

New contribution to Ross Ice Shelf (Antarctica) boundary conditions:

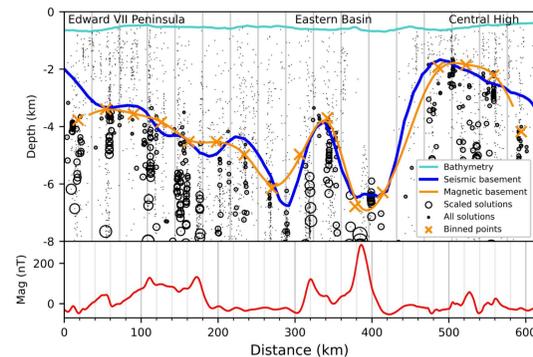
Basement Depths and Sediment Thickness Determined from Aeromagnetic Data

BACKGROUND:

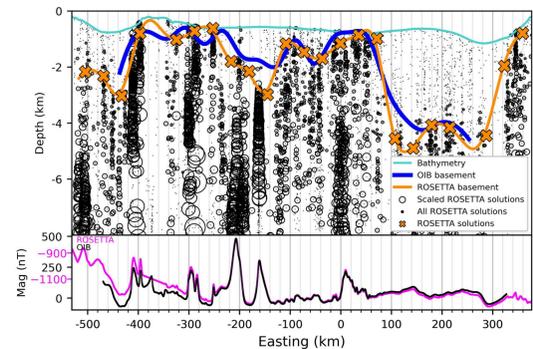
Basement rock depths under the Ross Ice Shelf (RIS) gives insight into the interplay of geology, tectonics, and glaciation of the region.

METHODS:

1. Determine depth to top of magnetic crust (basement surface) with Werner deconvolution of airborne magnetic data
2. OIB magnetic data¹ ties ROSETTA-Ice² basement (RIS) to Ross Sea seismic basement³
3. Merged RIS results with regional basement depths⁴
4. Difference from bathymetry⁵ gives sediment thickness



OIB line 403 (orange) to ANTOSTRAT (blue) comparison. Mean absolute difference between lines is 332m.

