HAZARDOUS WEATHER PHENOMENA IN THE WARM SEMESTER OF THE YEAR IN THE AREA OF ORADEA, BIHOR COUNTY

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Abstract

The paper presents the main hazardous weather phenomena in the warm period of the year (hail, thunderstorm and windstorm) in the area of Oradea. The study covered a period of 45 years (1970-2014). The most frequent event was thunderstorm, with a multiannual average of 36.3 days/year. In 55.6% of the years the number of thunderstorms was below the multiannual average, while in 44.4% of the years the number of occurrences was above it. Thunderstorms occur mainly in summer, when intense convection leads to the formation of thunderstorm clouds. The multiannual average of windstorm days is 1.9 zile, with a higher frequency of the event in the summer. Hail occurs rarely in the area of Oradea, the multiannual average is 1 day/year, but still, it is a dangerous phenomenon, as it can cause serious damage when the hailstones are big. It usually occurs in the warm period of the year, due to intense convective processes, which lead to the formation of vertically high Cumulonimbus clouds.

Key words: frequency, hail, thunderstorm, windstorm

INTRODUCTION

As long as hazardous events are determined at a particular time by certain weather conditions, they represent hazardous meteorological events, but when their frequency is higher and they are typical for a certain area, which is also shown by the multiannual averages, they become hazardous weather phenomena (Bălescu, Militaru, 1965; Bogdan, 1978; Bryant, 1991; Ciulache, Ionac, 1995; Bogdan, Niculescu, 1999; Ciulache, 2002; Gaceu, 2002; Cristea, 2004; Moza, 2009; Pereş, 2012; Pereş, Köteles, 2013; Costea, 2014; Pereş, 2015).

The hazardous weather phenomena which occur most frequently in the area of Oradea in the warm semester of the year, and which are presented in this study, are: hail, thunderstorm and windstorm.

MATERIAL AND METHOD

The analysis of hazardous weather phenomena was performed using data recorded on meteorological observation charts at the Oradea weather station. The data were obtained from the Archives of A.N.M. Bucharest. The study covered a period of 45 years (1970-2014). The paper presents the

monthly and annual patterns of the phenomena, as well as the factors which generate them.

RESULTS AND DISCUSSION

Hail

The multiannual average of hail days in Oradea is 1 day/year. Even if this phenomenon is rare, it can be extremely dangerous, as it can cause serious damage, especially when the size of the hailstones is big.

In the period included in the study (1970-2014), the highest frequency of hail days was recorded in 1974 and 1997, 3 days in each year (Fig. 1).

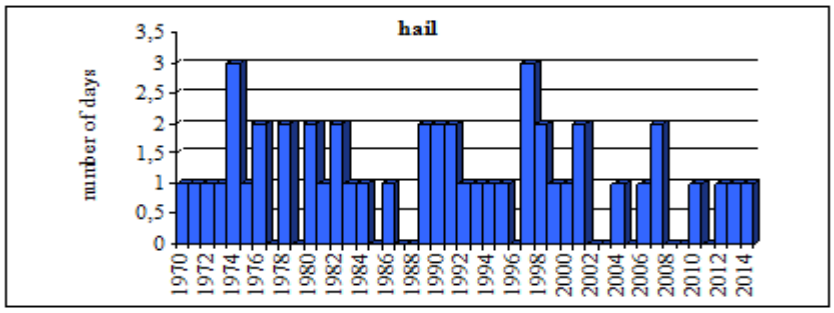

Fig. 1. Annual variation of hail days in Oradea, 1970-2014

There were 12 years when this hydrometeor did not occur at all, in 1977, 1979, 1985, 1987, 1988, 1996, 2002, 2003, 2005, 2008, 2009 and 2011, which represents 26.6% of the total number of years included in the study.

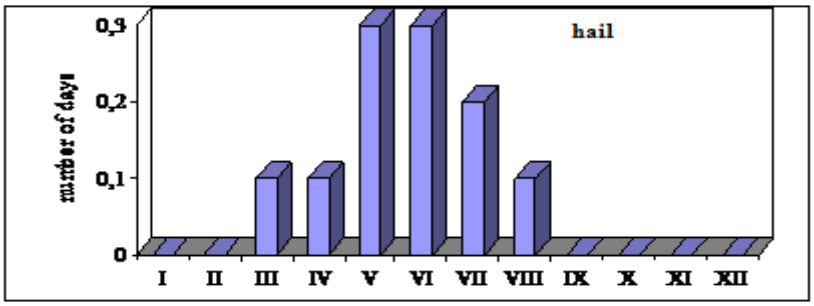

Fig. 2. Multiannual monthly averages of hail days in Oradea, 1970-2014

Hail usually occurs in the warm season of the year, when vertically high Cumulonimbus clouds are formed and the intensity of convection currents is high. Thus, in Oradea, hail occurs from March to August, but its occurrence was also recorded in February and October. In February, for instance, there were two days when hail occurred, in 1989 and 1995, and

