

RAZGLEDI**A SUPPLEMENT TO THE KNOWLEDGE OF THE
ATMOSPHERIC PROCESSES OVER VOJVODINA**

AVTORJA

Milan Radovanović

Naziv: dr.

Naslov: Geographical institute »Jovan Cvijić«, Serbian academy of sciences and arts, 9 Djura Jakšić,
CS – 11000 Belgrade, Serbia and MontenegroE-pošta: rmilan@net.yu

Telefon: +381 11 636 594

Faks: +381 11 637 597

Željko Bjeljac

Naziv: dr.

Naslov: Geographical institute »Jovan Cvijić«, Serbian academy of sciences and arts, 9 Djura Jakšić,
CS – 11000 Belgrade, Serbia and MontenegroE-pošta: gijcsanu@eunet.yu

Telefon: +381 11 636 594

Faks: +381 11 637 597

UDK: 551.5(497.113)

COBISS: 1.02

IZVLEČEK

Prispevek k poznavanju atmosferskih procesov nad Vojvodino

Članek obravnava nekatere vremenske pojave in procese v Vojvodini (Srbija in Črna gora), ki so povezani z nastankom in prehodom polj nizkega zračnega pritiska. Avtorja menita, da bi za dokončno potrditev nakazanih domnev potrebovala več meteoroloških podatkov. Hkrati sta prepričana, da bi bilo pri preučevanju podnebja v prihodnje treba nameniti večjo pozornost ekstremnim vremenskim razmeram.

KLJUČNE BESEDE

zračni pritisk, podnebje, ciklon, košava, Vojvodina, Srbija in Črna gora

ABSTRACT

A supplement to the knowledge of the atmospheric processes over Vojvodina

The paper discusses some weather phenomena and processes in Vojvodina (Serbia and Montenegro) that are related with the formation and the transition of cyclones. In order to prove their observations the authors think far richer meteorological database should be needed. Further on more attention to extreme weather situations should be paid.

KEYWORDS

air pressure, climate, cyclone, košava, Vojvodina, Serbia and Montenegro

Uredništvo je prispevek prejelo 24. marca 2003.

1 Introduction

In this paper we tried to point at determined climatic appearance and processes, which on traditional way presented, didn't get satisfied answers. It is about Vojvodina importance, as a part of Pannonian plain in view of cyclone creation, average maximal and minimal values of air pressure in determined part of year showing, interpretation of statistics indicators and air movement.

The economy and life in general, not only in Vojvodina greatly depend on the climatic conditions. When it is agriculture about which represent the basic activity of the northern part of Serbia it isn't necessary to emphasize the importance of the regime of some climatic elements. In the first place because of the terrain configuration, the large part of them is characterized by relatively even space arrangement. Having in mind that the air temperature, precipitations, relative humidity, etc. greatly depend on the air masses characteristics we'll try to make clear some specifications that are very characteristic for the territory of Vojvodina and its surrounding.

Above all it is about an unexcused emphasizing January and July as those parts of the year in which maximum and minimum average values of an air pressure appear. It is also noticed that the Pannonian plain represents a very important factor in forming the cyclones. An impression could be got that this fact isn't studied properly in expert literature. As far as we know, from this aspect the existing processes haven't been connected not even with the *košava* speed, except in forecast meteorology. At this moment we don't have a satisfied fund of data on the basis of which the quoted questions could be elaborated in details. However, on the basis of the current knowledge we would like to point to a little different approach in understanding the existing phenomena and processes.

2 An air pressure distribution

On the basis of the measured values (that is average month and annual air pressure reduced on 0°C) the territory of Vojvodina is situated in the range with the highest air pressure in Serbia. The average annual value varies from 1001 to 1007 mb. It seems that the stated index coincides with the bending of the Pannonian plain towards Southeast, so that the maximum values calculated for the Southeastern Peripannonian edge that is Timočka Krajina are the following: Veliko Gradište 1007.4 and Negotin 1011.8 mb (Radovanović 2001). We should also remark that a very small number of scientific papers are based on such values. Meteorologists the most often use the index of reduced air pressure on the sea level that is understandable if we bear in mind the character and nature of their researches. When it is reduced values about even in the college literature January and July are emphasized as the months with the extreme values during the year. The exception represents the terrains with the higher altitude, which in general isn't very important for Vojvodina. However, not only in Vojvodina, the minimum appears in April,



Figure 1: Ground floor situated position at 1 hour 24. 1. 1963 (Bilić 1976).

