THE WIND REGIME IN GURAHONŢ HOLLOW AREA

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Abstract

The current work makes a characterization of the Aeolian regime of the Gurahonţ hollow area. Thus, data related to the wind regime have been processed being taken from the Gurahonţ weather station for a period of 30 years, for the time interval 1982 – 2011. Its two parametrers have been analyzed , the direction and the speed of the wind, emphasizing the following: the annual frequency of the wind on directions, the monthly frequency of the wind on directions, the frequency of the atmosphere calmness, the monthly average wind speed and the speed of the wind on directions.

In Gurahonţ hollow area the direction and the frequency of the wind on certain directions are determined by the position of the hollow itself, by the particularities of the landscape, especially by the fragmentation degree and by its orientation. In specific urban areas the decisive factors are: the configuration of the built perimeter, the height of the buildings, the width and the orientation of the street net, etc. The highest annual wind frequency is registered from the north – west sector with 9.5% of the cases and the atmosphere calmness is produced in 58.2% of the cases. The multi annual average speed of the wind registers an average value of 1.1 m/s.

Key words: wind, direction, average speed, atmosphere calmness

INTRODUCTION

The wind regime in Gurahonţ Hollow, as in all the country, is determined by the development of the four main action centres of the atmosphere: The European Asian anticyclone, the Azores anticyclone (in summer), and the Iceland Minimum (in winter) and the Mediterranean Hollow during the cold season but also by the local geographical factors (Gaceu O., 2005).

MATERIAL AND METHOD

In order to emphasize the characteristics of the wind from the Gurahonţ hollow area we have processed the data from the time period 1982 – 2011 obtained from the instrumental observations performed at the Gurahonţ weather station.

The analysis has been done on the basis of the data enlisted in the meteorologoical observation tables from the above mentioned weather station. These data are stored and kept in the A.N.M's Archive in Bucharest. The data processed through statistical and mathematical methods have been graphically presented to clearly emphasize the wind regime.

RESULTS AND DISSCUSIONS

1. Wind direction

In order to determine the wind direction the wind rose is used.

The annual frequency of the wind on directions

From the analysis of the annual wind rose done for the weather station of the studied area, for the time period 1982 – 2011, it comes out that the north -west sector direction is prevailing with a frequency of 9.5% of the situations. A close frequency is registered from the east sector too, with 9.0% of the situations (see figure 1).

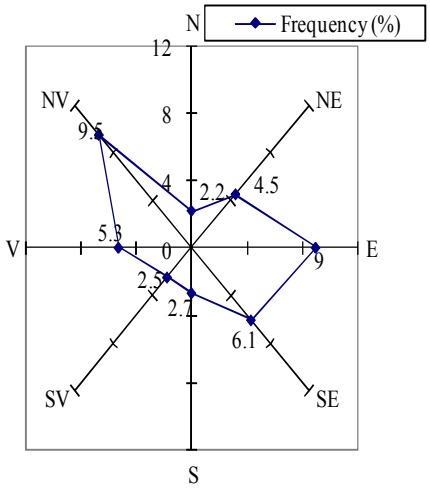

Figure 1. The annual frequency of the wind on cardinal directions in Gurahonț

The reduced values of the wind frequency are registered from the north direction with a frequency of 2.2 of the cases, from south -west with a frequency of 2.5% and from the south direction with a frequency of 2.7% of the cases.

The monthly frequency of the wind on directions

During the year, over the characteristic months, the directions present in the annual value prevail. This proves the fact that the surrounding landforms of the weather station are more significant for the local circulation than for the circulation of the air in altitude. Thus, in Gurahonț, the north – west direction owns a maximum frequency in June with 12.8% and it does not get below 6.1% in any month (in January). From the east sector the maximum frequency is registered in February when it has 12.6% of the cases. The lowest frequency from this sector is produced in July with 4.8% of the cases.

The lowest monthly frequencies of the wind direction in Gurahonț Hollow are produced in the winter months from the north sector and are comprised between 1.1 in January and 1.3 in December.

Table 1

The monthly and annual average frequency of the wind on cardinal directions (%)

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	year
Weather station/direction	Gurahonț (177 m)												
N	1.1	2.0	2.6	2.3	2.5	2.7	2.5	2.7	2.6	2.3	1.6	1.3	2.2
NE	4.3	4.3	4.5	4.4	4.7	3.8	3.9	3.7	4.1	5.1	5.8	4.9	4.5
E	9.9	12.6	11.4	9.4	7.9	5.1	4.8	6.5	7.7	10.1	11.4	10.9	9.0
SE	6.9	8.1	6.8	7	5.1	3.5	3.7	4.7	5.8	7.3	6.4	7.3	6.1
S	2.3	3.1	3.4	3.9	3.0	2.2	2.2	2.5	2.5	2.6	2.5	3.0	2.7
SV	1.5	1.8	2.9	3.4	4.0	3.7	3.0	2.4	2.3	2.2	1.9	1.5	2.5
V	3.6	4.2	6.4	6.9	6.5	7.1	8	6.4	4.8	3.4	3.6	2.9	5.3
NV	6.1	8.0	10.7	11.6	11.5	12.8	12.2	10.6	9.2	7.0	8.2	6.3	9.5
Calmness	64.3	55.9	51.3	51.1	54.8	59.1	57.9	60.5	61.0	60.0	58.6	61.9	58.2

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

In January the frequency of the wind from the east direction is prevailing being of 9.9 %. It registers the lowest frequency in January, the wind from the north directions with 1.1% and south – west with 1.5% (table 1).

