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Australia-East Antarctica geological linkages and ice-sheet flow

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For much of Antarctica, geophysical data have been too spatially sparse to reliably image geology and tectonic structures beneath the ice sheet. Robust supercontinental reconstructions to provide context to interpretations have also been lacking. Here we interpret new airborne gravity and magnetics data to define geology and tectonic structures within the Wilkes Land/Terre Adelie sector from 90°E to 150°E, penetrating up to 1000 km into the East Antarctic continent. We co-interpret East Antarctic and Australian geophysical data in a robust and independent Gondwana-fit reconstruction. Geological features are reliably interpreted in context, and show that the major tectonic provinces of Australia, and their bounding fault zones continue into Antarctica. This allows their geometries to be defined. Features imaged include,the boundary between Indo-antarctic crust and Australo-antarctic crust, the Perth Basin, The Albany-Fraser-Musgrave Orogen, the Gawler-Mawson Craton and the Ross Delamerian Orogen. The data also reveals East Antarctic Ice Sheet (EAIS) catchments, and current flow, is controlled by large-scale faults and sedimentary basins. We hypothesise that the tectonic inheritance of Gondwana breakup provided strong boundary conditions for the initiation and development of the EAIS at 34 Ma. These conditions have remained in place since, to the extent that they exert major influence on the present flow of ice.