

## CHARACTERISTICS OF THE AIR TEMPERATURE IN ȘTEI CITY AREA

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### **Abstract**

*The multi annual average temperature in Ștei city registers a value of 9.8°C. During the year the temperature has a normal course, the minimum value is registered in January with -1.3°C and the maximum value is in July when it reaches 19.4°C having as a result a monthly amplitude of 20.7°C.*

**Key words:** temperature, frequency, monthly, multi annual average, amplitude.

### **INTRODUCTION**

The air temperature is one of the main weather elements which affects the human activity and which produces a folded bioclimatic stress over the human body if its values tend to reach the extreme limits of variation (Teodoreanu Elena, 1977). The stress appears in the extreme seasons namely in winter when there are uncomfortable days due to the cooling of the weather and in summer when the folded stress is due to the excessive heating of the air.

### **MATERIAL AND METHOD**

In order to study the main particularities of the thermic regime from Ștei city area we have used air temperature related data from the Ștei weather station over a period of 22 years (1990 – 2011).

### **RESULTS AND DISCUSSIONS**

#### **1. The monthly and yearly average air temperature**

The thermic regime is formed under the influence of the atmosphere circulation particularities, of the radiative factors and of the underlying surface (Măhăra Gh., 2001).

In Ștei city the multi annual average temperature for the period 1990 – 2011 registers a value of 9.8°C.

The monthly average temperature varies in relation with the quantity of solar energy received by the earthly surface during a year. Thus, the monthly average temperature has a normal yearly course, it starts to ascend in January when it registers the lowest monthly thermic average value until July month that marks the maximum value of the monthly average

temperature, after which the course of the monthly average air temperature is a decreasing one until the end of the year. So, the minimum monthly value of the air temperature in Ștei registers in January with a value of  $-1.3^{\circ}\text{C}$  and the maximum is registered in July when it reaches  $19.4^{\circ}\text{C}$  resulting a monthly amplitude of  $20.7^{\circ}\text{C}$  (see figure 1). After reaching the lowest average value in January the temperature starts to increase from February on when it becomes positive so that, in July, it reaches the maximum from where it shall start to decrease until December.

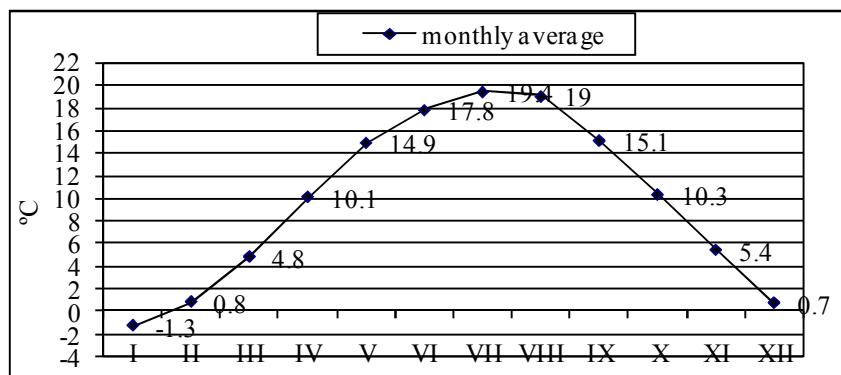


Figure 1. The monthly course of the air temperature in Ștei

The annual average thermic amplitude of  $20.7^{\circ}\text{C}$  shows a lower degree of continentalism in comparison with the east part of the country where this value passes over  $24 - 25^{\circ}\text{C}$  and it also shows the landscape's role as a thermic modifier.

During winter the average temperature is negative only in January while in December and February, in comparison with January, the temperatures are higher with  $2.0^{\circ}\text{C}$  și  $2.1^{\circ}\text{C}$ , and this fact is due to the intense circulation of cyclones. In January the cyclone circulation is lower and the anti-cyclone circulation from the north-east intensifies and due to the invasion of cold arctic air or due to the the monthly average temperature it is the lowest.

Due to the air circulation from the west and due to the fact that this area is sheltered from the invasions of the continental - polar air from the east and from the north-east, in Ștei area the winters are usually moderate without strong frost.

