

Recent baric and climatic conditions over East Europe with a focus on Belarus

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The global and regional climate changes are the object of intent monitoring and research works. The results of climatic investigations are highly demanded and taken into account in projecting of any kinds of economic and social activities. At the same time the reasons of climate changes still remain as a point of scientific discussion. Despite the heightened attention to the anthropogenic contribution to the climate change, the natural factors still lead in the climatic system fluctuations. In this connection the aim of the present study is an analysis of current peculiarities of the atmospheric circulation as a main natural climatic driver, estimation of the prevailing cyclonic passes over East Europe region and its climatology.

The hypothesis of the research work is that climatic changes observed in the study region in the recent decades (increase of air temperature, especially in winter season, regional changes of the moistening pattern, number and spatial distribution of extreme events) are caused by changes in the frequency of cyclones of different origin which led to various hydrometeorological conditions on their passes. According to the pattern of cyclones movement over the Atlantic-European region, we analyzed cyclonic activity by approaching cyclone selection in groups by their origin: (a) cyclones originated in the North Atlantic and sampled by two sub-groups: the West (with zonal west-east pass from Atlantic to the continent) and the Scandinavian (with meridian pass from the Scandinavia to the south); (b) cyclones that originate in the Mediterranean Sea, the Balkan Peninsula, and the Black Sea and are moving in the northward direction. The frequency of occurrence, radius, duration, and atmospheric pressure in the cyclone center (cyclone depth) have been studied for all types of cyclones.

The input information for the study is presented as two data-sets of cyclone tracks derived with the algorithms developed by different groups of authors: (1) the P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences and (2) the A.M. Obukhov Institute of Atmospheric Physics of the Russian Academy of Sciences. Both algorithms were applied to the ECMWF Era-Interim reanalysis. The study period is 1979-2016 (37 years). The cyclonic data-sets presented as coordinates and sea level pressure in the cyclone center during their life. The correspondent meteorological phenomena are used to investigate the long-term climatological anomalies in the study region such as invasions of warm and cold air masses, severe droughts, intensive precipitation, etc.

In our previous study (Partasenok *et al* 2014), we established some peculiarities of cyclone tracks change in the Atlantic-European region in winter season and in this connection the streamflow freshet formation in Belarus. The main feature of the study was an increase of the West cyclones number in the Atlantic-European region and detection the third sub-group of the Atlantic cyclones named the North cyclones. The increase this type of cyclones and its shift to the northward led to the precipitation growth in the northern part of Belarus in winter and formation the special hydrometeorological conditions for smaller than average snow-melting floods in the country during recent decades. The present study is a continuation of this research work with spreading calculations to all seasons of the year and emphasizing on the long-living climatological anomalies and extreme events connected with cyclones of the different origin.

Reference: Partasenok (Danilovich) I.S., P. Ya. Groisman, R.S. Chekan, and V. I. Melnik, 2014: Winter cyclone frequency and following freshet streamflow formation on the rivers in Belarus. *Environ. Res. Lett.*, **9**, 09005 (13 pp). doi:10.1088/1748-9326/9/9/095005 *Environ. Res. Lett.* **9** (2014) 109602 (2 pp) doi:10.1088/1748-9326/9/10/109602

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