

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

Basement Depths and Sediment Thickness Determined from Aeromagnetic Data

BACKGROUND:

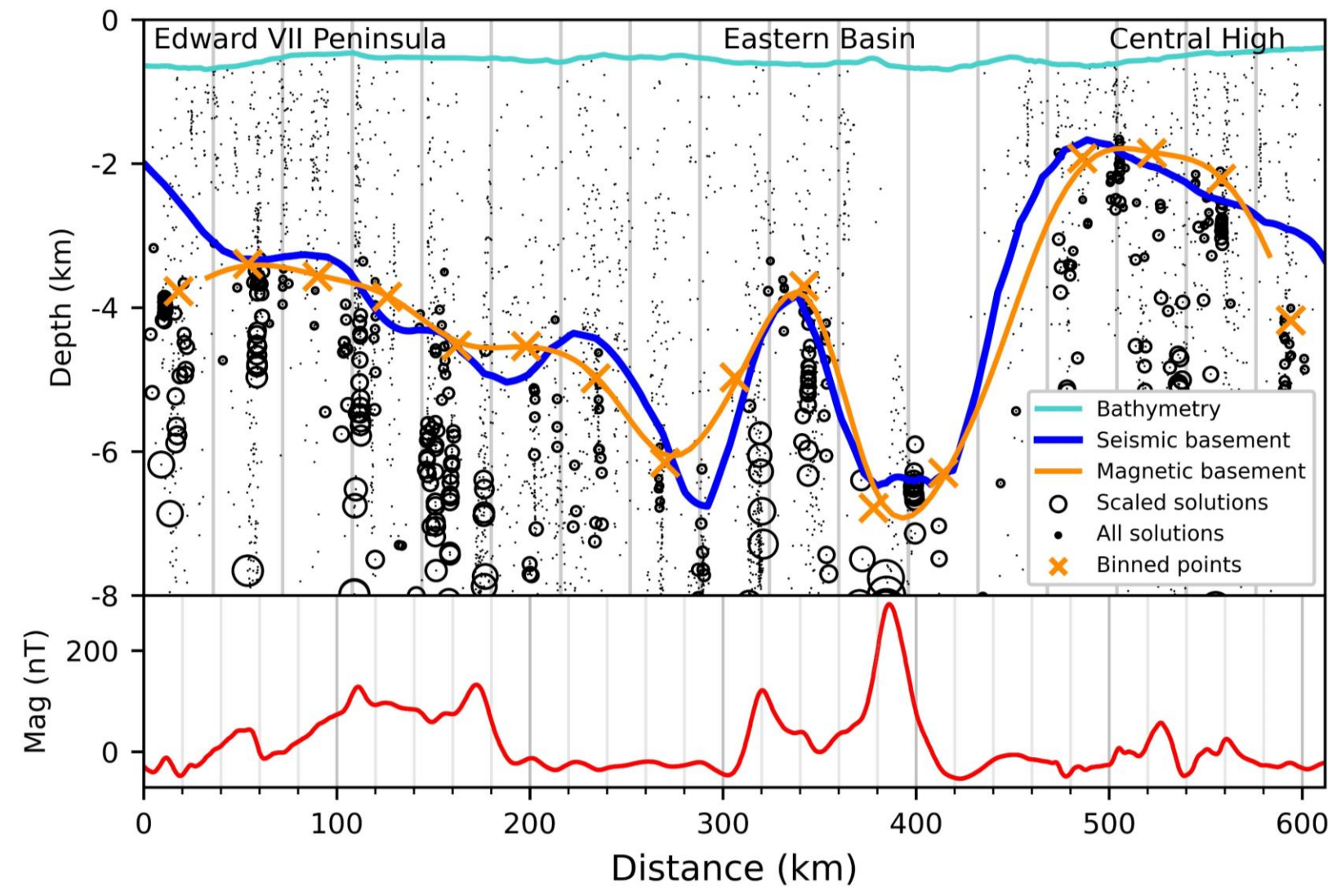
Basement rock depths under the Ross Ice Shelf (RIS) gives insight into the interplay of geology, tectonics, and glaciation of the region.