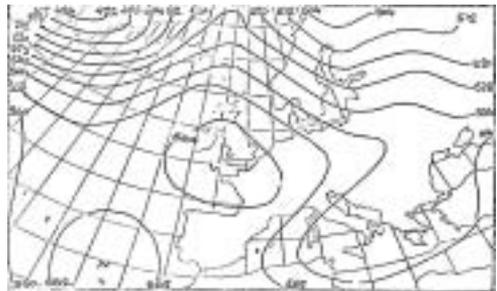


Figure 2: Simultaneous height position at 500 mb at 1 hour 24. 1. 1963 (Bilić 1976).

and the maximum in October. Though in many cases average October and January pressure values are very close. The reduced values give different picture. The highest air pressure in this case is related to the Peripannonian edge and Pomoravlje to Leskovac. The territory of Vojvodina is now characterized by the similar values as the region around the Zapadna Morava and Timok rivers. Observed in this way the maximum values are now really in January, but the minimum is still in April.

The basic cause of high pressure in January is closely connected with the breaches of cold air masses from the north. However, they could be from a great importance in October also and that is reflected to the high values of both measured and reduced air pressure in this part of the year. Contrary to that, relatively frequent passing of depressions in April cause the barometer minimums lower from those, when the maximum month precipitations occur. Thus it comes that cyclones that appear in April, although they are rarer than those in May, that is in June, in accordance with the atmospheric processes of the wider surrounding, have on the average lower pressure, but less month precipitations.

As a characteristic example of the air pressure influence to the air temperature we could mention the situation that happened in January 1963. A very expressed anticyclone that appeared after the breach of the continental arctic air masses from the Northeast caused the temperature fall under -30°C at some stations of Vojvodina (as well as in many places of the whole Serbia). In Vrbas and Vršac it was then noted the absolute negative extreme of -32.6°C . As an illustration we could mention that on the basis of uncompleted series indeed, the absolute minimum for Kopaonik (1711 m alt) was -31.0°C (7.3.1987.). Observing on this way the accumulating cold air masses by its intensity exceeds the influence of the altitude.

3 Cyclogenesis and the cyclone passing over Vojvodina

It is known that the western Mediterranean in the cold part of the year is the area with the most frequent cyclone appearing in the north hemisphere. In general, in the land part of the Balkans the cyclogenetic processes are very rare. It is interesting that the Pannonian plain, that is Vojvodina, appears here as more active center than any other neighbouring and not only neighbouring geographic region. It is very hard to get over an impression indeed that to an existing situation the configuration of the terrain that is the morphological structure of wider surrounding has a direct influence. Relatively spacious area of the Pannonian plain is fully expressed because if the area is smaller then such quantity of formed cyclones would be probably left out. The significance of the cyclogenesis of this part of Serbia is also fully expressed if we have in mind that on the 1/6 of the total presented area 65% of the



Figure 3: The frequencies of cyclogenesis in wider surrounding of former Yugoslavia in period 1951–1960 (Radinović 1981).



Figure 4: Identified cyclone centers in wider surrounding of former Yugoslavia in period 1951–1960 (Radinović 1981).

cyclones are formed. Contrary to that (figure 3 and 4) the author states that on over 25% of the territory not only one cyclone emerged in the observed period. In addition to a statement that the role of the relief in forming as well as in the cyclone passing is very important we could conclude that the cyclone appearances on the higher relief forms are very rare. The author we've already mentioned, studying this problem in details still emphasizes that it is about the depression of: »... *the small intensity and short lasting activity*...« and that we should have them in mind while studying the climates of our area. However, it is necessary to point to some more facts, which are not suitable to the quoted statement. First of all we would like to say that we don't have enough data that is results for the temporal series from 1961–1990 as the WMO recommends. If we accept Radinović's data as satisfied then on the basis of the current knowledge we could not speak about exclusively »small intensity« of noticed cyclones.

Namely, it often happens that intensive precipitations cover some parts of Serbia, but smaller or larger areas of Vojvodina, too depending on the development of the synoptic situation. Such cloud-burst is characteristic for cyclones that are moving down the valley of the Sava river towards east mainly in spring. We still don't know why is only emphasizing the spring cyclone passing standardized in our literature. Maybe it could be inappropriate at this moment, but even Vujević (1953) for much older period (1901–1930) established that they are not so rare even in April and November (13% of the annual value of appearing each). Mountains in the Valjevo region (about 1000 mm of precipitations to approximately 1000 m alt) get almost the same precipitation quantity during the year as Stara planina gets which has two times higher altitude than mountains of Valjevo. If in the case of Povlen, Maljen and other mountains of western Serbia is about the combination of cyclone moving and relief influence to the extract of the precipitations then the same explanation cannot be used in case of Vojvodina, too. Abundant extract of mainly short lasting rains followed at the same time by flooding the river courses needs additional explanation for northern parts of Serbia. For this reason an impression could be got that the data from figures 3 and 4 have greater importance that is their activity has greater importance to the regional atmospheric processes, as well as to the precipitations than it was meant till now. Above all, the variation coefficient (C_v) of mean month precipitation sums point to this, too. Namely, it has been shown that almost all stations in Vojvodina, have the lowest values of precipitations spreading in relation to the average, just in months when the cyclone comings are the most frequent. In other words, the precipitations are the most equalized in June, April and November.

