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Glacial climate states and abrupt climate change in MIROC AOGCM

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Millennial climate change such as D-O cycles and AIM recorded in ice cores in both Hemispheres is known to show a relatively higher amplitude in the middle-level of a glacial cycle than in the interglacial state or severe glacial state. Here we ran several sensitivity experiments using a coupled atmosphere and ocean GCM (MIROC4m, renamed from MIROC3.2.2) and show that the response to fresh water release to the ocean and bipolar response is highly dependent on the background climate. The experiments were conducted with 500 years water hosing of 0.05 to 0.1 Sv (where 1 Sv is equivalent to the water flux of 10m sea level rise in 100 years) in the North Atlantic 50-70N under different basic states; modern climate state with the pre-industrial condition, middle glacial climate state and full glacial condition, mainly differing in the ice sheet configuration and atmospheric amount of Greenhouse Gases. The results under middle glacial condition show largest cooling/warming response in North Atlantic and a reasonable bipolar warming/cooling signal revealed in the ice core data of the both hemisphere. We discuss the responses under different background climates which involve the strong coupling between atmosphere, ocean and sea ice and their dependence on the configuration of ice sheet.