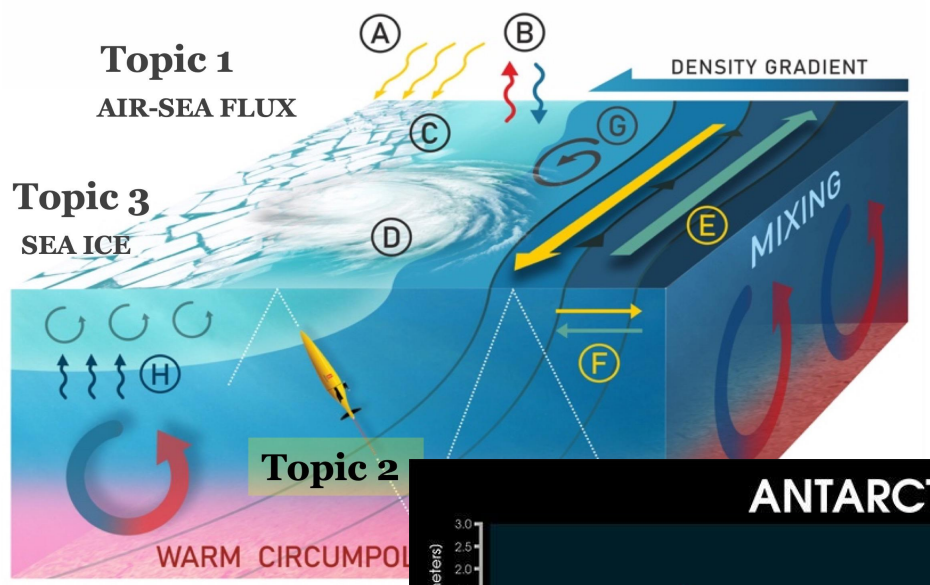
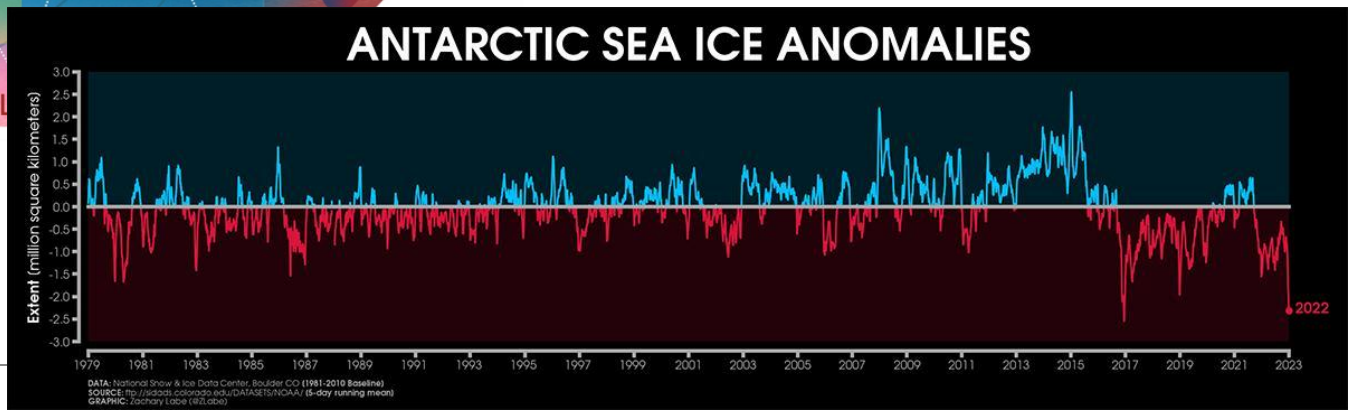
Pulse of the Weddell Sea

MARZIPAN: MARginal ice Zone Processes in the ANtarctic –

a fine-scale view of the upper ocean circulation in the Weddell Sea

T2 and T1, 3, 4… Collaborates with T5 & 7





POLARFORSKNINGS SEKRETARIATET
SWEDISH POLAR RESEARCH SECRETARIAT

MARZIPAN – upper ocean: **T2** & 1, 3, 4

Principal Investigator: Sebastiaan Swart, UGOT

- Upper ocean circulation, autonomous gliders and USVs, submesoscales

Co-PIs: Isabelle Giddy, UGOT – turbulent mixing, vertical heat flux

Marcel du Plessis, UGOT – submesoscale, air-sea fluxes

Participant(s): Fredriksson, Speich, Ward, Arndt, Edholm, Prend, Queste, Clement, Marzocchi, von Appen, Nicholson, Ansorge, Haumann, Lenn, Lincoln, Coadou

