this presentation, we investigate the relation between TNB polynya activity and distributions of water masses using CTD, LADCP, and mooring data observed in the TNB during the austral summer seasons in 2014–2016. The open area of the TNB polynya expanded over the period. This is likely associated with an increasing number of katabatic events (continuous westerly wind) which increased from 109 to 149 in the austral winter months. This resulted in the salinity of deep water masses for the austral summer in 2016 being larger than that in 2014 and 2015 by 0.03 and 0.02. Active brine rejection due to strong wind and widened polynya could be responsible for this. In addition, more frequent katabatic events for the winter months in 2016 make stronger wind-induced cyclonic circulation (~10 cm/s) in the TNB, in turn Modified Shelf Water, a precursor of AABW, is clearly detected. We hypothesize that a wide-open TNB polynya triggers faster transportation of HSSW to AABW, and we will discuss further features of wide/narrow TNB polynya and their impacts on thermohaline structures in the TNB.