

The early Cretaceous environmental changes linked to the emplacement of large igneous provinces activity? Mercury data from the early Aptian sediments

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The Early Cretaceous period is punctuated by shorter episodes of considerable palaeoceanographic and palaeoenvironmental change. Intense volcanic activity related to the emplacement of large igneous provinces (LIPs) is considered as an important trigger of oceanic anoxic events (OAEs) and related major environmental change. The establishment of exact temporal relationships between OAE-induced environmental perturbations dated by bio- and chemostratigraphy on one hand and phases of intensified volcanic activity dated by radiometric means on the other hand remains, however, a major challenge. The various stratigraphic time scales currently used have rather confused and smeared the stratigraphic signal, affecting correlations between OAE's, other episodes of environmental and evolutionary change, and LIP activity. The recent development of mercury (Hg) as a proxy of distal volcanic activity offers the possibility to investigate potential relationships between environmental perturbations and LIP activity in detail. Here we report the distribution of mercury contents in reference sections in different basins during the Early Aptian (oceanic anoxic event 1a) episode to better understand the role of LIPs during the Early Cretaceous period. It appears that the interval equivalent to the OAE1a is marked by significant increases in Hg contents. The persistence of the anomaly in the Hg/TOC ratios in all sediments suggest that the Hg anomalies are not only related to primary productivity, redox conditions, and organic matter preservation, but has deeper roots. Volcanic outgassing related to the greater Ontong Java LIPs activity are taken here as the main source of the mercury enrichments observed during the Early Aptian sediments. Our data indicate that magmatic pulses at the onset of the OAE1a triggered the early Aptian environmental perturbations.

Keywords: Early Aptian; organic matter; mercury; volcanic activity.