

Are current Arctic changes abrupt as compared with past abrupt changes such as DO events?

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The Arctic is currently warming at a high rate of change, with an average amplitude twice the global mean. Are these changes unprecedented in the climate record as we know it? How do these changes scale with some of the most pronounced abrupt warmings recorded in the palaeoclimate record, such as DO events? One obvious way to answer these questions is to compare present and projected changes with the classical examples of abrupt changes as recorded in the Greenland ice cores. These have been taken to show that key elements of the climate system are capable of changing abruptly, in particular in the Arctic region, but with major repercussions throughout the climate system outside of the high northern latitudes. In the ice2ice project we have documented that the amplitude and rate of change of the DO-warmings are highly dependent on sea ice diminution in the Nordic Seas. Here we show that ongoing Arctic sea ice retreat is involved in temperature changes over large regions of the Arctic that encompass rates of change that are on par with those of DO-events, and are compatible with rates of change recorded in model simulations of DO-events. An analysis of future temperature changes in CMIP5 model experiments show that, depending on future emission scenarios, major parts of the Arctic are likely to experience or have already experienced abrupt temperature changes. The extent of these changes is, however, geographically more constrained in low emission scenarios, but the analysis shows that model experiments underestimate the already observed abrupt changes.