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Extensive *Azolla* bloom in the Eocene Arctic Ocean: Indications for major episodes of fresh surface waters and possible consequences for global biogeochemical cycling

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During the Arctic Coring Expedition (ACEX) 302 of the Integrated Ocean Drilling Program (IODP) unique central Arctic drill cores have been recovered from the Lomonosov Ridge. Preliminary analyses of the laminated sediments have shown that enormous quantities of the free floating, freshwater fern *Azolla* grew and reproduced *in situ* in the mid Eocene (∼48,5 Ma) Arctic Ocean for a period of at least 800 kyrs. This implies that the Arctic surface waters must have been fresh to brackish during extended episodes.

As *Azolla* ranks among the fastest growing plants and is capable of fixing vast amounts of nitrogen through its symbiosis with the cyanobacteria *Anabaena azollae*, it is likely

that its extensive bloom in the Eocene Arctic Ocean for hundreds of thousands of years has influenced regional and even global biogeochemical cycling. Notably, the Eocene *Azolla* pulse was timed precisely at the transition from a greenhouse to an icehouse Earth.

Also at adjacent Nordic sea settings, *Azolla* has been found in Eocene sediments, recognized mainly by oil and gas exploration companies. It is believed that these Eocene *Azolla* pulses in the different geographical regions can all be ascribed to one big pulse in the Arctic, from where they were transported by fresh-water spills into adjacent locations.

The main objective of our multidisciplinary (palynological, biogeochemical, ecophysiological) project is to investigate the environmental changes which allowed for the extensive bloom of *Azolla* in the Eocene Arctic Ocean. Furthermore, we want to unravel the environmental and climatic consequences associated with such massive *Azolla* blooms. The latest results will be discussed.