The role of warm oceans in Oligocene Miocene Antarctic ice-sheet variability

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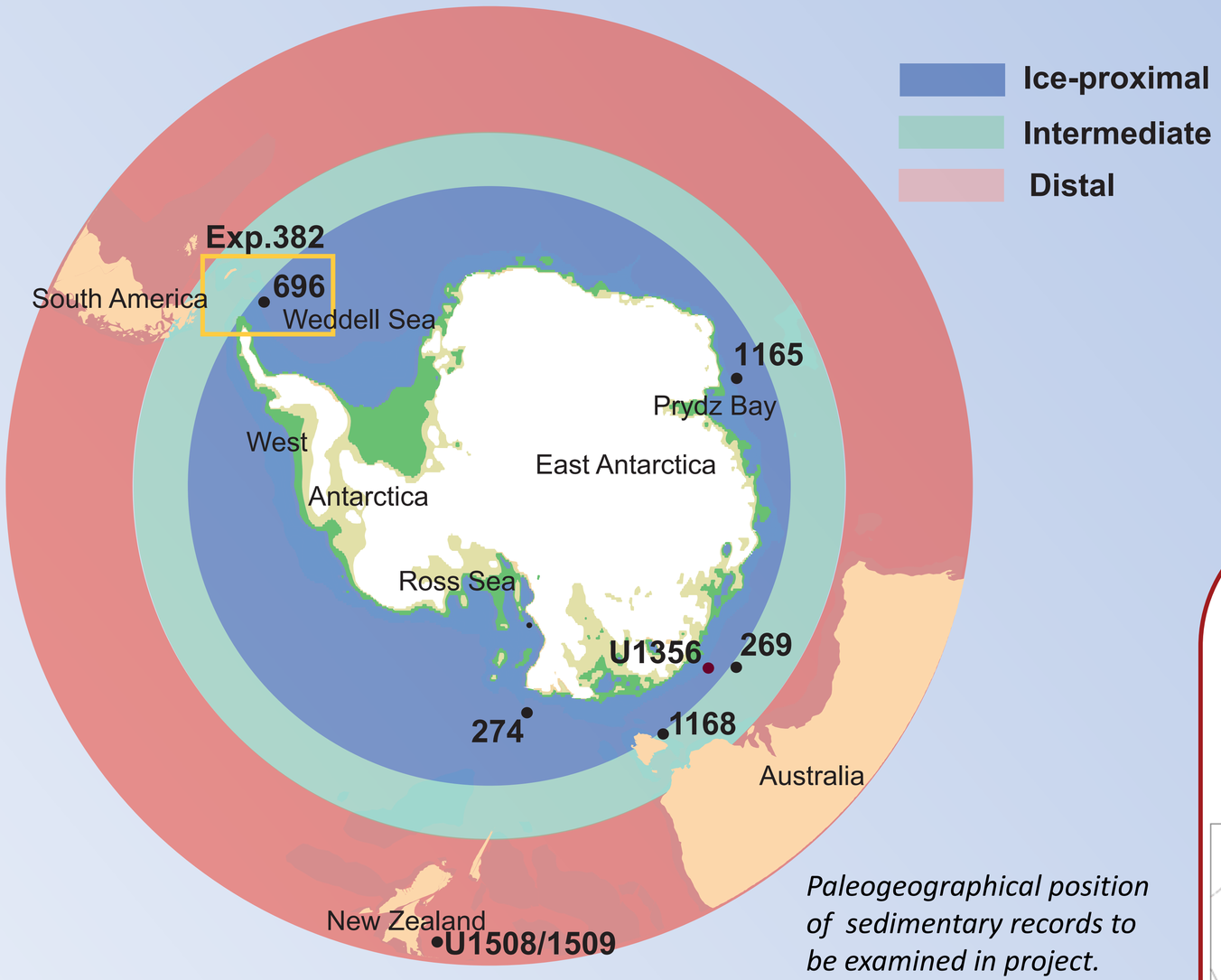
The Antarctic Ice Sheet (AIS) may be highly sensitive to future ocean-driven warming due to excessive subsurface melting. Ice-proximal reconstructions of past ice-ocean interactions in high southern latitudes are relatively rare, but critical for future sea level rise projections.

This project aims to reconstruct Oligocene-Miocene Antarctic ice-sheet fluctuations, sea-ice cover, surface-ocean primary productivity, ocean structure and temperatures using organic-walled dinoflagellate cyst (dinocyst) micropaleontology coupled with organic geochemical biomarker analyses for absolute temperature reconstructions (e.g., TEX_{86} and $U^{k'}_{37}$).



Paleogeographical position of sedimentary records to be examined in project.

