THE ATHMOSPHERE RAINFALL REGIME FROM THE ŞTEI CITY AREA

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Abstract

The works analyzes the multi annual atmosphere rainfall regime from Ştei city area for a period of 22 years. In the current work we had in view the following: the yearly rainfall regime, the inter monthly rainfall quantity variation, the semestrial average quantities as well as the annual and the monthly average number of the days with different quantities of rainfall.

Key words: atmosphere rainfall, quantity, frequency, minimum, maximum.

INTRODUCTION

In climatology, a day with rainfall is considered to be the 24 hour period in which the registered rainfall quantity (be it liquid, solid or mixed) is of at least 0.1 mm (Măhăra Gh., 2001).

MATERIAL AND METHOD

In order to analyze the distribution of the rainfall quantities we have used pluviometric observation data for the period 1990 – 2011 from Ştei weather station. The main methods used in the current study are: the analysis method the comparative method, statistics and mathematical methods, graphical methods.

RESULTS AND DISSCUSIONS

1. The annual rainfall regime

In Ştei city area, the multi annual average quantity of atmosphere rainfall registers 681.0 mm.

From one month to another the frequency and the intensity of the dry or humid air advections suffers changes and the thermic and dynamic convection takes place at different parameters so that the months of the year, in theis succession, shall present different values of rainfall quantities, values in accordance to the season that they match (Gaceu O., 2005).

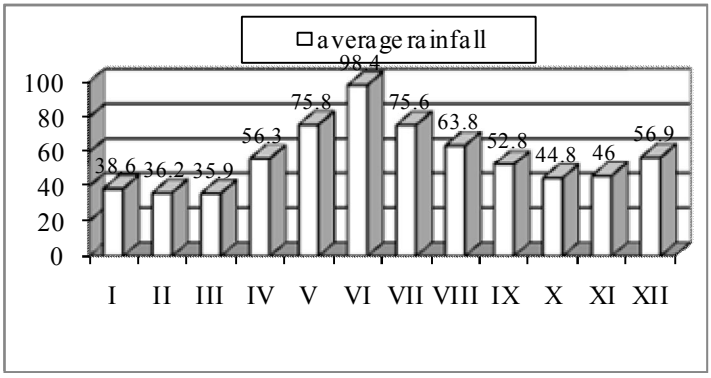
Analyzing the monthly values of the rainfall quantities it comes out that they present important differences from one month to another. The highest quantity of rainfall is registered during the hot season of the year due to the more intense frontal activity generated by the advection of some

wet air masses of ocean or of Mediterranean origin or due to stronger convective processes of thermic origin that generate showers during which important quantities of rainfall appear.

During the year the lowest rainfall quantities fall during the period January – March because the anti–cyclone regime is predominant then, a regime that prevents the development of thermic convection, thus the driest month of all being March (35.9 mm). March represents *the main minimum* for the rainfall quantity, the multi annual average being of 35.9 mm. Starting with April, the frontal activity and the cyclones' frequency intensify, fact emphasized by an increase of the multi annual monthly average, registering an average of 56.3 mm.

The enhancement of the cyclone activity and the increase of the air temperature, which determines an intensive convective activity, lead to significant increases of the rainfall quantities starting with May when an average quantity of 75.8 mm is registered and it increases in June until it reaches a *maximum value* of 98.4 mm.

July establishes an important drop of the average rainfall quantity in comparison with the previous month, the average value being of 75.6 mm. The monthly average rainfall quantity continues to decrease in August and in September so that in October *the second minimum* rainfall value is registered when the multi annual monthly average is of 44.8 mm.



In November the rainfall quantities increase due to an intense frontal activity generated by the contact of some air masses with different origins and with different thermic features leading to an increase of the haziness especially of the inferior and of the average one, November being the month in which the Stratus type of clouds have a great frequency. Thus, the monthly average rainfall quantity registers a value of 46.0 mm. The rainfall quantities register an increase in December as well, when the *secondary maximum* is registered with a multi annual monthly average of 56.9 mm

(see figure 1). This month is characterized by the advection of some wet air masses from the Mediterranean basin and by the stressed frequency of the mobile cyclones from the north of the Atlantic ocean, factors which generate abundant rainfall.

