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Title: DETRITAL ZIRCON RECORD OF CRUSTAL ASSEMBLY AND OROGENIC EVOLUTION ALONG THE PALEO-PACIFIC MARGIN OF ANTARCTICA

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Abstract: Detrital-zircon geochronology is now a standard tool in the study of continental tectonics. Because of inherent linkages with surficial processes and sediment transport, the study of detrital-zircon age populations in siliciclastic rocks is an important complement to connections between tectonic setting and sandstone composition pioneered by W. R. Dickinson. It has also become a powerful tool for the non-sedimentologist interested in crustal assembly and orogenesis. For the “basement” geologist interested in long-term evolution of Antarctic crust, for example, detrital-zircon geochronology can be used to: (1) characterize the age and composition of cratonic areas flanked by siliciclastic sediment, particularly for the East Antarctic shield that is largely masked by the polar ice cap; and (2) improve our understanding of the timing and nature of convergent plate-margin orogenesis, by integrating detrital-zircon provenance records with stratigraphic and structural-tectonic studies in order to constrain the depositional ages of syn-tectonic units, track changing sources, and estimate rates of denudation. These two themes are explored in the examples provided.

Detrital-zircon geochronology can be used to great advantage for documenting the age and composition of poorly-exposed Precambrian cratonic shields such as East Antarctica. Despite evidence for a rich Archean to Neoproterozoic history from coastal outcrop, our inability to penetrate several kilometers of ice cover limits our understanding of this continental crust. Detrital-zircon ages obtained from (a) Neoproterozoic and lower Paleozoic craton-margin assemblages, (b) Oligocene to Holocene glaciomarine deposits associated with known paleo-iceflow, and (c) Neogene to LGM continental ice-sheet deposits provide a unique time-transgressive record of crustal sources in the cratonic interior. When combined with tracer information (e.g., Hf isotopes), these proxy ages of East Antarctic crust have implications for Proterozoic assembly of Rodinia.

Craton-margin to syn-orogenic forearc deposits in the Transantarctic Mountains capture the transition from a passive margin formed during Rodinia rifting to active-margin tectonism associated with Gondwana assembly. In particular, these siliciclastic rocks record rapid intra-arc denudation and molasse deposition during Ross orogenesis, as constrained by stratigraphic, biostratigraphic, structural, thermochronological and

detrital-mineral ages for zircon and muscovite. The entire episode of linked tectonic and denudational events spanned a time interval of 7 to 25 m.y. during the late Early Cambrian to earliest Ordovician, with only a short time lag between tectonism and sedimentary response. The short-lived pulse of Andean-type tectonic activity is associated with inception of a Pacific-rim convergent plate margin marked by the composite Ross-Delamerian orogen formed during the final assembly of Gondwana.