

The variation of the Arctic cryosphere in the Last Millennium simulation using MIROC and MIROC-ESM

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In this study, we analyze the result of Last Millennium (LM) Experiment using GCM and ESM, to verify the response of the cryosphere to the hundreds-year-scale climate change. In addition to the sensitivity analysis between the forcing conditions, comparison with existing climate/paleoclimate data. The period of the LM experiment covers the Little Ice Age and Medieval Climate Anomaly, and responses of the cryosphere during those periods are of interest.

The models used in this study are the Atmosphere-Land-Ocean General Circulation Model MIROC and the Earth System Model MIROC-ESM. Resolution of atmosphere/land components are T42 (ca 2.8°) in horizontal, 80 layers in vertical. Ocean component has a resolution of 1.4° (longitude) by variable 0.56°-1.4° (latitude) in the horizontal and 44 levels in the vertical. As an ESM, MIROC-ESM has a carbon-cycle components for the land and ocean ecosystems. Setup of the experiments follow the protocol of model inter-comparison CMIP5/PMIP3.

As preliminary results, temporal variations in surface air temperature, snow amount, and snow/rain ratio for Siberia region was analyzed. Winter warming during 20th century is clear. Signatures are shown in rise of February Temperature, decrease in snow amount, increase in runoff during spring. Ratio of Snow fall / Precipitation is sensitive to the temperature, which may caused the above-mentioned trends in snow.

Keywords: paleoclimate, climate modelling, Last Millennium, cryosphere, climate change