FROM ISOTOPES TO ICE: REFINING THE TIMING AND STYLE OF LATE PALEOZOIC GLACIATION

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Abstract

The timing, duration, and extent of late Paleozoic ice sheets in southern Gondwana is poorly constrained, thus limiting our understanding of linkages between high-latitude glaciation, glacioeustasy and climate inferred from better constrained low-latitude successions. The Permo-Carboniferous succession of the Paraná Basin, Brazil, can potentially resolve this issue given the abundance of volcanic ashes coupled with a near continuous record of the late Paleozoic ice age and its turnover to greenhouse conditions. I propose to use high-precision CA-ID-TIMS analysis of the U-Pb isotopes of zircons extracted from ash deposits systematically collected throughout the Parana succession to develop a three-dimensional geochronologic framework of higher accuracy and precision than currently exists. This framework, in turn, will be used to identify ice source locations using Lu-Hf and U-Pb isotopes from zircons recovered from glacial sediments throughout the basin. The defined ice sources will ultimately be used to constrain global climate models of ice volume for the LPIA. In addition, fossil plants and paleosols that are replete throughout the Paraná will be used to reconstruct the climate within the glacial and interglacial cycles. This detailed stratigraphic/climatic model will be extrapolated to other Gondwana basins in order to better resolve the timing of LPIA glaciation globally and provide insight into the processes that control glacial-interglacial cycles in deep time. Ultimately, this project will enable comparison of the high and low latitude sedimentary record during Earth's last icehouse and allow the geologic community to study climate processes from the deep time at sub-million year time scales.

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