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EFFECTS OF THE RECENT ARCTIC SEAICE REDUCTION ON THE VERTICCAL COUPLING PROCESS BETWEEN THE TROPOSPHERE AND STRATOSPHERE

Yasunobu Miyoshi (*Kyushu University, Japan*)

Yasunobu Ogawa (*National Institute of Polar Research, Japan*)

Yoshihiro Tomikawa (*National Institute of Polar Research, Japan*)

Jinro Ukita (*Niigata University, Japan*)

Tetsu Nakamura (*Hokkaido University, Japan*)

Koji Yamazaki (*Hokkaido University, Japan*)

Meiji Honda (*Niigata University, Japan*)

Katsushi Iwamoto (*Niigata University, Japan*)

miyoshi@geo.kyushu-u.ac.jp

We examined impacts of the recent changes in the Arctic sea ice extent on the general circulation in the troposphere and stratosphere by performing a series of a general circulation model (GCM) experiments. The GCM used in this study was the Earth Simulator GCM (AFES) with T79 horizontal resolution and 56 vertical levels up to about the 60 km model top. Perpetual model runs were performed with the Arctic sea ice extent of the past period (1979 to 1983, *CNTL*) and the more recent period (2005 to 2009, *NICE*). We focus our attention on the impact of the Arctic sea ice reduction on the winter stratospheric circulation. The increase in the frequency of the stratospheric sudden warming (SSW) event and the weakening of the polar night jet during the early winter (December-January) were found in the *NICE* experiment. These changes were caused by the enhancement of the planetary wave activity in the *NICE* experiment. This implies that the global warming in the troposphere strongly affects the general circulation in the stratosphere through the upward propagation of the planetary wave. In order to clarify the effects of the changes in the high-latitude SST and/or the reduction of the Arctic sea ice on the stratospheric circulation, additional experiments were performed. Furthermore, the stratospheric influences on the Arctic environment during the winter and early spring through the stratosphere-troposphere coupling process were investigated.