

Abrupt Bølling-Allerød warming under continuous meltwater during the last deglaciation

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During the last deglaciation, a major global warming was punctuated by abrupt climate changes related to Atlantic Meridional Overturning Circulation (AMOC). However, cause of a rapid increase in the AMOC during Bølling-Allerød (BA) transition was unknown, and was reproduced by applying fluctuations in glacial meltwater. In this study, a transient simulation from the Last Glacial Maximum to the end of BA was conducted using MIROC4m, an atmosphere-ocean general circulation model, and continuous meltwater input equivalent to the melting speeds of ice sheets in the Northern Hemisphere were applied, as well as reconstructed insolation and greenhouse gases concentrations. The results showed that an abrupt recovery in the AMOC occurred during the BA transition, even the flux of glacial meltwater input was constant. The results also showed that the abrupt increase in the AMOC was mainly caused by the increased greenhouse gas concentrations, and the timing or the presence of abrupt increase in the AMOC depends on the flux of meltwater. These results indicate that an abrupt increase in the AMOC can be caused by gradual climate change without large fluctuations in glacial meltwater.