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Hydrological cycle perturbation of continental weathering during the Triassic-Jurassic transition and Toarcian Oceanic Anoxic Event

QIAN HE[1], STEPHEN P. HESSELBO[2], SOFIE LINDSTRÖM[3] AND JUN SHEN[4]

[1]China University of Geosciences (Wuhan)
[2]University of Exeter
[3]University of Copenhagen
[4]China University of Geosciences, Wuhan

The Early Jurassic represents a critical interval in Earth's history, characterized by significant ecosystem perturbations both on land and in oceans. Furthermore, huge releases of greenhouse gas (e.g., CO_2, CH_4) by large scale volcanic eruptions are generally assumed to cause significant increases in temperature during the Triassic-Jurassic transition (TJT) and Toarcian Oceanic Anoxic Event (T-OAE). Marine sediment records from this interval have been extensively studied, while the terrestrial ecosystem records remain limited. In this work, we present a continuous lacustrine succession from the Chuxiong Basin in Yunnan Province, China, through the analysis of an approximately 1800 m core. By integration of sedimentological, paleontological, geochemical, and astronomical data, we have established a chronology spanning about 23 million years from the Rhaetian (Late Triassic) to the Toarcian (late Early Jurassic), calibrated by the long eccentricity cycles. Distinct negative carbon isotope excursions and peaks in sedimentary Hg abundance, confirm significant volcanism during both the TJT and T-OAE. However, the Chemical Index of Alteration (CIA) and clay mineral data show opposing responses for the two events, indicating increasing and decreasing (or constant) chemical weathering intensity during the TJT and T-OAE, respectively. Additionally, lithium isotopes are obviously in positive deviations during these two hyperthermal events, and suggest weaker continental weathering during the TOAE versus TJT in Yunnan. We proposed that these event-specific chemical weathering variations imply responses of volcanism-induced hydrological changes at different latitudes during these events.