New astrochronology of the end-Triassic extinction (ETE) and initial carbon isotopic excursion (CIE)

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Lake level cycles in cores and outcrops of the Newark Basin rift comprise the basis of an astrochronology of the continental ETE and flows of the Central Atlantic Magmatic Province (*1*,*2*). Tuned with a synthetic precession model (*3*), this astrochronology was tested and corroborated by U-Pb geochronology of the interbedded lava flows and related intrusions (4). The tuning required a ~60 kyr gap corresponding to the Preakness Basalt formation of the Newark Basin. New cores from the Hartford Basin (*5*) fill this apparent gap, and have previously unknown lake level cycles corresponding to the upper two flows of the Preakness, and flows with these chemistries are correspondingly missing from the Hartford Basin (*6*).

The new cores thus complete the cycle stratigraphy allowing the construction of the first empirical U-Pb calibrated astrochronology of the ETE. This astrochronology can now be directly correlated to the marine, independently U-Pb-calibrated $\delta^{13}C$ data from the Pucara Basin section in Peru that has an ammonite-based ETE (7). Fourier analysis reveals only one significant frequency which is at 405 kyr. Based on the U-Pb age models, the 405 kyr peaks in intervals of high precessional variation in the Newark astrochronology are in phase with 405 kyr ^{13}C-depleted peaks. The marine and continental ETE events correlate comfortably within the limits of the two independent U-Pb age models and astrochronologies with the initiation of the CIE corresponding to that of the marine and continental ETE. The lacustrine and marine carbon-isotopic 405 ky astrochronologies provide a potential resolution of the various previously proposed, non-unique correlations of marine and continental sequences (*8*).

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