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New SHRIMP zircon age from the Larsemann Hills region, Prydz Bay, for A Late Mesoproterozoic to early Neoproterozoic and Pan-African tectono-thermal event in East Antarctica

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We reports a geochronological study of granulite-facies rocks from the Larsemann Hills of Prydz Bay, East Antarctica. SHRIMP zircon ages were obtained for various rock types including felsic gneiss, mafic gneiss, paragneiss, enderbite, granitic gneiss and leucogneiss. These age results, combined with zircon geochemical data and cathodoluminescence images, enable us to explore the morphological complexity in zircons that record polytectonic events. Features of multiple age zoning, for example, were observed in zircon separates from three felsic gneiss samples studied, which contain magmatic cores of ca. 1.13 Ga and metamorphic mantles and rims of ca. 1.0 and 0.53 Ga, respectively. This suggests a period of magmatism and crust formation in the late Mesoproterozoic and two subsequent phases of high-grade metamorphism during the early Neoproterozoic and early Paleozoic, respectively. Similar phenomena of zircon overgrowth were also observed in other rock types. Although early Paleozoic tectonic activity has been considered as most significant in Antarctic crustal evolution, our study provides the first convincing age evidence for the existence of a Prydz Bay late Mesoproterozoic mobile belt. With metamorphic P-T paths of metapelitic granulites, We find the M1 metamorphic evolution occurred during the late Proterozoic Grenvillian high-grade compression tectonic event (D1), and was accompanied by strong magmatism, showing a close affinity to the northern Prince Charles Mountains and Rayner complex. However, the overprinted M2 to M3 metamorphic evolution formed during the early Palaeozoic (530 Ma) Pan-African high-grade tectonic events (d2-D3), and was associated with an important intracontinental reworking.

The ca. 1.0 Ga metamorphic record preserved in diverse rocks from the study area furthermore supports the proposal of a continuous circum East Antarctica late Mesoproterozoic (Grenville-age) orogenic belt.

Within this framework, the Prydz Bay orogen is proposed to have been located in the central part of the Rodinia assembly that brought the Eastern Ghats of India together with Antarctica at ca.1.0Ga.

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