How to cite: Paveluc, L., Cojoc, G., Tirnovan, A., Ghindaoanu, B. (2019) *Representative Basin Trebeș-Negel - Analysis of Air Temperature Variation.* 2019 "Air and Water – Components of the Environment" Conference Proceedings, Cluj-Napoca, Romania, p. 283-288, DOI: 10.24193/AWC2019_28.

REPRESENTATIVE BASIN TREBEȘ-NEGEL - ANALYSIS OF AIR TEMPERATURE VARIATION

Larisa PAVELUC[12]✉, Gianina COJOC[2], Alina TIRNOVAN[2], Bogdan GHINDAOANU[1]✉

DOI: 10.24193/AWC2019_28

ABSTRACT. Located in the Eastern Carpathians area, the Trebeș-Negel Representative Basin represents an important hydrological objective at the Carpathian area level. It is used for research purposes and considered by Romanian Waters as representative and it is monitored since 1980. The information of the water and air temperature data has led to the consolidation of a significant database that can be used to analyze variations of water temperature influenced by air temperature which leads to the phenomenon of frost. In this study, we will investigate the variation of air temperature over a period of 8 years (from 2009 to 2017). For the first hydrometric station on the Trebeș river (Podis hydrometric station), in 2009, the ice jam has been found for 6 days in the first month of the year, the ice bridge has been found for 39 days (23 days in January, 3 days in February and 13 days in December) with an average of -2.3 ° C in January, 0.7 ° C in February and -0.7 in December. In the year of 2015, we identify the ice jam for 56 days. We can specify that the maximum temperature recorded in 2009 is 23.7 ° C in July.

Keywords (4-6): water and air temperature, Trebeș River, ice formation

1. INTRODUCTION

The Trebeș River (also known as Trebis), with the most important tributary – Negel - belongs to the lower Basin of Bistrita River, the confluence being near Bacău City (downstream Bacău Dam) at the altitude of 141.50 m (Table 1). On the right side, the most important tributaries that can be identified are the small rivers Fântana Pustnicului and Limpedea, and on the left Slatina, Cârligați and Negel. It is situated between the parallels 46°30´ and 46°40´ northern latitude and the meridians 26°40´ and 26°52´ eastern longitude (Fig. 1).

The Trebeș-Negel Representative Basin is located in a transitional climatic area, from oceanic influences, more humid and with moderate temperature, to continental influences and major thermal and pluvial discontinuities.

Throughout time both the thermal regime and the frost phenomena are kept permanently under observation so we could do this analysis, which shows that the

[1] Alexandru Ioan Cuza University of Iasi, Faculty of Geography and Geology, Department of Geography, 20A Carol I 20A Blvd., 700505, Iasi, Romania larisapaveluc@gmail.com
[2] Siret Water Basin Administration, Bacău, 1 Cuza Voda Str., 600274, Bacău, Romania

water temperature fluctuations, influenced by air temperature, lead to the emergence of the ice jam phenomenon. Our study area has 140 km^2, so in this way, we can see in more detail the changes that occur along the Trebeș River.

2. DATA AND METHODS

The hydrological data (temperatures of air and water, measurements of winter phenomena etc.) are obtained from Siret Water Basin Administration (Bacău) and it covers a period of 8 years (2009 - 2017).

Table 1. ***Morphometric data of the Trebes Basin***

Watercourse	Length (Km)	Altitude	
		upstream	downstream
Trebeș	28	375	160
Slatina	5	400	210
Cârligați	9	560	198
Negel	13	410	172

The program of observations and measurements conducted in the Trebeș-Negel Representative Basin leads to background data useful both for practical purposes and for basic research.

