The Cretaceous Oceanic Anoxic Events: new geochemical data from the Central Atlantic Ocean

BONACINA G.[1]*, PREVIDE MASSARA E.[2], SCOTTI P.[2], VIAGGI P.[2], PIVA A.[2], DIAMOND C.[3], NEWBY S.[4], HUNG C.[3], SANFILIPPO A.[1], LYONS T.W.[3], OWENS J. D.[4]

[1]Dipartimento di Scienze della Terra e dell'Ambiente, Univ. of Pavia, Via Ferrata 1a, 27100, Pavia, Italy (*correspondence: greta.bonacina01@universitadipavia.it)

[2]Eni S.p.A. Upstream Research and Technological Innovation, 20097 San Donato Milanese, MI, Italy

[3]Department of Earth and Planetary Sciences, University of California, Riverside, CA 92521, USA

[4]Department of Earth, Ocean and Atmospheric Science, Florida State University, Tallahassee, FL 32306, USA

Cretaceous "Oceanic Anoxic Events" (OAEs) are global climatic perturbations marked by enhanced burial of marine and terrestrial organic matter with associated positive carbon isotope excursions ($\delta^{13}C$), global warming, elevated pCO_2, enhanced weathering, increased hydrothermal activity, high sea level and changes in oceanic circulation. We present a geochemical study of a ~1.8 km-thick sedimentary section from the Central Atlantic Ocean spanning ~50 Myrs from the early Aptian to early Campanian. This relatively continuous record captures four OAEs (OAE 1c – OAE 3). The aim is to characterize the local and ocean-scale redox conditions using traditional and novel techniques in a multi-proxy approach that includes organic contents, trace element data, iron speciation and thallium isotopes.

The section can be divided into three main intervals: the first spans from Early Aptian to OAE 1c and is characterized by local slightly reducing conditions. In the second interval, iron speciation data suggest that local anoxia developed from OAE 1c and persisted until after OAE 3. High Fe_{pyr}/Fe_{HR} suggest locally sulfidic (euxinic) conditions from the onset of OAE 1d to OAE 3, with a climax during OAE 2. Expansion of euxinia during this interval led to a drawdown of Mo and V concentrations, reported also in previous work from other locations. The third interval, after OAE3 shows that local anoxia still persisted. Further, we go on to present thallium isotope data ($\varepsilon^{205}Tl$) documenting a long-term record of the waxing and waning of manganese-oxide burial on a global scale in this continuous record that provides a unique window to study an expanded Cretaceous record.