Paleoceanographic changes across the middle Cenomanian carbon-isotope excursion (MCE 1) from the UK chalk

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Abstract

Planktonic foraminifera were studied across the Mid-Cenomanian Event 1 (MCE 1, identified by a positive carbon-isotope excursion) at Lydden Spout, near Folkestone (Kent, southeast England, UK), the reference section of the middle Cenomanian Event 1 (MCE 1) characterized by a prominent double-peak carbon-isotope excursion of 1‰ identified in different ocean basins and considered a global event. Biostratigraphic and quantitative analysis of planktonic foraminifera are correlated to the carbon cycle perturbation that identifies the MCE 1, to the positive oxygen-isotope shifts identified within the MCE 1, and to the occurrence of Boreal macrofossils (*Chlamys arlesiensis*, *Oxytoma seminudum*, and *Praectinocamax primus*).
Planktonic foraminifera show moderate preservation, are common throughout the section and comprise 40-50% of total foraminiferal abundance, although the population is mainly composed by small-sized specimens ($<$ 250 micronm). Large-sized specimens become more common and show a continuous occurrence up-section after the termination of MCE 1. The stratigraphic interval studied is assigned to the *Thalmanninella greenhornensis* and *Rotalipora cushmani* Zones. Variations in abundance and species richness of the planktonic foraminifera are correlated with the inferred palaeoecological preferences of taxa and permit the identification of distinct palaeoenvironmental settings across the MCE 1.

The stratigraphic interval corresponding to the MCE 1 is characterized by the absence of single keeled oligotrophic rotaliporids, by the evolutionary appearance of double keeled mesoeutrophic dicarinellids, and by the appearance of *Muricohedbergella portsdownensis*, a species interpreted as a cold-water taxon that first appears at the same level of Boreal macrofossils, and a positive oxygen-isotope excursion of bulk carbonate within the lower part of MCE 1. These observations point to a palaeoceanographic scenario characterized by reduced stratification of surface waters and absence/disruption of the thermocline in a dominantly eutrophic regime during MCE 1.
Evidence provided by planktonic foraminifera, Boreal macrofossils and oxygen-isotope records documented for the late Cenomanian Plenus Cold Event (PCE) at Eastbourne (UK) reveal similarities that confirm the periodic inflow of cold Boreal seawater originating in the Norwegian Sea as previously postulated to explain the occurrence of Boreal fauna in the Anglo-Paris Basin. The southerly extension of this water mass may be related to the re-organization of circulation driven by the long eccentricity cycle.

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Keywords: Paleoceanography, middle Cenomanian event (MCE 1), planktonic foraminifera, Carbon and Oxygen stable isotopes