Comparison of the Kuroshio during LGM simulated by an ocean general circulation model driven by multiple paleoclimate models

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The Kuroshio that flows south of Japan has an important role in the climate of East Asia and Japan. In modern days, the Kuroshio presents a stable path and contributes to maintenance of warm climate. However, this stable condition is considered to be different in Last Glacial Maximum (LGM) when different environment conditions from the present day were reported. During the LGM, the sea surface level was lower than present by about 130 m and the westerlies shifted southward. In addition, the air-sea heat flux was also expected to be different from present. Therefore, it is necessary for the simulation for the Kuroshio in LGM to consider the changes in above three factors (sea level, westerly, and air-sea heat flux). The Kuroshio in LGM was calculated by a numerical model that included the above mentioned three factors in Muto (2018). The model results presented the southward shifting of the Kuroshio path and decreasing of the Kuroshio intensity. However, this result was obtained from one paleoclimate model (IPSL). Therefore, it is necessary to use more paleoclimate models to confirm the results given by Muto (2018).

In this study, we performed similar calculations for the Kuroshio in LGM using four additional paleoclimate models (CNRM, GISS, MIROC, MRI) as driven forcing of ocean model. Before calculation, we compared the vorticity of wind stress given by these paleoclimate models and obtained the Sverdrup transport that is also an index of Kuroshio intensity.

Among all the five paleoclimate models, the position of zero vorticity, which corresponds roughly the position of Kuroshio, shifted to the most southward in IPSL. At the same time, the Sverdrup transport was the lowest in IPSL. Therefore, the southward shifting of the Kuroshio path and the weakening of the Kuroshio intensity given by Muto (2018) are likely an extreme case among five paleoclimate models.

Keywords: Last Glacial Maximum, Kuroshio, paleoclimate models

