C-, Hg-stratigraphies, Hg isotopes and volcanic activity during extreme environmental turnover: the Cretaceous-Paleogene transition in Italy, Denmark and Argentina

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There is a renewed interest in volcanism as the major trigger for the Cretaceous–Paleogene transition (KTB) dramatic climatic change, decrease in biodiversity and mass extinction. We have used Hg contents as proxy for volcanic activity at the classical localities of Gubbio, Stevns Klint, both with preserved KTB layer, and in a near-complete succession at the Neuquén Basin, Argentina. These three localities display $\delta^{13}C$ pathways across the KTB with markedly negative excursion at the KTB. O isotopes yielded discrepant results at the KTB and, if primary, the negative $\delta^{18}O$ excursion at Gubbio and Neuquén recorded temperature increase, whereas at Stevns Klint, positive $\delta^{18}O$ anomaly points to temperature decrease. At Stevns Klint, Hg reaches 250 ng.g–1 in the KTB layer and in the Scaglia Rossa Fm. at Gubbio, three Hg spikes across the KTB were found (25 ng.g-1 at the KTB layer). Hg shows several spikes across the KTB in Neuquén Basin (up to 400 ng.g–1, Jagüel Fm.). High Hg levels attest that whatever phenomenon caused dramatic changes at the KTB, it expelled huge amounts of Hg to atmosphere. Co-variation between Hg and alumina suggests that Hg is adsorbed onto clays. Four $\delta^{202}Hg$ values for the KTB layer at Stevns Klint vary from -2.34 to -1.06 ‰, within the range for volcanogenic Hg. Hg isotopes may become a key in the solution of the role of meteorite impact versus volcanism as the predominant cause of past global catastrophes and mass extinction.