

## Analysis of factors contributing to the differences between Pliocene and present-day climates using an atmosphere-ocean-vegetation coupled model: CO<sub>2</sub> vs. geographical conditions

\*Sachio Nakagawa<sup>1</sup>, Ayako Abe-Ouchi<sup>1</sup>, Wing-Le Chan<sup>1</sup>, Taro Higuchi<sup>1</sup>, Ryouta O'ishi<sup>1</sup>, Takashi Obase<sup>1</sup>

1. University of Tokyo

It is known that glacial-interglacial cycles began around 2.7Ma. The initiation of the glacial-interglacial cycles has been thought to be due to a decrease in atmospheric CO<sub>2</sub> concentration, which caused a global cooling. On the other hand, some studies suggest that, in addition to the change in CO<sub>2</sub> concentration, differences in geographical conditions, such as land-sea mask and ice sheets, could also have caused the differences between the climate before the glacial-interglacial cycles and that of present-day. In this study, we analyzed the results of experiments conducted with MIROC-LPJ in which CO<sub>2</sub> concentration and geographical conditions were changed to those of present-day and Pliocene separately. The difference between temperatures in the experiments with different geographical conditions was larger than that in the experiments with different CO<sub>2</sub> concentration. Around the regions where the geographical conditions changed greatly, the difference in temperature due to this change was larger than the difference due to changes in CO<sub>2</sub> concentration. The climate also changed in other areas, through changes in vegetation and atmospheric circulation associated with the change in temperature. Around the Hudson Bay, which was land in the Pliocene, it was more likely to be warm in summer and cool in winter compared to present-day. From this result, it is thought that, although it was difficult for the Northern Hemisphere ice sheets to grow under Pliocene geographical conditions, after initiation of the glacial-interglacial cycles due to a decline in CO<sub>2</sub> concentration, ice sheets grew more easily as the Hudson Bay formed.

Keywords: Climate Model, Paleoclimate, Pliocene