

## Paroxysmal Deccan Eruptions linked to End-Cretaceous Mass Extinction

Thierry Adatte<sup>1\*</sup>, Gerta Keller<sup>2</sup>, Jorge E. Spangenberg<sup>3</sup> Paula Mateo<sup>4</sup>, Jahnavi Punekar<sup>5</sup>, Blair Schoene<sup>2</sup>, Kyle Samperton<sup>6</sup>, Michael P. Eddy<sup>7</sup>, Syed F.R. Khadri<sup>8</sup>, Sigal Abramovich<sup>9</sup>  
Johannes Monkenbusch<sup>10</sup>, Nicolas Thibault<sup>10</sup>.

<sup>1</sup>Institute of Earth Sciences, University of Lausanne, Switzerland.

<sup>2</sup>Department of Geosciences, Princeton University, USA.

<sup>3</sup>Institute of Earth Surface Dynamics, University of Lausanne, Switzerland.

<sup>4</sup>Division of Geological and Planetary Sciences, CALTECH, USA.

<sup>5</sup>Indian Institute of Technology Bombay, Mumbai, 400 076, India.

<sup>6</sup>Lawrence Livermore National Laboratory, Livermore, CA 94550, USA.

<sup>7</sup>Department of Earth, Atmospheric, and Planetary Sciences, Purdue University, USA.

<sup>8</sup>Department of Geology, Amravati University, Amravati, India.

<sup>9</sup>Department of Geological and Environmental Sciences, Ben Gurion University, Israel.

<sup>10</sup>Department of Geosciences, University of Copenhagen, Denmark.

The Chicxulub impact in Mexico and Deccan volcanism in India are both linked to the end-Cretaceous mass extinction but the relative timing of the impact, volcanic eruptions, and environmental changes remain controversial, precluding a full assessment of their respective roles. Mercury anomalies within the stratigraphic record have recently been proposed as atmospheric fallout of continental large igneous provinces (LIPs), and these anomalies are associated with all five major mass extinctions in Earth's history. If this proxy is robust, it could provide a record of volcanism directly correlated to mass extinctions and in the case of the End-extinction, the Chicxulub impact. To test this hypothesis, we analyzed mercury in the late Maastrichtian from the base of C29r to the Cretaceous-Paleogene boundary (KPB) in the astronomically tuned Elles section in Tunisia, and correlate this chemostratigraphic record with recent high-precision U-Pb geochronology of Deccan volcanism. Our results support that Hg is a robust indicator of LIP volcanism, and directly links Deccan volcanism to rapid global climate changes, ocean acidification and increasing environmental stress during the last 320-340 kyr of the Maastrichtian. Furthermore, our time-resolved Hg record and U-Pb resolved eruption volumes reveal paroxysmal volcanic eruptions (~30% by volume) during the final 35 kyr leading up to the KPB mass extinction.

Deccan Traps volcanism, U-Pb ages; mercury stratigraphy; End-Cretaceous; mass extinction, warming