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Parallel $p\mathrm{CO}_2$, Hydrologic and Conifer Physiognomic Trends across the end-Triassic extinction

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Although the end-Triassic extinction (201.6 Ma) had modest effects on plant diversity, we have found a strong effect in plant physiognomy. We describe trends in cheirolepidaceous conifer leaf and stomatal morphology from tropical Pangean great rift lake deposits (present northeastern USA) that broadly parallel orbital-to-seasonal scale $p\mathrm{CO}_2$ and hydrological cycle changes recorded from the same strata. The physiognomic changes appear at an abrupt (<10 ky) negative δ^{13}C excursion in n-alkanes synchronous with a palynological turnover and fern spike and continue through a prolonged negative δ^{13}C excursion that tracks the $p\mathrm{CO}_2$ and n-alkane hydrogen isotope records, lasting 900 ky (through all 3 basaltic extrusive events of CAMP), encompassing most of the Hettangian age. During intervals of elevated $p\mathrm{CO}_2$, cheirolepidaceous conifer leafy shoot forms *Brachyphyllum* and *Pagiophyllum* develop microphyllous leaves with thickened cuticle and sunken papillate stomata. Subsequently, a 2- to 5-fold increase in the area of leafy shoots in strata of latest Hettangian age suggest a return to lower thermal stress levels from lower $p\mathrm{CO}_2$, despite the fact that eastern North America continued to drift into more arid latitudes. The lower $p\mathrm{CO}_2$ is also associated with limestone deposits that are otherwise unusual and suggest that extremely elevated $p\mathrm{CO}_2$ drove extreme weathering of exposed local and new CAMP lavas. The floral physiognomic changes associated with the negative δ^{13}C excursion, very elevated $p\mathrm{CO}_2$ levels, and abrupt transitions in arid and humid conditions is a microcosm of the Mesozoic in which the dominance of cheiroleps overlaps with the highest $p\mathrm{CO}_2$ levels of the Phanerozoic.