

The role of warm oceans in past Antarctic ice-sheet variability. New drilling with IODP Expedition 382



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The Antarctic Ice Sheet (AIS) may be highly sensitive to future ocean-driven warming due to excessive subsurface melting, and consequential multi-meter rise in sea level. Studying the evolution and sensitivity of ocean-ice-climate interactions under past analogue climate conditions in the Southern Ocean, will be critical for future sea level rise projections.

International Ocean Discovery Program (IODP) Expedition 382, Iceberg Alley and Subantarctic Ice and Ocean Dynamics, will investigate how the coupled Antarctic ice-ocean-climate system evolved to the present state and how it behaved across major climate transitions in the past and particularly during warmer-than-present times. The aim is to drill six sites of Neogene (past 23 million years) sediments in the Scotia Sea (Figure 1), east of the Antarctic Peninsula, providing the first deep (900m) drilling in this important region of the Southern Ocean.

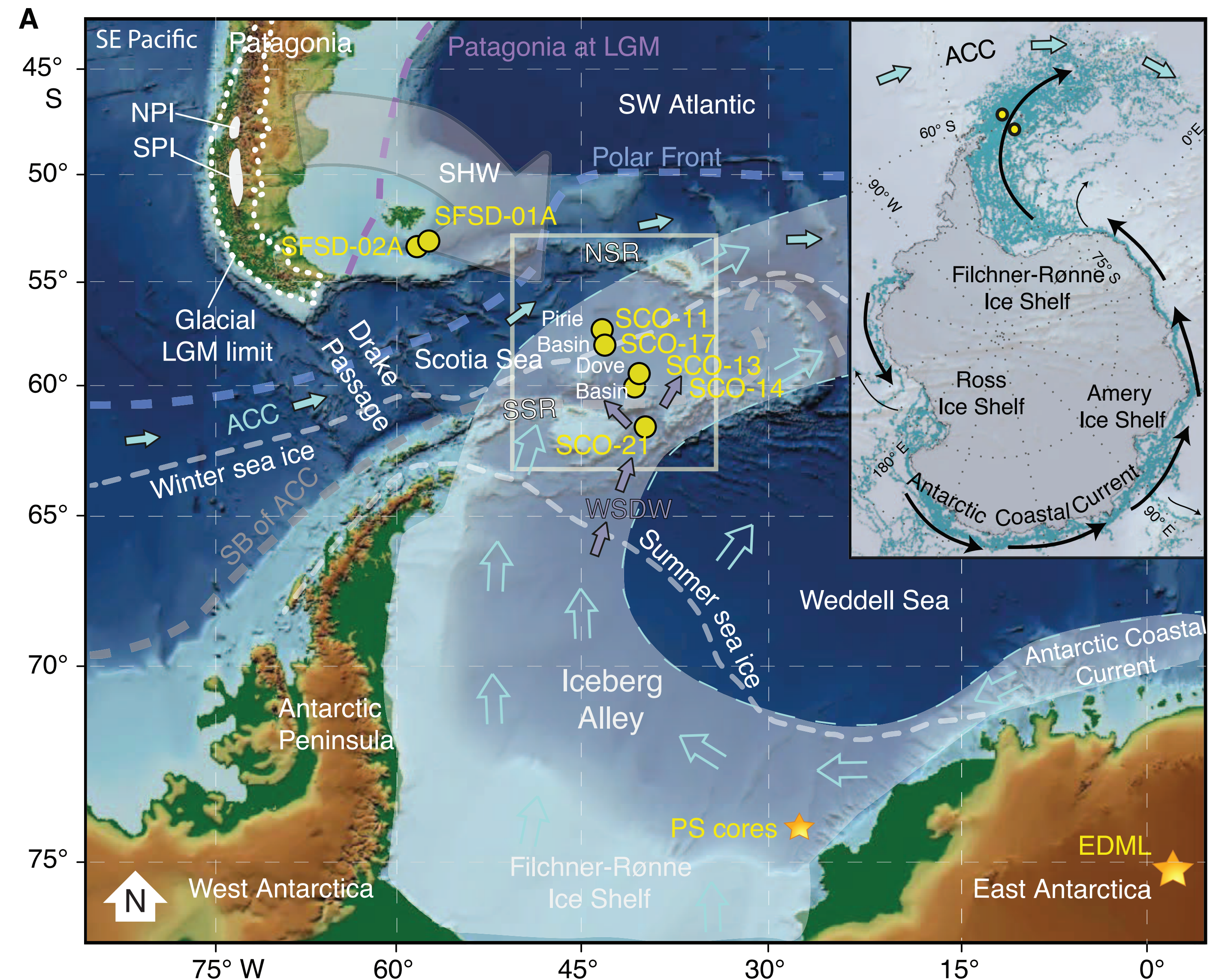


Figure 1: Map of the central Scotia Sea with proposed drilling sites (yellow dots). Open blue arrows indicate iceberg pathways drifting out of the Weddell Sea. Insert shows circum-Antarctic drift of icebergs calving off the Antarctic ice shelves (1999–2009) (Stuart and Long, 2011). Black arrows = general counterclockwise flow in the ACC. Figure modified from Weber et al. (2014).

