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Eocene palaeoenvironments and biostratigraphy in the Arctic: A diatom and chrysophyte perspective

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Compared to those from the Neogene and Quaternary, relatively little is known about Paleogene marine diatoms since records are geographically patchy and often stratigraphically incomplete. Yet, where Paleogene diatoms are preserved, their role as sensitive palaeoenvironmental indicators is undisputed, particularly in cases where calcareous microfossils are absent. This being so, new diatom-bearing Paleogene sections recovered by ocean drilling herald a generally greater advance for pre-Neogene diatom research, than that for the more established microfossil groups.

The recovery of a $\sim$100 m early Middle Eocene diatomaceous section on the Lomonosov Ridge in the Arctic Ocean in 2004 (Integrated Ocean Drilling Program Leg 302, "The Arctic Coring Expedition", ACEX), is arguably the most significant discovery for Paleogene diatoms in nearly two decades. The assemblages are abundant and diverse, well-preserved (exceptionally so in certain intervals) and characterised by shallow-water marine taxa, a significant number of which are new (endemic) species. Moreoever, the stratigraphic ranges of these new species is established to within a few centimetres of core depth. Not only have these discoveries afforded the opportunity for the formal description of several new taxa, but are also leading to the establishment of a new diatom zonation for the Arctic. Here we discuss the stratigraphic and palaeogeographic significance of the diatomaceous ACEX section in relation to existing onshore and offshore sites from the circum-Arctic, the Norwegian Sea, North Sea

Basin and North Atlantic and tie it to the existing dinoflagellate cyst age-model for the ACEX cores.

The ACEX diatoms occur in conjunction with variable abundances of other marine to brackish siliceous microfossils (ebridians, silicoflagellates and endoskeletal dinoflagellates) as well as diverse assemblages of freshwater chrysophyte cysts and marine and terrestrial palynomorphs. There are clear and frequent changes in dominance of the main siliceous microfossil groups throughout the section, reflecting of an extraordinary depositional environment where both shallow marine and freshwater influences prevailed. We quantify these changes for the diatoms and chrysophytes and report on the marine and terrestrial palaeoenvironmental significance of these changes at mm to m-scale resolutions.