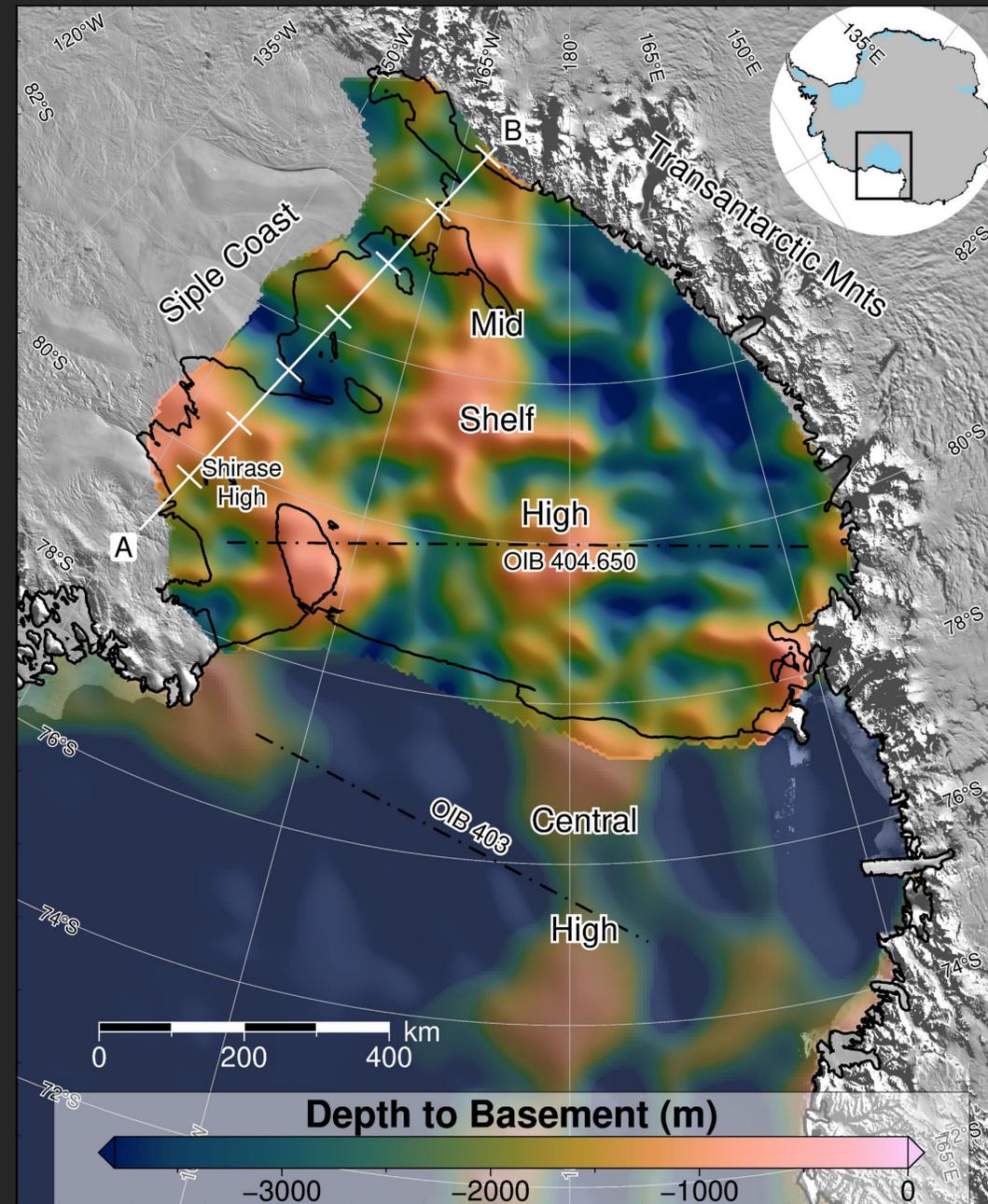


OIB line 404 (blue) to ROSETTA-Ice line 650 (orange) comparison. Mean absolute difference between lines is 387m.

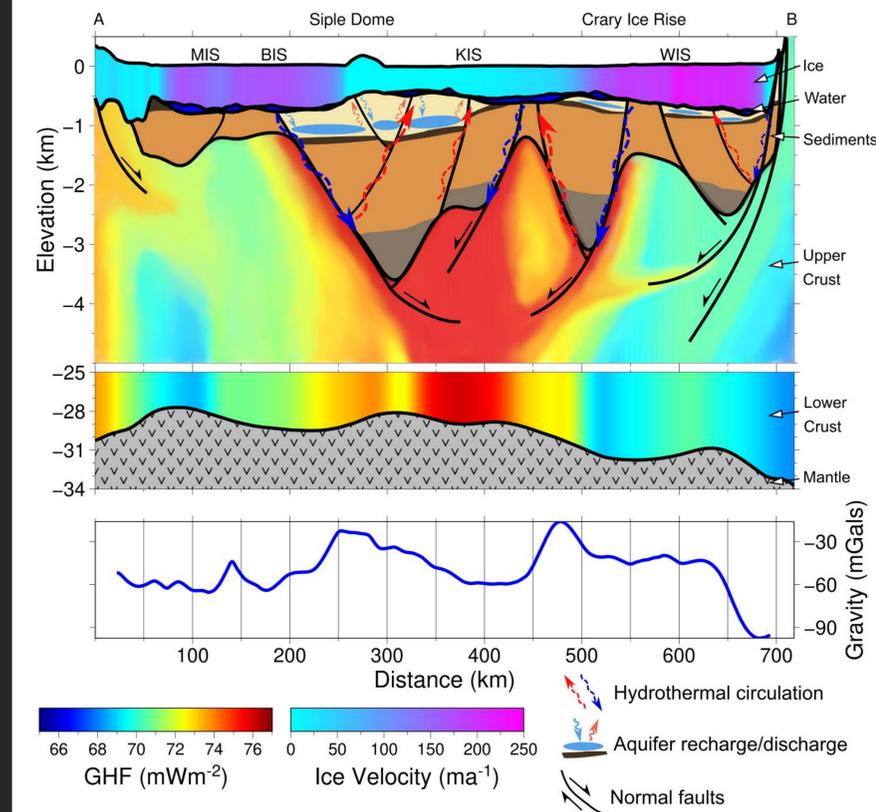
RESULTS:

- **Horst /graben** structures from West Antarctic Rift System
- 2 basement highs, likely locations for **initialization of Oligocene ice**
- Mid-Shelf High separates **East/West Antarctic geology**
- **East Ant. is deeper**, wide basin, stops at Shackleton Glacier
- **West Ant. is shallower**, with linear, narrow, deep basins
 - Siple Coast basins indicate **active rifting**
 - Faults concentrate **GHF / groundwater transport**
- RIS has **continuous drape of sediment**, 50-3800m thick

Imaging sub-Ross Ice Shelf geology with airborne magnetics



Ross Embayment basement elevations. Data from the Ross Ice Shelf are results from this study. Data offshore (transparent) are from a regional compilation⁴, mostly ANTOSTRAT³ seismic basement for the Ross Sea. OIB flights paths used for the tie are shown. A-B cross-section profile shown in white.



Siple Coast cross-section (A-B):

- Ice surface, ice base, and bathymetry from Bedmachine2⁵
- Basement from this study
- Moho from Shen et al. 2018⁶
- Ice is colored by velocity⁷
- Sediment layer shows interpreted faults, offset beds, aquifers, and water transport
- Lower crust, between -25km and Moho, shows GHF model⁸
- Upper crust is theoretical GHF, guided by inferred faults locations
- Lower panel shows ROSETTA-Ice gravity

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