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Tellurium in Maastrichtian-Danian sediments: the main phase of Deccan volcanism spans the K-Pg boundary and lasted for 600 kyr

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The age of the Deccan Flood basalts in India (66.6 – 65.5 Ma) overlaps in age with the Chicxulub impact and the Cretaceous-Paleogene mass extinction at 66 Ma. It is still debated whether environmental effects resulting from Deccan volcanism contributed to the extinction event, and whether the impact triggered the eruption of the youngest, most voluminous (Wai Formation) lava formations which make up about 70% by volume of the Deccan. In order to examine the precise timing of volcanism, impact, environmental change and extinction, we measured trace element concentrations in more than a thousand Maastrichtian to Danian sediment samples from different localities. We use tellurium concentrations and Te/Th ratios as a proxy for volcanic input. Te concentrations do not vary systematically with sediment lithology or with proxies for anoxia or paleoproductivity, and the largest variations in Te/Th are found in sections located closest to India at 66 Ma, consistent with a volcanic source for Te. At most localities, an increase in Te and Te/Th ratios occurs in the late Maastrichtian starting near the C30n – C29r boundary with a peak at the Zone CF2 – CF1 boundary, which we interpret as due to an early pulse of Deccan volcanism. A larger pulse of volcanism began in the very latest Maastrichtian CF1, a few 10 kyr before the Cretaceous – Paleogene boundary as defined by the iridium anomaly, and continued into the Danian until early NP2. Our results are consistent with high-precision U-Pb and Ar-Ar ages of Deccan lavas, but also show that the most intense phase of Deccan volcanism began shortly before the K-Pg boundary, and was therefore not triggered by the Chicxulub impact. The main volcanic phase of the Deccan was erupted within about 600 kyrs, but more or less continuously, rather than as a series of discrete pulses. The Late Maastrichtian Warming Event coincides with the earlier phase of Deccan volcanism, and the later more voluminous phase of Deccan volcanism likely led to climate instability in the latest Maastrichtian and early Danian and contributed to the end-Cretaceous extinction event.