

СМЕРЧИ НАД УКРАИНОЙ В 2001-2016 TORNADOES OVER UKRAINE IN 2001-2016

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Abstract. In this paper defined the Modern geographical distribution of tornadoes over Ukraine in 2001-2016 2016 years. Estimated the daily and annual progress of the phenomenon's emergence. Obtained the distribution of tornadoes according to the F-scale for different regions of Ukraine.

Key words: tornado, atmospheric vortex, geographic factor, F-Scale

Introduction. Tornado – a mesoscale vortex (meso- γ), which rotates very tall and has a narrow column of air with a diameter of about 100 meters, which extends from cumulonimbus clouds to the ground. These vortices are formed in the presence of strong and steady upward movement in cumulonimbus clouds and usually occurs in cold front with waves in the presence of cyclonic circulation meso-scale β in the lower troposphere with significant instability of the atmosphere.

Tornado causes huge catastrophic destruction due to a rather large force of wind pressure and large pressure difference between it and the environment

Tornado in Ukraine belongs to the most dangerous natural atmospheric phenomena. The degree of knowledge of its physical mechanism, the formation and prediction (prognostic guidelines) limited.

Results. Using interactive database of European Severe Storms Laboratory ESSL [1] detected 247 the occurrence of tornadoes (fig. 1) over Ukraine from 2001 to 2016.

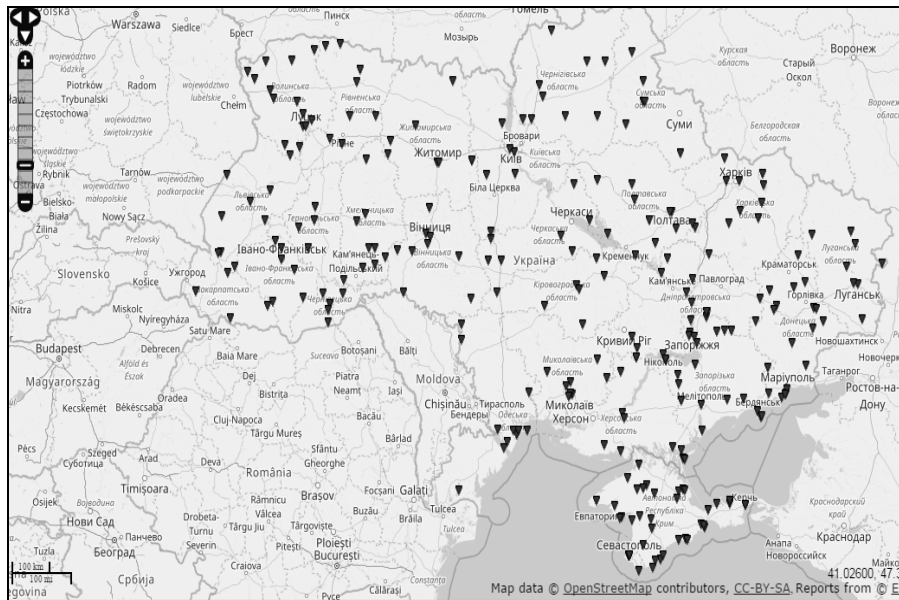


Figure.1. Map of the distribution tornadoes over Ukraine (2001-2016)

As can be seen from the graph (fig. 2) in the period 2001-2016 the number of tornadoes over Ukraine ranged from 8 to 25 cases per year, ie an average of 15.4. Most tornadoes (25 cases) were observed in 2006 and 2015, and only 7 vortices appeared in 2008 and 2009.

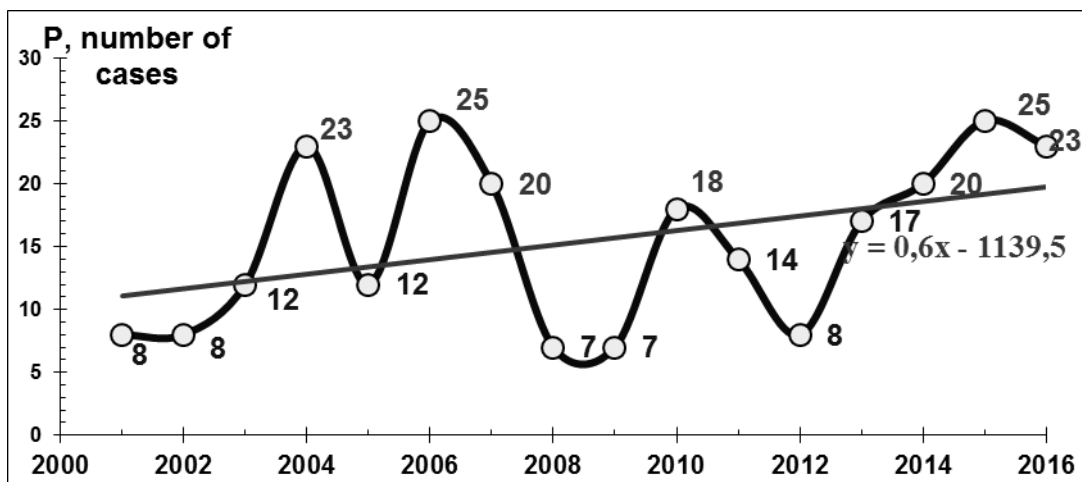


Figure.2. The frequency of tornadoes (P, number of cases) over Ukraine in 2001-2016.

