Chemistry of the Marlboro Clay in Virginia and Implications for the Paleocene-Eocene Thermal Maximum

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The Paleocene-Eocene Thermal Maximum (PETM) was a global hyperthermal (~5ºC warming) event marked by a rapid carbon isotope excursion (CIE) of >1‰ in the marine carbonate record *(e.g. Zeebe et al. Nature Geoscience 2009)*. Possible explanations for the CIE include intrusion of a sill complex into organic carbonate *(Aarnes et al. J. Geol. Soc. 2015)*, dissolution of methane hydrates *(Thomas et al. Geology 2002)*, and a comet impact event *(Schaller et al. Science 2016)*. Here we present new data across the PETM from the VirginiaDEQ-USGS Surprise Hill (SH) core, Northumberland Co., VA. We analyzed the Marlboro Clay, a thick, kaolinite-rich clay unit that marks the initiation of the PETM in the mid-Atlantic Coastal Plain of North America, as well as units above and below it. Bulk sediment records a $\delta^{13}C$ excursion of approximately -5‰ across the CIE, while benthic foraminifera (*Cibicidoides* spp.*)* record a synchronous excursion of approximately -4.5‰. These results are consistent with other records from the New Jersey Coastal Plain *(Makarova et al. Paleoceanography 2017)*. The excursion coincides with an increase in magnetic susceptibility, a decrease in bulk $CaCO_3$ content, and an ~2.5‰ decrease of $\delta^{18}O$ in both the bulk sediment and benthic foraminifera of the SH core. Pb isotope analyses of the <63 µm fraction sediments indicate a unique provenance make-up for the Marlboro Clay. The results of the study thus indicate that PETM Marlboro Clay was not generated simply by intensified weathering of the same source area as the underlying Aquia Formation and overlying Nanjemoy Formation. Any hypothesis that aims to explain the mechanism that triggered the PETM must also account for the observed distinct provenance make-up of the Marlboro Clay.