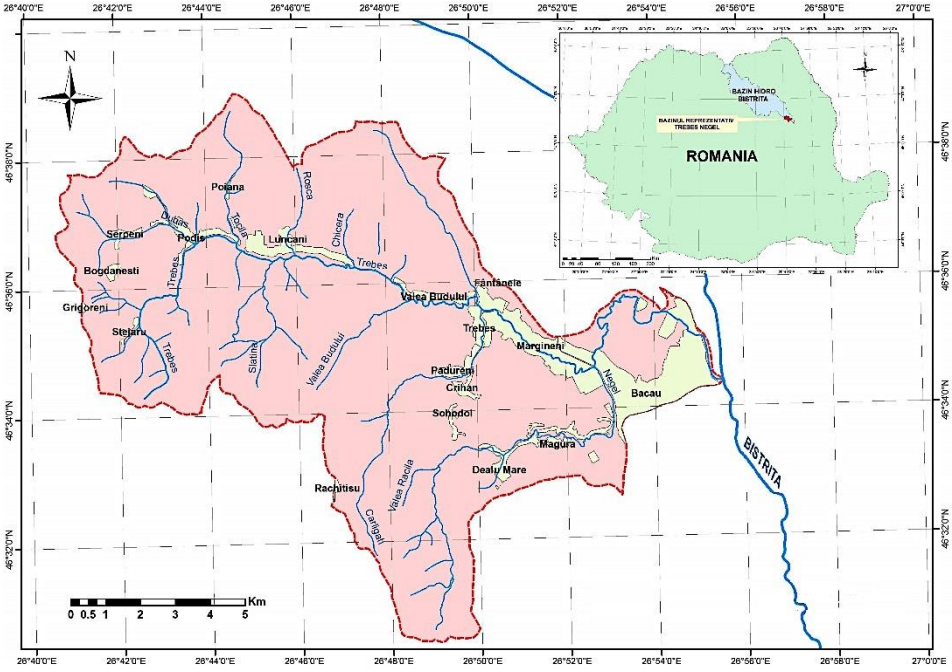


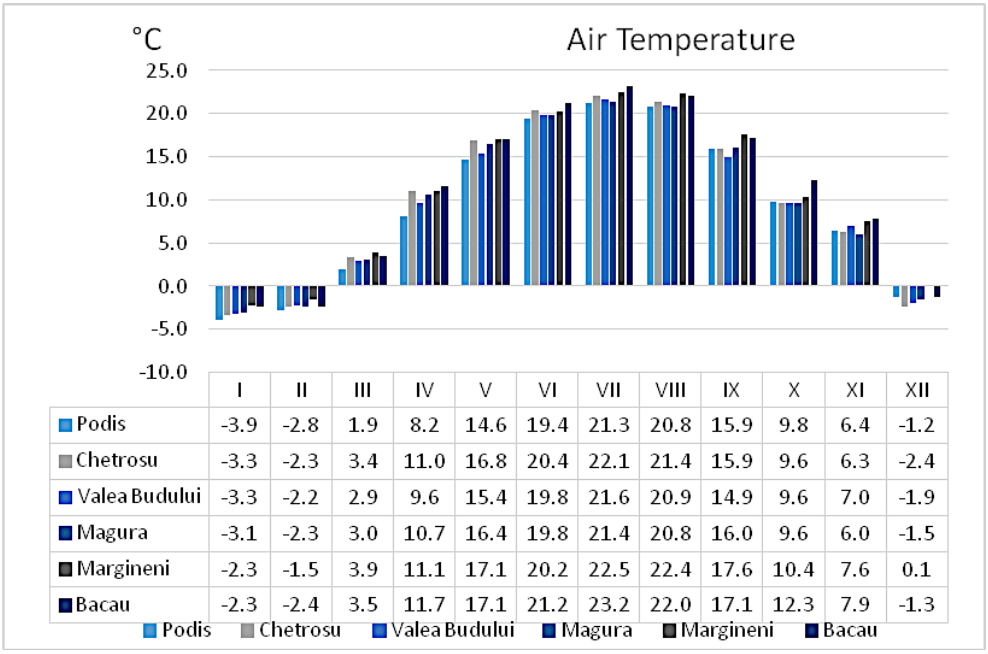
Fig. 1. Localization of the Trebeș-Negel Representative Basin and the positioning of hydrological stations

The hydrometrical stations on Trebeș River, in its upper part, are at Podis and the last, at Mărgineni. On Negel River there is only one hydrometric station – Măgura. Along the Trebeș River, there are other hydrometric stations from which we have taken information, at Chetrosu and Valea Budului. After the confluence of Trebeș with the Limpedea River, Trebeș name changes to Barnat and here the Bacău hydrometric station is located.

