THE CONDITIONS OF ATMOSPHERIC PRECIPITATIONS IN HUEDIN DEPRESSION

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Abstract
The geographic location of the Huedin Depression and the local topographic nature determine some pluviometric characteristics specific to this region. Huedin Depression is under the influence of the western and north west air masses, the humid oceanic masses.
When they meet the orographic barrier, the air masses rise, cool adiabatic until they reach the dew point, and then generate important quantities of precipitations on the western slope. From a certain altitude, the air masses are low in water vapors, still ascend, but they don't generate precipitations or they do but in smaller quantities. After they reached the level of the highest peaks, the air masses descend on the eastern slopes where they warm up adiabatic and they move away from the dew point temperature, determining the tearing of the cloudy systems and recording of a smaller quantity of precipitations than on the western slopes.

Key words: atmospheric precipitations, average quantities, deviations.

INTRODUCTION

The atmospheric precipitations are maybe the most important climatic element, without neglecting or minimizing the importance of the other elements, whose weather - climate influence transposes fully over the evolution and temporal and spatial distribution of the precipitations.

The practical importance of the precipitations is noticed daily in economical sectors such as: agriculture, forestry, constructions, transportation, tourism activities, territorial organization, etc., especially when they fall in big quantities in a small amount of time or when they don't fall at all or fall but in small quantities over a long period of time.

The clouds, as a basic source of the precipitations, tie their genesis and presence to the general circulation of the air masses, thermic convection, regional and local physical - geographical factors (especially the relief through its characteristics: altitude, shape, orientation, exposition, etc.) influencing the distribution in time and space of the liquid or solid precipitation quantities fallen from the cloudy masses that have diverse origins.

In time and in space, in short periods of time and small spaces, the precipitations have an aleatory evolution and distribution, but their analysis in longer periods of time, on extended surfaces in correlation with the precipitations quantities fallen in the nearby geographical spaces, can lead to separation of some regularities with a relative stability character.

Atmospheric precipitations constitute the climatic element with the greatest spatial-temporal variability regarding frequency, intensity and duration.

The conditions of atmospheric precipitations depend greatly on the general circulation characteristics of the atmosphere above Romania and implicitly over Huedin depression.

MATERIAL AND METHODS

For an accurate and realistic analysis of the spatial distribution of the precipitations quantities, it was used the data from the pluviometric observations from 1970 – 2008, from the meteorological station Huedin (560 m).

The analysis of the atmospheric precipitations was realized based on the data inscribed in the tables of meteorological observation from the meteorological station studied.

The main methods used are: analysis method, deductive method, comparative method, statistic-mathematic and graphic methods.

RESULTS AND DISCUSSION

The annual conditions of the atmospheric precipitations

During a year, the evolution of the monthly sum of precipitations modifies from a month to another in direct relationship with the reports established between the great baric centers that impose the atmospheric circulation and that direct the air masses and the atmospheric fronts (with the baric formations that accompany them).

Table 1

Monthly and annual average quantities of precipitations (mm), at Huedin, during 1970-2008

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Average	25.9	24.7	30.2	49.5	76.1	90.4	80.5	65.1	48.6	31.3	33.9	32.3	588.5

Source: data processed after A.N.M Archive

The multiannual average quantity of the atmospheric precipitations in Huedin Depression is 588.5 mm (see table 1).

From one year to another, the quantities of precipitations fallen in Huedin Depression evolve between great limits. The direction of the pluviometric evolution ascending or descending, in report with the multiannual average considered normal, on more wide spaces, is imposed by the dynamic of the air masses, but the differences in absolute values from close stations are explained through the influence of the local geographical factors (altitude, exposition, fragmentation and orientation of the relief, characteristics of the active surface, water shine, humid terrain, meadow, arable land, forest, human settlement etc.) that can amplify or diminish the advective and thermo-convective processes.

The cause of the episodical absence of the atmospheric precipitations, or of the very reduced quantities, is the predominance of the anticyclonic time with big frequencies of some baric anticyclonic stationary formations that form over Central Europe, North East and South East and that can unite with the anticyclonic dorsal from the North of Atlantic Ocean. The settling of the anticyclonic time leads to clear sky, atmospheric calm, with insolation and raised temperatures especially in the warm season of the year, lacking or very poor in precipitations in these years (Stoica C., 1960).

