VIII International Symposium on Marine Sciences 2022 (ISMS)
Las Palmas de Gran Canaria (Spain), 6-8th July 2022

SEASONAL VARIATIONS OF THE UPPER OCEAN IN THE SCOTIA SEA AND WEST OF THE ANTARCTIC PENINSULA: OBSERVATIONS FROM INSTRUMENTED SEALS

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Abstract: The Scotia Sea and Bransfield Strait represent two major exits through which water masses driven by the western boundary current system of the Weddell Sea gyre leave the basin. In the upper ocean of this study area (0-400 m), five water masses govern the hydrography: Antarctic Surface Water (AASW), Winter Water (WW), Transitional Zonal Water with Bellingshausen Sea influence (TBW), Transitional Zonal Water with Weddell Sea influence (TWW) and modified Circumpolar Deep Water (mCDW). However, due to the local hazardous weather conditions and sea-ice coverage that prevail through the fall and winter seasons, a year-round description of the regional hydrography has been traditionally hampered, especially in areas shallower than 1000 m where the standard parking depth of the freely drifting Argo floats prevent them to enter. The year-round hydrography of these shallower areas, with a greater influence in coastal scenarios, is of key interest given the role that the ocean plays as a thermal forcing to glacier retreat in polar regions.

To this aim, we use a set of historical data based on observations from instrumented seals. These seals migrate every year, during the warm seasons, from the South Orkney Islands and South Georgia Island towards the south along the west Antarctic Peninsula, performing the reverse route as the colder seasons evolve. In this study we present a series of transects of temperature and salinity down to 400 m depth, which cover the year-round variability of the regional hydrography of the shelf and open ocean of the Scotia Sea and West Antarctic Peninsula. These transects extend over distances as long as 1200 km, sampled during a period of time of nearly two months. Notably, on two occasions, the seals remained over nearly the same area in the Scotia Sea for several months, acting like a 'living mooring' and recording the time-varying temperature and salinity properties of local water masses through different seasons.

Preliminary results uncover the temperature and salinity variations governing the seasonal water mass transformation of the upper ocean in the Scotia Sea and West Antarctic Peninsula, with a special focus on the time-varying structure of thermal fronts.

Key words: Scotia Sea, West Antarctic Peninsula, Shelf Ocea, Seasonal Hydrography, Thermal Fronts, Instrumented Seals.