Observations and measurements were made in the field, minimum twice a day. The programs used are ArcGIS and Microsoft Excel.

3. RESULTS AND DISCUSSIONS

We start the study with the first year of analysis, 2009, and we meet almost all the ice formations in the year of 2012. Following a comparative analysis between the multiannual mean values (Fig. 2, Fig. 3)), the conclusion is that the air temperature variation during the year, also influences the Trebeș River area, whereas the gradual growth of air temperature and, implicitly, of the water temperature (Table 2). The exception is that the frost phenomena starts later and disappears earlier (Fig. 4).



	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Podis	-3.9	-2.8	1.9	8.2	14.6	19.4	21.3	20.8	15.9	9.8	6.4	-1.2
Chetrosu	-3.3	-2.3	3.4	11.0	16.8	20.4	22.1	21.4	15.9	9.6	6.3	-2.4
Valea Budului	-3.3	-2.2	2.9	9.6	15.4	19.8	21.6	20.9	14.9	9.6	7.0	-1.9
Magura	-3.1	-2.3	3.0	10.7	16.4	19.8	21.4	20.8	16.0	9.6	6.0	-1.5
Margineni	-2.3	-1.5	3.9	11.1	17.1	20.2	22.5	22.4	17.6	10.4	7.6	0.1
Bacau	-2.3	-2.4	3.5	11.7	17.1	21.2	23.2	22.0	17.1	12.3	7.9	-1.3

Fig. 2. The multiannual air temperatures at the hydrometrical station on the Trebeș River and at his most important tributary –Negel (2009-2017)

The multiannual average temperature of the Trebes River shows the temperature variation even if this river has a length of 28 km.

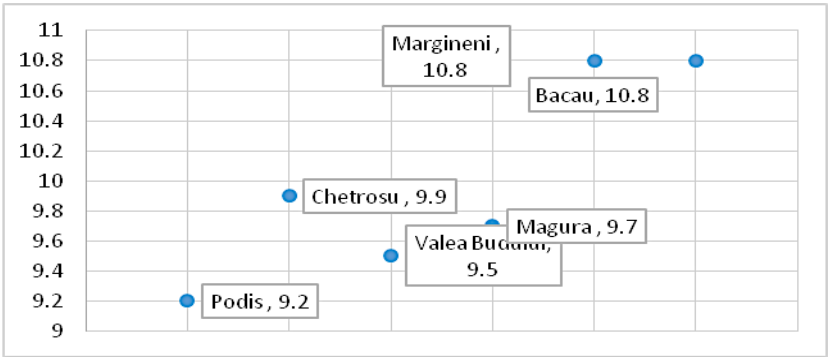
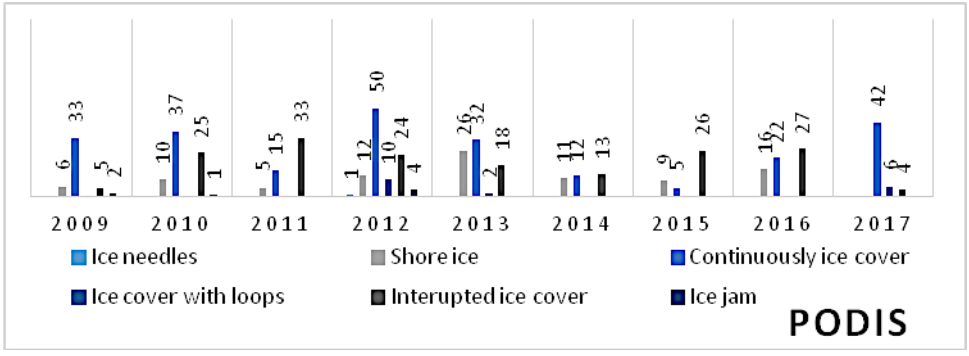
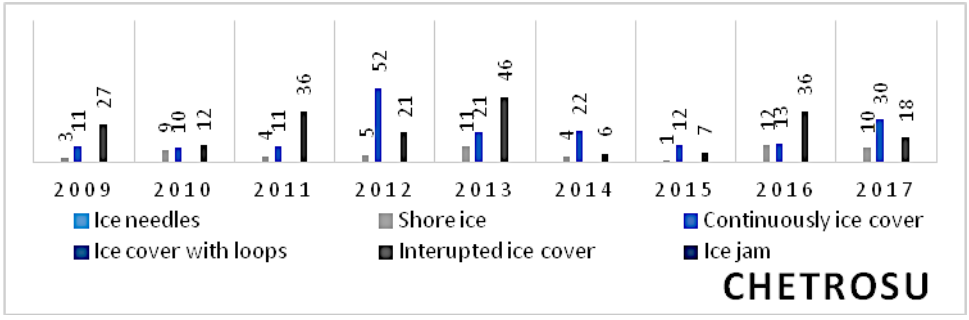


