

## Carbon isotopic test of the Triassic age of the lower Central High Atlas basalts

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The Triassic-Jurassic (Tr-J) boundary marks one of the most severe Phanerozoic mass extinctions. With a turnover of at least 50% of terrestrial biodiversity, the event set the ecological stage for the ascent of dinosaur-dominated ecosystems. Our previous work on the Tr-J boundary in eastern North American continental rift basins and work by others in marine and continental deposits demonstrate an associated modest Ir anomaly, a "fern spike," a stomatal (CO<sub>2</sub>) anomaly, and a pair of negative  $\delta^{13}\text{C}_{\text{org}}$  excursions. While these observations have been interpreted as condign with an extraterrestrial impact, much if not all of this evidence is also consonant with the temporally proximate voluminous flood basalts of the Central Atlantic magmatic province (CAMP). However, data from eastern North America suggest that all CAMP flows post-date the extinction level by tens of thousands of years, making causation unlikely. Nonetheless, Marzoli et al. (2004) and Knight et al. (2004) interpret magnetic reversals within the Central High Atlas basalts of Morocco as indicating that most of the lavas predate or were synchronous with the Tr-J boundary, making a plausible case for the CAMP as the cause of the extinction.

A predictive corollary of the Marzoli-Knight hypothesis is that the initial  $\delta^{13}\text{C}$  excursion seen globally should be within or above the Moroccan CAMP but not below it. To test this prediction, we examined the carbon isotopic composition of bulk organic material ( $\delta^{13}\text{C}_{\text{org}}$ ) through palyniferous strata below the lower basalt sequence of the Central High Atlas. While the Triassic index species *Patinasporites densus* does appear in the highest palyniferous sample as reported by Marzoli et al. (2004), our preliminary isotopic data suggests the presence of a major isotopic excursion below the oldest basalt, consistent with profiles from the Fundy basin of Canada and the Newark basin of the USA. These results are: 1) inconsistent with the hypothesis of Marzoli et al. (2004) and Knight (2004) that the lower Central High Atlas basalts predate the Triassic-Jurassic boundary; and 2) consistent with some reworking of Triassic palynomorphs at least locally into the first few 10s of centimeters of Early Jurassic strata.

The isotopic excursion seen in Morocco, eastern North America, and indeed globally is the signature of the massive carbon cycle disruption that occurred at the Tr-J boundary. Should the Central High Atlas basalts post-date that excursion, as suggested by our preliminary  $\delta^{13}\text{C}_{\text{org}}$  results, there would be no known examples of CAMP basalts contemporaneous with or predating the Tr-J boundary and direct causation of the mass extinction by the CAMP will be difficult to support.

### References

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