THE FEATURES OF THE PLUVIOMETRIC REGIME IN THE AREA OF THE STANA DE VALE SPA

Köteles Nandor*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea; Romania, e-mail: kotelesnandor@yahoo.com

Abstract

The geographical position of Stâna de Vale spa, situated vertically on the moving direction of the air masses from the west and the landscape that raises suddenly in front of the Beius Hollow gives this area a multi yearly average regime of rainfall of 1657.8mm. During the year two maximum values are produced (in June and in December) and two minimum rainfall values (In January, in March and in October). The main maximum is a feature of the entire country and emphasizes the continental aspect of the climate and the secondary maximum value proves the influence of the Mediterranean cyclone circulation in the studied region.

Key words: rainfall, maximum quantities.

INTRODUCTION

The aim of this study is to analyze the time variations of the rainfall in the area of Stâna de Vale spa; in the present work we have tried an analysis of the rainfall evolution, and of the factors that generate or impose them. There was a clear evidence of the influence of the physical and geographical condition variety, of the dynamic and radiative factors upon all the elements that define the rainfall from this resort.

The actual study has been realized on the basis of a rich rainfall data fund registered at Stâna de Vale weather station for a long period of time meaning for the time interval 1979 – 2010.

MATERIAL AND METHODS

For the multi yearly study of the rainfall from Stâna de Vale resort area (situated at 1108 m altitude) we have used data from the period 1979 – 2010 obtained from instrumental and visual observations performed at the weather station. The analysis of the rainfall has been done on the basis of the data mentioned in the weather observation tables from the studied weather station for a period of 32 years.

The main methods used in the current study are: the analysis method, the deductive method, the comparative method, the statistics and mathematical methods and the graphical methods. The use of the specific weather research means and methods has followed the most exact

processing of all the data we had at our disposal. With the help of the statistics and mathematical methods the data obtained from the N.M.A. Archive (National Meteorological Administration) had been processed then they were graphically shown to clearly emphasize the time variability of the weather element.

RESULTS AND DISCUSSION

The yearly regime of the rainfall

During a year the evolution of the monthly sums of rainfall modifies from one month to another in a direct relation with the reports that are established between the great barometric centres which impose the atmosphere circulation and which direct the air masses and the atmospheric fronts (with the barometric formations that accompany them).

The geographical settlement of Stâna de Vale spa and the feature of the local topography leads to some pluviometric particularities specific to this region. Thus, the shelter offered by the Apuseni Mountains in the east side and the large opening to the circulation of more humid air masses from the west make it that in Stâna de Vale the yearly rainfall be abundant. Stâna de Vale is under the influence of the air masses from the west and from the north-west, meaning the humid ocean air masses. Meeting the orographic barrier the airmasses enter an ascending movement, they cool adiabaticly until they reach the dew point after which they generate important quantities of rain on the west mountain slopes. From a certain altitude the air masses which are poor in water vapors continue to ascend but they no longer produce rainfall or if they do then the rainfall is in little quantities.

For a more exact, real and adequate analysis of the rainfall quantities we have used data from the pluviometric observations from the period 1979 – 2010, data registered at Stâna de Vale meteorological station. Thus from the analysis, from the processing and from the interpretation of the pluviometric data it comes out that the multi yearly average rainfall quantity is of 1657.8 mm/year.

From one year to another the yearly rainfall quantity has registered different values with positive or negative deviations from the multi yearly average.

The yearly rainfall quantities higher than the average are produced when the activity of the ocean cyclones which develop at the bottom of the Azores anticyclone and that of the Mediterranean cyclones is more intense. Thus, if there are persistent cyclone activities or active thermic convective processes then the rainfall quantities are rich and they determine a high humudity which can increse up to pluviometric or hydrologic excess.

Analyzing the deviations of the yearly average quantities from the multi yearly average it has been noticed that in 51.9 % of the studied years

the yearly average was higher and in 48.1 % cases they had lower values than the multi yearly average.

Average semestrial rainfall quantities

The season distribution of the rainfall quantities definitely in favor of the warm season is one of the main features of the moderate continental climate, including the transition shade subtype.

Table 1

Yearly and semestrial rainfall quantities in Stâna de Vale for the period 1979 – 2010

Station	Yearly qunatities	The cold semester (1st October – 31st Martie)		The warm semester (1st April – 30th September)	
	mm	mm	%	mm	%
Stâna de Vale	1657.8	726.3	43.8	931.5	56.2

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

On average, in the warm semester of the year (1st April – 30th September) for one square meter from the surface of Stâna de Vale resort there fall 931.5 mm of rain which represents 56.2% from the yearly pluviometric contribution (1657.8 mm) (see table 1). The dynamics of the air masses, very active especially from the west part and the dynamic and thermic convection that reach the maximum yearly quotas makes higher quantities of rain fall in the warm season.

