Rock magnetism before, during and after the CIE: a comparison between marine and continental sections

Devleeschouwer X.[1], Storme J.-Y.[2], Spassov S.[3], Yans J.[2]

→ xdevleeschouwer@naturalsciences.be

1 Royal Belgian Institute of Natural Sciences, Geological Survey of Belgium, Belgium

2 FUNDP, University of Namur, Department of Geology, Belgium

3 Royal Meteorological Institute, Laboratory of Paleomagnetism, Dourbes, Belgium

The Palaeocene–Eocene Thermal Maximum (PETM at 55.8 Ma) was a short-lived episode of extreme global temperatures, often regarded as a past analogue of the ongoing global warming. The PETM is defined chemostratigraphically by a carbon isotope excursion (CIE) recognized globally in both marine and terrestrial sections. The onset of this ca. 150-200 ka event marks the Palaeocene ⁄Eocene (P⁄E) boundary. Zumaia is the most complete and representative section of the early Palaeogene hemipelagic succession of the Pyrenees. Concerning the P/E boundary, the position of the CIE is now clearly identified in the Zumaia section using carbon isotope chemostratigraphy on organic matter ($\delta^{13}C_{org}$). Based on a detailed rock magnetic study, several magnetic susceptibility (MS) fluctuations are recognised and interpreted in terms of sea-level fluctuations and stratigraphic system tracts before, during and after the PETM. The MS signal on the whole section is mostly controlled by paramagnetic minerals (clays) and more specifically by the presence of different ferromagnetic phases during the CIE. The Hysteresis parameters (e.g. the viscosity index, the remanence coercivity, the contribution of a high-coercivity phase to the IRM curve) are highlighted with higher values only during the PETM interval and could partly be explained by the influx of detrital iron-oxide minerals derived from the nearby emerged continental areas. A comparison of the rock magnetic properties between this deep marine section on the Atlantic margin (Zumaia) and a Tethyan basin section (Sidi Nasseur, Tunisia) reveals at large-scale a similar signal of the low-field magnetic susceptibility fluctuations. In details, small-scale fluctuations precisely during the PETM are not influenced similarly as in Zumaia revealing a clear difference in continental derived material supply to the marine environment during the CIE. A comparison of the same rock magnetic properties and MS signal in continental sections (Vastérival and Sotteville-sur-Mer) from the Paris basin are really difficult taking into account the different hiatuses and the continental environments. No clear correlations are thus possible between the continental sections of the Paris basin and the marine Tethyan or North-Atlantic sections.