Does continental weathering trigger Oceanic Anoxic Events?

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Among the mechanisms proposed to trigger oceanic anoxic events (OAEs), a strong input of nutrients to the oceans is mentioned, leading to the deposition of carbon-rich sediments known as black shales at a worldwide scale. This study aims at constraining the role of continental weathering as a nutrient provider during OAE2 (Cenomanian / Turonian or C/T, ~93.5Ma). The Hf-Nd isotope system is a useful proxy to monitor both provenance of sediments (Nd isotope ratio are similar in all mineral phases) and continental weathering (due to sorting during alteration of mineral phases with different ε_{Hf}). In the Hf-Nd isotopic space, most terrestrial samples align along a well-correlated trend, the "terrestrial array," and a vertical deviation from this array corresponds to a change in mineralogical sorting [1].

We analysed whole-rock Hf-Nd isotopes of C/T sediments from Agadir (Morocco). We also extracted by acetic leaching the Nd trapped in the carbonated fraction and Fe-Mn coatings (interpreted as seawater ε_{Nd}) and analysed both leachate and residue (detrital fraction) for Hf-Nd isotopes. Whole rock and detrital fractions are characterised by a significant temporal change from relatively high values (ε_{Nd}=-7±1, ε_{Hf}=-5.5±3) to more continental values (ε_{Nd}=-12.2 ±1.7, ε_{Hf}=-13.4±3) over the C/T boundary. Seawater ε_{Nd} follows the same pattern (from ε_{Nd}=-5.4±0.7 to ε_{Nd}=-9.8±1).

Our seawater ε_{Nd} values differ from previous studies that show constant values across the C/T boundary [2], and indicate that in this region, seawater ε_{Nd} was controlled by continental inputs. In addition, the whole-rock and detrital fraction Nd and Hf isotopes define a well-correlated trend with no apparent deviation from the terrestrial array. This suggests that around the C/T boundary, no visible change in weathering regime occurred on the Moroccan shelf. More surprising is the whole-rock and detrital negative shift of ~6 ε_{Nd} over the C/T boundary that indicates a change in the provenance of continental material. These results differ from previously published data for C/T sediments that yielded constant values (ε_{Nd}~-15 for Demerara Rise [2,3] and Tarfaya [4]). This could indicate that changes in continental erosion can only be detected when contrasted lithology outcrop as is the case in the Agadir region but not upstream from Demerara and Tarfaya.

[1] Garçon et al. (2013) *GCA*, **121**, 177-195. [2] Martin et al. (2012) *EPSL*, **328**, 111-120. [3] Carpentier et al. (2008) *EPSL*, **272**, 199-211. [4] Ali et al. (2014), *JAES*, **90**, 64-76.