Formation and export of the modern Weddell Sea-sourced Antarctic Bottom Water Nd isotope signature

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Deep Water formed within the Weddell Sea is the most important variety of Antarctic Bottom Water (AABW) today, at present exporting approximately 7 Sv into the Southern Ocean further north [1, 2]. Weddell Sea AABW dominantly forms on the Antarctic continental shelf in front of the Filchner, Ronne and Larsen ice shelfs [3, 4]. The Nd isotopic composition of individual water masses is largely controlled by the average continental input signature. Hence from a neodymium (Nd) isotopic perspective the Weddell Sea is an attractive location for water mass tracing since the East Antarctic craton is substantial older than West Antarctic crustal sequences bordering the Weddell Sea [5]. Besides this geological diversity, sediments supplied into the Weddell Sea were largely only sub-glacially weathered prior to its transfer to Weddell Sea shelf sites. These glacially eroded sediments commonly have high surface-to-volume ratios and reactive mineral surfaces [6] that will lead to elevated REE release at the seafloor [7, 8], thereby altering the ambient bottom water Nd isotope signal.

During a very successful seawater sampling campaign on board RV Polarstern (PS111) in early 2018 we sampled all important water masses within the southern and southeastern Weddell Sea. Due to favourable sea ice conditions the entire length of the Filchner-Ronne ice shelf front could be sampled. Several deep water sampling sites in the southern and the northwestern Weddell Sea complement our sample set. Alongide CTD-based hydrographic data, we are able to distinguish REE- and Nd isotope-specific trace metal cycling from water mass mixing processes. Our new data corroborate the suggestion that the admixture of relatively warm Weddell Gyre water to Weddell Sea Bottom Water provides the required bouyancy for Weddell Sea Deep Water to leave the Weddell Sea as AABW.

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