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The trigger of Mid-Brunhes coccolithophore bloom: new evidences from coccolith assamblages, geochemical and morphologic data

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Several coccolithophores bloom event have been discovered during the Pleistocene. Among these evolutionary events, the Mid-Bruhes Gephyrocapsa caribbeanica bloom can be discovered globally. During this event, the coccolith calcium carbonate accumulate rate increased about 5-10 times larger than the post and pre-period, which may altered the ocean carbon cycle dramatically (e.g. Bark et al., 2006). However, the trigger of this event is still indeterminate. Rickaby et al. (2007) suggested the low eccentricity extending the growth days of coccolithophore in the high latitude. While other researches, who focused on the glacial-interglacial variations during the Mid-Brunish bloom event, always attributed the dynamic of coccolithophoric productivity to the migration of polar front or the monsoon variations. Moreover, most of the studies focused on the mid or high latitude. The bloom pattern in the tropical ocean was ignored.

In this study, we measured the coccolith geochemical and morphologic data from 4 cores in both high and low latitude during the last 800 kyr and reviewed published data from another 14 cores to reveal the mechanism driving the cococlithophore bloom, especially some processes beyond the glacial-interglacial. Significant bloom events were identified in 15 cores during 600-350 ka, however, the timing of coccolithophore bloom was different among regions. Generally, the blooms firstly happened in the high latitude and east Pacific upwelling and then spread to the low latitude such as east Pacific warm pool. It seems the bloom events were not global synchronous which may challenge the previous insolation driving hypothesis. We suggested that the coccolithophore bloom was triggered by nutrient pattern in the ocean. For the region in where nutrient level is controlled by ocean circulation may response fast to the dynamics of earth boundary conditions, while for the region in which nutrient content is controlled by weathering and river input, the response time may longer than one Glacial-Interglacial cycle.