On average in the cold season (1st October – 31st March) for one square meter from the surface of Stâna de Vale resort there fall 726.3 mm of rain which represents 43.8% from the average yearly sum (1657.8 mm) (see table 1). In this season the anticyclone weather estates are frequent, the thermic convection is weak and the atmosphere dynamics is dominated by the cold and dry continental air masses having their origin in the north and north-east of Europe or in the north-west of Siberia. All these factors lead to reduced quantities of rainfall.

Average montlhy rainfall quantities

From one month to another the frequency and intensity of the dry or humid air advections suffer changes and the thermic and dynamic convection manifests itself at different parameters so that the months of the year in their succession shall present different values of the rainfall quantities resembling the season the fit in.

The rainfall register different values from one month to another according to the air mass circulation, to altitude, to lanscape forms, to the slopes' position, to local conditions. Thus, the lowest rainfall quantities fall in the interval January – March (see figure 1), due to the predominance of

the anticyclone regime which does not allow the thermic convection to develop, the most droughty month being February (approximately 98 mm). Starting with March the rainfall grows progressively until June when the main maximum yearly pluviometric is registered (almost 179 mm). The rains from this month are generated by the high frequency of the ocean cyclones which move to the north periphery of the Azores Anticyclone's dorsal, bringing cold and humid air masses that favor the rainfall and by the convective processes which, through thermic and dynamic convection make the air unstable. From June the rain quantity decreases until October when the secondary minimum is registered (almost 120 mm) because now the anticyclone regime from the end of summer and from the beginning of autumn is predominat.

In December the second secondary maximum appears, of almost 152 mm (see figure 1) a maximum determined by the cyclones from the Mediterranean Sea that cross the Pannonian Plain. From the presented facts it results that during the year within the area of Stâna de Vale resort two maximum points are produced (in June and in December) and two minimum pluviometric points are produced (in January – March and in October). The main maximum is characteristic for the entire country and emphasizes the continental feature of the climate and the secondary maximum proves the influence of the mediterranean cyclone movement in the studied region.

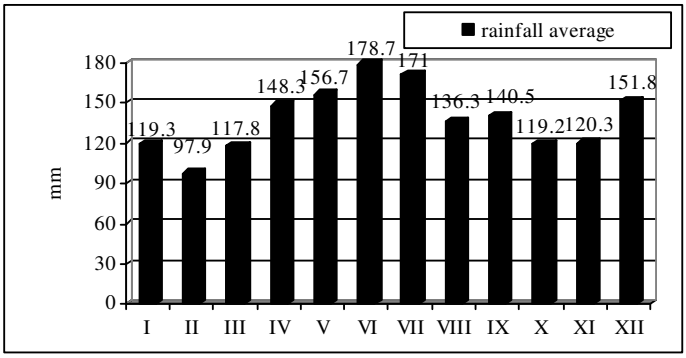

Fig. 1 The evolution of the monthly rainfall average quantities in Stâna de Vale

The frequency of the days with different rainfall quantities

In the weather science a rain day is considered the 24 hour interval in which the registered quantity of rainfall (liquid, solid or mixed) was of at least 0.1 mm.

The meteorological instruments with direct reading (the pluviometer) or with direct registration (the pluviograph) do not measure rainfall quantities below 0.1 mm so that in the categories of rainfall days only those days enter in which the minimum quantities fallen under the form of rain,

snow, sleet, drizzle, etc are higher than or equal to 0.1 mm or close to this and which at a brief analysis would not show a great importance because their benefit in the realization of the pluviometric contribution is not consistent enough. But whenever they are signalled they mark a time sequel with a reduced duration of Sun shine, with high nebulosity, with high values of air humidity, with low values of saturation deficit, with intensifications of the air mass movements, with attenuations of the higher or lower temperature values in air or on the ground which interrupt the warmer or the frost periods on the fund of significant changes that appear in the ecuation radiative –caloric.

Each day in which even the smallest quantity of rain falls can have an extraordinary importance in the life of the plants especially when it interrupts evenif for a short period of time due to dryness or drought each phenological stage apart according to the agriculutural crop which in order to be safe needs ceratin quantities of rainfall but the efficiency of their use is more obvoius in case in which their torrent degree is more reduced and when the rains that fall have quantities enlisted in the limits of 1 – 10 mm. From an agricultural point of view a rain is useful when it sums at least 1 mm and an efficient rain must have at least 8 – 10 mm. The necessary optimum frequency is to have a rain every 4 days during the warm season, the optimum monthly quantity in this season being of 60 – 80 mm. From an agricultural point of view 10 mm of rains fallen in five days, uniformly distributed have the same efficiency as 100 mm of rains fallen in only two days.

