Day 2: Afternoon

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

Key Topics:

- Physical Oceanography: Mesoscale variability (e.g. eddies), long-term moorings, spatiotemporal variation of glacial meltwater, surface signatures of dense water outflows from satellite altimetry.
- Biological Oceanography: Zooplankton and Antarctic silverfish, Patterns of phytoplankton photosynthetic performance.

Main Developments:

- Phytoplankton, Zooplankton, and Toothfish (Antarctic toothfish is a big part of the fishing industry and zooplankton + silverfish abundance can be used as sentinels of change in the food web):
  - Phytoplankton are important as the base of the food web, as well as contributing to the biological food pump.
  - In polynyas there is high biomass and active photosynthesis
  - Phytoplankton and ecological response is tightly correlated to ice coverage and polynya formation over time.
  - Terra Nova Bay has long been held as the most productive region in the Ross Sea, but new data shows that Ruppert Coast has much higher Chl-a.
  - Time-anomalies of temperature and salinity reveal intense mesoscale variability. Some of the eddies/filaments are salty, warm, and oxygen rich, some have super-cooled waters. These eddies impact the BGC of the region (high chlorophyll, low POC).
  - Current bottlenecks in sampling are: limited to summer season, ice covered waters, sample processing requires time and expertise.
- Ice Shelf Water (because of its unique properties, ISW likely impacts hydrography, sea ice formation, and marine ecosystem):
  - The product of the mixing between the shelf water and the meltwater is called Ice Shelf Water (ISW; its temperature is colder than the surface freezing point).
  - ISW could pre-condition the system for HSSW formation. (Super-cooled water is water that is below the in-situ freezing point, which may be different from the surface freezing point.
  - ISW outflow under the Nansen Ice Shelf (with HSSW incursion)
  - CTD data suggest ISW becomes colder and lighter during austral summer, and can be observed from later December (may be due to higher basal melt rates in Nansen Ice Shelf). Approximate meltwater fraction suggests that the amount of meltwater decreases from Feb to June over the year.
- Dense Water Overflows
  - Dense shelf water outflow is affected by the tides in the Ross sea, where the tides act as a break and the density acts as an accelerator.
  - Potential to measure dese water overflows from satellites by looking at the pressure.

Open Questions/Future Directions:

- Continued data acquisition using CPRs/Bongo Nets/ etc to provide sustained and consistent sampling of biology.
- Understanding drivers and temporal variability in change to toothfish/zooplankton populations
- How much of the Iron is delivered to different areas, and what is the timing of that and other nutrients throughout the year?
- How does the spatiotemporal variability of ISW influence sea ice distribution?
- Can we spot the variability of overflows from space? How can we use this methdology?