The annual precipitation quantities bigger than average take place when the activity of the oceanic cyclons developing at the outskirts of Azoric anticyclon and of the mediterranean cyclone, is more intense. Therefore, in the conditions of some persistent cyclonic activities or of some thermo-convective activities, the quantities of precipitations are rich, determining a high humidity that can rise to pluviometrical or hydrological excess.

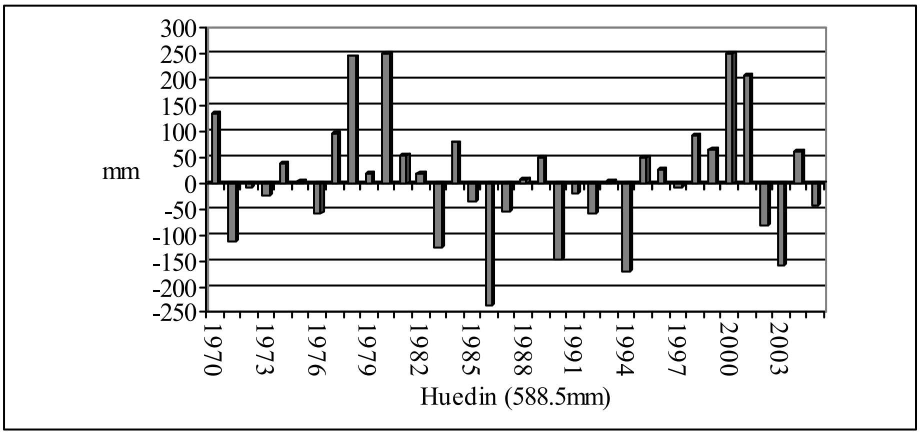

Figure 1 The deviations of the annual precipitation quantities versus the multiannual average at Huedin

At Huedin, percent wise, in the 39 years studied, the positive deviation has a bigger value (55.6%) than the negative one (44.4%).

At Huedin the positive deviations of over 250 mm are in 1980 with 252.7 mm and 251.3 mm in 2000, deviations of over 200 mm are 2, in 1978 of 245.8 and 207.3 in 2001.

The positive deviations smaller that 50 mm are in 8 years, the smallest are: 3.2 mm in 1975; 3.6 mm in 1993; 7.2 in 1988; 18.2 mm in 1979; 18.6 mm in 1982 (see figure 1).

The biggest negative deviation was in 1986 of -235.3 mm, 1994 of 170.4 and 159.8 in 2003. Under -50 mm there are 3 deviations: -8.8 mm in 1997, -9.1 mm in 1972 and -19.3 mm in 1991.

Monthly average precipitation quantities

From a month to another, the frequency and intensity of the advections of humid and dry air modify, and the thermic and dynamic convection takes place at different parameters, therefore the months of the year, in their succession, will show different values of precipitation quantities.

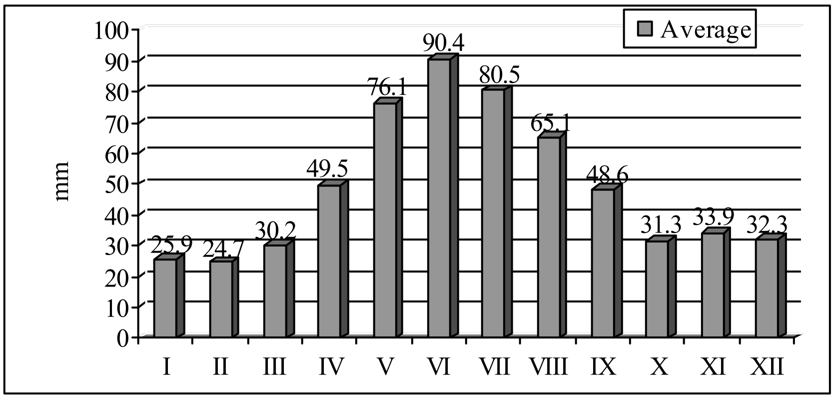

Figure 2 The evolution of the monthly average precipitation quantities, at Huedin, during 1970-2008

