Day 1: Afternoon

Observations to understand ocean dynamic processes

Key Topics:

- Submesoscale and mesoscale processes in the Southern Ocean and their effect on mixing and ventilation
  - Submesoscale dynamics (cold filamentary intensification)
  - Ventilation of the global ocean – but focused on smaller scales.
  - 'Mean flow suppression': filaments or similar can form, but they may get washed away by main flow before becoming 'significant'
  - Mixing and water mass modification Weddell scotia Confluence (Discovery Bank)
- Water mass Seasonality in Cape Darnley and tracing Antarctic freshwater in Ross Sea

Main Developments:

- High energy regions downstream of bathymetric features have recently ventilated water (looks like near horizontal lies on T-S diagram), compared with some regions such as Drake Passage that are capped by freshwater from the B. Sea
- Processes controlling ventilation in Drake Passage: sea ice advection - creates cap; local submesoscale subduction and stirring; eddy suppression by polar front
- Discovery Bank is highly conducive to Taylor column formation (columns of rotating water above bathymetric bumps)
- If there is 10 Sv of bottom water going into abyss via bottom water plumes, sinking of 20 Sv in SML and upwelling of 30 Sv
- Estimates of diapycnal (~10^-5) and isopycal (~10) diffusivity moderate in UCDW, LCDW, AABW.
- Freshwater: models of basal melt do not match obs and time-varying freshwater coming from the continent via subglacial lakes.

Open Questions/ Future Directions :

- What impact does enhanced mixing in Taylor columns have on the Southern Ocean water masses? There may be more, and a lot of, regions like the Discovery Bank. Similarly, Submesoscale filaments impact magnitude and location of tracer transport but they are not included in models.
- Where does freshwater flow? Find sub-glacial basins in Antarctica (~50% more than currently mapped) and measure their freshwater amount.
- Comprehensive investigation into the presence of Taylor columns around Antarctica.
- Get 4 cheap mooring arrays in the chokepoints of AABW to get some inference about global ocean circulation
- Further quantification of diapycnal versus isopycnal mixing.