Draught in the low latitudes and cooling by global soot aerosols led to the mass extinction at the Cretaceous-Paleogene boundary

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The extinction of the dinosaurs at the Cretaceous/Paleogene boundary led to the macroevolution of mammals and appearance of humans. The current hypothesis for the extinction of the dinosaurs is that an asteroid impact at Chicxulub, present-day Mexico, formed condensed aerosols in the stratosphere, which caused the cessation of photosynthesis and global near-freezing conditions. Here, we propose a new hypothesis that latitude-dependent climate changes caused by the soot aerosols in the stratosphere could consistently explain both the extinction of the dinosaurs and the survival of the crocodilians. Our geochemical data show that stratospheric soot aerosols were ejected from the oil-rich area by the asteroid impact and spread globally, coinciding with the devastation of land plants. Our model calculation and biological interpretation indicate that the soot aerosols caused sufficiently colder climates at the mid-high latitudes for several years, inducing the extinction of the dinosaurs and crocodilians in those areas. However, the climate still remained warm enough for their survival and the weak sunlight was still sufficient for plant photosynthesis at low latitudes, but the substantial decreases in precipitation occurred at low latitudes over several years resulting in draught, which may have affected their eventual extinction or survival.
More than 90% species of planktonic foraminifera, which inhibited the global seas, became extinct coinciding with the asteroid impact at the Cretaceous/Paleogene boundary. Our model calculation indicates that the soot aerosols caused 7–11°C, 4–8°C, and 3–6°C cooling at most in the 2 m, 50 m, and 100 m water depths in the low-middle latitude ocean. The rapid global cooling may have caused the marine extinctions.

Keywords: mass extinction, dinosaurs, planktonic foraminifera, Cretaceous-Paleogene boundary, soot, climate

