

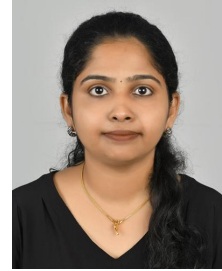
Oceanographic changes due to Ice Shelf Melting in the Prydz Bay region of the Indian Sector of the Southern Ocean

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ABSTRACT

The coastal ocean in Prydz Bay, bounded by the Amery and West ice shelves, is characterised by strong seasonal variability and complex water mass interactions. A key process shaping this environment is basal melting of the ice shelves, which exerts a substantial influence on the thermohaline structure along the continental margins. The incursion of relatively warm water masses into the ice shelf cavities enhances basal ablation, leading to the release of glacial meltwater. This freshwater input strengthens vertical stratification, suppresses deep convective mixing, and alters the exchange of heat and salt between the upper and deeper layers of the water column.

As the meltwater is exported from the cavities and advected towards the Cape Darnley polynya and adjacent canyon systems, it modifies the density structure of locally formed dense shelf water, a critical precursor for Antarctic Bottom Water (AABW). Such modifications can influence both the volume and properties of AABW, ventilating the abyssal ocean, thereby contributing to large-scale oceanographic and climatic impacts.

To investigate these processes, glacial meltwater tracers originating from the Amery and West ice shelf cavities are incorporated into a coupled ocean–sea ice–ice shelf configuration of the Regional Ocean Modelling System (ROMS). This approach enables a quantitative assessment of meltwater pathways, their interaction with polynya processes, and their role in shaping the transformation of shelf waters in the Prydz Bay region of East Antarctica.

Keywords: Southern Ocean, Meridional Overturning Circulation, Regional Ocean Modelling System, Prydz Bay, Ice shelf, sea ice, Indian Sector of the Southern Ocean (ISSO)