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Nature and extent of a Tonian Oceanic Arc Super Terrane (TOAST) in eastern Dronning Maud Land, East Antarctica: integrating geology and geophysics

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An extensive Tonian Oceanic Arc Super Terrane (TOAST) has been recognized in a so far poorly studied area in eastern Dronning Maud Land based on integrated geological-geophysical studies. The TOAST is sandwiched in between Kalahari and Rukerland and consists of a characteristic gabbro-trondhjemitic-tonalite-granite suite dated at ca. 1000-900 Ma. TOAST samples have normalised trace element patterns typical for subduction-related magmas, have mostly a positive initial epsilon Nd and lack significant inheritance, typical for juvenile crust. The TOAST underwent protracted Late Neoproterozoic/Early Palaeozoic crustal reworking, migmatization and polyphase melt production as a result of accretion-collision tectonics from ca. 650-500 Ma. Airborne geophysics allows us to speculate that the TOAST has a significant southern extent until ca. 77°S, where it abuts against a cryptic craton. The western margin of the TOAST probably represents the Forster Magnetic Anomaly in central Dronning Maud Land, whilst the eastern margin is poorly surveyed at present. We have tested the validity of the southern extension of the TOAST with the help of a U-Pb zircon detrital moraine study from the southern side of the Sør Rondane Mts. One-thousand zircons from nine moraine samples from southernmost Sør Rondane, the Nansen ice field and Steingarden, were dated by LA-ICP-MS. The analyses fall into three major age groups at ca. 1080, 950 and 550 Ma; only very few older Palaeoproterozoic zircons were found. Apart from late-tectonic granites, another common lithology in the moraines is a grey gneiss with a U-Pb zircon age of ca. 1080 Ma, similar to the oldest major age peak found. Rocks of this age are not commonly exposed in Sør Rondane. Similar to TOAST samples, the grey gneisses have a subduction signature with negative Nb/Ta anomalies; however, they are more evolved than the proximate juvenile TOAST. Although rocks with ages of ca. 1080 Ma are common in the Maud and Rayner belts to the E and W, the grey gneisses in the moraines differ from the latter two in that they are much more juvenile. The

grey gneisses probably rather represent an early, late Mesoproterozoic phase of the TOAST. A Late Mesoproterozoic/Tonian metamorphic overprint is neither recorded in rocks of the TOAST nor the grey gneisses, indicating that these oceanic arcs probably evolved outboard of Rodinia.

