HAIL STORMS AS HAZARDOUS WEATHER PHNOMENON IN ORADEA CITY

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Abstract

The aim of the present paper is o analyse the spatial and time variations of hail storms as climatologic phenomenon of risk in the perimeter of the Oradea city; in the current paper we have ventured both an analysis of its evolution and its causing and generating factors. Thus, we have highlighted both the influence of physico-geographical factors, and of the active surface structure on this hazardous climatologic phenomenon in Oradea City, and the fact that this phenomenon is generated at the contact between the climate layers of low hills and plains, being influenced also by the climatologically conditions from Western and South-Western Europe.

The present study has been accomplished on the basis of a reach data base, recorded at the Oradea meteorological station throughout a long period of time, from 1970 to 2005, respectively.

Key words: hail, hailstorms, hazardous weather phenomenon, variations

INTRODUCTION

The factors that generate the climate are the following: sun radiation, the active sub-adjacent surface, the general circulation of the atmospheric masses, and the anthropogenic activity. The share of the above mentioned factors in generating the climatologic conditions varies from one region to another. However, the solar radiation remains always the decisive factor, as if lacking, the other three factors would not be able to act (Ciulache S., 2002).

Due to the four categories of climatic factors (sun radiation, dynamic, physico-geographical, and anthropogenic factors), the weather elements (temperature, humidity, air nebulosity, rainfalls, wind, etc.) shows different evolutions and alter their values, from one region to another.

The main climatologic factor is represented by the solar radiation which leads to the variation of other climatologic elements.

Due to Romania's geographical location in the mid latitudes area of the Nordic hemisphere, the climate of our country is being influenced by the baric centres which act at the level of European continent. Function of the evolution of these baric centres, weathers phenomena occur and influence our area.

The main climatologic physico-geographical factors (the relief, hydrographical network, and vegetation and soil characteristics) influence, both in time and space, the evolution of the climatologic parameters.

The climatologic anthropogenic factor has a substantial influence on climatic elements, especially in the urban areas, where the human activity is the most intense.

The unfavourable weather conditions occur within a great time span and large areas; they can be hazardous and have serious negative impact on all socio-economic fields. Thus, the hazardous climatic phenomenon impedes on human practical activity and may produce damages, causing human losses and material damages.

Given the fact that this hazardous phenomena are caused, at a certain moment, by certain meteorological conditions, these constitute hazardous meteorological phenomena:

however, when these phenomena have a larger occurrence rate and characterise a certain territory, being reflected in multi-annual average values, they constitute genuine climatologic hazards (Cristea Maria, 2004).

In our country and in Oradea implicitly, due to continental-temperate climate with oceanic influences, one of the most present climatologic phenomena is the hailstorm.

The hailstorm is a rainfall with transparent or translucide ice particles, in general of spherical, conical or irregular shape (between 5 and 50 mm) which is falling from a cloud. The hail falls usually in the (summer) seasons of the year, and it is almost always accompanied by thunderstorms and strong winds (Instructions for meteorological stations, 1995).

In general, the hail stone falls on reduced surfaces (10 – 15 km) in a short period of time (2 – 10 min., up to 15 min.). It may cause serious damages, by destroying the crops.

For the hail storms to be generated, one needs strong upward air currents in the upper part of the Cumulonimbus cloud, where the ice crystals and supercooled water drops are dominant. Thus, ice crystals and snow flakes, while passing through the area with over supercooled water drops, are growing through sublimation, and thus forming loose spheroid crystals called soft "frozen pellets of snow"; if these ones crashes into larger over frozen water drops, they are covered by a transparent layer of ice and become hard lumps of ice; If the hard lumps of ice are caught by ascendant air currents in the upper part of the cloud, they are covered, with an opaque layer of ice following a sublimation process and immediately after that they are falling again, reaching again the supercooled water droplets area, in where, through coalescence, they are covered by a transparent layer of ice. When the phenomenon is repeating, the ice lump is growing, being formed by concentric, white, translucide and transparent layers of ice. When the ice weight is large enough to break the resistance of the upper (ascendant) air currents, it falls as hails stones. The size of hails stones depends upon the force and duration of the cloud convection currents (Măhăra Gh., 2001). Other factors for hail stone formation are the following: the presence of a large amount of water between the basis of cloud and the freezing level, the cloud peak to reach or to overcome the isothermal level of -10ºC, high level of specific humidity on the ground level (7 – 10 g/kg), small humidity deficit, the temperature at the upper limit of the cloud to be between -30ºC and -60ºC, the maximum temperature on the ground to be higher or equal with the higher or equal with cumulated temperature, the level of basic isometters (0ºC and -10ºC) to be lower than previous radio probing.

