



## **Cyclone activity and circulation oscillation in North Atlantic**

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The goal of present study is to investigate the consistency of the long-term variations of cyclone activity over North Atlantic region (30n-80n, 50w-70e) in winter season and examine their relationships with large-scale atmospheric circulation features such as North Atlantic and East –Atlantic oscillations. The cyclone activity parameters (the cyclone density and cyclone intensity) were calculated based on automated cyclone tracking algorithm. The data used to extract the cyclone activity are the 6-hourly SLP from the NCEP/NCAR reanalysis 1948-2011. The cyclone density and the cyclone intensity were calculated by counting the cyclone occurrences and sum of cyclone centers MSLP anomalies at each grid point over North Atlantic during the month.

The winter patterns of mean composite cyclone activity parameters were constructed for years with different combination of North Atlantic and East –Atlantic oscillations phases (NAO and EA indices). The years with strong NAO and weak EA were outstanding by significant cyclone activity intensification, as cyclone density, as the cyclone intensity, over high latitudes of North Atlantic during the years with strong positive NAO index and over midlatitudes of East Atlantic and Europe during years with negative NAO index. The years with strong EA and weak NAO were outstanding by more strong cyclone activity over Europe. The cyclone density and cyclone intensity in North Europe during the years with strong positive index EA are more significant in comparison with positive NAO years. In the years with strong negative index EA as cyclone activity intensification in midlatitudes of Europe, as cyclone activity weakening over North Europe, are more strong in comparison with negative NAO years. The years of coincide NAO and EA phases were outstanding maximum cyclone anomalies over North Atlantic and North Europe: maximum cyclone intensity and significant increases of extreme cyclones during positive phases NAO and EA, and minimum cyclone activity during negative phases NAO and EA. The years with strong, but opposite NAO and EA indices, were selected by the most interesting cyclone activity patterns. During these years the cyclone activity pattern over Atlantic in main according to pattern of NAO strong index, and the cyclone activity pattern over Europe according to pattern of EA strong index.

Thus the study shows that NAO index in main reflects the cyclone anomalies development over North Atlantic, but the cyclone anomalies development over Europe is better reflected by EA index. That is more, the analyses of the cyclone activity patterns during years with different phases of NAO and EA gives the possibility to suppose, that the character of cyclone activity anomalies over North Atlantic and Europe, of cyclone density and the cyclone intensity, in main determines development some phase NAO and EA.