Fig. 3. The multiannual average air temperatures at the hydrometrical station on the Trebeș River and at his most important tributary –Negel (2009-2017)

Table 2. ***The minimum and maximum air temperature of these 8 years***

	Podis	Chetrosu	Valea Budului	Magura	Margineni	Bacau
Value minimum	-28.0	-26.5	-28.0	-23.0	-19.0	-24.0
Date minimum	2.II	2.II	2.II	11.II	8.I	11.II
Year minimum	2012	2012	2012	2012	2012	2012
Value maximum	38.0	39.0	38.0	34.0	38.0	37.0
Date maximum	8.VII	7.VIII	8.VII	4.VII	5.VIII	23.VII
Year maximum	2015	2012	2014	2012	2015	2009





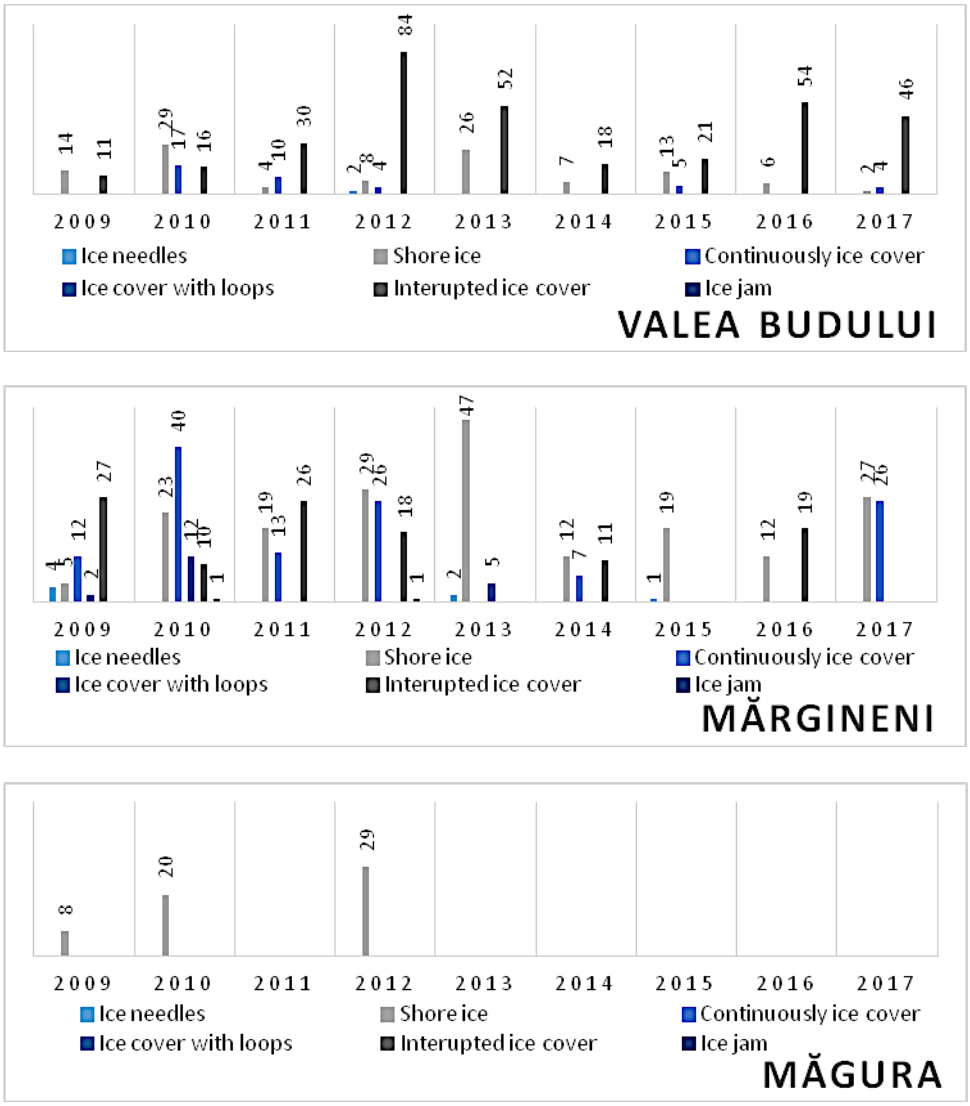


Fig. 4. Types of ice formation, at the hydrometrical stations on the Trebes River and at his most important tributary –Negel, during the period 2009 - 2017

As a result of the analysis of air temperature variation data and its influence on the water temperature, it can be seen from the above figures that the days when the winter phenomena can be identified, especially the ice bridge, are quite frequent (interrupted ice cover – 84 days at Valea Budului, continuously ice cover 40 days at Mărgineni, etc.) and are maintained particularly in December, January, that is, during the same period when the air temperature is low and conducive to the formation of these phenomena on the rivers.

5. CONCLUSIONS

The present study analyzed the variation of the air temperature and its influence on the water temperature, implicitly the winter phenomena that arise as a consequence of the low temperatures (the values were recorded at the hydrometrical stations on the main course of the river Trebeș and its most important tributary, Negel).

The most significant years are 2015 and 2013 (who have the most days of interrupted ice cover), where there are changes in the thermal regime and the associated frost phenomena represent a risk factor particularly important and frequent in this area.