METHODS:

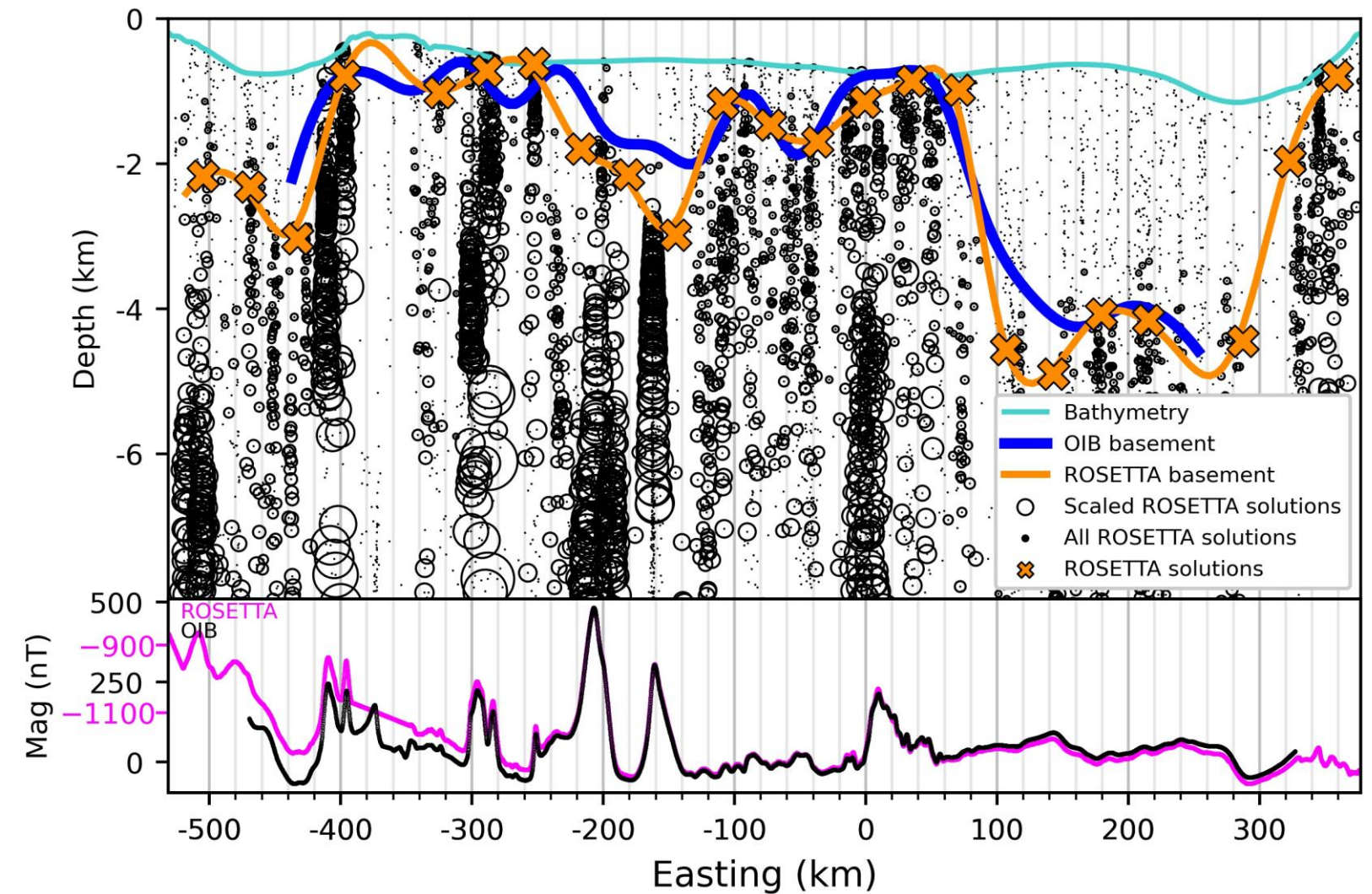
- 1. Determine depth to top of magnetic crust (basement surface) with Werner deconvolution of airborne magnetic data
- 2. OIB magnetic data<sup>1</sup> ties ROSETTA-Ice<sup>2</sup> basement (RIS) to Ross Sea seismic basement<sup>3</sup>
- 3. Merged RIS results with regional basement depths<sup>4</sup>
- 4. Difference from bathymetry<sup>5</sup> gives sediment thickness