Analysis of interannual variability of the frequency of tornadoes led to the conclusion of the increasing number of tornadoes from 2001 to 2016, but it is difficult to distinguish the contribution of natural and social factors. That is, its share of the increase in the number of registered tornadoes making rapid development in

recent years, social networks and opportunities present in the population quality photographs of events and instant distribution of images.

As shown in fig. 3, for the period 2001-2016 years tornadoes formed mainly from May to August (89%), and the warm half of the year accounted for 96%. That is, there were 11 tornadoes in the cold season, so without the contribution of thermal convection, including 9 cases occurred in March and one in January 2011 and October 2002.

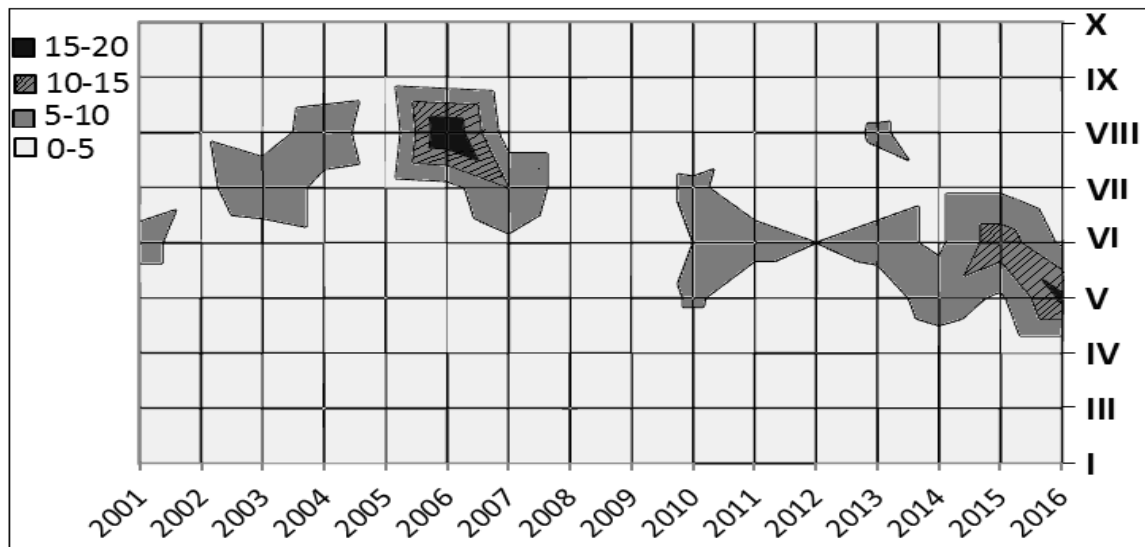


Figure.3. Seasonal distribution of tornadoes over Ukraine (2001-2016)

Depending on the region has changed markedly seasonal course of tornado formation (Fig. 4), namely in northern and southern regions of relatively less active tornadoes formed in July (12 and 17%). In the west and in the center there was relatively similar seasonal distribution, while from May to August frequency of tornadoes was approximately 20%.

Eastern regions differed advantage available July vortices (38%) and their sudden decrease in August (3%) and a significant share in March. May reduce the number of tornadoes in August and September (only one case) due to insufficient collateral moist eastern regions.

Research period characterized by predominant formation of tornadoes from 12 to 18 hours (58%), but this share decreased by 11% compared with the [2] is reduced contribution of thermal convection in the processes of tornadoes.

If we consider the distribution of tornadoes in appearance depending on time of day and season, the highest number of vortices was recorded during the day (12-18 UTC) from May to July, which were not significantly different from [2-4]. Interestingly, in September, repeatability morning and afternoon tornadoes same (47% or 7 cases), possibly due to their relatively small numbers.

The influence of geography on daily progress can be seen in the warmest region is in southern Ukraine, where the proportion of the morning and afternoon tornadoes are virtually identical.