The frequency of the days with hailstorms depends on the following: the instability of the atmospheric masses, air front type, thermal and baric contrast among air masses, relief shapes, versant exposure to sun, altitude, etc.

MATERIAL AND METHODS

In order to highlight this hazardous weather event within Oradea city area, we have used the data obtained from 1970 to 2005 from the instrumental and visual observations pursued at Oradea weather station.

The analysis of this hazardous weather phenomenon has been carried out on the basis of the data recoded in the weather observation tables from the above mentioned station, throughout a 36 years period of time.

By the help of the mathematic and statistical methods, the data obtained from the National Meteorological Agency were processed. The results obtained by the intermediate of the mathematical and statistical methods were transposed into graphs in order to forecast clearly the phenomenon variability in time.

The use of the specific climatologic methods and means aimed at a processing a most accurate as possible of the available data, seeking through this the role of the city, as climatologic factor, in the evolution of the climatologic phenomena.

RESULTS AND DISCUSSIONS

In Oradea city, the average number of days with hailstone storms is 1.2 days/year (see Table 1). Despite the scarcity of the phenomenon, it could become hazardous by producing significant material damages, especially when the size of the hailstones is large. Within the reference period, the largest number of the annual days with hailstone storms recorded in Oradea city, occurred from 1974 to 1997, when three such cases were recorded.

Table 1

The average, monthly and annual, number of days with hailstone storms in Oradea city from 1970 to 2005

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	An
Average number of days	0.0	0.1	0.1	0.1	0.3	0.3	0.2	0.1	0.0	0.0	0.0	0.0	1.2

Source: data processed out of the archive of National Meteorological Agency - A.N.M.

The hails stone storms occur usually in the summer seasons of the year. In Oradea city, this time span is between the months of March and August, despite the fact that several cases were recorded in February, in the same reference period, in 1989 and 1995, respectively. The highest values occurs in May and June, with a multi-annual monthly occurrence rate of 0.3, while in July, this rate is of 0.2 days (see Figure 1).

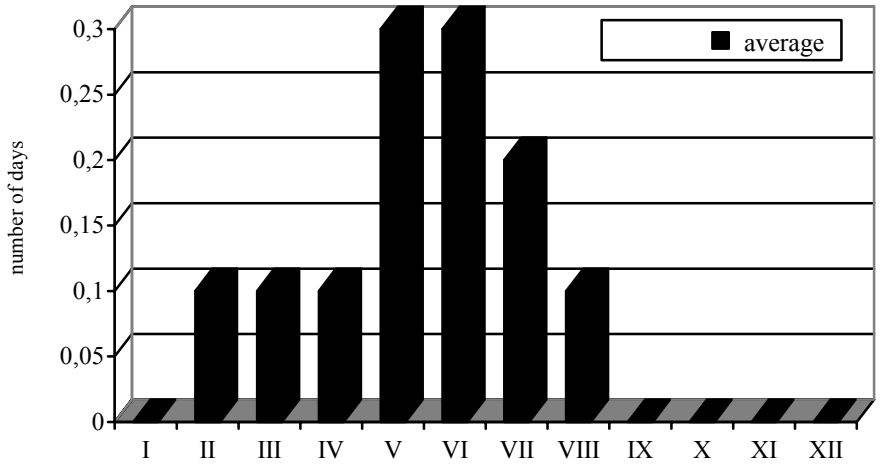

Figure 1 The monthly evolution of the average number of days with hail storms in Oradea city, from 1970 to 2005

The higher values of days with hailstones storms recorded in May, June, and July is caused by the higher frequency of the maritime wet, cold, and instable air masses in this time of the year.

CONCLUSIONS

The paper *Hail storms as hazardous weather phenomenon in Oradea city* analysis the evolution of this phenomenon function of the factors which causes or generates it, by highlighting the climatic specificity of this region. This hazardous climatologic phenomenon has been studied on the basis of the material gathered represented by the measured or observed data within 1970 – 2005 period of time at Oradea weather station (placed at 135 m. altitude). On the basis both of the data resulted from the meteorological observations and measurements, and the existing bibliography, the genetic causes and the main parameters that define this hazardous climatologic phenomenon from the analysed area were established.

Following the conclusions of the achieved analysis, one can state the fact that the hails tone storms could become hazardous when its frequency is higher; however, in the Oradea city area the incidence rate of this phenomenon is a relatively low one.

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