Algal Constraints on the Cenozoic History of Atmospheric CO_2

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Future acidification of the oceans due to raised carbon dioxide levels will cause a drastic change in ocean chemistry that has not been experienced for at least the last 650,000 years, and will likely reduce marine calcification.

Coccolithophores, calcareous haptophyte algae, constitute a key biological group subjected to this global process. The rate at which the natural populations can acclimatise or adapt to changes in ocean chemistry is an essential factor in how their natural feedback mechanisms will operate in future.

Novel experiments testing the environmental tolerance of different extant coccolithophore species to various conditions of seawater carbonate chemistry reveal the need to consider species-specific effects when evaluating whole ecosystem responses to elevated pCO_2 [1]. Specifically, PIC/POC ratios in *Coccolithus pelagicus* appeared unaffected by the range in CO_2 tested [1], which to date remains unexplained.

We argue that the evolutionary history of the *Coccolithus* genus, which originated in the early Paleocene, holds not only invaluable information on how species evolve within 'planktic super-species' [2] whilst keeping rather conservative coccolith morphologies, as will be demonstrated. It potentially is also a crucial factor in constraining maximum levels of atmospheric CO_2 experienced in the geological past.

References

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[2] de Vargas C., et al. (2004) Super-species in calcareous plankton. In H.R. Thierstein and J.R. Young (Eds.), *Coccolithophores: from molecular processes to global impact*, Springer-Verlag, 271-298.