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Refining the Carboniferous-Permian Successions of the Paraná Basin, Brazil via High-Resolution Zircon U-Pb CA-TIMS Dating

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The late Paleozoic Ice Age (LPIA) is Earth's only record of a CO_2-forced climatic transition from an icehouse to greenhouse state in a vegetated world [1,2]. Despite a refined framework of Gondwanan ice distribution, questions remain about the timing, volume, and synchronicity of high-latitude continental ice and the subsequent deglaciation [3]. These questions ultimately preclude our understanding of linkages between ice volume, sea level, and high- and low-latitude climate. Poor constraints on the timing and synchronicity of glacial and interglacial transitions reflect a lack of high-resolution radioisotopic dates from high-latitude, ice-proximal Carboniferous-Permian successions. The Rio Bonito Fm in Rio Grande do Sul State of southern Brazil hosts the oldest non-glaciogenic Carboniferous-Permian deposits of the Paraná Basin, thus recording the icehouse-to-greenhouse transition. Despite a widespread effort over the last two decades to constrain these deposits in time by means of U-Pb zircon geochronology, published datasets of the Candiota and Faxinal coals of the Rio Bonito Fm host discrepancies that may reflect post-eruptive open system behaviour of zircon and analytical artifacts [4-7]. These discrepancies have hindered the correlation of the Candiota and Faxinal sediments within the larger Gondwanan framework. Here we present the first U-Pb ages on closed system single zircons using Chemical Abrasion Thermal Ionizing Mass Spectrometry (CA-TIMS) techniques on Permo-Carboniferous ash deposits of the Paraná Basin. Preliminary results indicate two major and distinct coal-forming periods that are separated by ca 10 Ma. Our results and conclusions are not in agreement with multi-crystal U-Pb TIMS and SIMS ages that suggest coeval deposition of the Candiota and Faxinal coals. In addition, our analysis constrains the glacial deposits in Rio Grande do Sul State to the Carboniferous. CA-TIMS analyses applied to zircons from additional ash deposits are aimed at constructing a robust chronostratigraphic framework for the Carboniferous-Permian succession of the Paraná Basin, which will facilitate a better understanding of the timing and ice dynamics of the LPIA.

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