Item

New insights into winter-time dynamics of the Ross Sea: an analysis of grounded Argo floats under ice

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Abstract The Ross Ice Shelf (RIS) floats over the southern sector of the Ross Sea creating beneath a crucial area for ocean-ice interactions, known as the cavity. This area is characterized by the formation of Ice Shelf Water (ISW) as well as the intrusion of warm water, which is the main driver of basal melting and ice shelf calving. Ocean-driven basal melting and calving are the predominant causes of ice-shelf buttressing losses and the ice discharge that directly affects the global sea level. While the RIS is not considered to be under threat from the on-shelf intrusion of warm Circumpolar Deep Water (CDW), dense High Salinity Shelf Water (HSSW) and seasonally warmed Antarctic Surface Water (AASW) are expected to cause significant basal melting. The RIS northwest sector, which is directly exposed to solar-heated AASW, sees melt rates that nearly triple during the summer months. In this work, we present unprecedented thermohaline observations from Argo floats close to the north-western sector of the RIS during 2020-2022. Data from the floats provide insights into the year-around water mass structure along and even under the RIS. The continuous under-ice profiles made it possible to observe the complete cycle of water column change during seasonal transitions, the formation of HSSW in the RIS polynya as well as the outflow of ISW. Moreover, one Argo float spent 6 months under the RIS, collecting data directly at the sea-ice interface and capturing the intrusion of warm surface waters into the shelf cavity during the summer.

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