

Ocean Acidification: Insights from the Paleocene-Eocene Thermal Maximum (PETM)

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Throughout the Anthropocene, CO₂ has been released to the atmosphere as a by-product of human activities, mostly through fossil fuel burning. A fraction (~30%) of this anthropogenic CO₂ has been absorbed by the oceans and decreased the pH, carbonate ion concentration and the saturation state of marine waters with respect to carbonate minerals, a phenomenon called ocean acidification (OA). OA events have occurred many times in the past, including at the Paleocene-Eocene Thermal Maximum (PETM) and the Cretaceous-Paleogene boundary.

A 100m section of well-preserved, shallow water carbonates that crosses the PETM was sampled at Campo, Spain. The stratigraphy, sedimentology and geochemistry of these rocks display changes that could be attributed to OA. The stable carbon isotope ($\delta^{13}\text{C}$) signature of these rocks reveals a large negative excursion. This excursion shows massive release of depleted carbon to the atmosphere during the formation of these rocks which could be the cause of a possible OA. Thin sections of these rocks show a variety of dissolution patterns around and in bioclasts composed of high-magnesium calcites and aragonite, metastable carbonate mineral phases. The bulk geochemistry shows the loss of Mg²⁺ and Sr²⁺ as we cross the boundary which is due to low-magnesium calcite formation over the dissolution of high-magnesium calcite and aragonite. Additional analyses such as stable and radiogenic Sr and scanning electron microscopy will be carried out to determine the extent of the OA event in Campo.