Analysis of the deglaciation of MIS 11(Termination V) using an ice-sheet model.

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It is known that the climate of the late Pleistocene is characterized by 100-kyr glacial-interglacial cycles, which are considered to be driven by boreal summer insolation. Insolation is determined from three orbital parameters; obliquity (41-kyr periodicity), precession (19, 23-kyr periodicity) and eccentricity (100-kyr periodicity). Within the 100-kyr cycles, MIS 11 has the characteristic feature that large-amplitude deglaciation and long interglacial occurred even though the insolation was especially weak due to small eccentricity. This seems to contradict the astronomical explanation that boreal summer insolation drives the climate cycle. The mechanism remains unclear and further investigation of MIS 11 is needed. In this study, we used an ice-sheet model, IcIES (Ice sheet model for Integrated Earth System Studies) (Abe-Ouchi et al., 2013), to investigate the response of ice sheet to external forcings on the climate system and, in particular, focused on the deglaciation of Termination V (MIS 11). We investigated the phase relationship between obliquity and precession in each termination of the 100-kyr cycles using wavelet analysis. We found that the deglaciation of MIS 11 needs the contribution of both insolation and CO_2 increase because termination does not occur when CO_2 is kept constant. Moreover, when we carried out a series of experiments in which the CO_2 input was shifted by increments of 1000 years from -5000 years to +5000 years during Termination V, in all these experiments, deglaciation was complete when precession reached its second minimum, around 410kyr BP.