The precipitations have different values from a month to another depending on the circulation of air masses, of altitude, of relief forms, of the slopes expositions, of local conditions. Therefore the smaller quantities of precipitations fall between January through March (see figure 2), because of the prevailing of the anticyclonic conditions, that stop the development of the thermic convection, the driest month being February (24.7 mm). Starting with March the precipitations grow progressively until June when we record the main annual pluviometrical maximum, 90.4 mm. The rain from this month is generated by the great frequency of the oceanic cyclons that move from the northern outline of the Azoric anticyclone dorsal, bringing cold and humid air masses favorable to the precipitations, also the convective processes that unstabilise the air through the thermical and dynamic convection. From June to October, the precipitations recede, when there is recorded the minimum secondary, 31.3 mm, because of the prevailing of the anticyclonic conditions from the end of summer and beginning of autumn.

In December there is the second secondary maximum of 32.3, maximum determined by the cyclons from the Mediterranean Sea that cross the Panonic Plain. From all that it's been presented results that in the Huedin Depression during the year there are produced 2 pluviometric maximums (June, December) and 2 pluviometric minimums (February, October). The main maximum is specific to the entire country and points out the continental character of the climate, and the secondary maximum proves the influence of the mediterranean cyclonic circulation in the studied region.

The maximum precipitation quantity fallen in 24 hours (mm) and the monthly average

The maximum precipitation quantities in 24 hours, generally, have as origin the humid air advections from the western sector in the warm season, from the mediteranean region in the cold season, to which is added the frontal and orographical dynamic convection that is produced during the year and thermical convection that meets better manifestation conditions in the warm period of the year, especially the summer months. In the summer months, though, when the air has a bigger capacity of storing water vapors, when the atmospheric fronts that come from Atlantic and crosses Europe on the west-east general direction have behind them the humid and unstable air masses and when the thermo-dynamic convection reaches the highest numbers, are produced the biggest quantities of precipitations in 24 hours throughout the year.

The production of the maximum precipitation quantities in 24 hours differ very much from a point to another, fact that emphasizes the strict local character of every meteorological observation point.

In table 2 are given the daily maximum precipitation quantities for every month. These quantities are smaller in the cold season because of the anticyclonic conditions of continental nature, in which the air masses have a reduced content of water vapours, and the thermical convection is very weak. In the warm season of the year, the water quantity fallen in 24 hours reaches the greatest values because of the intensifying of the frontal processes (especially the cold fronts) and convective processes.

Table 2

The maximum precipitation quantities fallen in 24 hours (mm) and the average monthly quantities at Huedin, during 1970-2008

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Q. max 24 hrs	25.4	39.2	34.4	28.9	44.4	68.1	50.0	52.5	38.5	21.0	34.3	26.6	68.1
Date	01.80	10.84	28.88	16.77	22.77	24.73	21.01	21.74	20.94	22.92	06.95	27.95	24.06.1973
Average	25.9	24.7	30.2	49.5	76.1	90.4	80.5	65.1	48.6	31.3	33.9	32.3	587.1

Source: data processed after A.N.M Archive

The most significant maximum precipitation quantities in 24 hours, fall in the summer months when they have a sudden shower character and can cause devastation to the vegetation and soil.

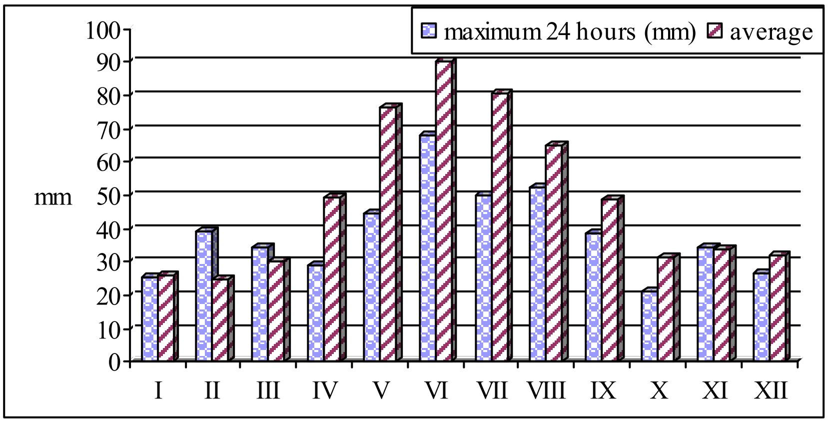

Figure 3 The maximum precipitation quantities fallen in 24 hours (mm) and the average monthly quantities at Huedin

