

## **MONITORING HIDRO-CLIMATIC HAZARDS IN THE WESTERN PART OF THE TIMIȘ COUNTY, ROMANIA**

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### ***Abstract***

Climatic changes, so common today, are considered to be a threat to the environment and to agriculture, especially if we refer to distribution of temperature and precipitations in time, but also to the more and more accentuated increase in number of extreme phenomena. According to the definition by the European Drought Observer, this is determined by the lack of precipitations over a longer period of time, so that average precipitation values vary depending on space, the drought having to be reported to the area under study [2].

The current paper analyses the south-western part of the Timis county, represented by Sannicolau Mare, known as one of the areas most exposed to drought especially during the warm period of the year.

Two years were analysed from the point of view of the drought as a climatic hazard, namely 2015 and 2016. The climatic data originate from the Meteorological Station from Sannicolau Mare. The analysis of some indices known from specialty literature, which analyse the drought phenomena, showed that the years under study were very warm, exceeding the multiannual area average by one degree, 2015 displaying the highest temperature during the warm as well as the cold season.

Regarding the drought periods, marked by more or less intense and prolonged hygric deficits, they were registered during both years, with the difference that in 2015 this period was even more extended, from April to September with a 396.3 mm deficit, while during 2016, the drought period was shorter and divided in two, with a maximum from July-September, but the total hygric deficit was only slightly more reduced than during the preceding year.

The analysis of the climatic indices under study showed that 2015 is the driest year, and can be catalogued as droughty, as can be inferred from most of the analysed indices.

**Key words:** drought indices, hygric deficit, climatic hazard

### **INTRODUCTION**

The drought phenomenon and its two recurrent phenomena, aridity and desertification represent according to the United Nations Organization the second largest problem with global implications that humankind

confronts with, after environmental pollution. Due to the negative effects that are induced by it, drought is part of the dangerous phenomena category.

Meteorological drought, drought and the phenomena associated with it, hidric deficits and desertification respectively, represent a great problem that mankind confronts with, in the last half of century [2,5].

Droughts are the result of rainfall reduction from a certain region under the annual average, due to high temperatures, for a certain amount of time, whose size is considered of different length from one area to another

The global extent of these unwanted phenomena is underlined by the climatic data which show progressive warmth of atmosphere but also a reduction of rainfall quantities, respectively an irregular distribution of it, which leads to the occurrence of drought. [3,6].

Observations and measurements made worldwide and in Romania regarding some climatic parameters and of climate effects on water resources indicate certain signs that support the climatic change hypothesis.

#### **MATERIAL AND METHOD**

In this paper, we analyse the following factors:

- Mean monthly and annual temperatures and their evolution during the period analysed, with the differences compared to multi-annual means;

- Annual precipitations and precipitations during vegetation recorded at the Meteorological Station in Sannicolau Mare and their evolution and deviations compared to multi-annual means;

- Evapotranspiration monthly, annual and vegetation values calculated with the Thornthwaite formula; [1]

- Annual hydric indices Topor index, Hellman index, Seleaninov index [2,3,7].

Pluviometric characterization of a month is made by comparing rainfall quantities dropped in the respective month with the multi-annual average, being distributed into 9 categories [3,4].

#### **RESULTS AND DISCUSSION**

After analyzing monthly average temperatures evolution at Sannicolau Mare and their deviations towards the average multi-annual values, it can be observed in chart 1 that the year 2015 was the warmest year, followed by 2016.

In the two analyzed years annual average temperatures were superior to normal, with values between 1,7 – 1,0°C, and in the warm season the highest average temperature value was recorded in the year 2015, with an extent of normal with 1,1°C, followed by 2016, +0,5°C than normal. The warmest months from 2015 and 2016 were the ones in the cold season:

February, January, March with a temperature of 2°C more than normal, the same for November and December 2015, when were warmer with 2 degrees than multiannual average.

The year 2016 was a year from the point of view of dropped rainfall quantities, therefore, the annual rainfall sum was 640,6 mm, more than annual average (530,8mm), the same in the warm season the dropped rainfall quantity was a lot higher than normal of the warm season at Sannicolau Mare.

It can be observed from chart 3 that in the year 2015 the total hidric deficit was higher, but with a long manifestation period from April-September inclusively. The year 2016 was a year with a low hidric deficit, (chart 4) as a value and as expansion (July-September) of 336mm.

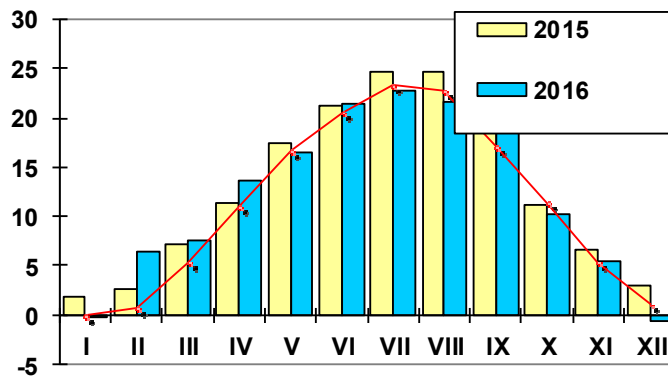


Figure 1. Monthly mean temperatures in the years 2015-2016

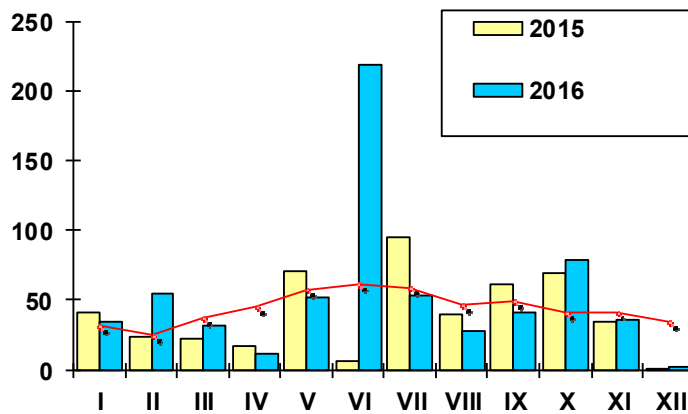


Figure 2. Monthly mean precipitations in the years 2015-2016

*Table 1*

Pluviometric Characterisation after N. Topor Index in the period 2015 – 2016  
In Sânnicolau Mare

