Cause of the Paleocene-Eocene thermal maximum: Constraints from a global carbon cycle modeling

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One of the most rapid global warming events in Earth's history occurred at the Paleocene-Eocene boundary (ca. 55 Ma). During the Paleocene-Eocene thermal maximum (PETM), the global temperature increased by more than 5 ^{o}C within a few thousand years (e.g., Zachos et al., 2001). The PETM corresponds to an abrupt negative carbon isotope excursion (CIE) in marine and terrestrial sedimentary sections (e.g., Kennett and Stott, 1991; Koch et al., 1992), implying a massive and rapid release of ^{13}C-depleted carbon to ocean and atmosphere in this interval. However, the source of the massive carbon injection during the PETM remains uncertain (Zachos et al., 2008).

In order to constrain the cause of the PETM, we reexamine the observed magnitude of the CIE and released carbon mass, and then reconstruct the perturbation of global carbon cycle during the PETM by using a simple one-box global carbon cycle model.