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Terrestrial ecosystem collapse associated to the K-Pg boundary and dinosaur extinction: palynological evidences

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We report here the discovery of the stratigraphically youngest in situ dinosaur specimen. This ceratopsian brow horn was found in southeastern Montana, in the Western Interior of the United States in a poorly rooted, silty mudstone floodplain deposit and only 13 centimeters below the palynologically defined K–Pg boundary. The boundary is identified using three criteria: 1) substantial decrease in diversity and abundance of Cretaceous pollen and spore taxa that completely disappear from the palynological record a few meters above the boundary, 2) the presence of a "fern spike", and 3) palynostratigraphical correlation to a nearby section where primary extraterrestrial impact markers are present (e.g., iridium anomaly, spherules and shocked quartz).

The palynological record in the rock sequence immediately following the K–Pg boundary consistently indicates a sudden and major loss of the Cretaceous components across the North American record. During this rapid decline, the palynological assemblages are dominated by freshwater ferns (Azolla) and algae (usually Pediastrum sp. and Penetetrapites sp.) indicating generalized flooding in the area. The onset of the Paleocene sedimentation is subsequently announced by the presence of variegated beds, multiple lignite seams and small scale meandering river systems, starting with palynological associations that attest for reworking and erosion. The destabilization of terrestrial ecosystems is coincident with the markers of the K–Pg boundary, supporting a catastrophic event taking place over a very short duration.

The in situ ceratopsian brow horn demonstrates that a gap devoid of non-avian dinosaur fossils in the last meters of the Cretaceous is artificial and thus inconsistent with the hypothesis that non-avian dinosaurs were extinct prior to the K–Pg boundary asteroid impact event.