Miocene diatom fossils shed light on the paleoenvironmental and biogeographical history of the Antarctic Continent

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In contrast to the rich marine fossil record that extends to the late Mesozoic, records of pre-Quaternary lacustrine diatom deposits are relatively scarce, particularly from the high latitudes. Such records provide information concerning paleoenvironmental change, as well as new insights concerning the evolution and biogeography of freshwater diatom floras. Here, we report two well-preserved lacustrine diatom assemblages from the Transantarctic Mountains in Continental Antarctica dating back to the Middle Miocene (ca. 14 – 17.5 Ma): Mount Boreas in the Olympus Range in the western Dry Valleys, and the Friis Hills adjacent to the Asgard Range in the southern Dry Valleys.

In total, 17 samples of Mount Boreas and 9 samples of the Friis Hills were investigated. Diverse diatom floras were revealed, represented by at least 131 taxa (38 genera) and 128 taxa (36 genera) from Mount Boreas and the Friis Hills, respectively. Both floras are dominated by small colonial fragilarioid taxa and a large diversity of benthic taxa belonging to amongst others the genera *Eunotia*, *Gomphonema*, *Pinnularia* and *Brachysira*. Detailed counts of the Mount Boreas sediments suggest that the Mount Boreas lake persisted for several thousands of years and underwent progressive natural acidification. Extensive bryophyte growth suggest an initial shallow water phase, followed by deepening and the occurrence of tychoplanktonic taxa including *Aulacoseira*.

Many of the observed Miocene genera and species groups are currently not found in Continental Antarctica, suggesting that the extant Continental Antarctic diatom flora became established after the Mid Miocene cooling event (ca. 14 Ma), when Antarctic glaciation became intensified. In contrast, the Miocene flora shares compositional affinities with the present-day flora of the Arctic region (e.g., high diversity with eunotioid and cymbelloid diatoms), as well as marked biogeographical links with the Gondwanan continents of South America and Australasia, as evidenced by the occurrence of marker genera such as *Veigaludwigia* and *Eunophora*.

Together, these new fossil diatom localities shed a unique light on the evolution of Antarctic lake ecosystems and taxonomic and biogeographic aspects of the Antarctic freshwater flora. Moreover, as the fossil assemblages are extremely well preserved, they provide valuable temporal constraints for time-calibrated molecular phylogenies of modern congeneric diatom taxa.