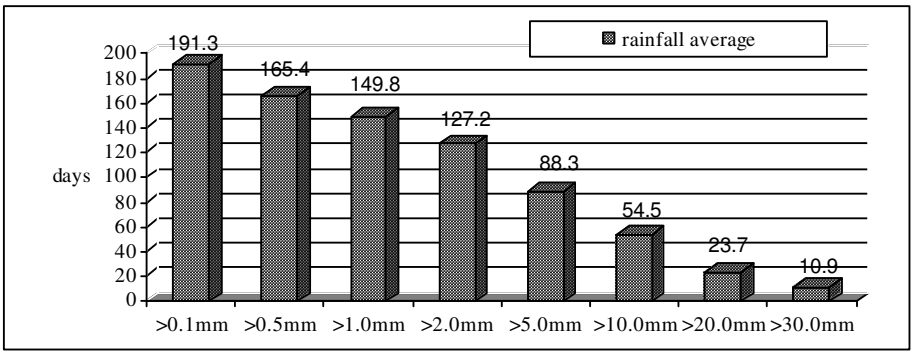

Fig. 2 The yearly number of rainfall days comprised between certain limits in Stâna de Vale for the period 1979 – 2010

In Stâna de Vale, the yearly number of days with rainfall quantities of ≥ 0.1 mm is on average of 191.3 easily decreasing to 165.4 days as the value verge of the sums increases in case of rainfalls ≥ 0.5 mm; 149.8 days for

those with rainfalls ≥ 1.0 mm; 127.2 days for rainfalls ≥ 2.0 mm; 88.3 days in case of rainfalls ≥ 5.0 mm; 54.5 days in case of daylight rainfalls ≥ 10.0 mm, 23.7 days in case of daylight rainfalls ≥ 20 mm and only 10.9 days for the rainfall quantities ≥ 30 mm (see figure 2).

In figure 2 the evolution of the yearly average number of rainfall days is presented. These rainfall days are higher than or equal to different pluviometric verges for Stâna de Vale station as an average for the period 1979 – 2010.

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

The maximum rainfall quantities in 24 hours usually have as an origin the humid air advections from the west sector during the warm season and from the mediterranean sector in the cold season to which we can add the frontal dynamic and orographic convection which can be produced all the year round and the thermic convection which finds better conditions to manifest itself in the warm period of the year and especially in summer months. But during the summer months when the air has a great ability to store water vapors, when the atmosphere fronts that come from the Atalntic ocean and cross Europe on the general west-east direction have humid and unstable air on their back and when the thermo-dynamic convection reaches the highest quotas then and only then the highest quantities of rainfall are produced in 24 hours.

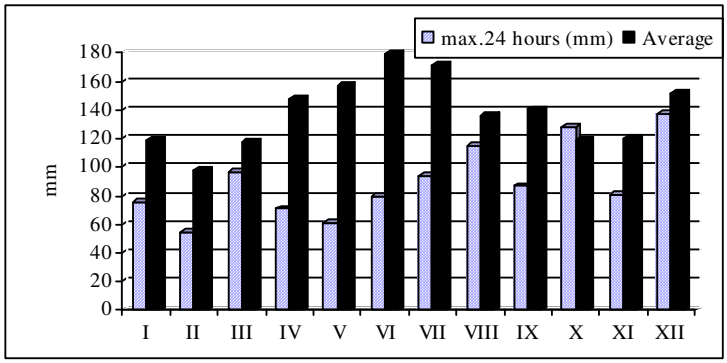

Fig. 3 The maximum quantities of rain fallen in 24 hours (mm) and the monthly average quantities in Stâna de Vale station

In Stâna de Vale there is only one case in which the rainfall quantity produced in 24 hours is higher than the multi yearly average. This rainfall was produced on the 19th of October 1996 when the quantity in 24 hours was of 128.0 mm and the multi yearly average of the month is of 119.2 mm of rainfall (see figure 3).

During the 32 years studied the highest rainfall quantity that was produced in 24 hours in Stâna de Vale took place on the 24th of December 1995, the quantity being of 137.6 mm.

CONCLUSIONS

In Stâna de Vale spa the multi yearly rainfall regime registers a quantity of 1657.8 mm. The high quantity of rainfalls here in Stâna de Vale is due to the fact that this station is situated on the west mountain slope; this station is also a barrier against the ocean air masses at the optimum pluviometric level from the Apuseni Mountains (1000 – 2000 m); the rainfall also appear here due to the landscape that suddenly raises in front of the Beius Hollow, the air masses being obliged to rapidly enter a forced ascending movement and to pour rain, to precipitate.

On average in the warm semester of the year (1st April – 30th September) on the level of one square meter from the surface of the resort 931.5 mm of rainfall are produced which represents 56.2% from the yearly pluviometric contribution (1657.8 mm). On average in the cold season (1st October – 31st March) on each square meter 726.3 mm of rainfall are produced meaning 43.8% from the average yearly sum.

During the year in Stâna de Vale area two maximum values are produced (in June and in December) and two pluviometric minimum values are produced (in January – March and in October). The main maximum is characteristic for the entire country and emphasizes the continental character of the climate and the secondary maximum proves the influence of the mediterranean cyclone circulation in the studied region.

In Stâna de Vale the yearly number of rainfall days higher than or equal to 1 mm is on average of 191.3 days slightly decreasing as the value verge of the sums increases. During the 32 years studied the highest quantity of rain fallen in 24 hours was produced on the 24th of December 1995, the quantity being of 137.6 mm.

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