Title: Paleoclimatic changes during the late Maastrichtian and early Danian in South Atlantic

Abstract

The temporal link between large igneous provinces (LIPs) magmatism and global environmental changes, including mass extinctions, has led to extensive studies on cause-and-effect relationship between them. The volatiles released from LIPs magmatism (e.g., SO_2, CO_2, HCl) has been hypothesized to have both short-term effects (e.g., cooling associated with sulphate aerosols, acid rain, ozone depletion) on a decadal time scale to long term environmental changes on a millennial time scale. The Deccan flood volcanism (DFV) is one such well-studied LIP that erupted between ~66.3 and 65.4 Ma and is temporally linked with the Cretaceous-Paleogene (K/Pg) boundary mass extinctions at ~66 Ma. The K/Pg boundary mass extinction has also been linked to the Chicxulub asteroid impact, which is often argued as the primary driver of the mass extinction. The latest Maastrichtian warming event (LMWE), and Dan-C2 hyperthermal event in the early Danian fall within the timeline of the DFV and are generally linked with the early (/main) and the late phase of Deccan eruptions. However, these hyperthermal events are also debated to be mere regional expressions rather than global events. To better understand such climatic changes in the South Atlantic, we conducted multi-proxy studies on the DSDP site 356 core that spans these events. The chronology of the core was improved using high-resolution magnetostratigraphic analyses (~240 samples were demagnetized using alternating-field and thermal demagnetization analyses). For the paleoclimate reconstruction, environmental magnetic, geochemical, and C, O (bulk carbonate) and Hg isotopic analyses were performed. The low magnetic susceptibility (MS) zone, ~50 to 60 ka before the K/Pg boundary, often reported from western Tethys records (e.g., Gubbio Italy, Bidart France and Zumaia Spain), was also found in the DSDP site 356 core with almost complete loss of detrital magnetic signal. This low MS zone was characterized by low Fe intensity and high Ca/Ti. The $\delta^{18}O$ results showed significantly decreased values (warming) in the early Danian coinciding with eruptions of the DFV, accompanied by the Hg and Pb anomalies (markers for volcanism). The new multi-proxy results from the late Maastrichtian and early Danian of the South Atlantic significantly improve our understanding of the volcanism-induced changes in the global climate.