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# Astronomical control on climate and vegetation history at the Triassic-Jurassic transition

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The end-Triassic mass extinction (∼201.5 Ma), marked by major terrestrial ecosystem changes and a 50% loss in marine biodiversity, closely coincides with the onset of intensified volcanic activity in the Central Atlantic Magmatic Province (CAMP), the largest igneous province on earth. The end-Triassic environmental crisis is followed by successive recovery in the early Jurassic Hettangian stage. However, accurate timing of events is poorly constrained.

Here we present combined chemical and biological proxy records and field observations, covering the uppermost Triassic and lower Jurassic marine successions of St. Audrie's Bay and East Quantoxhead (UK). A floating astronomical time-scale of ∼2.5 Myr has been constructed based on the recognition of ∼100-kyr eccentricity cycles. Individual black shale occurrences are interpreted to reflect precession-controlled changes in monsoon intensity.

Gaseous CO2 release by the increased volcanic activity strongly enhanced greenhouse warming and likely caused a shift from a diverse gymnosperm vegetation to a monotonous Cheirolepidiaceous conifer vegetation. Vegetation distribution at the Triassic-Jurassic transition was likely influenced by the strong temperature and humidity gradient from the oceans to the interior of Pangea. Vegetation cover was mostly situated in coastal regions, with the inlands being more arid. Strong eccentricity-scale paced increases in pollen concentrations suggest the inland expansion of Cheirolepidiaceous vegetation cover, which is likely caused by intensified monsoon activity. Our palynological data further shows precession-scale paced peaks in spore abundance during the mass extinction interval, suggesting astronomical forcing of the hydrological cycle under extreme climatic conditions.