

Development of an Ice Sheet Model coupled General Circulation Model and application of Energy Balance Model on the estimation of Ice Sheet mass balance

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A sea level rise is an important topic in a future climate projection. In the past warm period known as the Last Interglacial (LIG), paleoevidences indicate sea level rise of several meters. Paleoclimate modeling community applies past GCM results on ice sheet models and tries to reproduce past sea level rises. We designed a coupling procedure between an ice sheet model and a general circulation model and are planning to introduce a surface mass balance of ice sheet not only by a typical empirical method called PDD (Positive Degree Days) but also surface mass balance on the ice sheet as an upper boundary condition. The PDD only refers the surface atmosphere temperature and snowfall. In the present study, we use a process-based land surface model MATSIRO to estimate surface mass balance forced not only by temperature and snowfall but also by other surface variables including shortwave and longwave radiation. We compare the characteristics of resultant ice melt amount from PDD and MATSIRO to evaluate the inclusion of process-based heat and water balance instead of empirical equation. We apply this procedure on the estimation of Greenland mass balance in the LIG.

Keywords: ice sheet, mass balance, general circulation model