Drivers of Neogene coccolithophore macroevolution

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This study aims to investigate the driving mechanisms of macroevolutionary changes in Neogene nannofossil communities. We provide a global perspective into the macroevolutionary drivers that have influenced coccolithophore communities over the last 15 million years during Neogene cooling. Two datasets are analyzed: (1) a low-resolution (~2.5 Myr sample spacing) global comparison of nine sites spanning the Atlantic, Indian, Pacific, and Southern Ocean basins and (2) a high-resolution (200 kyr sample spacing) dataset from International Ocean Discovery Program (IODP) Expedition 363, Site U1482 (7.7–1.7 Ma) that document the critical Late Miocene to Early Pleistocene interval. These high-resolution data are from a representative tropical, high-diversity succession with apparent continuous recovery through this key interval. The Family Noelaerhabdaceae were greatly impacted by declining pCO_2 with an overall decrease in *Reticulofenestra* coccolith size beginning in the Late Miocene. In contrast, *Gephyrocapsa* spp. increased in abundance concurrently, signifying that multiple controlling factors were influencing nannoplankton communities by the end of the Miocene. New evidence demonstrates that the role of a deepened nutricline prompted macroevolution of coccolithophores and was a greater forcing influence than pCO_2 alone. The following adaptive changes within communities were recognized: the decline of *Reticulofenestra* coccolith size, the extinction of *Discoaster* spp. in the Early Pleistocene, and the increased abundance of *Florisphaera profunda*, a deep-photic zone taxon.