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Millennial scale change in climate and iceberg calving on the Svalbard margin during MIS 2 and 3

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We present results on the millennial scale Dansgaard-Oescger events from the high Arctic (>76˚N), and the response of the Svalbard-Barents Sea Ice Sheet to rapid climate change. The study is based on the distribution of planktic δ^{18}O values, magnetic susceptibility and the concentration and composition of ice rafted debris (IRD) in two different size fractions in two marine sediment cores from the west Svalbard margin at 1130 and 1880 meter water depth. Both cores cover the Marine Isotope Stages (MIS) 2 and 3 in high resolution. The magnetic susceptibility and the oxygen isotope records can be correlated in great detail to previously published records from the southern Norwegian Sea and northern North Atlantic and show a similar pattern of variation with high values during the warm interstadial periods and low values during cold stadial phases. In both cores we find higher IRD concentrations and fluxes during the warm interstadial phases than during the cold stadial phases. The composition of IRD also changes with the millennial scale shifts. In the interstadial phases, the IRD consists of characteristic dark coloured, metamorphic and sedimentary rocks (schists, slates, shales and sandstones) derived from local sources from Svalbard and the Barents Sea. In the stadial phases the IRD is composed predominantly of quartz derived from sources elsewhere. Our results demonstrate that outlet glaciers from the Svalbard-Barents Sea Ice Sheet responded to the interstadial-stadial climatic fluctuations, with highest calving rates during climatic warmth. This is in anti-phase with ice sheets from lower latitudes, i.e. the Icelandic, Scandinavian, and British ice sheets, which have all been reported to calve within the cold stadial phase. The response of the high Arctic ice sheet indicates that ocean and atmospheric heat was the trigger for the iceberg release.