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Mooring measurement of Antarctic Bottom Water export from the Cape Darnley Polynya and sea-ice thickness within this polynya

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Antarctic Bottom Water (AABW) originates from dense shelf water produced during sea-ice formation in coastal polynyas. As AABW formation sites, Weddell and Ross Seas and the region off Adelie Land are well known. Our recent study based on the satellite sea-ice data (Tamura et al., 2008) showed that the Cape Darnley Polynya (CDP) located northwest off the Amery Ice Shelf has the second highest sea-ice production next to the Ross Sea Polynya. This suggests that the CDP is possibly another important AABW production site. However, this hypothesis is not fully tested due to the scarcity of in situ observations. In order to test this hypothesis, we conducted hydrographic and mooring measurement in this region in February 2008 and January 2009. Hydrographic data reveal the existence of thick AABW layer along sections downstream (westward) of the CDP. Time-series data at the moorings downstream of this polynya show that low-temperature (high-density) signals appeared after April-June. These signals were associated with strong downslope flow along the submarine canyon and appeared shortly after the increase of sea-ice production within the CDP during March. Thickness of the AABW layer exceeded 300 m during winter at the moorings downstream of the CDP. These facts indicate that bottom water is indeed produced locally around the CDP. In order to estimate sea-ice production within the CDP, we also conducted mooring measurement with ice-profiling sonars for a year from February 2010. This measurement provided rare time-series data of ice thickness within Antarctic coastal polynyas.