

Palaeoenvironmental records across the early Toarcian hyperthermal event: From onset to recovery

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Earth's climate history has been punctuated by many episodes of extreme climate change that were often associated with fast fluctuations in atmospheric greenhouse gas levels. Such coincidence proves a strong feedback link between the climate and the carbon cycle. The Toarcian Oceanic Anoxic Event (T-OAE, ca. 183 Ma) was one of the most extreme hyperthermal events of the Phanerozoic associated with the massive input of carbon into the ocean-atmosphere system and accompanied by major environmental changes. The causes and consequences of this global-change event are relatively well constrained, but how the Earth's climate system naturally stabilized and recovered remains largely understudied. In particular, constraints on the carbon feedback mechanisms that amplified or suppressed climate change, their timing, and their fluxes are needed to determine Earth's sensitivity to changing climate conditions. In this communication, I will present a new multi-proxy dataset combining sedimentological observations and mineralogical and geochemical analyses performed on worldwide distributed T-OAE sedimentary successions from France, Morocco, Siberia, and Chile. The correlation of the studied sites is based on the new high-resolution carbon isotope stratigraphy. Emphasis was given to exploring the evolution of the two feedback mechanisms considered central in the stabilization and recovery of the carbon cycle-climate system: (1) weathering of continental silicates and (2) burial of organic carbon. Lithium isotope ratios are used to proxy of global weathering rates and reveal that higher silicate weathering rates during the Toarcian hyperthermal likely helped the climate system recover and return to cooler climatic conditions. High mercury and tellurium concentrations recorded after the T-OAE interval suggest that protracted Karoo-Ferrar volcanic activity may have impacted the feedback mechanisms and hence played a role in the response of Earth's climate. This study offers quantitative input to have a holistic understanding of