During fall, starting with September the temperature decreases all of a sudden, the multi annual average of these months varying from  $15.1^{\circ}\text{C}$  in September and  $5.4^{\circ}\text{C}$  in November. This cooling of the air temperature is due to the intensification of air cooling through radiative processes and due

to the increase of the cold air advection under the action of the Siberian anti-cyclone.

From the analysis of the thermic differences between the months of the year it comes out that the modification of the air temperature average values from one month to another is done at a slow step during the summer months and in the winter months as well ( $1 - 2^{\circ}\text{C}$ ), more obvious thermic contrasts being registered in the transition seasons ( $10^{\circ}\text{C}$ ).

## 2. The frequency of the days with different temperature values.

The analysis of the frequency of the days with different characteristic temperatures is of a great importance also. During a year the air temperature is below or over certain limits and according to these limits categories of days have been established: frost nights, freezing days, winter days, summer days, tropical days.

*Frost nights with minimum temperatures of  $\leq -10^{\circ}\text{C}$* , are registered in řtei area during the cold season especially in January when an average number of 5.4 such days can be registered.

Due to the many cold air advects from north, north-west and especially from the north-east of the continent and due to the characteristics of the anti-cyclone regimes frost nights can also be registered in the months from the beginning and from the end of the transition seasons (Gaceu O., 2005). Thus, such cases have also been registered in November and in March.

In February the multi annual average number of frost nights is of 2.7 days a year and in December a number of 2.5 days a year are registered in which the minimum daylight temperature goes below  $-10^{\circ}\text{C}$ .

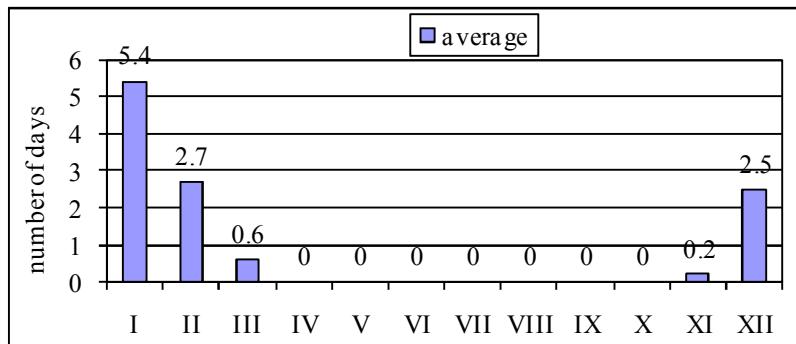


Figure 2. Monthly average number of frost nights  
(minimum temperature  $\leq 10^{\circ}\text{C}$ ) in řtei

Knowing the number of the frost nights from the transition seasons has got a great practical significance as these nights can be risk factors for fields like agriculture, building and construction, transport and last but not least for human health. The number of frost nights in March is on average

of 0.6 days a year and in November the multi annual average number of these days is of 0.2 days a year (see figure 2). In řtei the frequency of the frost nights for the period 1990 – 2011 is of over 11 cases.

In řtei, *the winter days with maximum temperatures of  $\leq 0^{\circ}\text{C}$*  have got a higher frequency than the frost nights. The winter days are present not only during the cold season in December, January and in February but also during the transition seasons.

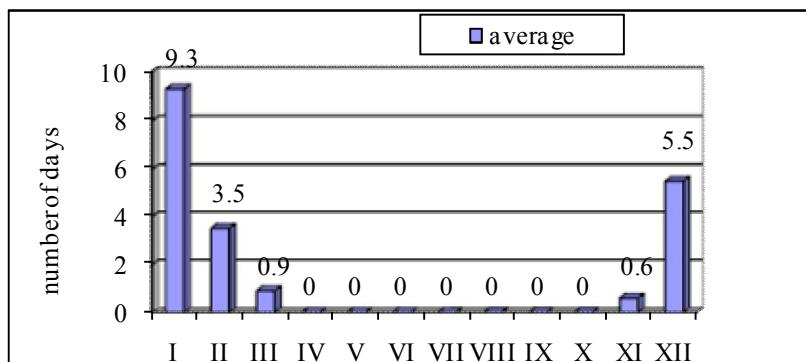


Figure 3. Monthly average number of winter days  
(maximum temperature  $\leq 0^{\circ}\text{C}$ ) in řtei

From among the winter months the highest average number of winter days is registered in January with an issue average of 9.3 days. For February the yearly average number of winter days is of 3.5 days. A higher frequency is to be noticed in December when the multi annual average number of winter days is of 5.5 days.

