

Modelling the climate and ice sheet at LGM

Ayako Abe-Ouchi[1]

[1] CCSR, Univ. Tokyo

Through several studies in the past, it is stated that the cooling at Last Glacial Maximum (LGM) over the NH is caused mainly by the ice sheet existence. It is natural to state a question why and how the ice sheets over Europe and north America have grown and disappeared. To explain the ice sheet growth and termination, there are debates whether the climate was driven by orbital forcing and/or CO₂, or how much self-maintenance mechanism of ice sheet worked. In this study, we try to evaluate the main ice sheet - atmosphere feedback, such as ice albedo feedback, elevation - mass balance feedback, stationary wave feedback (through temperature) and transient eddy feedback (through precipitation). Sensitivity experiments are performed using the CCSR/NIES AGCM (T106, 1x1 deg, L20).

Additionally a three dimensional thermo-mechanical ice sheet model (Saito and Abe-Ouchi, 2003) is used to diagnose each effect. It is driven with a Degree Day mass balance model forced by AGCM (monthly mean temperature and precipitation). The main conclusions are as following;(1) The ice sheet during the LGM is maintained mostly by albedo feedback and elevation-mass balance feedback.(2) Stationary wave effect on temperature is extracted. Its effect is important for the advance in the east part of Laurentide ice sheet and prevents the migration in the Alaska region.(3) Lapse rate is about 5 k/km. (4) Laurentide do help the Fennoscandia ice sheet to grow in the western part through the transient eddy feedback.(5) Growth of Fennoscandinan ice sheet to the south in the western part is prevented by the stationary wave feedback of Laurentide ice sheet and the presence of itself.