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New deglacial and Holocene micropaleontological and geochemical records from the southern margin of the Svalbard Archipelago (Arctic Ocean)

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This study is presented in the context of the Spanish research project "The development of an Arctic ice stream-dominated sedimentary system: The southern Svalbard continental margin" (SVAIS), developed within the framework of the International Polar Year (IPY) Activity N. 367 (NICE STREAMS). Its main goal is to understand the evolution of glacial continental margins and their relationship with the changes in ice sheet dynamics induced by natural climatic changes, combining the geophysical data with the sediment record both collected during an oceanographic cruise in the Storfjorden area (SW Svalbard margin) in August 2007. This marine depositional system, dominated by an ice stream during the last glacial period, was selected due to its small size inducing a rapid response to climatic changes, and for the oceanographic relevance of the area for global ocean circulation. The results obtained aim to define the sedimentary architecture and morphology, and to provide more insight into the paleoceanographic and paleoclimatic evolution of the region.

We specifically report on new micropaleontological and geochemical data obtained from the sediment cores. A preliminary age model indicates that the sediment sequences cover approximately the Last Deglaciation and the Holocene. Microfossils are generally well preserved, although the abundances of the different groups show marked shifts along the record. Low concentrations of coccolithophores, diatoms, planktic foraminifers and cysts of organic-walled dinoflagellates (dinocysts) are found at the lower half of the sequence (IRD-rich, coarser-grained sediments), and increase towards the Late Holocene (fine-grained bioturbated sediments). The Climatic Optimum is characterized by the warmest sea surface temperatures as estimated from the fossil assemblage, diverse transfer functions and biogeochemical proxies, and by high nutrient contents in the bottom waters shown by light carbon isotope values and high Cd/Ca ratios in benthic foraminifers. Dilution by terrigenous material, related to the retreat of the Barents Sea Ice Sheet in response to changes in the strength of the Atlantic-sourced, warm Western Spitsbergen Current, seems to be important in driving the abundances of microfossils and of organic compounds. The different stages of the Deglaciation and the Holocene and the associated modifications in the surface oceanic environment are documented by changes in the fossil assemblage composition of the different microfossil groups, while synchronous changes in the bottom water masses are registered by stable isotope and trace element analyses of benthic foraminifers.