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The role of volcanism in catalysing rapid global warming events of the early Eocene: evidence from mercury records

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A gradual long-term global warming trend in the early Paleogene was punctuated by transient hyperthermals, which are distinguished by negative carbon isotope excursions (CIEs) in the sedimentary record, rapid global warming and ocean acidification. Recent research on large igneous provinces (LIPs) demonstrates their potential climate forcing ability, through direct CO_2 input into the atmosphere and/or thermal alteration of organic-rich rocks by magmatic intrusions. The link between the Paleocene-Eocene Thermal Maximum and North Atlantic Igneous Province (NAIP) volcanism has gained traction, however, a connection between other early Eocene hyperthermals and NAIP volcanism remains poorly investigated.

Mercury (Hg) is a trace component of volcanic gas emitted from modern volcanoes which can be globally distributed through the atmosphere before deposition and burial. Sedimentary Hg, and Hg normalised to total organic carbon and sulfur (Hg/TOC and Hg/TS ratios) are therefore widely used as geochemical tracers of volcanism. We present a high-resolution organic carbon isotope record to resolve the position of potential hyperthermals in an early Eocene record from Jordan. Subsequently, we investigate Hg/TOC and Hg/TS ratios in concurrent early Eocene records from Jordan and New Zealand, which we consider alongside volcanic, sedimentary, and environmental influences on Hg to resolve whether Hg anomalies are related to internal sedimentary processes or external Hg loading from volcanic activity.