The trigger for the mid-Brunhes coccolithophore bloom: New evidence from coccolith assemblages and geochemical and morphological data

Hongrui Zhang

Tongji University, State Key Laboratory of Marine Geology, Shanghai 200092, China; ETH Zürich, Geological Institute, Department of Earth Science, 8092 Zürich, Switzerland; 103443_rui@tongji.edu.cn

Heather Stoll, Iván Hernández-Almeid, Luz María Mejia, José Guitián

ETH Zürich, as above; heather.stoll@erdw.ethz.ch, ivan.hernandez@erdw.ethz.ch, muz.mejia@erdw.ethz.ch, jose.guitian@erdw.ethz.ch

Chuanlian L. Liu

Tongji University, as above; liucl@tongji.edu.cn

Several coccolithophore bloom events have been discovered in the Pleistocene. Among these events, the mid-Brunhes *Gephyrocapsa caribbeanica* bloom can be recognised globally. During this event, the coccolith calcium carbonate accumulation rate increased to approximately 5–10 times greater than in the period above and below this event, and this may have altered the ocean carbon cycle dramatically (e.g. Barker et al., 2006). However, the trigger for this event is still undetermined. Moreover, most previous studies have focused on the mid- or high latitudes.

In this study, we measured coccolith geochemical and morphological data from four cores from both the high and low latitudes during the last 800 kyr, and reviewed published data from another 14 cores, to try to determine the mechanism driving coccolithophore blooms, especially any processes other than glacial-åinterglacial effects. Significant coccolithophore bloom events were identified in 15 cores during the period 600–350 ka, but the timing of these blooms was different in different regions. Generally, the blooms first occurred at high latitudes and in the East Pacific upwelling and then spread to low latitudes, such as the East Pacific warm pool. It appears that the bloom events were not globally synchronous, which may challenge the previous insolation-driven hypothesis. Instead, we suggest that coccolithophore blooms were triggered by nutrient patterns in the ocean. For regions where the nutrient level is controlled by ocean circulation, there may be a rapid response time for changes in the dynamics of Earth's boundary conditions, while for regions in which nutrient content is controlled by weathering and river input, the response time may be longer than one glacial-interglacial cycle.

References

Barker, S., Archer, D., Booth, L. et al. 2006. Globally increased pelagic carbonate production during the mid-Brunhes dissolution interval and the CO_2 paradox of MIS 11. *Quaternary Science Reviews*, **25**(23–24): 3278–3293.