The negative effects of the ice jam phenomenon require developing methods of prevention and reduction. Human intervention for the reduction of the effects of these phenomena is limited because non-structural measures are useful for the short term; meanwhile, structural measures involve some very high costs.

REFERENCES

1. ABAS (Siret Water Basin Administration) Arhive.
2. Beltaos S. (2002) *Effects of climate on mid-winter ice jams*. Hydrological Processes
3. Cojoc G. et al. (2014), *The importance of water temperature fluctuations in relation to the hydrological factor. case study – Bistrita river basin (Romania)*
4. Craciun I., Giurma I., Giurma-Handley C., Telisca M., Boboc V.(2011), *Evaluating the climatic changes in the hydrological flow regime of the moldavian areas*. Environmental Engineering & Management Journal (EEMJ)
5. Radoane M., Ciaglic V., Radoane N. (2010). *Hydropower impact on the ice jam formation on the upper Bistrita River, Romania*. Cold Regions Science and Technology
6. Romanescu, G. (2005), *Riscul inundaţiilor în amonte de lacul Izvorul Muntelui şi efectul imediat asupra trăsăturilor geomorfologice ale albiei*, Riscuri și Catastrofe, Volum IV, Nr 2, Cluj Napoca.
7. Sandu I., Pescaru V.I., Poiana I., (2008), *Clima României*, Editura Academiei Romane, București
8. Surdeanu, V., Berindean, N., Olariu, P. (2005), *Factorii geografici care determină formarea zăpoarelor în bazinul superior al râului Bistrița*, Riscuri și Catastrofe, Volum IV, Nr 2, Cluj Napoca.
9. Webb, B.W., Nobilis, F. (2007), *Long term changes in river temperature and the influence of the climatic and hydrological factors*, Hydrological Sciences Journal, 52(1), IAHS Press, UK.