In February the frequency of the wind from the east prevails but the frequency of the wind from the north direction increases slightly, the most significant increase being registered for the frequency of the wind from the north -west direction with 1.9%. This fact is due to the intensification of the atmosphere circulation from the north sector issued by the activity of the Mobile Polar Anticyclones which, attracted by the minimum barrel formed in the Mediterranean basin descend towards Romania's latitudes.

In March the frequency of the wind from the east direction decreases once the frequency of the wind from the north direction intensifies. Thus, the frequency of the wind from the east drops with over 1% in comparison with the previous month registering an average frequency of 11.4%. The frequency of the wind from the north – west direction increases this month from 8.0% in February to 10.7% in March being with 2.7% higher than the previous month and with 1.2% higher than the multi annual average. The frequency of the wind from the north direction increases this month from 2.0% in February to 2.6% in March being higher than the previous month with 0.6% and with 0.4% higher than the multi annual average.

In April the frequency of the wind from the east continues to drop in comparison with the previous month, and at the same time an increase of the

wind from the north – west being noticed (table 1). The frequency of the wind from the east registers in April 9.4% of the cases, with 0.4% more than the multi annual average and with 2% less than the previous month. The frequency of the wind from the north – west registers 11.6%, with 2.1% more than the multi annual average and with 0.9% more than the previous month.

In May the frequency of the wind from the east decreases even more, the monthly value being of 7.9%, under the multi annual average with 1.1%. The direction from the north – west sector registers a slight decrease with 0.1% from 11.6% in April to 11.5% in May. Even so, it still remains the prevailing direction (table 1).

The frequency of the wind in June registers a decrease and in this month of the wind frequency from the east it registers 5.1%, with 3.9% less than the multi annual average. The frequency from the north – west sector registers 12.8% being the highest value in the whole year, with 1.3% more than the previous month and with 3.3% more than the multi annual average.

In July the frequency of the wind from the north – west direction registers a slight decrease and still with all these it remains the prevailing direction from the north – west sector. In this month the direction from the east sector registers the lowest frequency from the year with 4.8% of the cases.

In August the frequency of the wind from the east sector starts to increase remaining more reduced than the multiannual average, being of 6.5%. The frequency of the wind from the north – west direction continues to decrease but it still remains prevailing, being of 10.6% of the cases.

In September the frequency of the wind from the east direction continues to increase, now being of 7.7%, with 1.3% under the annual average. The frequency of the wind from the north – west direction continues to decrease from 10.6% in the previous month to 9.2% in September.

In October the frequency of the wind from the east continues to increase now being of 10.1% with 1.1% over the annual average, at the same time with the decrease of the wind frequency from the north – west which in its turn registers this month 7.0% with 2.5% less than the average (table 1).

In November the frequency of the wind from the east direction continues to increase with 1.3% in comparison with the previous month registering 11.4% of the cases, being over the annual average value with 2.4% (table 1). The north – west direction registers an increase of the frequency with 1.2% in comparison with the previous month, with 1.3% less than the annual average (9.5%).

In comparison with the previous month, the frequency of the wind from the east direction registers a slight decrease with 0.5% but still remaining over the multi annual average value with 1.9% and registering a frequency of 10.9%. In this month the direction from the north -west sector registers a decrease of the frequency with 1.9% in comparison with the previous month when it registered 8.2% being less than the annual average with 3.2% (table 1).

The frequency of the atmosphere calmness

The atmosphere calmness represents the estate of the weather without wind, this calmness being related to the presence and the persistence of the anticyclone barrel formations and to the local geographical conditions (Bogdan Octavia, Dragota Carmen, 1997).

Analyzing the annual frequency of the atmosphere calmness it can be noticed that it has a higher frequency than the wind periods, appearing in 58.2% of the cases.

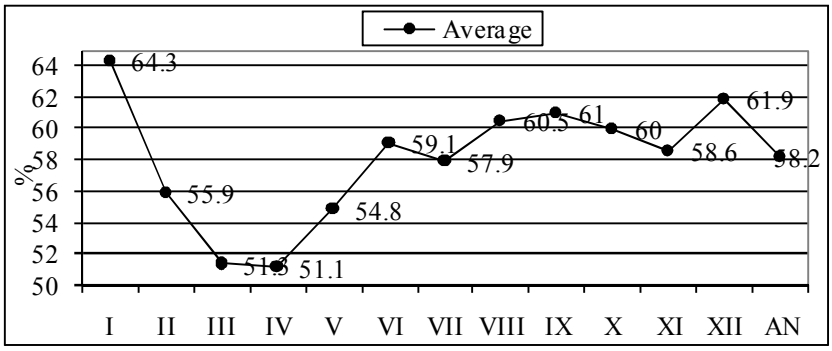

Figure 2. The monthly average frequency of the atmosphere calmness in Gurahonț

The frequency of the atmosphere calmness changes from one month to another, the highest frequency being registered during winter, 64.3% in January due to the efflux of the cold air from the slopes and to its stratification at soil.

