Hypothesis testing with sediment mixing models: preliminary results from 'unmixing' the Cretaceous-Paleogene boundary

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Improved age models, sampling resolution, and analytical techniques provide powerful approaches for increasing the resolution – and our understanding – of past climatic and biotic events. The interpretation of the fossil record is limited by sediment mixing, which spreads the record of a stratigraphically constrained event into overlying and underlying strata, and is a pervasive feature of most sedimentary environments. The relative timing, duration, and magnitude of events in Earth's history are thus obscured by sediment mixing. While many studies regularly incorporate methodologies to improve age models, sampling, and analytical resolution, few attempt to quantify and account for the effect of sediment mixing. In this study, we showcase the potential utility of sediment mixing models for hypothesis testing in deep time.

In previous work, we found that high-resolution iridium anomalies can be used to parameterize sediment mixing models across the Cretaceous-Paleogene boundary. Here we use iridium-parameterized sediment mixing models at pelagic sites in the Pacific, Indian, and Atlantic Ocean (DSDP Sites 577, 465, 527, and ODP Sites 738 and 690) to estimate the magnitude and duration of a boundary-related $\delta^{13}C$ excursion. We use these estimates of magnitude, duration, and occurrence to improve our tests of possible mechanisms underlying this pattern.