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A multidisciplinary approach to identify thermohaline circulation under an East-Antarctic ice shelf

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Ice-penetrating radar profiling across the grounding line of an ice rise promontory in Dronning Maud Land, Antarctica, and ice core drilling in the adjacent ice shelf revealed the existence of a thermohaline circulation underneath an ice shelf in an area of shallow water depth (<300 m). This is significant because the bulk of evidence of such ice-ocean interactions under ice shelves stems from either large ice shelves or deep troughs within the continental shelf (e.g. Deep Thermohaline Circulation). Sub-ice melting at the grounding line was detected from the unusual dipping of englacial radar reflectors in the radar profiles. Inverse modeling attributed this dipping to a constant melting rate of $\approx$15 cm a^{-1}. In the adjacent ice shelf, several meters of marine ice accretion were detected in a rift system close to the ice rise promontory, based on ice core drilling and televiewer observations of the borehole. For the remainder of the ice shelf, accretion is probably limited (<5 m) as calculated from the combined GPS and radar data.