Paper Number: 2121

Unveiling East Antarctica and its supercontinental linkages with geophysical imaging

Ferraccioli, F.[1], Aitken, A.[2], Bell, R.E.[3], Blankenship, D.D.[4], Young, D. [4], Eagles, G.[5], Jacobs, J.[6], Forsberg, R.[7], Finn, C.A.[8], Martos, Y. [1], Armadillo, E. [9], Ebbing, J.[10], Jokat, W. [5], Jordan, T.A.[1], Ruppell, A.[11], Läufer, A. [11], Dalziel, I.[4]

[1]British Antarctic Survey (NERC), Cambridge, UK ffe@bas.ac.uk
[2]University of Western Australia, Perth, Australia
[3]Lamont -Doherty Earth Observatory, Palisades, NY, USA
[4]University of Texas, Institute for Geophysics, Austin, Texas, USA
[5]Alfred Wegener Institute, Bremerhaven, Germany
[6]University of Bergen, Bergen, Norway
[7]Technical University of Denmark –Space, Lyngby, Denmark
[8]US Geological Survey, Denver, Colorado, USA
[9]University of Genova, Italy
[10]University of Kiel, Germany
[11]BGR- Federal Institute for Geosciences and Natural Resources

---

East Antarctica is a keystone in the Gondwana, Rodinia and Columbia supercontinental puzzle. Recent aerogeophysical research efforts augmented by gravity (Scheinert et al., 2016) and seismological data compilations (An et al., 2015) are providing tantalising new views into the large-scale crustal architecture of East Antarctica and its supercontinental linkages.

A mosaic of distinct Precambrian basement provinces has been imaged in interior East Antarctica (Ferraccioli et al., 2011). A major suture separates the Archean-Neoproterozoic Ruker Province from an inferred Grenvillian-age orogenic Gamburtsev Province with remarkably thick crust (up to 60 km thick) and thick lithosphere (over 200 km thick). Whether the proposed suture is linked to Grenvillian-age assembly of Rodinia or the later assembly of Gondwana in Pan-African times is controversial (e.g. Ferraccioli et al., 2011 vs An et al., 2015). Further east, magnetic highs delineate the subglacial extent of a Paleo to Mesoproterozoic Nimrod-South Pole province (Goodge and Finn, 2010) that flanks a composite Mawson Continent- including the Gawler Craton of South Australia (Aitken et al., 2014). An over 1,900 km long magnetic and gravity boundary along the western flank of the Wilkes Subglacial Basin is interpreted as a lithospheric scale Paleoproterozoic suture zone linked to the collision of Laurentia and East Antarctica within Columbia (Ferraccioli et al., 2016, Nature, in prep.).

Aerogeophysical imaging reveals an extensive Keweenawan-age (ca 1.1 Ga) large igneous province in the Coats Land Block -isotopically tied with the Mid-Continent Rift System of Laurentia (Loewy et al., 2011). Grenvillian-age arc terranes are delineated from aeromagnetic images and confirm linkages between the Namaqua-Natal and Maud belts in South Africa and Dronning Maud Land. The aeromagnetically distinct Southeast Dronning Maud Land province (Mieth and Jokat, 2014) has been interpreted as a reworked 1000-900 Ma Oceanic Arc Superterrane (Jacobs et al., 2015). Imprints of Pan-African age transpression, collision and indentation tectonics are recognised in the previously unexplored Recovery Frontier and interpreted as recording the final amalgamation of Gondwana.

References:

[1] Scheinert M. et al. (2016) GRL doi: 10.1002/2015GL067439.
[2] An M. et al. (2015) JGR 120(1): 359-383.
[3] Ferraccioli F. et al. (2011) Nature 479: 388-392
[4] Goodge J. and Finn C.A. (2010) JGR 115: doi: 10.1029/2009JB006890
[5] Aitken A et al. (2014) Gondwana Res 41(7):2390-2400
[6] Loewy S.L. et al. (2011) Geology 39(9): 859-862.
[7] Mieth M. and Jokat W. (2014) Gondwana Res. 25(1): 358-367
[8] Jacobs J. et al. (2015) Precambrian Res. 265: 249-272.