SMHI, UGOT, ENS Paris, U Ireland, AWI, UW, NOC, CSIR, Bangor

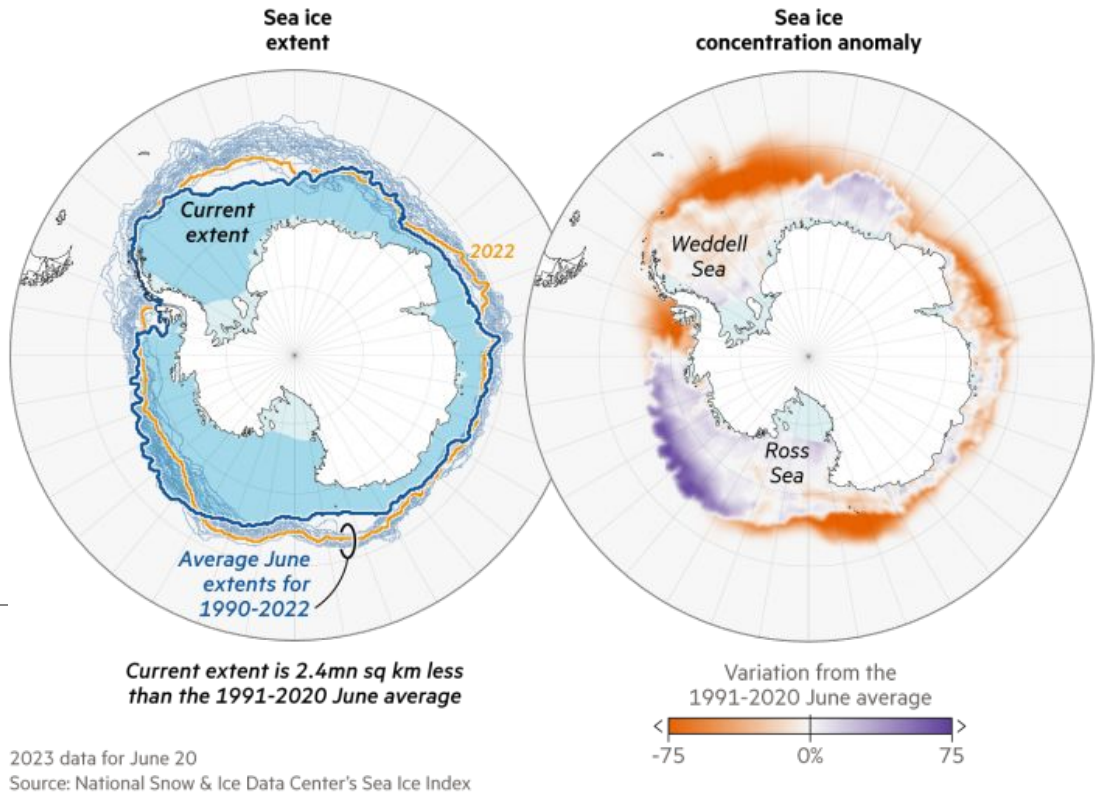
Mixing, large scale circulation, CO2 & C export, sea ice, fine scale ocean, ocean-ice interactions, satellite observations, towed instruments, gliders, outreach

Research questions

Hypothesis: fine-scale ocean circulation in the MIZ increase heat and carbon exchange across the air-sea interface and into the ocean interior *via vertical transport and mixing*

1. How does sea ice melt/formation impact upper ocean circulation?
2. How are these circulations altered by storms (wind stress and heat flux)?
3. What's the prevalence of such fine-scale flows under sea ice and near leads?

How might such processes change or contribute to sea ice decline/growth now and in the future?