During the months of the transition seasons the days with maximum temperatures equal or lower than  $0^{\circ}\text{C}$ , can be found only in March and in November. For March the multi annual average number of winter days is of 0.9 days and November registers an average number of 0.6 days a month. (see figure 3). The multi annual average number of winter days is of 19.6 days.

*Freezing days, days with minimum temperatures of  $\leq 0^{\circ}\text{C}$ ,* are more frequent in řtei city area and they can be registered in the period September – April. Their maximum frequency is registered in the winter months with a multi annual average of 24.3 days in January, 20.4 days in December and 19.1 days in February (see figure 4).

The data related to the number of freezing days registered in the transition seasons' months are of a great practical importance because registering temperatures below  $0^{\circ}\text{C}$  is a risk factor for some agricultural crops and harvests. By associating these temperature values with other

weather phenomena they become risk factors for other human activity fields. In March and in November the freezing days have a monthly average appearance of 13.2 days and of 10.1 days respectively. In September there were also registered cases when the daylight minimum temperature went below 0°C. These situations appear at random only, their frequency being much lower but there is the possibility of them to appear when cold masses of air of arctic-polar origin arrive over the west part of Romania. The average appearance of such days is of 0.1 days.

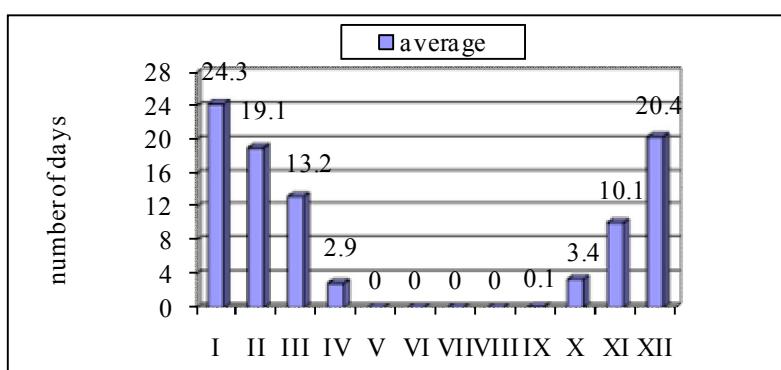


Figure 4. Monthly average number of freezing days  
(Minimum temperature  $\leq 0^{\circ}\text{C}$ ) in řtei

A higher frequency of the freezing days is registered in April and in October with an appearance average of 2.9 days and of 3.4 days respectively (see figure 4). In řtei the multi annual average number of freezing days is of 93.3 days.

*The summer days with maximum temperature of  $\geq 25^{\circ}\text{C}$*  are registered in řtei city area from March until October. The maximum frequency of these days is registered during the warm season of the year.

High temperatures are usually registered in the anti – cyclone regime, the latter being characterized through the invasion of the continental dry air from average latitudes or through the invasion of the tropical air from Central Asia or from the North of Africa. Having in view these conditions a very hot weather establishes associated with dry winds (Gaceu O., 2005).

It is of a great practical importance to know the number of days when the air temperature is higher than  $25^{\circ}\text{C}$  especially in agriculture but also in the human health area especially when these days appear during the transition seasons and when they alternate with colder periods (Teodoreanu Elena, 1997). In řtei, the period of the year which fosters the issue of the summer days is from March until October.

The monthly maximum number of summer days is registered in July when their frequency is of 19 days a month, a closer frequency being also registered in August with a number of 18.9 days (see figure 5).

In what the transition seasons months are concerned their frequency is lower. In March a low average number of summer days has been registered, of only 0.1 days a year. A low frequency is also registered in April and in October with an average of 1.3 days and of 1.6 days respectively.

