EMS Annual Meeting Abstracts
Vol. 14, EMS2017-27-1, 2017

Influence of Siberian autumn snow cover on the following winter atmospheric dynamics using modeling data and observations

Yuliya Martynova (1,2), Elena Kharyutkina (2), Vladimir Krupchatnikov (1,2)

(1) Siberian Regional Hydrometeorological Research Institute, Novosibirsk, Russia, (2) Institute of Monitoring of Climatic and Ecological Systems SB RAS, Tomsk, Russia

Studies which deal with the influence of autumn snow cover anomalies on atmospheric dynamics in the following winter are topical nowadays (Cohen J. et al., 2007, 2014; Martynova Yu.V. and Krupchatnikov V.N., 2010; etc.) The most extensive snow cover is formed in Siberia and, according to NOAA satellite observations, this cover is generally formed in October (Gong G. et al., 2003). The area of snow cover rapidly increases exceeding normal values in Siberia during last decades. Emerged diabatic cooling in the region of under study results in pressure increase over and temperature decrease under the corresponding normal values. 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 (Cohen J. et al., 2007).

Analysis is provided on the base of INMCM 5.0 (Volodin E.M., 2014) simulation data set, ERA-Interim reanalysis data and observations.

The results of detection and estimation of described above physical mechanism in INMCM5.0 data are presented. The comparison of the results obtained using INMCM5.0 modeling data and ERA-Interim reanalysis data and observations is provided. The analysis of climatic changes, based on temporal variability of meteorological parameters such as air and soil temperature, atmospheric pressure and precipitation, is also carried out.

Acknowledgements

This work is partially supported by RFBR grants 16-35-00301, 16-05-00558 and by the grant of the RF President -2018.2017.5. The authors thank Dr. Volodin E.M. for providing INMCM data.

References

Cohen J. et al. Stratosphere-troposphere coupling and links with Eurasian land-surface variability. // J. Climate. 2007. V. 20. P. 5335-5343.

Cohen J. et al. Linking Siberian snow cover to precursors of stratospheric variability // J. Clim., 2014. - V. 27. - p. 5422-5432.

Gong G.et al. Modeled Northern Hemisphere winter climate response to realistic Siberian snow anomalies. // J. Climate, 2003. - V. 16. - P. 3917–3931.

Martynova Yu.V. and Krupchatnikov V.N. A study of the sensitivity of the surface temperature in Eurasia in winter to snow-cover anomalies: The role of the stratosphere // Izv. Atmos. Ocean. Phy. 2010. V 46, Issue 6, pp 757-769.

Volodin E.M. Possible reasons for low climate-model sensitivity to increased carbon dioxide concentrations // Izv. Atmos. Ocean. Phy. 2014. V 50, Issue 4 , pp 350-355.