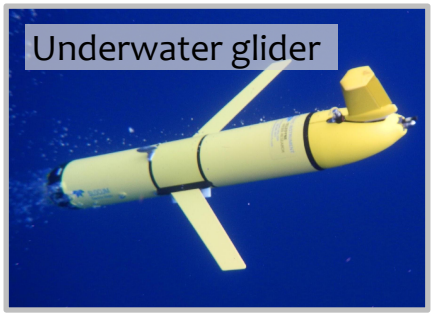


POLARFORSKNINGS SEKRETARIATET
SWEDISH POLAR RESEARCH SECRETARIAT

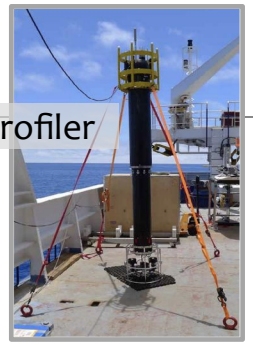
Parameters measured within the project

- Hydrographic profiling *by gliders, ASIP and* ***ship-towed CTD***
- Surface data and currents *by USVs and ship*
- Collaborators: *ASIP, Ice Tethered Profilers, Ice Mass Balance Buoys*
- Oceanography:
  - *T, S, O2*
  - *Microstructure turbulence*
  - *ADCP currents from surface and profiled (1000m)*
- *Auxilliary datasets*
  - *Chl-a, backscatter (470/600nm), NO3 (SUNA)*
  - *Meteorology*
  - *pCO2*
  - *Sea ice data – thickness, heat fluxes, met*


Towed CTD


Underwater glider


USV Wave Glider


ASIP Profiler

Type of data collection

Ship survey with towed instrumentation – 3D ocean snapshot

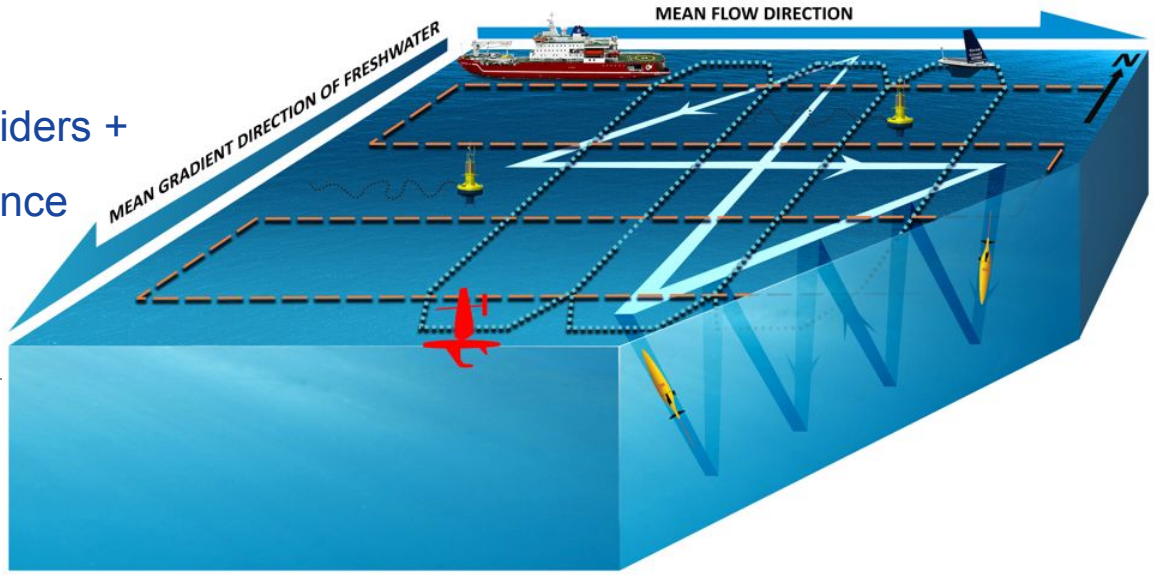
- At sea ice edge and into ice pack….50 x 50km box; 0-1000/2000 m deep
- 10 days ship time – capture a synoptic cycle (storm/no storm)

Glider, USV and ASIP missions

- ASIP has 2 day autonomy – requires ship to rendezvous
- Gliders + USVs out for x months – consider recovery on another ship or on return leg
- Gliders in under ice, submesoscale bowties, and large scale transects

Onboard activity:

- Towed CTD, calibration CTDs (at gliders + ASIP), ADCPs, TSG/pCO2 maintenance
- Calibrations: Titrino and Portacell for O2 and S



POLARFORSKNINGS SEKRETARIATET
SWEDISH POLAR RESEARCH SECRETARIAT

Logistic support requirements

- Towed CTD aft or side of vessel
- Access to the towed system (e.g. Triaxis, MVP) – Can SPRS help?
- CTDs with ADCP at robotics deployments for calibration (3-4 hrs each)

- Robotics deployments aft or using side crane – experienced deck crew highly favourable!
- Small boat support for deployments/recovery (when feasible)
- On board storage for platforms – several m^2

- On ice instrument installation – require crane/helicopter access

- 5 berths (includes technical support) – could be less depending on other project overlap + support
- *Consider additional berths for capacity building/training*