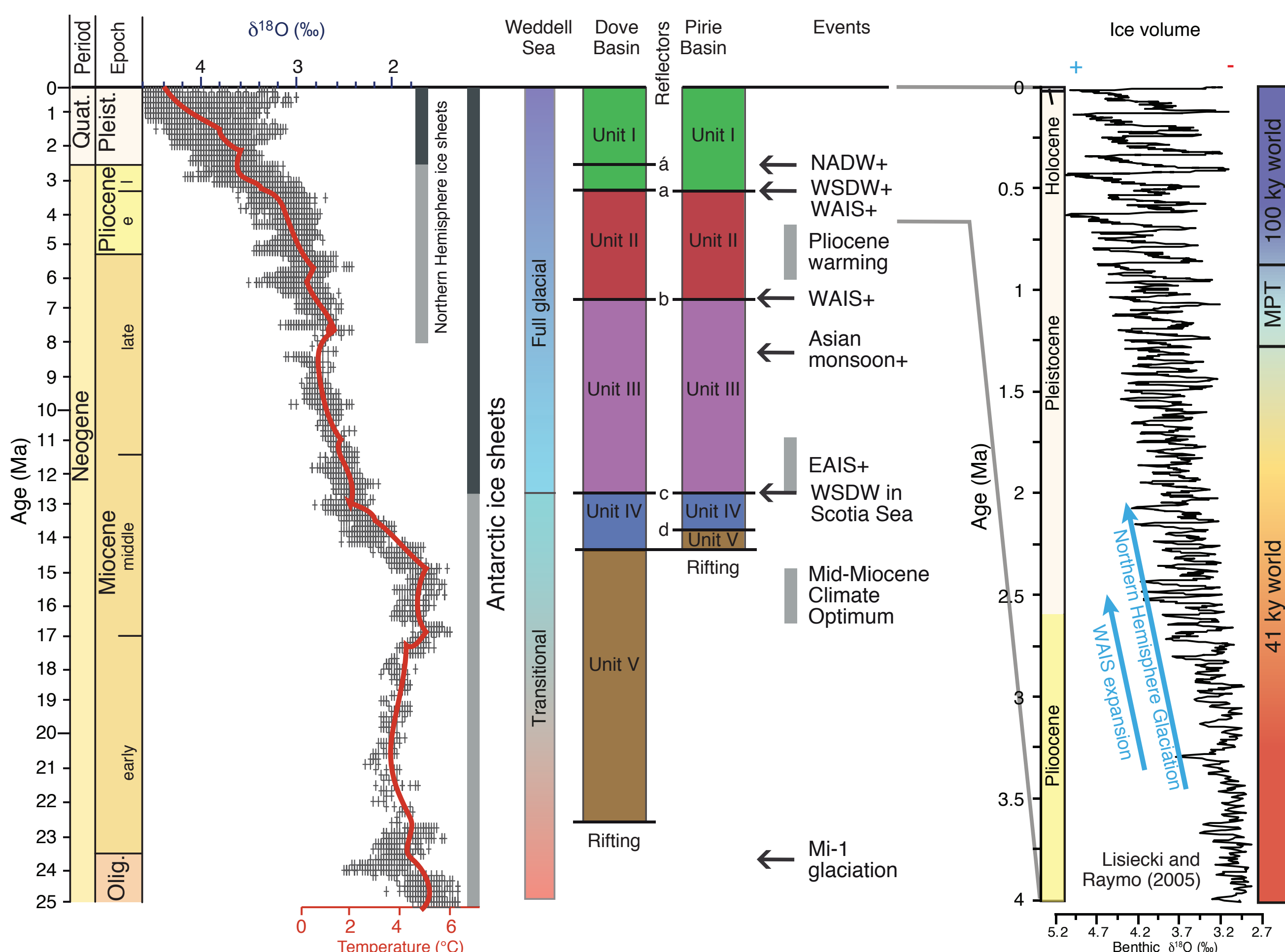
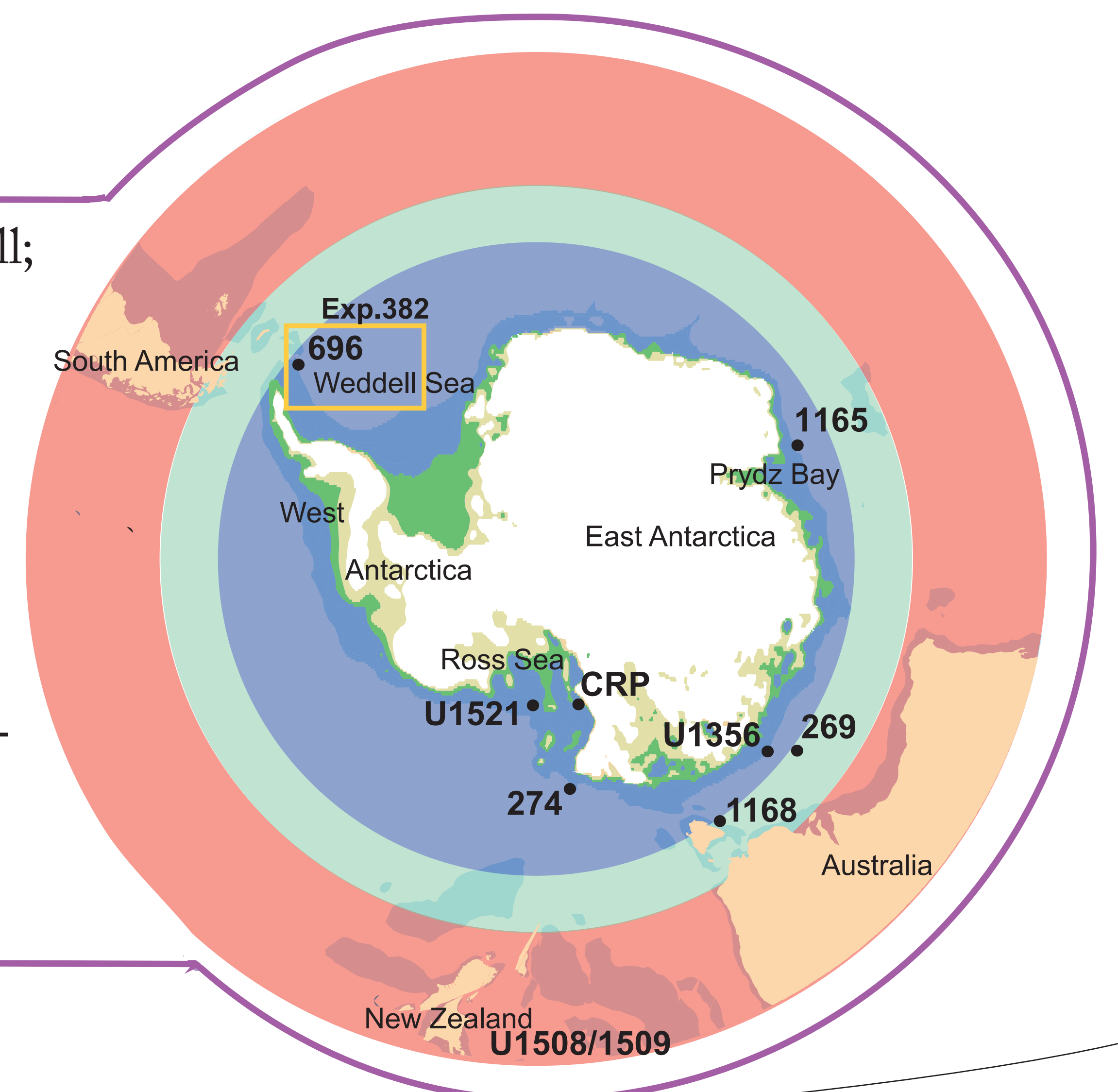


Figure 2. Seismic stratigraphy and associated ice sheet and climate events. Weber, M.E., Raymo, M.E., Peck, V.L., and Williams, T., 2018. Expedition 382 Scientific Prospectus.

In my PhD project; *The role of warm oceans in the past Antarctic ice-sheet variability*, I will;

- ★ (re)examine ODP/IODP sedimentary cores from the broader circum-Antarctic region (see map) to extrapolate the pilot palynological results to other regions of the Southern Ocean.
- ★ Couple results with organic geochemical biomarker analysis for absolute sea surface temperature reconstructions (e.g, TEX₈₆, U₃₇^k).

The regional spread of oceanographic reconstructions will yield a circum-Antarctic-wide view on past ice-proximal ocean conditions crucial for more realistic ice sheet model simulations which are ultimately used to predict future sea level rise.



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