Dinosaur extinction at the K-T boundary; slow decline, volcanic eruptions, or impact?

ABSTRACT

Compared with other mass extinctions, the extinction at the Cretaceous-Paleogene (K–Pg) boundary (~65.5 million years ago) has attracted remarkable public attention because of the appeal of dinosaurs to the public imagination. The non-avian dinosaurs which ruled the Earth for about 170 million years disappeared at the end of the Cretaceous. It is difficult to find a conclusive answer to the questions of why this mass extinction occurred and whether they were in a long-term decline, or their demise happened suddenly. The extinction event coincided with a large asteroid impact at Chicxulub (Mexico) and with the Deccan volcanic eruptions in India which persuade scientists to correlate these causes with the K–Pg event. On the other hand, some other studies demonstrate that dinosaurs were in decline tens of millions of years prior to the Cretaceous-Paleogene boundary because of changes in global and regional climatic patterns. The Chicxulub Asteroid Impact would have killed the dinosaurs by setting off a global cataclysm and environmental upheaval after striking the Earth. Massive eruptions of Deccan volcanism formed giant dust clouds which obscured sunlight and caused short-term global cooling. In addition, the emitted SO_2 and CO_2, also, made sulfate aerosol particulates in the stratosphere which reflected incoming solar radiation and brought about global cooling and acid rain. These severe environmental changes could have led to extinction. In contrast, changes in global climate which were initiated several million years before the K–Pg boundary could have reduced the dinosaur biodiversity. In this hypothesis, global temperature variations, sea-level fluctuations, and continental fragmentation might have played pivotal roles in diversity changes. Currently, the Chicxulub impact explanation appears to have the strongest evidence and is most widely accepted.