

## **Impact of glacial ice sheets on the duration of the stadial climate**

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It has been shown from ice core reconstructions that glacial periods experienced climate shifts between warm interstadials and cold stadials. The duration of these climate modes varied during glacial periods, and that both the interstadials and stadials was shorter during Marine Isotope Stage 3 (MIS3) compare to MIS5. Recent study showed that the duration of the interstdials is controlled by Antarctic temperate through its impact on the stability of the Atlantic Meridional Overturning Circulation (AMOC). However, similar relation could not be found for the stadials, suggesting that other climate factor (e.g. changes in ice sheet size, greenhouse gases and insolation) may play a role. Thus, for a better understanding of the stability of the climate, it is very important to evaluate the impact of these climate factors on the duration of the stadial climate. In this study, we investigate the role of glacial ice sheets. For this purpose, freshwater hosing experiments are conducted with an atmosphere-ocean general circulation model MIROC4m under several ice sheets configurations computed by an ice sheet model Icies (Abe-Ouchi et al. 2013). The impact of glacial ice sheets on the duration of the stadial climate is evaluated by comparing the behavior of the weak AMOC after the freshwater forcing is reduced. All experiments show drastic weakening of the AMOC in response to freshwater hosing, which accompanied cooling over the North Atlantic, southward shift of the tropical rain belt and warming over the Antarctic. When the fresh water hosing is reduced, we find that experiments with smaller ice sheet takes more time to recover. Sensitivity simulations show that differences in the surface wind is important. Thus our result suggests that differences in the shape of the ice sheets between MIS3 and MIS5 may play an important role in causing shorter stadials during MIS3 compare to MIS5.