Geophysical Research Abstracts
Vol. 14, EGU2012-13175-5, 2012
EGU General Assembly 2012

Boreal Atmospheric circulation patterns on the basis of the world network weather station data

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Due to the recent developments of various methods of data representation in meteorology, the image of the globe-scale atmospheric circulation system has appeared. Basically, the circulation assessment is based on the indirect teleconnection method and rotated principal component analysis of the sea level pressure or geopotential height fields. These methods have several constraints because of the integration of intermittent and frontal atmospheric synoptic variability.As follows from the work of prof. B.L. Dzerdzeevskii, due to the existing of Arctic blocking processes, simplified geostrophic wind concept on the basis of the low-frequency baric patterns of the permanent centers of action, should be reconsidered in more details.
For this purpose, weather station direct in-situ data with the use of progressive vector diagrams for wind speed and direction time series visualization are appropriate. Wind diagrams incorporate various fluctuations with time scales from synoptic to climatic, which can be considered without any filtration applied.
The subject of work is to study the long-term wind regimes in the Northern Hemisphere, with the aim to obtain atmospheric circulation patterns in the regions of interest, in particular induced by the NAO(North Atlantic oscillation), EAWR(East Atlantic-West Russia) and SH(Siberian High) centers of action at different time and space scales.
The analysis is based on the standard meteorological data (including wind direction and speed) of WMO network weather stations in the period since 1998 up to the present. For intercalibration and validation, NCEP-NCAR and QuickSCAT sea winds databases were considered, as well.
Basic features of the wind variability are governed by the relevant types of the large-scale synoptic atmospheric processes, which depend upon the state of the global atmospheric circulation, their large-scale gyres and separate smaller vorticity cells. All the individual wind diagrams appear as having rather simple low-frequency structure.
Long-term wind variations were splitted to winter and summer seasons.
Schematic view of the troposhere circulation in NCP(North-Caspian Pattern) or EAWR baric permanent structure was not confirmed by the data in hand. According to the weather stations around the Black Sea, the climatic winds have cyclonic vorticity, the center of rotation being located approximately over Turkey.
The evolution of fields from small to large time scales is carried out by the "universal" set of wind vector variations, which due to their crucial role deserves a special name "Elementary cycle" (EC). Typical EC variations are described by a cyclic wind change from one persistent direction to another. The similarity of EC variations at different time scales is considered as wind fractality. It is shown, that the fractality is due to recurrence of basic regional baric synoptic fields. Fractal dimensions on the basis of wavelet decomposition and statistical significance using Monte Carlo technique were estimated.