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Why is the D-O cycle-like-abrupt change frequently seen in the midway of Glacial cycle
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阿部 彩子 [1*], 齋藤 冬樹 [2], 大垣内 るみ [2]
Ayako Abe-Ouchi[1*], Fuyuki SAITO[2], Rumi Ohgaito[2]

[1] 東大大気海洋研究所, [2]JAMSTEC
[1]AORI, U-Tokyo, [2]JAMSTEC

Millennial climate change such as D-O cycles, 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. Although massive discharge or melt water of Ice sheet to ocean is one of the cause thought to be responsible?for the millennial climate change, the thermal response to fresh water release in North Atlantic in global?models and/or the paleoclimatic data in the region far from North Atlantic do not agree and even do not explain?the dependence of the amplitude upon the level of climate state. Here we ran several sensitivity experiments using?a coupled atmosphere and ocean GCM (MIROC3 and 4) and IcIES Ice sheet model and show that (1) the response to fresh water release to?the ocean and bipolar response is highly dependent on the background climate and (2) the ice sheet change in millennia time scale occurs only when the condition of insolation and ice sheet are under certain range of condition. The AOGCM 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 in the same manner and position as CMIP/PMIP protocol under different?basic states; Modern Hosing under modern climate with the pre-industrial condition,?Intermediate Glacial hosing under the condition with intermediate level of Greenhouse?Gases , insolation, ice sheet and Glacial hosing under LGM condition (21ka as PMIP2).?The results show largest cooling response in North Atlantic and a reasonable bipolar warming signal as in the ice?cores of Antarctica, and the dependence upon background climate is not relatively the same for the both hemisphere. The favorable condition for the abrupt changes is discussed in terms of insolation, icesheet size, sea ice extent and the melt water amount.