

Predictability of a drastic reduction in the Arctic sea ice

*Jun Ono¹, Hiroaki Tatebe¹, Yoshiki Komuro¹

1. Japan Agency for Marine-Earth Science and Technology

The mechanism and predictability for a drastic reduction in the Arctic sea ice extent (SIE) are examined using the Model for Interdisciplinary Research on Climate (MIROC) version 5.2. Here, a control (CTRL) and perfect-model (PRED) experiments are conducted under the Arctic Predictability and Prediction on Seasonal to Interannual Timescales (APPOSIT) project. In CTRL, drastic reductions in SIE occur at a rate of a few times in 200 years regardless of forcing fixed at the year 2000. In each drastic year, the Arctic Dipole Anomaly (ADA) characterized by positive sea level pressure anomaly over the Beaufort Sea and negative over the Kara Sea is formed in summer. Sea ice retreats by winds associated with the ADA, further melts due to heat input through the open water, and drastically decreases. This resembles the mechanism for September 2007. CTRL suggests that the drastic reduction is caused by a combination of the ADA and preconditioning of the Arctic Ocean interior through the ocean heat fluxes from the North Atlantic and Pacific Oceans. As for the drastic year, September SIE can be predicted in PRED started from July, but not from April due to the inaccurate prediction of the ADA. As for the year with small anomaly, September SIE can be predicted from April thanks to the memory of ocean and sea ice.

Keywords: Predictability, Arctic sea ice, drastic reduction