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Volcanism and related Environmental changes linked to Late Maastrichtian High Stress and KT Mass Extinction

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Near the end of the Maastrichtian Earth was hit by a confluence of catastrophes ranging from impacts to some of the most devastating volcanic eruptions coupled with major changes in climate, sea level and ocean chemistry that ultimately led to the Cretaceous-Tertiary boundary (KTB) mass extinction. For three decades this mass extinction has been commonly attributed to the sole kill-effect of the Chicxulub impact on Yucatan. Multi-disciplinary evidence (paleontologic, stratigraphic, sedimentologic geochemical) from the Yucatan impact crater to sections in Mexico and Texas revealed that this impact predates the KTB and caused no mass extinction. Recent studies reveal that the most devastating Deccan volcanic eruptions in India occurred near the end of the Maastrichtian and ended coincident with the KT mass extinction (Keller et al., 2008). Examination of biotic stress in the marine realm leading up to the KT mass extinction reveals times of environmental stresses associated with volcanism, greenhouse warming, mesotrophic basins and shallow marginal settings from the Tethys Ocean to the South Atlantic and Indian Oceans (Keller and Abramovich, 2009). Biotic stress conditions vary with the degree of environmental change and range from intraspecies size reduction, to loss of diversity and ultimately mass extinction. No significant biotic stress was observed in assemblages before and after the Chicxulub impact identified by a layer of impact spherules in late Maastrichtian sediments of zone CF1 predating the KTB in Mexico and Texas (Keller et al., 2009b,c). Maximum biotic stress leading to the KT mass extinction is associated with Deccan volcanism in India near the end of the Maastrichtian. This suggests that the mass extinction was likely a direct cause of Deccan volcanism, although the presence of a major Ir anomaly at the KTB does not rule out the possibility of a second major bolide impact exacerbating already catastrophic conditions.

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