there was one day in October, in 1982. The highest occurrences were recorded in May and June, with multiannual monthly averages of 0.3 days. The average for July is 0.2 days, while in March, April and August it is 0.1 days (Fig. 2).

Hail days occur most often in May and June, as a result of the higher frequency of humid, cold and unstable maritime air masses in this period of the year (Măhăra, 1967; Köteles, Moza, 2010).

Thunderstorm

In Oradea, the multiannual average of thunderstorm days is 36.3 days, with variations from one year to another between 63 days in 1975 and 22 days in 2001 (Fig. 3).

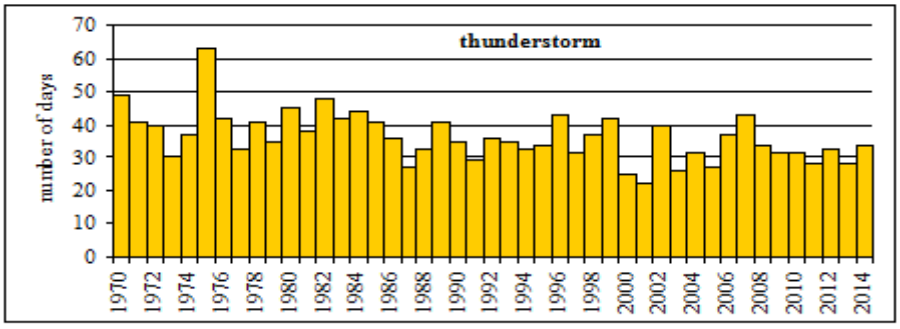

Fig. 3. Annual variation of thunderstorm days in Oradea, 1970-2014

Over the years, the number of thunderstorm days was either below the multiannual average or above it. Thus, in more than 50% (55.6) of the years there were negative deviations from the average, while positive deviations were recorded in 44.4% of the years (Fig. 4).

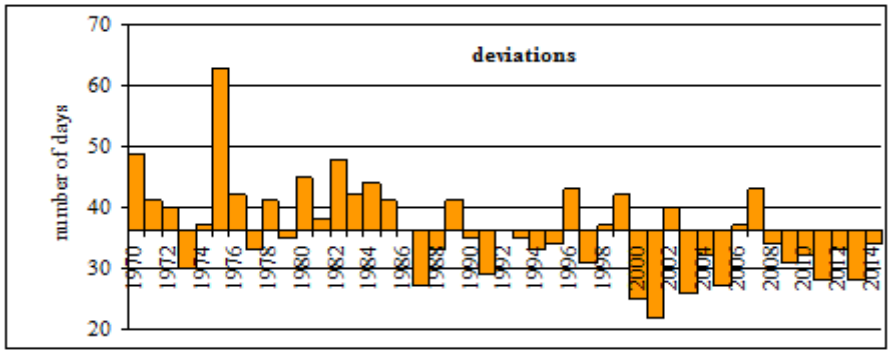

Fig. 4. Deviations of the annual numbers of thunderstorm days from the multiannual average in Oradea, 1970-2014

Due to its geographical location, Oradea is on the way of humid air masses, which means that there are favourable conditions for the occurrence of thunderstorms over the whole year, their frequency being smaller in the winter and much higher in the summer. The phenomenon is more common in the summer due to the more intense solar irradiance, the high frequency of unstable air masses and to thermal convection (Măhăra, Roman, 2001). Thus, the highest numbers of thunderstorm days are recorded in May, June and July, with 7-8 days on the average. In August their number is around 6 days (Fig. 5).