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

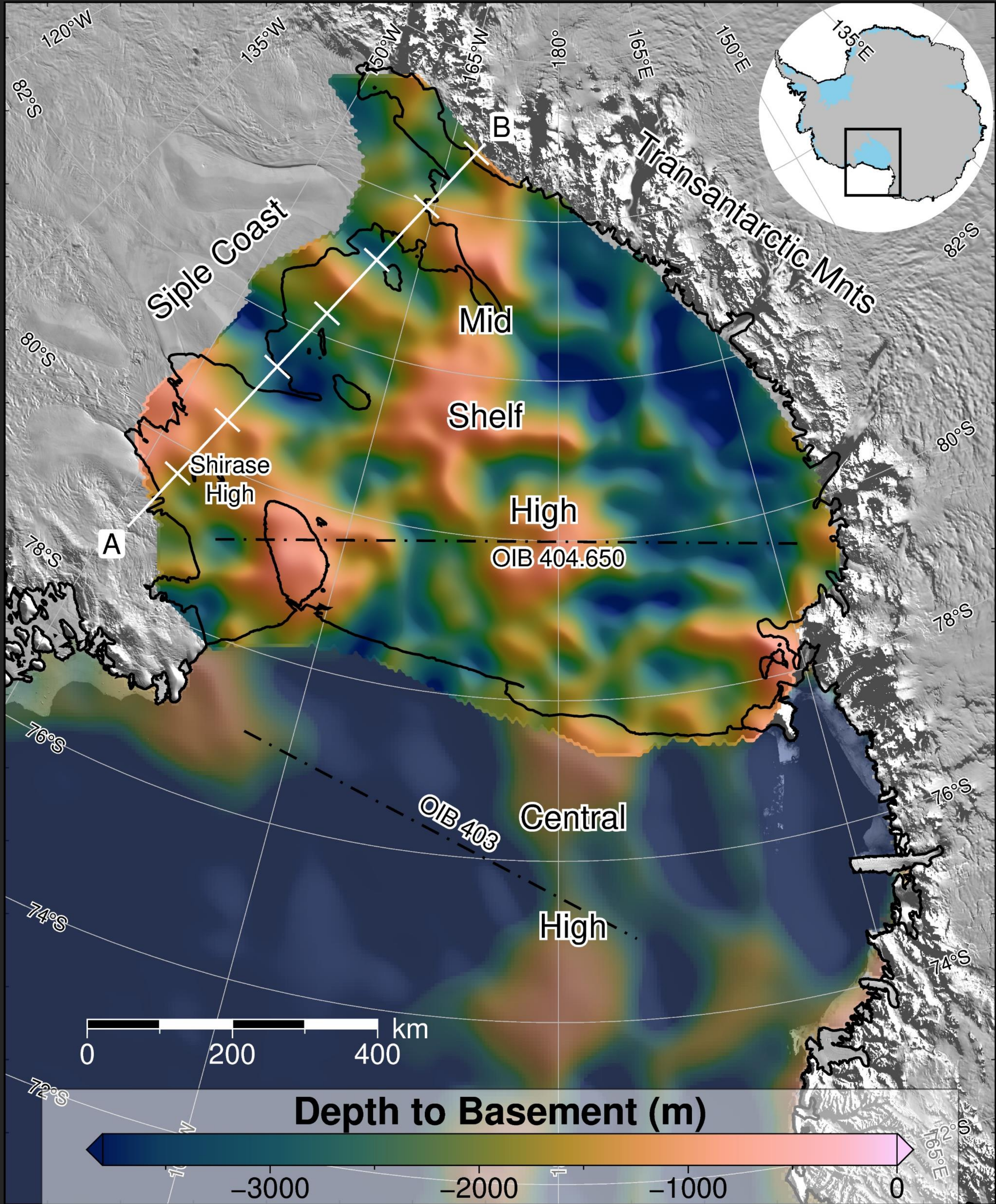


OIB line 403 (orange) to ANTOSTRAT (blue) comparison. Mean absolute difference between lines is 332m.

