# The imprint of Neogene and Quaternary climate filtering on contemporary biogeographic patterns in the Antarctic lacustrine diatom biome

Elie Verleyen[1], Eveline Pinseel[1], Bart Van de Vijver[2], Dominic A. Hodgson[3], Margaret Harper[4], Alexander P. Wolfe[5], Adam R. Lewis[6], Warren Dickinson[7], Allan C. Ashworth[6], the ANTDIAT consortium[1], Koen Sabbe[1], Wim Vyverman[1]

[1]Ghent University, Protistology and Aquatic Ecology, Krijgslaan 281 S8, 9000 Gent, Belgium; Elie.verleyen@ugent.be
[2]Botanic Garden Meise, Nieuwelaan 38, 1860 Meise, Belgium;
[3]British Antarctic Survey, High Cross, Madingley Road, CB3 0ET, Cambridge, UK;
[4]School of Geography, Environment and Earth Sciences, Victoria University of Wellington, PO Box 600, Wellington 6140, New Zealand;
[5]Department of Biological Sciences, University of Alberta, Edmonton AB T6G 2E3, Canada;
[6]Department of Geosciences, North Dakota State University Main Campus, Fargo ND 58105, United States of America;
[7]Antarctic Research Centre, Victoria University, P.O. Box 600, Wellington 6140, New Zealand.

## Abstract

Despite increasing evidence for significant levels of endemism among various microbial groups, a comprehensive understanding of the evolution of regional microbiota and how they are shaped by tectonic and paleoclimate events remains virtually lacking. Here we provide insights into the biogeographic history of Antarctic freshwater diatom biomes based on taxonomic inventories of the contemporary flora and fossil assemblages from the past 15 Ma, including time slices from the Mid Miocene, the Late Pleistocene, and the Holocene. Preceding the Mid-Miocene cooling event, a rich diatom flora existed in Continental Antarctica. However, at the morphospecies level, the overwhelming majority of the Miocene taxa could not be assigned to modern morphospecies. By the Late Pleistocene, the diatom flora was entirely composed of modern species, but local communities were non-analogous to contemporary continental Antarctic ones, and contain a suite of taxa currently confined to other biogeographic regions of the Antarctic Realm. Since the early Holocene, a modern continental diatom flora was present, being severely impoverished and strongly enriched in (semi-)terrestrial taxa. Taken together, our data support the hypothesis of widespread but selective extinction among an ancient diatom flora in response to the Mid Miocene cooling (ca. 14 Ma) and the subsequent expansion of ice sheets, followed by the evolution of a species-poor yet highly adapted and largely endemic modern diatom flora. This suggests that the geological and climatic history of Antarctica affected the history of diatom lineages and their diversity patterns in similar ways as it did for macroorganisms.

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