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Recent Aeromagnetic Anomaly views of the Antarctic continent

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Antarctica is a keystone within the Gondwana and Rodinia supercontinents. However, despite intense geological research along the coastal fringes of Antarctica, the interior of the continent remains one of the most poorly understood regions on Earth. Aeromagnetic investigations are a useful tool to help disclose the structure and the evolution of continents from the Precambrian to the Cenozoic and Antarctica is no exception. Here I review a variety of aeromagnetic studies in East and West Antarctica performed since the completion of the first generation ADMAP -Antarctic Digital Magnetic Anomaly Project- in 2001. In western Dronning Maud, in East Antarctica, aeromagnetic data help delineate the extent of the Jurassic Jutulstraumen subglacial rift that is flanked by remnants of a Grenvillian-age (ca 1.1. Ga) igneous province and magmatic arc. Different magnetic signatures appear to characterize the Coats Land block but reconnaissance surveys are insufficient to fully delineate the extent and significance of the Coats Land block, a possible tectonic tracer of Laurentia within Rodinia (Loewy et al., 2011). Further in the interior of East Antarctica, a mosaic of distinct and hitherto largely unknown Precambrian provinces has recently been revealed by combining aeromagnetic and satellite magnetic data with models of crustal thickness constrained by gravity modeling and seismology (Ferraccioli et al., 2011, Nature). A major collisional suture may lie between the Archean Ruker Province and an inferred Proterozoic Gamburtsev Province but the age of final assembly of central East Antarctica remains uncertain and controversial. I favour a Grenville-age collisional event (linked to Rodinia assembly) or possibly older Paleoproteroic collision, followed by intraplate reactivation, as opposed to Neoproterozoic or Early Cambrian collision linked to East-West Gondwana assembly (Boger, 2011). New aerogeophysical surveys over Prince Elizabeth and Queen Mary Land could test this hypothesis further and contribute towards understanding the role that the inherited Precambrian architecture exerted on the location and development of the East Antarctic Rift System, which was active both before and during Gondwana break-up. Over Wilkes Land, aeromagnetic data offer tantalizing new glimpses into the extent of Precambrian basement provinces that have been extensively studied in formerly adjacent Australia. An over 1,900 km long magnetic low is traced from a new magnetic anomaly compilation along the margin of the Archean-Proterozoic Mawson continent, and is interpreted as delineating part of a Neoproterozoic rift system that heralded Rodinia break-up. Aeromagnetic data are also helping in deciphering Phanerozoic crustal growth along the paleo-Pacific active margin of Gondwana. In northern Victoria Land aeromagnetic anomaly interpretation, coupled with geochemical and structural observations is clarifying the architecture and evolution of Cambro-Ordovician terranes that were affected by the Ross Orogen. In the Antarctic Peninsula aeromagnetic and aerogravity data suggest the existence of several distinct arc provinces that may have docked against the Gondwana margin during the Cretaceous age Palmer Land event. Aeromagnetic interpretation over the West Antarctic ice sheet provides new insights into the extent of Cenozoic magmatism and rift basins within the West Antarctic Rift System and into the inland extent of the Jurassic Weddell Sea Rift