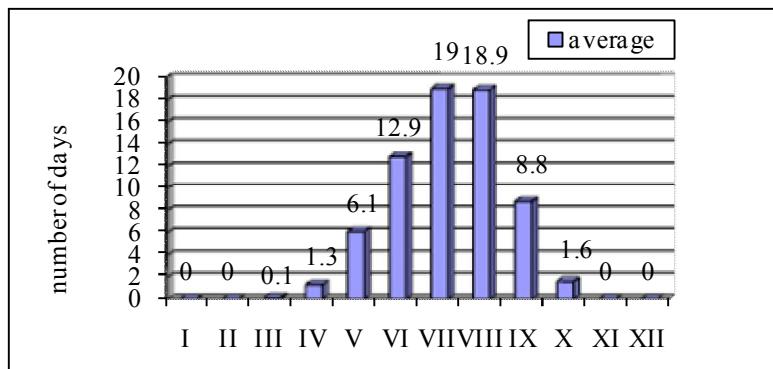


Figure 5. Monthly average number of summer days  
(Maximum temperature  $\geq 25^{\circ}\text{C}$ ) in Ștei

The number of summer days for the transition seasons is higher in the months from the end of spring and from the beginning of fall, their frequency being of 6.1 days in May and of 8.8 days in September. In Ștei, the multi annual average number of summer days is of 68.6 days.

*The frequency of the days with maximum temperature of  $\geq 30^{\circ}\text{C}$  is maximum during the warm season, the monthly period when these days can appear is between May and September.*

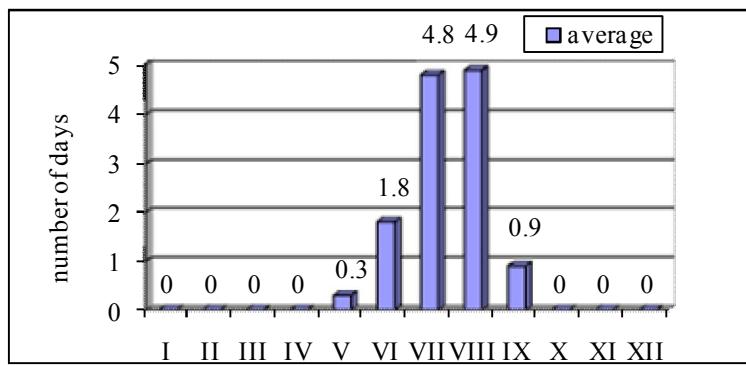


Figure 6. Monthly average number of tropical days  
(maximum temperature  $\geq 30^{\circ}\text{C}$ ) in Ștei

The main cause why these maximum daylight temperatures higher than  $\geq 30^{\circ}\text{C}$  appear is the advection of masses of hot air from the south of the continent, air masses of tropical origin. The highest monthly average number is registered in August with a multi annual frequency of 4.9 days a month. An almost equal frequency is registered in July with an average of 4.8 days (see figure 6). In the months from the end of spring and from the beginning of fall their frequency is reduced with a multi annual average lower than 1 day a month. Thus, in May there are 0.3 days and in September there are 0.9 days. The multi annual average number of tropical days is of 12.6 days a year.

## CONCLUSIONS

In Ștei city the multi annual average temperature for the period 1990 – 2011 registers a value of  $9.8^{\circ}\text{C}$ . The monthly average temperature has a normal yearly course thus the minimum air temperature value is registered in January with a value of  $-1.3^{\circ}\text{C}$ , and the maximum air temperature value is registered in July when it reaches  $19.4^{\circ}\text{C}$  resulting a monthly amplitude of  $20.7^{\circ}\text{C}$ .

The frequency of the *frost nights* for the studied period of time is of over 11. In Ștei city area, during a year, the frost nights last from November until March. The multi annual average number of *winter days* is of 19.6 days. During the year the winter days are registered in the period November - March.

*Freezing days* are produced in the period September – April with a maximum frequency in the winter months. The multi annual average number of the freezing days is of 93.3 days.

In Ștei city area, the period of the year which fosters the issue of *summer days* is from March until October, the maximum frequency being registered in July. In Ștei, the multi annual average number of *summer days* is of 68.6 days.

The frequency of the days with maximum temperature of  $\geq 30^{\circ}\text{C}$  is at its peak during the warm season; the monthly period in which these days can appear is between May and September. The multi annual average number of *tropical days* is of 12.6 days a year.

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