Geophysical Research Abstracts
Vol. 17, EGU2015-7071, 2015
EGU General Assembly 2015

The impact of the Arctic Sea Ice retreat on extratropical cyclones and anticyclones over Northern Eurasia: atmospheric model simulations

Mirseid Akperov (1), Vladimir Semenov (1,2), Igor Mokhov (1), Antony Lupo (3,4)

(1) A.M. Obukhov Institute of Atmospheric Physics, RAS, Moscow, Russia (aseid@ifaran.ru), (2) GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany, (3) Department of Soil, Environmental, and Atmospheric Sciences, University of Missouri, Columbia, USA, (4) Belgorod State University, Belgorod, Russia

The Arctic region has been warming more than twice as fast as the other parts of the world during the last few decades. The rapid Arctic warming is accompanied with the dramatic change of Arctic sea ice cover. Recently, it has been suggested that such climatic changes might have led to the increase of anomalous weather events in winter over Northern Eurasia. One example is anomalous cold winters over Northern Eurasia associated with atmospheric blocking events. However, a large uncertainty remains concerning robustness of the observed relationship and associated mechanisms of impact. The main goal of this research is to explore the connection between the declining Arctic sea ice (most strongly expressed in the Barents-Kara Seas region) in the cold season and the change of cyclonic and anti-cyclonic activity over Northern Eurasia using simulations with atmospheric general circulation model (AGCM).

The simulations were performed with the ECHAM5 AGCM using identical sea surface temperature climatology but different sea ice concentrations (SIC) for the periods corresponding to the high (1966-1969), low (1990-1995) and very low (2005-2012) SIC regimes in the Arctic as well as for the mean climatological SIC for 1971-2000. The duration of each simulation was 50 years.

For the regimes with high and very low SIC, a statistically significant increase in the number of long-living anticyclones (with lifetime of more than 5 days) over Northern Eurasia was found. Long-living cyclones exhibited different changes in their number depending on their intensity.

The analysis of the spatial patterns of cyclonic and anti-cyclonic activity over Eurasia was performed. We found an increase of the frequency of cyclones over the central region of the European part of Russia (EPR) and anticyclones over the northern region of the EPR for the regimes with a high sea ice concentration in the Arctic. For the regime with very low SIC the shift of the frequency of cyclones and anticyclones towards the central part of Russia was found.