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Coccolith Evolution and Paleoceanography in Miocene/Pliocene on both sides of the Isthmus of Panama

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During the Miocene and Pliocene fundamental changes of surface water circulation affected both the Tropical Eastern Pacific and the Caribbean. We investigated coccolithophore assemblages from ODP Site 1000 (Caribbean) and ODP Site 1241 (Tropical Eastern Pacific) with emphasis on three different time intervals: 8-5 Ma (Biogenic Bloom); 4.5-3.8 Ma (Initial Closure of the Panamanian Isthmus) and 3-2.5 Ma (Final Closure and Northern Hemisphere Glaciation).

The First Interval is marked by a large increase of carbonate accumulation in the almost all tropical and subtropical ODP Sites, mainly due to enhanced coccolithophore productivity and the presence of larger coccoliths, compared to the younger intervals. During the initial closure of the Isthmus of Panama we observe a major speciation event among coccolithophores, the first occurrence of the genus Gephyrocapsa, in both sites synchronously. The initial speciation precedes the changes in surface water circulation (SST, SSS, Productivity) associated with the initial closure, so most likely is not the trigger for this prominent event. However, once the closure proceeded and surface water masses were influenced by the restricted flow through the Gateway, we observe morphological changes within Gephyrocapsa and their rise to dominance, associated with an increase in productivity indicated by decreasing relative abundances of F. profunda in the Caribbean. Although the Eastern Equatorial Pacific was more eutrophic compared to the Caribbean, the evolutionary history of coccolithophores is similar in both sites, although coccolithophore ecology is different. In the last interval, associated with the final closure, we observe the temporal disappearance of Gephyrocapsa and and an return of Reticulofenestra dominance.