

# Paleocene–Eocene calcareous nannofossil biostratigraphy of the Surprise Hill core from Virginia, USA

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We present the lithology and calcareous nannofossil biostratigraphy of the Surprise Hill core, which was drilled in the Salisbury Embayment in Northumberland County, Virginia, USA. The sedimentary record begins in the early Danian and includes a robust Paleocene–Eocene Thermal Maximum (PETM) section up through the Early Eocene Climatic Optimum (EECO). We identified calcareous nannofossil datums that include the first occurrence (FO) of *Heliolithus cantabriae* (59.60 Ma) in the Brightseat Formation, the FO of *Discoaster multiradiatus* (56.01 Ma) in the upper Aquia Formation, the FOs of *Discoaster salisburgensis* var. *anartios* and *Rhombaster* spp. (54.99 Ma) in the lower Marlboro Clay, and the FOs of *Tribrachiatus orthostylus* (53.67 Ma) and *Discoaster lodoensis* (52.64 Ma), the last occurrence (LO) of *T. orthostylus* (50.66 Ma), the FO of *Discoaster sublodoensis* with five rays (48.96 Ma), and the LO of *D. lodoensis* (48.37 Ma) in the Nanjemoy Formation. An unconformity is present at 208.8 m that marks the contact between the Danian Brightseat Formation below and the Selandian through Thanetian Aquia Formation above.

The abundance of *Chiasmolithus bidens* decreased precipitously just before the PETM, and this was also documented in the South Dover Bridge (SDB) core in Maryland and in the tropical Atlantic from Ocean Drilling Program (ODP) Hole 1259B. Additionally, *Hornibrookina arca*, whose abundance is usually <5%, increased to ~40% in the Aquia Formation just prior to the PETM. A similar increase was also documented in three other cores in Maryland. The carbon isotope excursion (CIE) of the PETM was identified from analyses of benthic foraminifera and is accompanied by a change in the nannofossil assemblage, with *C. bidens* and *H. arca* being almost absent. A dissolution zone (85 cm thick) was recognized in the basal Marlboro Clay, which is consistent with global patterns of dissolution at the PETM onset. During the PETM, the genus *Toweius* shows little change in relative abundance, but there is a clear change in species composition within the genus, and *Toweius serotinus* replaces *T. tovae* and *T. eminens* as the dominant species. In the recovery phase of the PETM, *T. tovae* and *T. eminens* are replaced by *T. callosus* and *T. occultatus*, which is similar to what was found in the SDB core. The abundance of the genus *Reticulofenestra* increases gradually through the interval, and the *Toweius*–*Reticulofenestra* turnover occurs just after the FO of *Discoaster lodoensis*, which marks the base of Zone NP12. The calcareous nannofossil assemblage data from the Surprise Hill core provide a better understanding of the biotic response to paleoenvironmental changes on the continental shelf from the late Paleocene to early Eocene.