Table 1

The inter – monthly variation of the rainfall quantity in Ştei

Month	XII-I	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX	IX-X	X-XI	XI-XII
Inter – monthly variation (mm)	18.3	2.4	0.3	-20.4	-19.5	-22.6	22.8	11.8	11.0	18.0	-1.2	-10.9

Source: data processed from the A.N.M.'s Archive

Analyzing the inter – monthly variation of the multi annual monthly average rainfall quantity one can notice that a significant increase of the values is registered between the months June – July, with 22.8 mm; high values are also being produced in the months December – January with 18.3 mm. The most stressed decrease of the rainfall activity is produced in the months May – June with – 22.6 mm as well as in the months March – April with – 20.4 mm (see table 1).

The average semestrial rainfall quantities

The season distribution of the rainfall quantities, definitely in favor of the hot season is one of the basic features of the moderate continental type of climate and of the transitional temptation subtype one.

Table 2

Annual and semestrial rainfall quantities in Ştei, 1990 – 2011

Weather station	Annual quantities	Cold semester (1st October - 31st March)		Hot semester (1st April - 30th September)	
	mm	mm	%	mm	%
Ştei	681.0	258.4	37.9	422.7	62.1

Source: data processed from the A.N.M.'s Archive

On average, during the hot semester of the year (1st April - 30th September) for one square meter from the surface of Stei city there fall 422.7 mm of rainfall which represents 62.1% from the annual pluviometric contribution (681.0 mm) (see table 2). The dynamics of the air masses, very active especially from the west sector and the dynamic and thermic advection which reach maximum annual values lead to much higher quantities of rainfall during the hot semester.

On average, in the cold semester (1st October - 31st March) on each square meter of Ştei city there fall 258.4 mm of rainfall, meaning 37.9% from the annual average sum (681.0 mm) (see table 2). During this season the anti-cyclone weather types are frequent, the thermic convection is much

weaker and the atmosphere dynamics is dominated by the dry and cold continental air masses originating from the north and north – east of Europe or from the north – west of Siberia. Together all these factors lead to low quantities of rainfall.

2. Quantity and frequency of the atmosphere rainfall

In Ştei, the annual number of days with ≥ 0.1 mm rainfall quantities is on average of 141.4 days, slowly decreasing to 117.2 days as the value limit of the sums increases in the case of ≥ 0.5 mm rainfall quantities.; 101.1 days for the ≥ 1.0 mm rainfall quantities; 78.6 days for ≥ 2.0 mm rainfall; 44.2 days in case of ≥ 5.0 mm rainfall; 20.4 days in case of ≥ 10.0 mm daylight rainfall; 4.7 days in case of ≥ 20 mm daylight rainfall and only 1.4 days for ≥ 30 mm rainfall quantities (see figure 2).

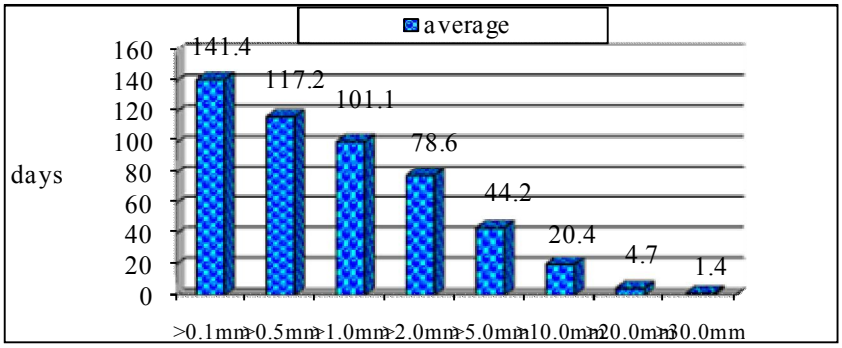


Figure 2. The annual number of days with rainfall covered between certain limits in Ştei

From the analysis and interpretation of the data related to the number of days in which certain quantities of rainfall are registered, it comes out that the multi annual average number of the days in which the rainfall quantity was ≥ 0.1 mm is of 141.4 days. Their number differ from one month to another. The maximum number is registered in the months from the end of spring and beginning of summer, in May and in June the average values are of 14.4 days. High values are also registered in December these being on average of 13.8 days.

