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What triggered the Early Cretaceous Oceanic Anoxic Event 1a? The Platinum Group Element perspective

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The Early Cretaceous oceanic anoxic event, OAE1a, is represented by a global marine deposition of organic-rich sediments attributed to several causes: 1) the release of gas hydrates from continental margin sediments due to warming; 2) the increased cycling of ^{12}C due to increased flux of nutrients and high productivity; and 3) the emplacement of large igneous provinces (LIPs) due to their temporal coincidences with many of these OAEs. Os isotope data for the organic-rich sedimentary sequence at Gorgo a Cerbara, central Italy containing the Selli Level horizon that represents the OAE1a, indicate a causal link between this event and the contemporaneous emplacement of the Ontong Java Plateau (OJP), an oceanic LIP in the Pacific. However, there is still a standing controversy regarding the cause of such emplacement. Two competing hypotheses are considered capable for the emplacement of a large igneous province in an oceanic setting: the mantle plume model and the bolide impact model. The Os isotope signature alone is not an unequivocal evidence to discriminate between the two models. The PGE elements, specifically Ir, in sedimentary sequences are best tracers for extraterrestrial input into the terrestrial and marine environments. Thus, if the OJP emplacement were caused by a bolide impact, the event is expected to leave a record on the sediments being deposited at the same time, such as the Selli Level horizon. The present study looks at the platinum group elements (PGE) composition across the Selli Level horizon at Gorgo a Cerbara, central Italy which were previously analyzed for Os isotopes to investigate further whether the OAE1a event represented by these sediments and the contemporaneous emplacement of the OJP was triggered by a mantle plume or a bolide impact. The results show that PGE abundances and inter-element ratios do not support the bolide impact model for the origin of the OJP, consistent with the Os isotope evidence that massive volcanism resulting in the emplacement of the OJP triggered the Early Cretaceous oceanic anoxic event.

Keywords: Ontong Java Plateau, Oceanic Anoxic Event 1a, Os isotopes, Platinum Group Elements, Large Igneous Provinces, Early Cretaceous