Objectives

- ★ Generate high-resolution dinocyst assemblage data
- ★ Target intervals within the Oligocene and Miocene (~34-5 Ma ago) when atmospheric CO2 concentrations exceedes that of present- day
- ★ Improve existing age models using dinocyst zonation
- ★ Biomarker quantitative temperature data
- ★ Compare with numerical modelling

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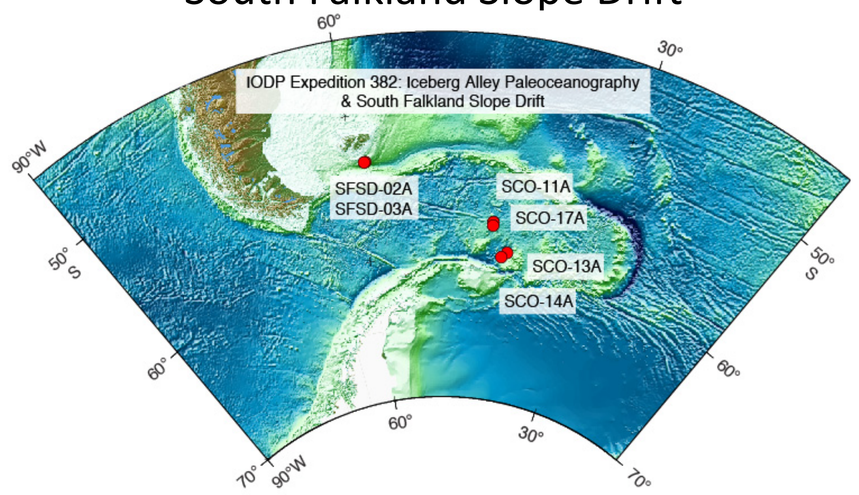
Iceberg Alley Paleoceanography and South Falkland Slope Drift



- Sailing as: Shipboard palynologist
- 20. March – 20. May 2019, Punta Arenas, Chile
- The aim is to reconstruct late Neogene - present variability in AIS mass loss and oceanic and atmospheric circulation in the Scotia Sea.

Pilot results from Site U1356

Paleomagnetic signal and independent age control from diatoms and calcareous nannoplankton allows for stratigraphically calibrated dinocyst events and develop the first dinoflagellate cyst zonation schemes.

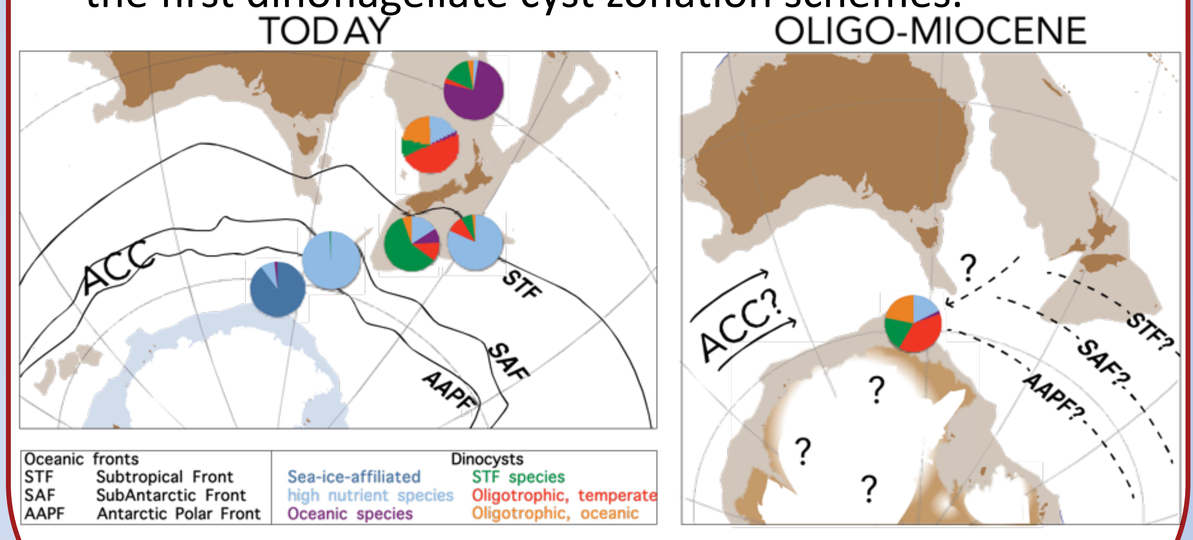
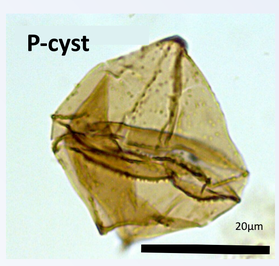


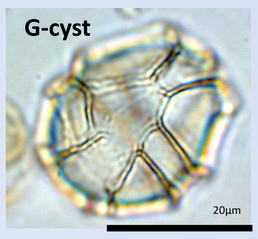
Figure after Sangiorgi et al., 2018

We will examine existing and soon to be drilled ODP/IODP sediment cores from the broader circum-Antarctic region to extrapolate the pilot results from Site U1356 (Bijl et al., in review) to other regions of the Southern Ocean. Applying modern taxonomic concepts and biozonation schemes available from U1356 can improve the understanding of age, oceanographic and climate evolution of the Antarctic region. A parallel numerical modelling project, in which our field data will be interpolated and tested against physical oceanographic laws, will together with the regional interpolation give better understanding of climate-ocean-ice sheet interactions in the Southern Ocean, ultimately assisting in predicting future sea level rise.



Lejeunecysta sp

Box 1: Dinoflagellate cysts, as tools to establish palaeoenvironmental and palaeoceanographic reconstructions: Protoperidinioids (P) cysts are heterotrophic (that fed on other plankton,) usually related to globally high SSTs, high nutrient availability, and typical of coastal and neritic settings. While Gonyaulacoid (G) cysts are autotrophic.



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