Geophysical Research Abstracts
Vol. 20, EGU2018-14779-1, 2018
EGU General Assembly 2018

Long-term Changes of the Wintertime Temperature Extremes in Moscow and their Relation to Regional Atmospheric Dynamics

Yulia Zyulyaeva, Joshua Studholme, and Igor Zveryaev

Shirshov Institute of Oceanology, RAS, Laboratory of Ocean-Atmosphere Interaction and Monitoring of Climate Change, Moscow, Russian Federation (yulia@sail.msk.ru)

Interannual variability and long-term changes in the wintertime (DJF) cold and warm temperature extremes in Moscow between 1949–2012 are investigated using observed air temperature (AT) station data and ERA-Interim reanalysis.
Significant interdecadal changes in a range of characteristics are identified. In particular, we find a high magnitude long-term AT warming trend of 0.45º per decade. This is over twice the magnitude of estimates for summertime (JJA) long-term warming over the same period (0.22º per decade).
We find a principal difference between PDFs constructed for winter and summer daily AT anomalies. Summer daily AT anomalies in Moscow (studied in previously published analyses) are characterized by a Gaussian (i.e. normal) distribution but the wintertime distribution of AT anomalies exhibit strong skewness. We show prominent changes in the skewness of the early winter PDFs. This is related to a reduction in the number of extremely cold days (with ATs are below 10th percentile threshold) in December. Thus, we identify a shift in the climatological onset of the winter season in Moscow.
We link these statistical results to physical processes and detect a significant association between wintertime temperature extremes in Moscow and variations in the North Atlantic storm track location. This is strongest for higher frequency (1-6 days) variations. To identify the origin of air masses implicated in extreme cold and warm events, we computed their 5 days Lagrangian back-trajectories. We classified trajectories based on their 5-days origin (between times - 96 hours and 120 hours), changes in different types investigated. Our analysis revealed that in winter extreme warm events in Moscow are associated with air masses originated (and advected) from the North Atlantic and Mediterranean region. Air masses implicated in extreme cold events are mostly of the Arctic and Siberian origin.
This work was supported by the Russian Science Foundation grant 14-50-00095.