Geophysical Research Abstracts
Vol. 17, EGU2015-431, 2015
EGU General Assembly 2015

Reproduction of influence of autumn snow cover anomalies on the following winter atmospheric dynamics in INMCM4.0 and INMCM5.0 data

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There are different studies of the influence of autumn snow cover anomalies on atmospheric dynamics in the following winter (e.g. Allen R.J. and Zender C.S., 2011; Martynova Yu.V. and Krupchatnikov V.N., 2010). The mechanism of this effect is complex and largely affects stratospheric processes (Cohen J. et al., 2007). The snow cover rapidly increases exceeding normal values. Emerged diabatic cooling results in pressure increase over and temperature decrease under the normal value. Thus, in troposphere upward energy flux increases, and then it is absorbed in stratosphere. Strong convergence of wave activity flux causes geopotential heights increase, polar vortex slowdown and stratospheric temperature increase. Emerged geopotential and wind anomalies extend from stratosphere to troposphere up to surface. As a result, strong negative AO mode appears near the surface as surface air temperature increase.

Siberia plays important role in this mechanism. Firstly, the most extensive snow cover is formed there. Secondly, according to NOAA satellite observations this cover is generally formed in October (Gong G. Et al., 2003). As a result, Siberia is very interesting for investigations of the autumn snow cover anomalies influence on the atmospheric dynamics in the following winter.

This study is devoted to detection and estimation of described mechanism in INMCM4.0 and INMCM5.0 data. INMCM5.0 model represents further development of INMCM4.0 model (Volodin E.M. et al., 2010; Volodin E.M., 2014). They are different both from physical (various physical processes) and numerical (spatial resolution) points of view, thus giving different results representing various physical processes.

An analysis of some parameters of atmospheric dynamics shows that top of atmosphere and vertical resolution set in INMCM models play important role in reproduction of influence of the Siberian autumn snow cover anomalies on the Northern Hemisphere atmospheric dynamics in the following winter.

Acknowledgements
Author acknowledges Dr. Volodin E.M. for providing INMCM data and valued advices. This work is partially supported by SB RAS project VIII.80.2.1, RFBR grant 13-05-12034, 13-05-00480, 14-05-00502 and grant of the President of the Russian Federation.

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