At Huedin there are 3 situations in the months of February, March and November, therefore on 10.02.1984 the quantity of precipitations fallen in 24 hours is 39.2 mm, and the multiannual average is 24.7 mm; on 28.03.1988 the quantity in 24 hours is 34.4 mm and the multiannual average is 30.2 mm; on 06.11.1995 the precipitations in 24 hours are 34.3 mm, and the month's average for the 36 years is 33.9 mm (see figure 3).

CONCLUSIONS

The average multiannual quantity of atmospheric precipitations in Huedin Depression records an average of 588.5 mm.

At Huedin in the 39 years studied, percent wise, the negative deviation has a higher value (55.6%) than the negative deviation (44.4%).

In Huedin Depression, during the year are produced 2 maximums (June, December) and 2 pluviometric minimums (February, October). The main maximum is characteristic to the entire country and emphasizes the continental character of the climate, and the secondary maximum proves the influence of the mediteranean cyclonic circulation in the studied region.

REFERENCES

1. Berindei O., Gr. Pop, Gh. Măhăra, Aurora Posea, 1977, Câmpia Crişurilor, Crişul Repede, Țara Beiuşului, Cercetări în geografia României, Editura Ştiințifică şi Enciclopedică, Bucureşti.
2. Ciulache S., 2002, Meteorologie şi climatologie, Editura Universitară Bucureşti.
3. Gaceu O., 2002, Elemete de climatologie practică, Editura Universității din Oradea.
4. Gaceu O., 2005, Clima şi riscurile climatice din Munții Bihor şi Vlădeasa, Editura Universității din Oradea.
5. Köteles N., Ana Cornelia Moza, 2010, Relative air moisture in Crişul Repede drainage area. International Symposium „Trends in the European Agriculture Development", May 20-21, 2010, Timişoara, Banat's University of Agricultural Sciences and Veterinary Medicine Timişoara, Faculty of Agriculture and University of Novi Sad Faculty of Agriculture.
6. Măhăra Gh., 1979, Circulația aerului pe glob, Editura Ştiințifică şi Enciclopedică, Bucureşti.
7. Măhăra Gh., 2001, Meteorologie, Editura Universității din Oradea.
8. Moza Ana Cornelia, 2008, Aspects regarding the mean annual quantities of rainfall in the Crişul Repede hydrographic basin. Analele Univeristății din Oradea, Seria Geografie, Tom XVIII, Editura Universității din Oradea, ISSN 1221 – 1273, pag. 74-80.
9. Moza Ana Cornelia, 2008, The maximum quantities of rain-fall in 24 hours in the Crişul Repede hydrographic area, Editura Universității din Oradea, Analele Universității din Oradea, Fascicula: Protecția Mediului, Vol XIII, Anul 13, I.S.S.N. 1224-6255, pag. 409-413.
10. Moza Ana Cornelia, 2009, Clima şi poluarea aerului în bazinul hidrografic Crişul Repede, Editura Universității din Oradea.
11. Posea Aurora, 1977, Crişul Repede, în vol. „Câmpia Crişurilor, Crişul Repede, Țara Beiuşului". Cercetări în Geografia României, Editura Ştiințifică şi Enciclopedică, Bucureşti.
12. Stoica C., 1960, Precipitații atmosferice în regim anticiclonic, Cul. Lucr. I.M./1960, C.S.A., I.M., Bucureşti.
13. Topor N., C. Stoica, 1965, Tipuri de circulație atmosferică deasupra Europei, C.S.A., I.M., Bucureşti.
14. Zăpârțan Maria, Olimpia Mintaş, Ana Moza, Eliza Agud, 2009, Biometeorologie şi Bioclimatologie, Editura Eikon, Cluj-Napoca.
15. *** 1995, Instrucțiuni pentru stațiile meteorologice, I.N.M.H., Bucureşti.