The lowest number of days in which the atmosphere rainfall has been ≥ 0.1 mm are registered in the months from the end of summer and from the beginning of fall, the lowest monthly average value belonging to October with 8.2 days; low values have also been registered in September with 9.4 days and in August with 9.9 days.

The temporary distribution of the days with certain quantities of rainfall has got a great practical importance. Thus, for Ştei city area we have calculated the monthly and annual frequency of the days with quantities of

≥ 0.5 mm, ≥ 1.0 mm, ≥ 2.0 mm, ≥ 5.0 mm, ≥ 10 mm, ≥ 20 mm şi ≥ 30 mm, graphically presented in figure 3.

Analyzing the monthly average number of days with these rainfall quantities one can notice the fact that these days register the highest values in the hot season and in December and the lowest values belong to the months from the end of the summer and from the beginning of fall as well as to the months from the end of the winter and from the beginning of spring. (see figure 3).

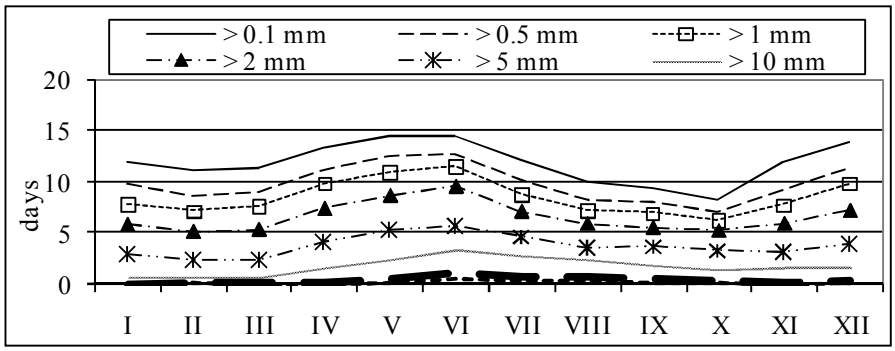


Figure 3. The monthly variation of the average number of days with different quantities of rainfall

CONCLUSIONS

The multi annual average quantity of the atmosphere rainfall in Ştei city area registers 681.0 mm. During the year, in Ştei city area, two maximum pluviometric values are produced (June, December) and two minimum pluviometric values are produced (March, October). The main maximum is characteristic for the whole country and it emphasizes the continental feature of the climate and the secondary maximum proves the influence of the Mediterranean cyclone circulation in the studied region.

On average, during the hot semester of the year (1st April - 30th September) on each square meter of Ştei city's surface there fall 422.7 mm of rainfall, meaning 62.1% from the annual pluviometric contribution (681.0 mm). On average, during the cold semester of the year (1st October - 31st March) on each square meter of Ştei city there fall 258.4 mm of rainfall, meaning 37.9% from the annual average sum (681.0 mm).

The reduced quantities of rainfall from this season are due to the high frequency of the anti–cyclones, to the much diminished thermic convection as well as to the atmosphere dynamics which is dominated by the cold and dry continental air masses.

In Ştei, the annual number of days with rainfall quantities of ≥ 0.1 mm is, on average of 141.4 days, slowly decreasing as the value limit of the sums increases.

