

## Tipping points in past climate:

### Generating novel climate and hydrological records of the Paleocene-Eocene Thermal Maximum

Department: Earth Sciences

Research group: Stratigraphy & Paleontology

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### Project description

The Eocene (56–34 million years ago) encompasses the warmest time interval since the demise of the dinosaurs. Ocean temperatures were on average 8–10°C warmer than at present and atmospheric CO<sub>2</sub> concentrations exceeded 3-6 times pre-industrial levels – making the Eocene a useful analogue for high emission scenarios of future climate change. Superimposed on this warm background climate, several periods of rapid warming and carbon cycle perturbation stood out, called “hyperthermals”. The largest of these was the Paleocene-Eocene Thermal Maximum (PETM), which was associated with global warming, tipping points in the carbon cycle, and massive rainfall events. Understanding these changes is highly relevant for understanding future climate change.

This Bright Minds Assistantship – embedded within the active research lines at the Stratigraphy & Paleontology group – will have the Bright Minds student working on generating various proxy records, including ratios of stable carbon ( $\delta^{13}\text{C}$ ) isotopes, from field samples taken in northern Spain. The PETM has been recognized at this section based on prior work, but essential mysteries remain surrounding the climatic and hydrological change this record entails.

Labwork will include preparation of samples for analysis and running samples on the isotope ratio mass spectrometer (IRMS), and follow-up analyses based on these results, generating high-resolution records. If interested, there will be opportunities to join a fieldwork sampling expedition in spring 2025 to northern Spain to expand the PETM sample set. We will use the new records to reconstruct climate, carbon cycling, and hydrological change, and perform data analysis to assess the presence of tipping points in any of these Earth System components. Ultimately these results are expected to be used for scientific publication, and if interested, the student can be actively involved in the data analysis and writing stage of the research as well. If wanted, this will give them full access to the entire scientific journey from field work to lab work through data analysis to writing and publication.

### Job requirements

The student should have a background in paleoceanography and/or paleoclimate and have affinity and motivation to work in the lab. Prior lab experience is a plus but not required.