Sea Ice Formation Rate and Temporal Variation of Temperature and Salinity at the Vicinity of Wilkins Ice Shelf from Data Collected by Southern Elephant Seals in 2008

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The use of marine mammals as autonomous platforms for collecting oceanographic data has revolutionized the understanding of physical properties of low or non-sampled regions of the polar oceans. The use of these animals became possible due to advancements in the development of electronic devices, sensors and batteries carried by them. Oceanographic data collected by two southern elephant seals (Mirounga leonina) during the Fall of 2008 were used to infer the sea-ice formation rate in the region adjacent to the Wilkins Ice Shelf, west of the Antarctic Peninsula at that period. The sea-ice formation rate was estimated from the salt balance equation for the upper (100 m) ocean at a daily frequency for the period between 13 February and 20 June 2008. The oceanographic data collected by the animals were also used to present the temporal variation of the water temperature and salinity from surface to 300 m depth in the study area. Sea ice formation rate ranged between 0,087 m/day in early April and 0,008 m/day in late June. Temperature and salinity ranged from -1.84°C to 1.60°C and 32.85 to 34.85, respectively, for the upper 300 m of the water column in the analyzed period. The sea-ice formation rate estimations do not consider water advection, only temporal changes of the vertical profile of salinity. This may cause underestimates of the real sea-ice formation rate. The intense reduction of sea ice rate formation from April to June 2008 may be related to the intrusion of the Circumpolar Depth Water (CDW) into the study region. As a consequence of that we believe that this process can be partly responsible for the disintegration of the Wilkins Ice Shelf during the winter of 2008. The data presented here are considered a new frontier in physical and biological oceanography, providing a new approach for monitoring sea ice changes and oceanographic conditions in polar oceans. This is especially valid for regions covered by sea ice where traditional instruments deployed by research vessels cannot be used.

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