Guiding input for the ACCESS-NRI
from high-latitude ocean group:

# ACCESS Discussion Day

27 August 2021

# Ocean (sea ice/BGC) high latitude Southern Ocean

| | Idea | Short (< 1 year)<br>Medium (1-2 yr)<br>Long (2-5 yr) | NRI team |
|---|---|---|---|
| 8 | Hardening evolving model parameterisations | Medium/long | Software |
| 9 | High-latitude model assessment with evolving model versions and for global vs regional models | Medium/long | Ocean-SeaIce |
| 10 | Atmospheric snow - wind-blown, deposition, shading algae; precip in general | Medium | Atmosphere/Software |
| 11 | Atmospheric regional | Medium/long | Atmosphere |
| 12 | BGC in WOMBAT, coupled to atmosphere aerosols & chemistry (Likely already covered by Atm Chem group) | Medium | Software |
| 13 | Script maintenance, i.e., post processing, harvesting, plots, summarizing, high-level information, et | Medium/long | User |
| 14 | Assessment metrics needed | Short/medium/long | Software |

# Ocean (sea ice/BGC) high latitude Southern Ocean

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|---|---|---|---|
| 1 | High-latitude parameterisations/configurations tailored for Antarctic, e.g. sea ice, cloud. This may require software modification. | Short/medium | Ocean-SeaIce, Atmosphere, Software |
| 2 | Multi-resolution configuration management to support cross-resolution studies, parameterisation, etc. | Short/medium/long | Software |
| 3 | Provide MOM6/CICE6/WW3 coupling for the community | Short/medium | Coupled |
| 4 | Add new prognostic tracers into models, e.g., DMS into WOMBAT for ocean BGC or MSA in atm model. | Medium/long | Software |
| 5 | Include under-ice-shelf ocean circulation in MOM6 for improved deep water masses | Medium | Ocean-SeaIce |
| 6 | Inclusion of snow model or parameterisation in atm and ocean models, i.e., with view to improve physical and BGC processes. | Medium | Coupled |
| 7 | Hardening of evolving model parameterisations assisting from observations to process parameterisation to global model | Medium | Software |

More information on any of the NRI ideas

- The community is starved for sufficient and high quality observations.
- SOOS would appreciate advice out of ACCESS to guide target areas to fill data gaps. ACCESS NRI to enhance this via fit-for-purpose infrastructure for synthesis. -> End user pathway.
- Atm model: BoM: Pan-antarctic modelling… to provide high-res atm forcing for near-coastal processes. I.e., katabatics for sea-ice forcing etc. Important for (short-term) forecasting and climate processes.
- Snow is central to the phys and the ecosystems:
  - Part 1 (in atm model): Snow precip
  - Part 2 (in sea-ice model): snow on cryosphere needs to be improved. → cloud, radiation, snow on ice… → BGC & Primary Production
- Sea ice (e.g., CICE6 coupling to MOM6): critical for global climate - in collaboration with COSIMA
- Need to have model configuration allowing wave/ice-shelf interaction, i.e., correct wave propagation.
- Fully coupled needed… but allowing some functions to be turned off/on depending on focus of research to avoid compute and data overhead where not needed.
- Highly adaptable DA system required.
- Need for Machine Learning tools to harvest model output.
- Location for ACCESS-NRI staff: Some to be embedded regionally, i.e., in Hobart, Sydney, Melb, etc?

Any other notes
- Need for interactive iceberg model (advection, shear, melt)
- Interactive coupling with ice sheets: ice-shelf cavity and coastal boundaries.
- Improved high-res atmospheric forcing is a must, especially for polar processes.
- Need more obs data → Establish sustained long-term monitoring sites/transects.