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Cr and Os isotope response to rapid deoxygenation of the ocean during the PETM from site U1580 of the Agulhas Plateau

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The Paleocene-Eocene Thermal Maximum (PETM) which occurred about 56 million years ago is often cited as an analogue of anthropogenic climate change and impacts of climate change like ocean deoxygenation. Rapid global warming during this time is linked through carbon isotopes to massive releases of greenhouse gases to the atmosphere from the decomposition of methane hydrates and/or oxidation of organic matter in marine sediments as indicated by a pronounced excursion to light carbon isotope values across the PETM in marine sediment archives. Emplacement of a magmatic sill complex into organic rich marine sediments in the North Atlantic may have triggered the warming event with an initial pulse of carbon dioxide that then de-stabilized clathrate deposits in marine sediments from other regions of the oceans, and/or carbon cycling in the oceans through volcanically driven ocean circulation changes. Deciphering the timing of the climate forcing and feedback during the PETM requires a good continuous section, which is carbonate rich throughout, especially at the onset of the event. Cr isotopes are a redox proxy that have the potential to reconstruct the deoxygenation history of the oceans during the PETM. Osmium isotopes and Os concentrations can assess the interplay between increased mantle inputs of Os from volcanic eruptions and accelerated continental weathering inputs of Os from rivers. In this study we present new Os and Cr isotope records of the PETM in sediments from site U1580 during IODP expedition 392. Site U1580 recovered a complete, well-preserved record of the PETM on the Agulhas Plateau. In contrast to most deep-sea records, site U1580 sediments remained carbonate rich across the boundary, without the clay layer that typically results from carbonate dissolution during the PETM. The minimal carbonate dissolution at Site U1580 makes it ideal for proxy reconstruction of the events connected to climate change during the PETM, particularly surrounding the onset of the event which is typically truncated by carbonate dissolution at other well-studied sites.