Studied year	Normal months	Rainy months	Droughty months	Pluviometric index value Ia	Year characterisation
2015	1	5	6	0,84	Drought year
2016	2	3	7	0,5	Very drought year

*Table 2*

Characterization after Hellman criterion of the period 2015-2016 at Sânnicolau Mare

YEAR	MONTH	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2015		LFP	LN	LFS	LES	LP	LES	LEP	LPS	LP	LEP	LPS	LES
2016		LN	LEP	LPS	LES	LN	LEP	LPS	LFS	LPS	LEP	LPS	LES

*Table 3*

Characterisation of the years 2015, 2016 in Sânnicolau Mare depending on the main climate indices

Climatic type depending on indices	P – ETP (mm)	Donciu Index	Thornthwaite Index	De Martonne Index	Majercakova 2007 Index	Lang Index
<b>2015</b>	-304,5	61,3	-38,7	21,2	89,9	37,9
<i>Interpretation</i>	Semi -arid	Semi -arid	Semi-arid Climate	Semi wet climate	Dry	<b>mediteranean climate</b>
<b>2016</b>	-110,3	85,3	14,7	29,1	119,7	53,4
<i>Interprtation</i>	Medium dry	Medium dry	Medium dry climat	Semi wet climat	Wet	Semiarid climate

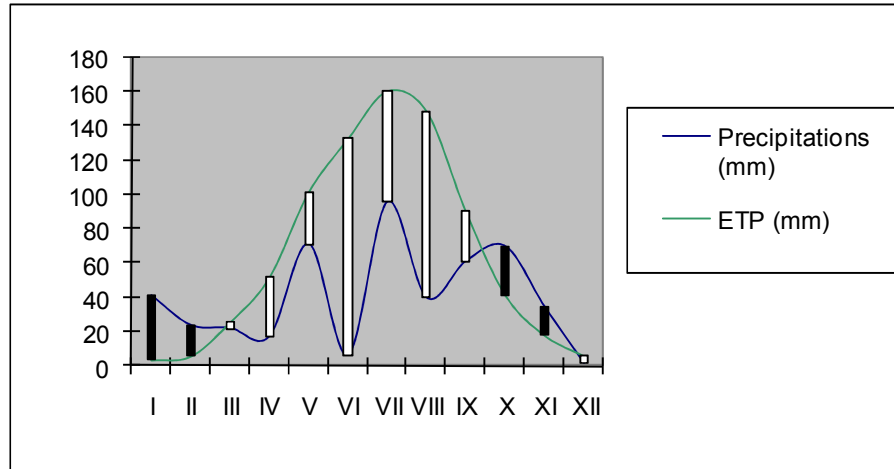


Fig. 3. Hydroclimatic result in the conditions from Sannicolau Mare 2015

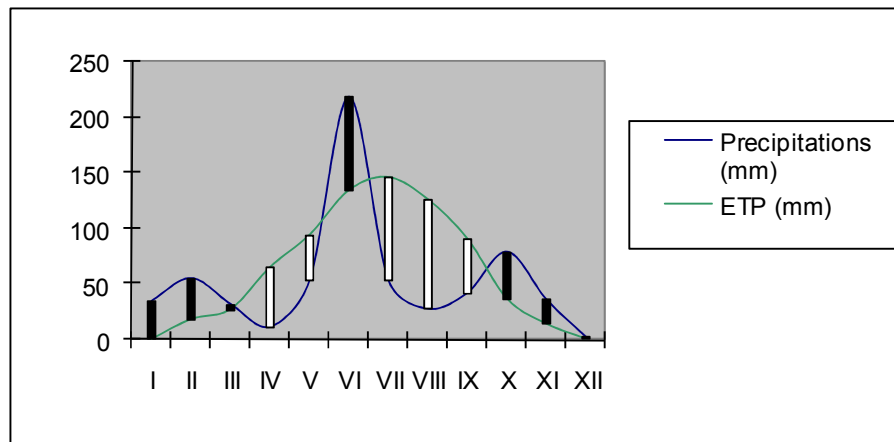


Fig. 4. Hydroclimatic result in the conditions from Sannicolau Mare 2016

## CONCLUSIONS

After analyzing the years 2015-2016 at Sannicolau Mare, the result is that the year 2015 was the warmest year, the annual average temperature was of 12,7°C, followed by the year 2016 with the average annual temperature of 12,0°C, comparatively with the area's normal of 11°C.

From a pluviometric point of view, the year 2016 was an excedentary year in rainfalls, when annual sum of rainfall was considerably higher than normal, but in 2015 annual sum of rainfall was less than normal with 49 mm.

The highest hidric deficits were recorded in the year 2015, from April until September (396,3mm) while in the year 2016 the hidric deficit was rmportant (336mm) having an extremely short period of manifestation, April-May and July-September;

Depending on the main climatic indexes, Donciu index, Thornthwaite index, de Martonne index, global humidity Thornthwaite index, Lang index the years 2015 and 2016 were semi –arid, medium dry, dry, especially the year 2015.

The Topor index shows that the year was 2015 droughty and very droughty and 2016 a slighly rainy year.

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