FORCING OF MILLENNIAL-SCALE DANSGAARD-OESCHGER CLIMATE CYCLES AND GLOBAL RESPONSE

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The discovery of a late Quaternary series of large, quasi-periodical, multidecadal warmings and coolings (D/O cycles) in the polar ice sheets and various sediment sequences has revolutionized thinking about global climate change. Understanding the causes of the feedbacks and forcings involved is a key to a better understanding and potential prediction of global climate change. It may be largely linked to processes in the ocean. Indeed, surface and deep-water paleoclimate records in the N.W. North Atlantic exhibit large fluctuations in thermohaline circulation (THC) from 60-12 cal ka, with a master periodicity of ~1500 y such as the D-O cycles of Greenland temperature. Interstadial summer sea-surface temperatures (SSTsu) averaged to 8¡C and salinities (SSS) to 36 psu, recording a strong Irminger Current and Atlantic THC. Stadial SSTsu dropped to 2-4¡C, in phase with SSS drops by 1-2 psu. They record big meltwater injections into the East Greenland Current, that turned off North Atlantic deepwater convection and thus, the heat advection to the north, in harmony with various models. Based on the composition of ice rafted debris, meltwater and ice rafting mainly came from Iceland and East Greenland, with the icebergs being initially jammed for ~250 y in the Denmark Strait. Also the end of stadials, the abrupt D-O warming, was probably tied to iceberg melt via abundant seasonal sea-ice and brinewater formation in the meltwater covered N.W. North Atlantic, which led the temperatur rise on Greenland by as little as 130 y in the 1/1460-y frequency band. Accordingly, brinewater convection may have finally entrained warm surface water from the subtropics and hereby triggered a sudden reactivation of the THC, with global links up to the N.W. Pacific.