

Recent aerogeophysical exploration sheds new light into the last frontier on Earth: East Antarctica

Fausto Ferraccioli ¹

¹*British Antarctic Survey*

Coastal exposures and sediment provenance studies provide tantalising glimpses into up to 3 billion years of geological history of East Antarctica. However, extensive ice sheet cover hampers our knowledge of subglacial geology and deeper crustal architecture and therefore our understanding of the processes responsible for the amalgamation of East Antarctica is still in an infancy stage compared to other continents.

Here we exploit recent aerogeophysical exploration efforts to help unveil the large-scale architecture of several distinct East Antarctic crustal provinces. We focus on three key sectors: the Gamburtsev Province; the Transantarctic Mountains and Wilkes Basin area; and the Shackleton Range/Dronning Maud Land region. These areas provide new insights into East Antarctica and its broader supercontinental linkages from Gondwana through to Rodinia and Columbia.

With the aid of new magnetic and gravity models we first examine the crustal architecture and tectonic origin of the previously proposed Gamburtsev Suture (Ferraccioli et al., 2011, *Nature*) that separates the Ruker Province from an inferred Grenvillian-age Gamburtsev Province with up to 60 km thick crust and thick lithosphere (over 200 km thick). A new compilation of satellite and airborne datasets is also used here to assess potential linkages between the Gamburtsev Province and a recently inferred Tonian-age accretionary belt identified in the Sor Rondane region, which was also reworked in Pan-African times.

The most remarkable feature in East Antarctica is a 1,900 km-long linear magnetic and gravity boundary imaged along the western flank of the Wilkes Basin, which is interpreted here as a major lithospheric-scale Paleoproterozoic suture zone (ca 1.7 Ga) that inverted a former passive margin. Two ribbon-like Archean and Paleoproterozoic microcontinents were assembled during this stage, resembling the accretion of Paleoproterozoic and Archean microcontinental ribbons in Australia.

In the Shackleton Range/Dronning Maud Land region our new potential field compilations reveal a wide tract of complex anastomosing crustal-scale shear/suture zones of Pan-African age. These large-scale fault belts are part of the East African-Antarctic Orogen of Gondwana. We show how these belts flank and variably deform the margins of several pre-existing crustal provinces of Archean, Paleo-Mesoproterozoic and Grenvillian-age, which in turn provide key tracers and piercing points to develop enhanced supercontinent reconstructions.

References

Ferraccioli, F., C. A. Finn, T. A. Jordan, R. E. Bell, L. M. Anderson and D. Damaske, East Antarctic rifting triggers uplift of the Gamburtsev Mountains, *Nature*, 479, 388-392, 2011.