Transient simulations of deglaciations using climate model MIROC and abrupt climate changes

*Takashi Obase[1], Ayako Abe-Ouchi[1], Fuyuki SAITO[2]

1. Atmosphere and Ocean Research Institute, The University of Tokyo, 2. Japan Agency for Marine-Earth Science and Technology

One notable point of the last deglaciation (21 to 9ka BP) is that a major global warming trend was punctuated by abrupt climate changes related to Atlantic meridional overturning circulation (AMOC). We conducted transient simulations of the last deglaciation with the actual orbital forcing and GHG, and continuous meltwater is applied to the North Atlantic to represent glacial meltwater from the Northern Hemisphere ice sheet. We show that an abrupt climate change, is associated with significant decrease in North Atlantic sea ice and the formation of deep convection of the AMOC. This indicates that abrupt climate change was a response to gradual warming with the presense of glacial meltwater from the Northern Hemisphere ice sheets. We also conducted sensitivity experiments with larger glacial meltwater input (by factor of 1.5) to mimic the penultimate deglaciation (about 138 to 127ka BP). In that experiment, the abrupt climate change occurred only at the beginning of the last interglacial. The results, together with the Northern Hemisphere ice sheet model experiments (using ice sheet model IcIES-MIROC) suggest the importance of the transient climate and AMOC responses to the different orbital forcing conditions of the last two deglaciations, through the mechanisms of mass loss of the Northern Hemisphere ice sheet and meltwater influx to the ocean. In this presentation, we discuss the occurrence of abrupt climate changes and its relevance to ice sheets.

