Tropical Climate Instability during the Early Permian Deglaciation

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The early Permian demise of the late Paleozoic ice age marks the last icehouse-to-greenhouse transition on Earth. Understanding the climate dynamics and low-to-high latitude teleconnections requires an accurate age model and high temporal resolution climate proxy records. We present a latest Carboniferous-early Permian age model based on CA-TIMS U-Pb zircon ages from a terrestrial succession in the Yongcheng Basin of southern North China and derive quantitative mean annual surface temperatures (MAT) using a weathering index-based transfer function. The terrestrial MAT time series correlate well with time-equivalent low-latitude marine sea surface temperature reconstructions. Observed cooling and warming intervals through the succession are coeval with periods of advance and retreat of the Gondwana ice sheets. Repeated major warming events are associated with negative carbon isotope excursions and rises in atmospheric pCO_2. Our results establish a high-resolution stratigraphic framework for and illustrate a dynamic nature of the climate during the early Permian demise of Earth`s penultimate icehouse. The apparent synchroneity of major shifts in low-latitude terrestrial MATs and SSTs and their correspondence to the high-latitude glaciation/deglaciation history in southern Gondwana highlights the global connectivity and dynamic nature of climate changes during the final phase of Earth's penultimate icehouse.