

Regional ocean observing and modelling system developments in the Ross Sea sector

Keep an eye out for: NZ-led Ross Sea Voyages 2025 and 2027; NIWA is always keen to deploy floats on their pre-planned voyages.

Key Topics:

- The importance of the Ross Sea Marine Protected Area
- Ross Sea: Bottom water salinity, density, salinity budget, heat and water mass Coupled model 'Polar-SKRIPS'
- Dynamics of gravity current plumes.
- Observing ice shelf cavity hydrography

Main Developments:

- Correlation between SAM and bottom salinity/density changes in Terra Nova Bay, as well as the thickness of DSW (120 m change in one year), on interannual scales.
- In the western Ross Sea, there is a balance between the influence of the ASL vs SAM. E.g. if ASL weakens, the effects of SAM are stronger.
- 'Polar-SKRIPS' = Development of a flux-conserving coupled model of the Ross Sea Sector. 'Polar-SKRIPS' seems to do a good job of mesoscale variability and is good for process studies in coastal Antarctica regions. This model does a good job of reproducing the variability in bottom water properties (A. Malyarenko et al.)
- Regional differences in the control on the salt budget within the Ross Sea itself. Advection between the different regions seems to be important.
- Cascading of dense water downs a slope is not straightforward.
 - Baroclinic instabilities are produced in the form of topographic Rossby waves.
 - In an idealized model, a steep bathymetric slope ($s=2/15$) will have a steady along-isobath flow, but if the slope get less steep, then topographic Rossby waves are generated.

Open Questions/Future Directions:

- Work toward filling in some of the observational gaps in the Ross Sea (D. Fernandez et al., + New Zealand Science Platform)
 - Where should future observations in the Ross Sea region be targeted?
 - Better mapping of the bathymetry on cont. shelves, especially under the ice (70% of the Ross cont. shelf area is shallower than 600 m)
 - Opportunities for smarter observational campaigns in ice shelf cavities – more on this tomorrow.
 - Current obs used to study Ross Sea circulation are: historic hydrographic, moorings at key locations, emerging number of autonomous floats, and seal-borne CTDs, XBTs. But biases such as biased toward winter time.
- An improved theoretical and observational understanding of dense plume dynamics.
- How can the science community contribute effectively to CCAMLR for decision making on conservation measures in this region? How can we build effective policy-focused research networks?