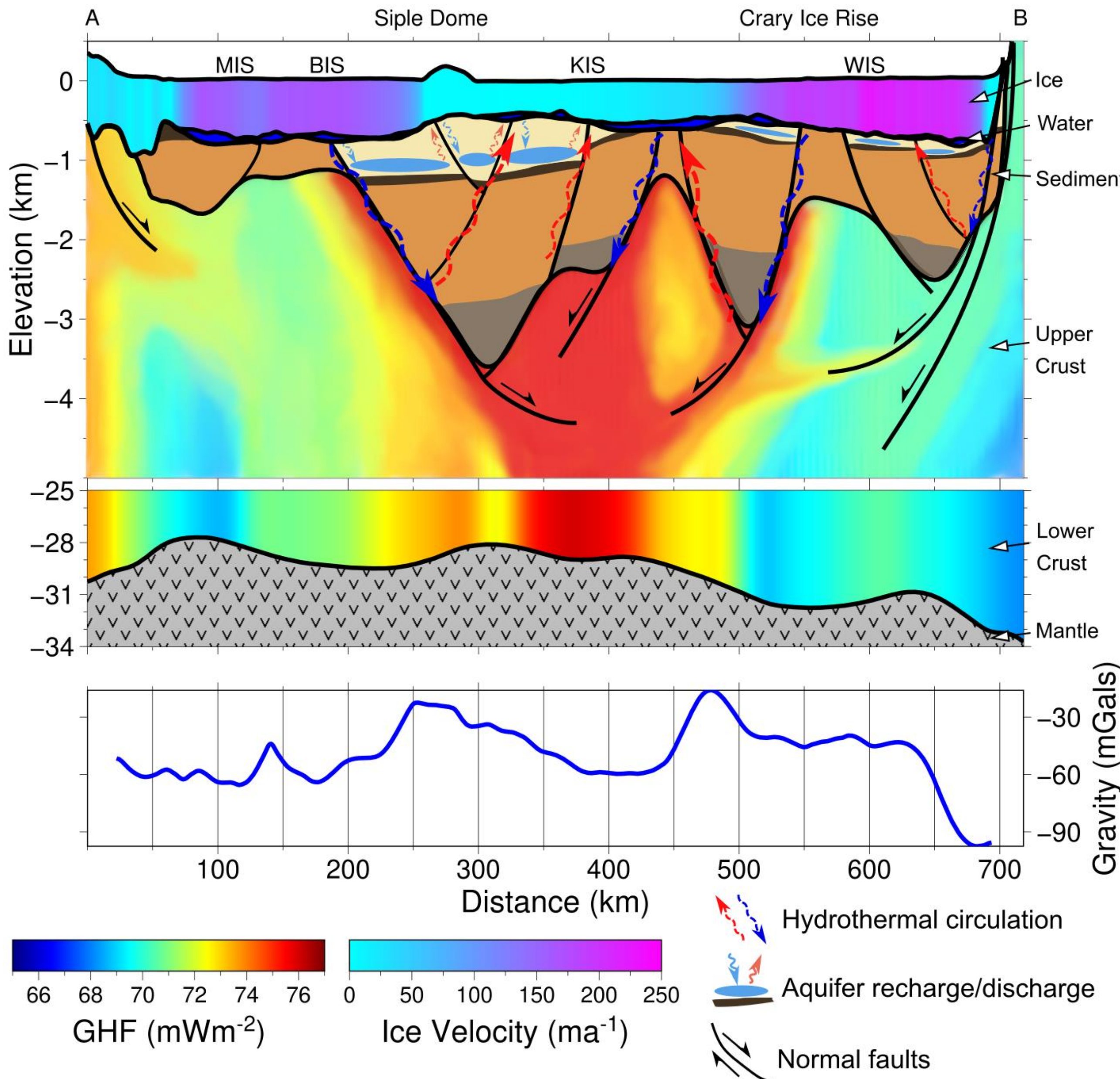


OIB line 404 (blue) to ROSETTA-Ice line 650 (orange) comparison. Mean absolute difference between lines is 387m.

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 compilation<sup>4</sup>, mostly ANTOSTRAT<sup>3</sup> 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 Bedmachine2<sup>5</sup>
- Basement from this study
- Moho from Shen et al. 2018<sup>6</sup>
- Ice is colored by velocity<sup>7</sup>
- Sediment layer shows interpreted faults, offset beds, aquifers, and water transport
- Lower crust, between -25km and Moho, shows GHF model<sup>8</sup>
- Upper crust is theoretical GHF, guided by inferred faults locations
- Lower panel shows ROSETTA-Ice gravity

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