

## Circumpolar Antarctic Ice Sheet-Ocean obs: towards an integrated view and improved climate models

### Key Topics:

- NECKLACE: circumpolar basal melt rates.
- Ross Sea Ice Tongues, Subglacial drainages, 'internal tsunamigenesis' and mixing driven by glacier calving in Antarctica.
- A connected circulation system in the West Antarctic seas: what are the processes that control variability in those exchange pathways?

### Main Developments:

- Ice Tongues (a body of ice that floats on water and is supplied by ice from a grounded glacier, but it is longer than wide, not constrained to topog, fed by 1-2 glaciers)
  - Can be seen as sentinels of oceanographic changes
  - They can completely detach from the grounding line (e.g. Parker Ice Tongue).
  - Ice Tongues have basal mass changes of around 0.5-1.5 m ice per year, depending on where you are in Antarctica.
  - Fast Ice Stabilizes the Ice Tongues (Lateral flexure observed with InSAR in the Erebus Tongue)
- Subglacial drainage (flow of freshwater beneath and ice sheet – very hard to observed in Antarctica because ice is so thick. This drainage flushes ice shelf cavities, the begins to flush out further downstream.)
  - 'Swampy' areas beneath the ice, channelized streams, and near constraint discharge into the ocean which is modulated as the subglacial lakes fill then drain.
  - What impact does subglacial drainage have on ice shelf melting and why?
    - Small-area averaged effect, but localized effects are strong and it increases melting by buoyancy-driven convection.
- Sea floor roughness decreases the shelf circulation, and increases the Antarctic Slope Current. This ends up reducing the presence of warm CDW over the shelf and the heat supply towards the ice shelf cavities
- Calving events of large scale are quite normal.
- Land-fast sea ice and Pack ice: Thickness measurements are rare, but needed
- On-shelf off-shelf connection:
  - Dense water export pathways and other shelf circulation: modified by the density, which is in turn affected by meltwater
  - Gyre pathways show lots of variability, in the Ross Gyre it contracts and expands in response to the wind stress curl.
  - Potential for changes in stratification to change overturning on the shelves and in the deep.

### Open Questions/Future Directions:

- Strategies for optimizing future field deployments and further work on the Totten Glacier ('sleeping giant that is waking up')
- What role does coastal sea ice play in the overall sea ice?
- The link between stratification and water mass transformation is critical for understanding transient changes in the three dimensional overturning circulation?

