



New Evidence for Canopy Collapse at the Cretaceous-Paleogene Boundary from Leaf Cuticles

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Since the discovery of the massive bolide impact at the Cretaceous-Paleogene Boundary (~66 Ma), there has been much speculation on how the impact event affected terrestrial landscapes. A sudden shift to an over-dominance of fern spores – the “fern spike” – immediately above the K-Pg boundary clay indicates a substantial disruption to terrestrial plant communities. We present new data to assess canopy dynamics across the K-Pg event using the morphology of leaf epidermal cells, which respond to the amount of sunlight leaves receive during development. We reconstructed a high-resolution record (~1 cm) of canopy density quantified as Leaf Area Index (LAI—the area of foliage/area of ground) from dispersed leaf cuticles preserved in palynological samples from the K-Pg John’s Nose locality near Marmarth, North Dakota, USA. The results show the presence of consistently dense forest canopies prior to the K-Pg event, but an opening of the canopy abruptly following emplacement of the boundary clay. This open signal occurs during the peak of the fern spike and is brief in duration. After the fern spike, the LAI rebounds to pre-event levels within ecological timescales. These data are concordant with previous interpretations of the fern spike that suggest forest canopy collapse. In addition, they permit the estimation of recovery time for forests to regain their original structure (though compositionally different from pre-impact floral communities), and they provide additional evidence of habitat loss and a breakdown in terrestrial primary production.