

大気海洋結合モデルと氷床モデルによる南極海洋および氷床の古気候における役割 Modelling the importance of Southern ocean and Antarctic ice sheet in Plio-Pleistocene climates

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In order to understand the factors influencing the Antarctic climate and Ice sheet and evaluating its influence upon global climate, many paleoclimate modelling under LGM condition and Pliocene are performed and two examples are shown here. Southern Ocean is important as the source of Antarctic Bottom water formation which influences the atlantic meridional overturning circulation (AMOC) and carbon storage. Here we analyse the latest multi models of CMIP5 and PMIP experiments as well as MIROC model (Japanese GCM) and show that the deepening of AMOC simulated in most of the models come from the insufficient model performance in Southern ocean. We further show that the models which don't have shallower glacial AMOC have even stronger AMOC because of the existence of ice sheets, through the feedback between the AMOC, sea ice and wind stress in the north Atlantic. The second topic is on the modeling the Antarctica ice sheet, on which we discuss the influence of global climate change under glacial condition and Pliocene in models to aid interpretation of paleodata showing the increase in altitude in some area and retreat of margin, decrease of sea level in Pliocene. By combining ice sheet model and GCM, we show that the mid Pliocene ice sheet shows an increase in altitude in East Antarctica especially in the Queen Maud Land region because of accumulation increase, while a thinning or retreat in the Wilkes land and Aurora basin where relatively the bedrock is low. Further studies need an update in ice sheet modeling treating properly the ocean-ice interaction, basal processes and rebound of bedrock, as well as climate experiments taking into account the different orbital conditions.

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