

Sedimentary processes and environmental changes of Wijdefjorden, northern Spitsbergen since the last deglaciation: Preliminary results of the “end-member analysis”

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The Svalbard archipelago is currently facing environmental changes due to rapid global warming. In this context, western Spitsbergen has been the focus of particular concern, because of the prevailing influence of the West Spitsbergen Current, which carries warm Atlantic waters into the Arctic Ocean, influencing climates and climate-related environmental changes at northern high latitudes since the last deglaciation. Compared to western Spitsbergen, however, northern Spitsbergen has been rarely investigated, albeit potentially connected to climate-related changes. Wijdefjorden in northern Spitsbergen, facing tidewaters in the fjord head and the eastern Arctic Ocean further offshore, could be a proper site to study climate-related sedimentary changes since the last deglaciation. This study investigated sedimentary environmental changes such as glacial retreat, iceberg discharge, sea-ice extent, and bottom-current speed since the last deglaciation using end-member analysis of grain-size data analyzed in four sediment cores from Wijdefjorden. Five end-members (EMs 1-5) were defined based on the characteristics of grain-size distribution curves such as mode and skewness. EM1 and EM2 exhibit fine modes (4.3 - 9.3 μm). Their predominance in the sediment with color lamination, suggests that EM1 and EM2 were deposited via suspension settling from meltwater plume. EM3 and EM4 display coarser modes (15 - 49 μm) and coarse-skewed grain-size distributions. Considering their major contribution to the sediment with lesser fine grains and homogeneous sedimentary structure, they are likely related to winnowing by bottom-currents or underflows. EM5 is polymodal and very poorly sorted, including grains larger than 150 μm . Based on comparison with ice-rafted debris (IRD, > 150 μm) count data and the abundant sand-size grains, we interpret that EM5 represents diamicton or IRD transported by the iceberg and/or sea-ice. The temporal changes in the proportions of EMs allow us to better understand complex climate-related depositional processes and environmental changes in Wijdefjorden since the last deglaciation.