



Tornadoes regions in Poland - meteorological conditions and spatial and temporal distribution

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The main objective of this work was to establish regions in which tornadoes occur, and to recognize the meteorological conditions on days when tornadoes occur in Poland in 1995-2014. The basic analyses included establishing thermodynamic and kinematic conditions in the vertical profile of the troposphere, determining types of synoptic situations, determining meteorological conditions in the lower troposphere, evaluating baric and thermal situation on the basis of data coming from re-analysis, and establishing temporal and spatial variability.

The undertaken research allowed the author to distinguish three regions in Poland where tornadoes occur. Region 1 comprises mainly of South Baltic coast, region 2 is the Lakelands and the northern part of Mid-Polish Lowlands, and region 3 consists of the southern part of Mid-Polish Lowlands, Polish Highlands, Sub-Carpathian Basins and the mountains.

Atmosphere probing results showed that the lowest CAPE values were recorded in the region 1, where there is an influence of the proximity of the Baltic Sea and the related more stable air mass. Moreover, in the region 1, the more humid and cooler air flowing in from the Baltic Sea was the reason for the lower level of condensation. Increased kinematic indexes were recorded in region 3, which suggests that there are better and more favorable conditions for the organization of storms and the formation of tornadoes in this area.

In the region 1, the lowest air temperature and the highest humidity were recorded during the days with tornadoes, which was caused by close proximity to the sea basin. In turn, the region 2 and 3 was characterized by the highest air temperature, but also by lower air humidity than in the region 1.

The results obtained on the basis of re-analysis regarding the baric and thermal situations show that the tornadoes were formed mostly with positive anomalies of the geopotential surface, which indicates the presence of warmer than usual masses of air over Poland. On the other hand, the values of atmospheric pressure on sea level were lower than usual. Bar conditions at an altitude of approximately 1.5km in the region 1 were characterized by negative geopotential anomalies, whereas in region 2 and 3 they were positive. This suggests the flow of cooler air masses from the North to the region 1, and the presence of warmer air in the region 2 and 3. This dependence is also visible in the distribution of air temperature anomaly over Poland.