

SESSION: From Physics to Top Predators at islands and seamounts in the Southern Ocean

MARS Themes:

Oceans and marine ecosystems under global change

Earth systems observations

Ecosystems, biodiversity and biodiscovery

Research Infrastructure and platform

Title:

Influence of eddies and fronts on the shelf seas of the sub-Antarctic Prince Edward Islands

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Abstract:

Within the Southern Ocean, ecosystems such as the Prince Edward Islands (PEIs) sustain rich environments with large populations of top predators. Thus, there is a crucial need to enhance our understanding of drivers of oceanographic variability and impacts on biological communities in such regions. Daily-averaged bottom temperatures and water-column current speeds from two moorings at the PEIs showed warming/cooling events of 0.5-2 °C, concomitant with changes in current speed and direction. These variations were associated with advection of waters into the shelf region from passing anticyclonic/cyclonic eddies, some of which influenced shelf circulation for >30 days at a time. The impact of frontal movement was quantified by increased current speeds throughout the water column when the southern branch of the sub-Antarctic Front (S-SAF), or the northern branch of the Antarctic Polar Front was close to the islands. When the S-SAF was north of the PEIs, bottom temperatures were lower due to stronger influx of Antarctic surface and intermediate waters. In contrast, when the S-SAF was south of the PEIs, bottom temperatures were elevated due to the occurrence of larger proportions of warmer, more saline surface and intermediate sub-Antarctic and even Subtropical waters. During 2014-2017, generally lower temperatures reflected more frequent northward movements of the S-SAF, but the more elevated temperatures since 2018 indicated a more southerly position of the S-SAF, which has also been observed in satellite altimetry. Predominance of westerly flow in the southern portion of inter-island region suggests the existence of a Taylor column, at times enhanced or dissipated by the juxtaposition of some eddies. Due to its coarse spatial resolution, satellite altimetry fails to capture this westerly flow, demonstrating the critical need to sustain and enhance in situ observations in the region.

Format:

Oral presentation

Keywords: (add ; between keywords)

Prince Edward Islands; sub-Antarctic Front; Antarctic Polar Front; mesoscale eddies; satellite altimetry; moorings