

## Two production stages of coccolithophores in the winter as revealed from sediment traps in the northern South China Sea

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Coccolithophores are one of the most successful marine calcifying algae in the modern ocean, and coccoliths are the calcareous fossil remnants left in marine sediments after coccolithophores die. These calcite scales record the environmental conditions of the near-surface ocean (e.g. primary productivity, sea-water temperature and carbonate chemistry) and are promising subjects in palaeoceanographic and palaeoclimatic studies. Hence, a comprehensive understanding of the ecology and phenology of living coccolithophores, as well as their interactions with other plankton, is needed to develop better constraints for their use in palaeoenvironmental studies. Here, we have documented modern coccolithophore production using coccolith fluxes in samples that were collected from sediment traps at ~500 m water depth from 2013 to 2015, in the northern South China Sea. In addition to the expected seasonality of coccolithophore production, which increases during the winter due to the strong water-mixing induced by monsoon winds, a two-stage mode of coccolithophore production was also recognised in relatively coastal waters. The first stage includes the production of *Gephyrocapsa oceanica* in December, when the macronutrient inventory is built, and the second stage describes the growth of *Emiliania huxleyi* in late February, with the depletion of silicate nutrients. This two-stage mode originates from subtle differences in the ability of the two species to assimilate nutrients. In addition, coccolithophore production is significantly influenced by decadal oceanic events (i.e. El Niño) in the northern South China Sea.