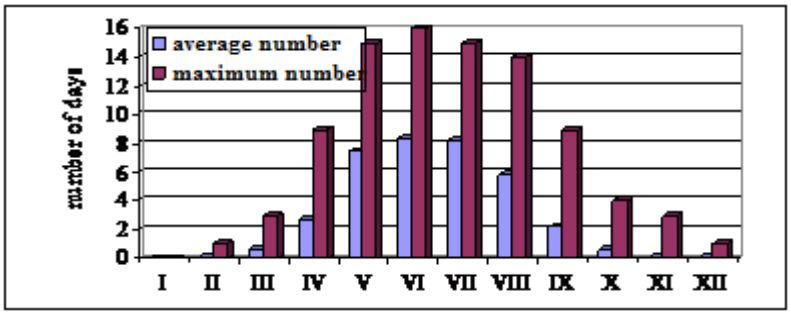

Fig. 5. Multiannual monthly averages of thunderstorm days and monthly maximums in Oradea, 1970-2014

In the period included in the study, the highest number of thunderstorm days was recorded in June 1980, when it occurred on 16 days. In January, thunderstorm never occurred, and in the other winter months its occurrence was accidental. Thus, in November, December and February it occurred between one and three days.

The few occurrences in the cold season are due to the sudden replacement of the tropical air with a cold polar air mass (Stăncescu, Iliescu, 1972; Iliescu, 1989; Moldovan, 2003; Moza, 2009).

Windstorm

The multiannual average of windstorm days is only 1.9 days. Even if the frequency of the phenomenon is low, due to its sudden formation and intense unfolding, as well as the damage caused, it is considered a hazardous weather event.

In the area of Oradea, the highest occurrence of windstorms was recorded in 1974 and 2010, 7 times in each year. In the period included in the study there were only three years when the number of windstorms was above 5, the two years mentioned above and 1977, when the event occurred 6 times, whereas in 1979 there were 5 windstorm days (Fig. 6).

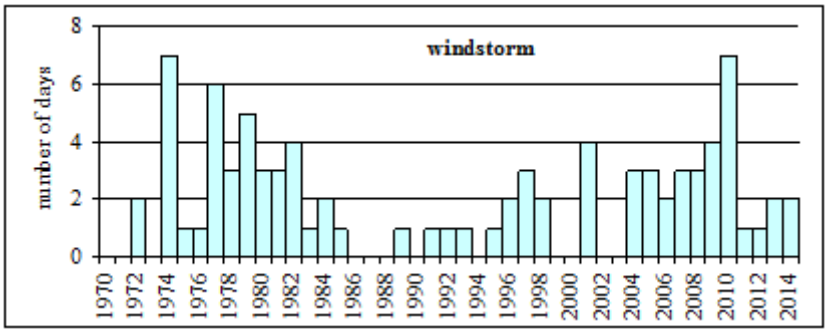

Fig. 6. Annual variation of windstorm days in Oradea, 1970-2014

Windstorms occur in the warm season, from March to October, but there was one year, 2004, when such an event occurred in November. The maximums occur in July, with a multiannual monthly average of 0.6 days (Fig. 7).

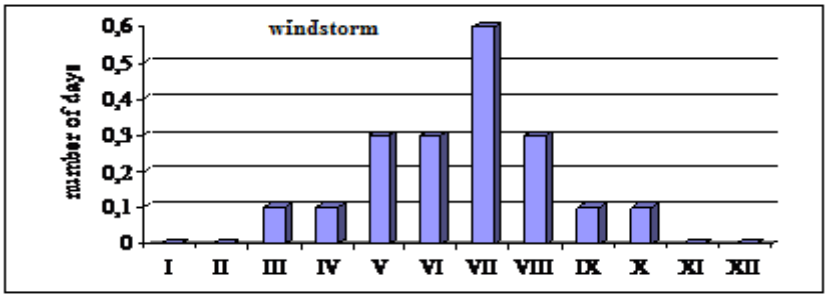

Fig. 7. Multiannual monthly averages of windstorm days in Oradea, 1970-2014

The higher frequency in the warm season is due to thermal and dynamic convections, which lead to the formation of Cumulonimbus clouds.

CONCLUSIONS

In Oradea the multiannual average of hail days is 1 day per year. Hail usually occurs in the warm period of the year, due to more intense thermal convection processes. Thus, hail occurs from March to August, with the highest number of days in the months of May and June, due to the higher frequency of humid, cold and unstable maritime air masses.

Thunderstorms are frequent (the average is 36.3 days/year).They can be very dangerous in the summer and cause significant damage to properties, and even loss of human lives.

The multiannual average of windstorm days is 1.9 days. This weather event occurs mainly in the warm period of the year, between March and October, when the convective processes are more intense.

Acknowledgments

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