The most reduced frequency of the atmosphere calmness is registered in the spring months, period characterized by a great variability of the atmosphere dynamics when in the Gurahonț hollow area masses of air of different origin and with different thermic features alternate relatively quickly and which generate a more intense Aeolian activity. Thus, the month with the most reduced frequency of the atmosphere calmness is April with 51.1% of the cases and March with a frequency of 51.3% of the cases (see figure 2).

2. Wind speed

The wind speed is given by the distance crossed by the air in a time unit. The force that the wind exerts depends on the size of the horizontal barrel gradient and by the influence of the physical and geographical factors (Măhăra Gh., 2001).

The monthly average wind speed

In Gurahonț the multi annual average wind speed for the time interval 1982 – 2011 registers an average value of 1.1 m/s.

During the year the highest monthly wind speeds are registered in the periods when the temperature and pressure contrasts are high, that means in spring, especially in March and in April (1.4 m/s in April and 1.3 m/s in March).

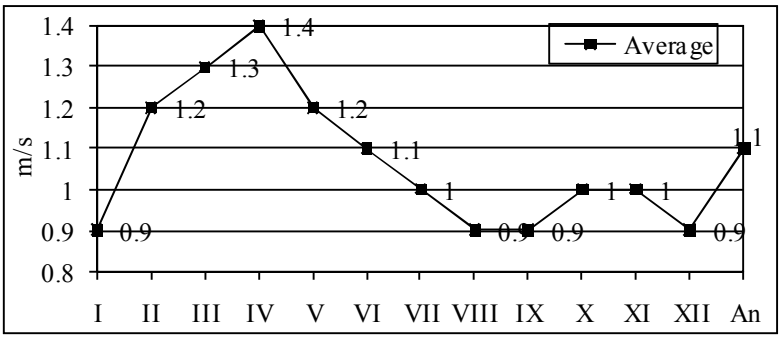

Figure 3. The monthly course of the wind speed in Gurahonț

The lowest monthly average speeds are produced in summer, in August and in September as well as in winter, in December and in January with 0.9 m/s (see figure 3).

The speed of the wind on directions

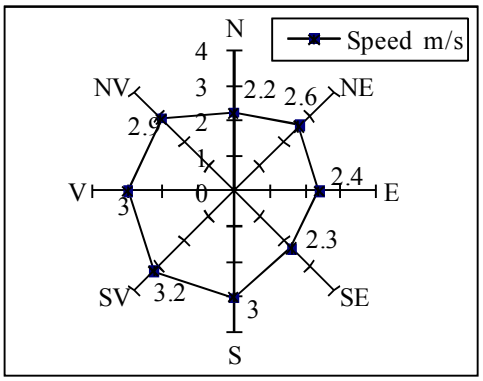

Figure 4. The multiannual average speed of the wind on directions (m/s) in Gurahonț

Analyzing the annual average values of the wind speed on the eight cardinal directions it can be noticed that in Gurahonț the maximum speed of the wind belongs to the south – west direction with average values of 3.2 m/s.

From the south and west directions the wind blows with an average speed of 3.0 m/s. From the north – west sector the wind registers an average speed of 2.9 m/s and from the north – east it registers 2.6 m/s (see figure 4).

The lowest annual average speeds on directions belong to the north direction with an average speed of 2.2 m/s, to the south – east direction with 2.3 m/s and to the east direction with 2.4 m/s.

CONCLUSIONS

From the analysis of the wind rose for the period 1982 – 2011 it comes out that the north – west sector direction prevails with a frequency of 9.5% of the cases.

During the year, over the characteristic months the directions presented in the annual value prevail. It proves the fact that the surrounding landforms are more significant for the local circulation than the circulation of the air in altitude. Thus, in Gurahonț, the north – west direction holds a maximum frequency in June with 12.8% and it does not get below 6.1% in any other month (in January).

The atmosphere calmness registers an annual frequency higher than the wind periods, being registered in 58.2% of the cases. Each month its frequency modifies, the highest frequency being registered during winter, 64.3% in January, due to the efflux of the cold air from the slopes and to the cold air stratification on the soil. The most reduced frequency is registered during spring, a period characterized by a great diversity of the atmosphere dynamics which generates a more intense Aeolian activity. Thus, month April registers the lowest frequency of the atmosphere calmness with 51.1% of the cases.

The multi annual average speed of the wind in Gurahonț registers a value of 1.1 m/s. During the year the highest monthly speed values of the wind are registered in the periods in which the temperature and pressure contrasts are high, meaning in spring, more exactly in March and in April.

The maximum speed of the wind concerning the eight cardinal directions belongs to the south – west direction with average values of 3.2 m/s.

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