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Exploring Potential drivers of expanded Ocean Anoxia during Ocean Anoxic Event 2 in Tarfaya Basin (Morrocco) with SEM-EDS

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Ocean Anoxic Events (OAEs) are short periods (<1 Myr) in Earth's history characterized by expanded ocean anoxia. Understanding the potential drivers and feedbacks of these events is important in our understanding of the impacts of widespread anoxia on the carbon cycle, as well as the rates and magnitude of potential future deoxygenation. Ocean Anoxic Event 2 is the best described of the series of OAEs during the Cretaceous, a period in Earth's history characterized by relatively high temperatures and high atmospheric CO_2. However, ambiguities remain on the mechanisms controlling these periods of increased carbon burial that have been associated with redox cyclicity between ferruginous and euxinic conditions. Poulton et al. (2015)[1] proposed that sulfate limitation did not control the occurrence of ferruginous conditions, but rather these cyclical occurrences of ferruginous conditions were a function of continental weathering. Specifically, increased continental weathering would have increased the input of silicates, and the associated iron, to the ocean. To test this hypothesis, we use SEM-EDS to examine 8 samples from Tarfaya Basin (Moroccan shelf) spanning OAE2 to identify mineral phases that can distinguish between increased terrestrial input and sulfur limitation. For instance, the size variation of framboidal pyrite in the sediments has been established as an indicator of water chemistry. However, secondary sedimentary formation can hamper this interpretation, with authigenic pyrite reflecting pore water chemistry rather than that of the overlying ocean water. Using the SEM to examine pyrite morphology, we can identify pyrite origin and therefore determine its relevance as a water chemistry indication. Additionally, the presence of detrital quartz and feldspars can be used to indicate terrestrial material. Here we present these findings to discuss the dominant controls on ocean anoxia off the Moroccan Shelf during OAE2.

[1]Poulton, Simon W., et al. "A Continental-Weathering Control on Orbitally Driven Redox-Nutrient Cycling during Cretaceous Oceanic Anoxic Event 2." *Geology*, vol. 43, no. 11, 24 Sept. 2015, pp. 963–966, https://doi.org/10.1130/g36837.1. Accessed 14 Feb. 2023.