

## **CAMP-induced CO<sub>2</sub> injection drove hydrological cycle intensification across the end-Triassic extinction**

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Although models predict that elevated  $p\text{CO}_2$  intensifies the hydrological cycle, with an implied amplification of the effects of orbitally forced precipitation fluctuations, there is surprisingly little direct evidence to support a coupling during warm worlds before 0.8 Ma. One of the most pronounced Phanerozoic warm intervals ( $p\text{CO}_2$  values  $>1,000$  ppm) is associated with the end-Triassic extinction ( $\sim 201.6$  Ma), coincident with emplacement of the Central Atlantic Magmatic Province (CAMP). We used compound specific hydrogen isotopes ( $\delta\text{D}$ ) of terrestrial higher plant derived  $n$ -alkanes, lithologic, and soil carbonate data to reconstruct the hydrologic cycle from Newark Supergroup rift lakes (North America) and shallow marine sections in England.

Newark Supergroup basins record variance in lake level expression of the climatic precession cycle based on lithology, and  $\delta\text{D}$  appears temporally linked to  $p\text{CO}_2$  based on soil carbonate proxy data from the same strata. Cyclicity variance is high during times of high  $p\text{CO}_2$  ( $\sim 4000$  ppm) including much of the Late Triassic and during the end-Triassic mass extinction when there are massive atmospheric  $p\text{CO}_2$  injections ( $\sim 5,000 - 6,000$  ppm) associated with CAMP, but drops precipitously when  $p\text{CO}_2$  declines below 2,500 ppm during the Rhaetian and early Jurassic ( $<2,000$  ppm). This increased variance drove insolation-paced increases in precipitation. Leaf wax  $\delta\text{D}$  shows significant variability, reflecting an enhanced hydrological cycle at the end-Triassic extinction with repeated sudden shifts in relative evaporation. In marine strata,  $^{87}\text{Sr}/^{86}\text{Sr}$  values track  $p\text{CO}_2$  with a dramatic decrease from 0.70795 to 0.70765 suggesting a terrestrial/marine linkage through weathering,  $\text{CO}_2$ , and runoff. Even though North America was moving further north into the arid belt, sedimentary facies,  $\delta\text{D}$  trends and physiognomic changes in cheirolepidiaceae conifers suggest lower evaporation relative to precipitation consistent with lower  $p\text{CO}_2$  due to CAMP weathering.  $\delta\text{D}$  and lithologic data from the Bristol Channel Basin support the generality of this pattern, in an area far from the CAMP eruptions.