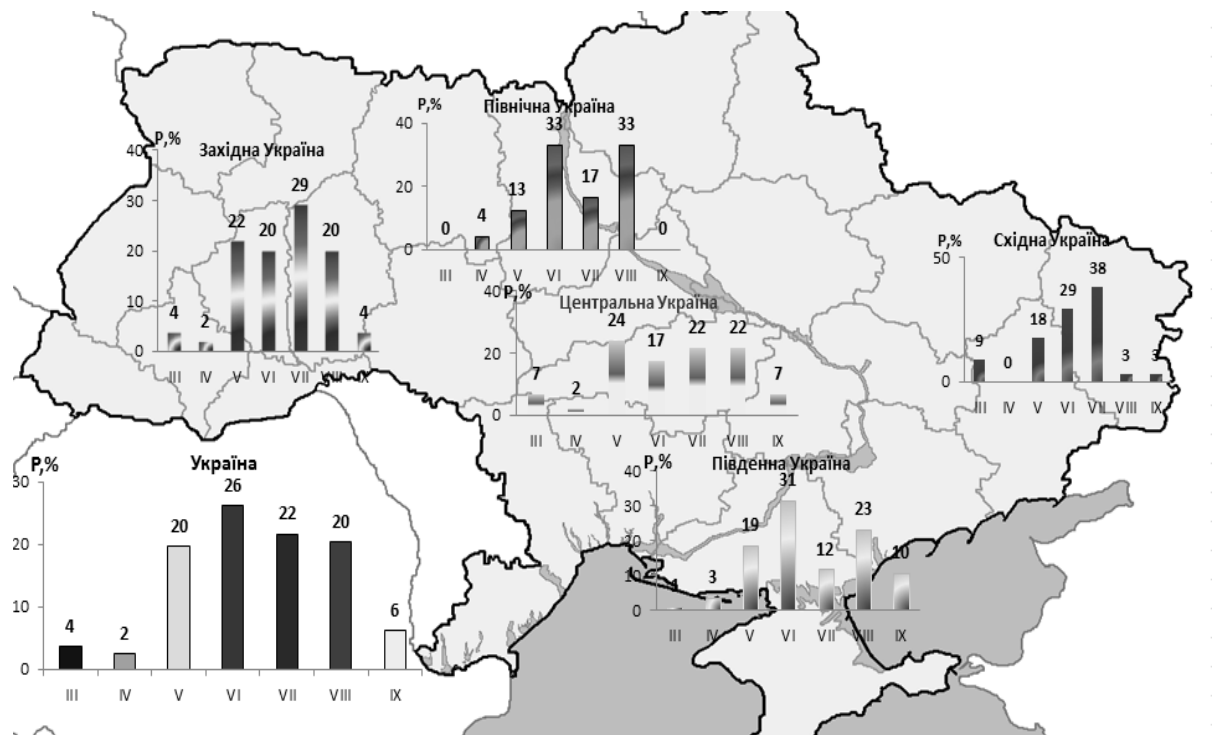


Figure.4. Regional features seasonal formation of tornadoes Ukraine

As for the intensity of tornadoes on a scale Fujita, then over Ukraine from 2001 to 2016 was dominated by weak vortex (66%), that class F0 (Table 1). Strong tornadoes or class F3 recorded only 6 times, and half of them are there in the north. In eastern Ukraine and in the center there were no strong tornadoes.

F0 largest share class was typical for the southern regions (83%) and lowest for the northern (48%). Tornadoes with moderate intensity (F1) formed mainly in eastern Ukraine, and significant (F2) - in the west.

Table 1

The intensity (F-scale) of tornadoes in regions of Ukraine

| Regions | Intensity (F-scale) | | | | | | | |
|-----------------|---------------------|----|--------|----|--------|----|--------|----|
| | F0 | | F1 | | F2 | | F3 | |
| | number | % | number | % | number | % | number | % |
| North Ukraine | 12 | 48 | 5 | 20 | 5 | 20 | 3 | 12 |
| South Ukraine | 72 | 83 | 8 | 9 | 6 | 7 | 1 | 1 |
| Eastern Ukraine | 19 | 56 | 14 | 41 | 1 | 3 | 0 | 0 |
| Western Ukraine | 31 | 56 | 10 | 18 | 12 | 22 | 2 | 4 |
| Central Ukraine | 30 | 65 | 9 | 20 | 7 | 15 | 0 | 0 |
| Ukraine | 164 | 66 | 46 | 19 | 31 | 13 | 6 | 2 |

By authors

Summary and Conclusions.

1. Comparing modern period and the years 1961-1990. [2] found that in recent years the annual inherent smoother progress by increasing the proportion of May and August.

2. The whole territory of Ukraine from 2001 to 2016 suffered from tornadoes, but more often they occurred in the south (35%), least of all in the North (10%) of the country. Depending on the region has changed markedly seasonal course of tornado formation.

3. Over Ukraine prevailed (66%) weak vortex (class F0), and strong tornadoes (class F3) recorded only 6 times, and half of them are there in the north. The largest share of class F0 was typical for the southern regions (83%)

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Аннотация.

В этой работе определено современное географическое распределение торнадо над Украиной в 2001-2016 гг. Оценено суточный и годовой ход возникновения этого явления. Получено распределение торнадо согласно F-шкале для разных регионов Украины.

Ключевые слова (на рус.яз.): смерч, атмосферный вихрь, географический фактор, F-шкала.

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