Transformative effects of the end-Cretaceous event on the evolution of modern Neotropical rainforests

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The end-Cretaceous (K/Pg) event was catastrophic for terrestrial ecosystems that reshaped plant communities worldwide. Yet, until recently, the fate of tropical forests following the K/Pg boundary has been largely unknown. We used abundant pollen and leaf fossils collected in Colombia to quantify plant extinction and ecological change in tropical forests across the K/Pg boundary in tropical South America. Regional changes in diversity were quantified using a palynological dataset that span the Maastrichtian–Paleocene interval, representing three authoctonous leaf floras that were used to infer forest structure, plant composition, and plant-insect interactions.

Maastrichtian rainforests were diverse assemblages of ferns, angiosperms, and conifers that formed open canopies and had diverse plant–insect interactions. Plant diversity declined by 45% at the K/Pg boundary, establishing a long interval (~6 million years) of unusual low plant diversity in the Neotropics. Paleocene plant communities became dominated by angiosperms, whereas conifers became (nearly) regionally extinct. By the mid–late Paleocene, tropical forests resembled modern-aspect rainforests in having closed canopies and a multistratal structure. Despite their low taxonomic diversity, Paleocene rainforests were ecologically diverse and had the same plant-family composition, dominated by legumes and palms, as modern Neotropical rainforests.

The transformation in forest structure and plant composition across the K/Pg boundary likely is a byproduct of the ecological catastrophe at the end-Cretaceous, and indicates fundamental changes in carbon fixation, evapotranspiration and nutrient cycling.