REFERENCES

1. Ciulache S., 2002, Meteorologie şi climatologie, Editura Universitară Bucureşti.
2. Croitoru Adina Eliza, T.C. Gherman, 2002, Situaţii sinoptice care au generat luni excedentare pluviometric în regiunea de nord-vest a României, Studia Universitatis Babeş-Bolyai, Geoghaphia XLVII, 2, Cluj-Napoca, pag. 25-32.
3. Dragotă Carmen, Gh. Măhăra, 1997, Durata efectivă (în ore şi minute) a precipitaţiilor lichide pe teritoriul României, Analele Universităţii din Oradea, Seria Geografie, Tom VII, pag. 89-95.
4. Dumiter Aurelia Florina, 2007, Clima şi topoclimatele oraşului Oradea, Editura Universităţii din Oradea.
5. Erhan Elena, 1999, Meteorologie şi climatologie practică, Edit. Univ."AL.I.Cuza", Iaşi.
6. Gaceu O., 1998, Regimul pluviometric al staţiunii balneoclimaterice Stâna de Vale, Analele Univeristăţii din Oradea, VIII, Oradea, pag. 66-74.
7. Gaceu O., 2001, Elemete de meteorologie practică, Editura Universităţii din Oradea.
8. Gaceu O., 2002, Elemete de climatologie practică, Editura Universităţii din Oradea.
9. Gaceu O., 2005, Clima şi riscurile climatice din Munţii Bihor şi Vlădeasa, Editura Universităţii din Oradea.
10. Gaceu O., Ribana Linc, 2005, Aspecte privind regimul precipitaţiilor atmosferice în Munţii Bihor şi Vladeasa, Romanian Journal of Climatology, Iaşi, pag. 203-210.
11. Köteles N., 2010, Hidrologie şi hidrogeologie aplicată, Editura Universităţii din Oradea.
12. Köteles N., Ana Cornelia Pereş, 2011, The Conditions of Atmospheric Precipitations in Huedin Depression. Analele Universităţii din Oradea, Fascicula Protecţia Mediului Vol. XVI A, Anul 16, Editura Universităţii din Oradea, 2011, ISSN 1224-6255, pag. 404-410.
13. Köteles N., 2011, The Features of the Pluviometric Regime in the Area of the Stana de Vale Spa. Analele Universităţii din Oradea, Fascicula Protecţia Mediului, Vol 17 (16), International Symposia "Risk Factors for Environment and Food Safety" & "Natural Resources and Sustainable Development" & "50 Years of Agricultural Research in Oradea", Faculty of Environmental Protection, November 4-5, 2011, Oradea, Romania, Editura Universităţii din Oradea, 2011, ISSN 1224-6255, pag. 669-676.
14. Măhăra Gh., Nadia Măhăra, 1981, Regimul precipitaţiilor în zona Staţiunii Stâna de Vale, Nymphaea, Folia nature Biharia, VIII-IX, Oradea, pag. 387-394.
15. Măhăra Gh., 2001, Meteorologie, Editura Universităţii din Oradea.
16. Moldovan Fl., 1986, Tipuri de vreme caracteristice pentru partea de nord-vest a României, Studii şi Cercet., Meteor., I.N.M.H., Bucureşti, pag. 59-73.
17. Moza Ana Cornelia, 2008, Aspects regarding the mean annual quantities of rainfall in the Crişul Repede hydrographic basin, Analele Univeristăţii din Oradea, Seria Geografie, Tom XVIII, pag. 74-80.
18. Moza Ana Cornelia, 2008, The maximum quantities of rain-fall in 24 hours in the Crişul Repede hydrographic area, Editura Universităţii din Oradea, Analele Universităţii din Oradea, Fascicula: Protecţia Mediului, Vol XIII, Anul 13, I.S.S.N. 1224-6255, pag. 409-413.
19. Moza Ana Cornelia, 2009, Clima şi poluarea aerului în bazinul hidrografic Crişul Repede, Editura Universităţii din Oradea.
20. Stăncescu I., 1996, Implicarea treptelor de relief în elaborarea diagnozelor şi prognozelor meteorologice, Studii şi Cercetări de Geografie, Editura Academiei Române, Tomul XLIII, pag. 69-74.