

Cyclone activity over Baltic region and upper-air atmospheric circulation

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The aim of this work is to study the relationships between cyclone activity, NAO phase and upper-air atmospheric circulation over Baltic region during winter seasons. The cyclone activity parameters were calculated based on automated cyclone tracking algorithm based on the 6-hourly SLP from the NCEP/NCAR reanalysis 1948-2012. There are cyclone frequency and cyclone activity index, calculated as number cyclone centers and sum of cyclone centers MSLP anomalies at each grid point during the month. The upper-air atmospheric circulation parameters, the upper-air wind speed (200 gPa) and upper-air divergence (200 gPa), were calculated based on mean month reanalysis data. The many studies shows, that these parameters are dominating environmental variables, controlling upper-air baroclinicity and cyclones intensification.

The Baltic region is outstanding by the strong extreme cyclone activity. The number of extreme cyclones, cyclones with MSLP of 970 hPa or less, increases during the period of study, and now is to 60-80% in integral cyclone intensity. It is important to note, that the increases of the number and integral intensity of extreme cyclones over Baltic region are accompanied by increases of mean wind and mean divergence in upper air. Results of the regression analysis shows the positive correlation between upper-air variables (as wind speed, as divergence), and the number of extreme cyclones over the region. On the other side, the negative correlation was observed between upper-air variables and moderate cyclones.

The years with strong positive NAO were outstanding by significant extreme cyclone activity intensification over Baltic region. Wind composite maps for winter seasons with different NAO phases shows, that during years with strong positive NAO were observed strong upper-air wind increase to jet stream values over north latitudes in Europa.

Thus the study shows, that the increases of extreme cyclone activity over Baltic region during past years may be connected with favourable conditions in upper-air for cyclones intensification.