While explaining mentioned processes it is very important to point out the opinion of the contemporary climatology that the sharp division of precipitations on frontal, convective and orographic is not always possible. It is obvious that only one of mentioned sorts could emerge but mostly there are combinations while one of the components could prevail over or they are approximately equally important. So we don't have solid proofs that the mentioned cyclones represent the main factor of forming the precipitations. This is a very complex mechanism and a large number of combinations of the development of temporal states that is differently manifested at relatively homogeneous terrain.

Interesting results were got for the standard deviation, which is for the average dispersion of air temperatures in a relation to the month average. From 78 main meteorological stations in Serbia a large number of them showed that December is more stable then any other winter month. It came out that only Palić and Novi Sad Rimski Šančevi have the same values for November and December (2.0 and 2.1°C each). In Bačka Topola, Šid, Sombor, Sremska Mitrovica, Vrbas, but also in Negotin and Vladimirovci, the differences between November and December are to 0.1°C. It is necessary to explain why do the end of autumn and the beginning of winter have considerably higher temperature stability than other winter months. They are otherwise characteristic by the frequent changes of air masses of different temperature characteristics. At large number of stations the dispersion in December is smaller than in March, but at some stations it is smaller even in April or they are at the same range (Radovanović 2001).

One more very important moment that goes together with previous thoughts is related to the *košava*. This question as far as we know hasn't still got a satisfied geographic explanation. The question is why

does the highest speed of this wind that is the largest intensity appear exactly in the southeastern part of Vojvodina that is in Vršac. Maybe it is better to say that mentioned cyclones haven't been taken into relation with the *košava* speed adequately till now. As Penzar thought (1977) the largest intensity winds could have in March and April (Belgrade), but autumn cyclones could also cause high wind speeds in a range of *košava*. In Vršac, mean speed is 11.8 m/s in January. To get a very precise answer to this question it is necessary to have long enough series of synoptic observings. Namely it is clear that almost half of the cyclones follow already determined paths. It happens very often that they change their direction that could not be strictly classified not a one of known paths. Sometimes it happens that they move contrary to the average direction. Unfortunately, such database is still very hard to get to.

4 Povzetek: Prispevek k poznavanju atmosferskih procesov nad Vojvodino

(prevedel Mauro Hrvatin)

Na temelju zbranih meteoroloških podatkov smo poskušali izpostaviti nekatere vremenske pojave in procese, ki so povezani predvsem z zračnim pritiskom. Posredni meteorološki kazalci kažejo na domnevno povezanost med cikloni, ki nastajajo nad Vojvodino ali se nad to pokrajino le pomikajo, in nekaterimi podnebnimi procesi. Za dokončno potrditev nakazanih domnev bi potrebovali veliko večjo količino podatkov.

V prihodnje bo treba nameniti večjo pozornost tistim časovnim obdobjem v okviru leta, ko nastopajo ekstremne vremenske razmere, in s tem preseči stereotipni pristop v raziskovanju. V skladu s sedanjim razvojem geografskih informacijskih sistemov upamo, da bomo v prihodnosti lahko predložili dejanske dokaze za dosedanje domneve.

5 References

- Bilić, V. 1976: Klima Loznice i njen uticaj na društveno-ekonomsku aktivnost grada i okoline. Doktorska disertacija, Geografski fakultet Univerziteta u Beogradu. Beograd.
- Dukić, D. 1981: Osobine vetrova u jugoistočnoj Bačkoj. Glasnik Srpskog geografskog društva 21. Beograd. Hidrometeorological annual books I and II for period 1961–1990. FHMI. Beograd.
- Janković-Golubović, J. 1992: Anliza vetra na području Srbije. Zbornik radova RHMZ. Beograd.
- Milosavljević, M. 1950: Fizičke osobine vetrova u Beogradu. Beograd.
- Penzar, B. 1977: Tlak zraka, vjetar. Prilozi poznavanju vremena i klime SFRJ, 2. Beograd.
- Radovanović, M. 2001: Uticaj reljefa i atmosferske cirkulacije na diferencijaciju klimata u Srbiji. Doktorska disertacija, Geografski fakultet Univerziteta u Beogradu. Beograd.
- Radinović, Đ. 1981: Vreme i klima Jugoslavije. Beograd.
- Radinović, Đ. 2000: Metodologija za izradu klimatografije Srbije. Elaborat na RHMZ. Beograd.
- Ranković, S., Radičević, D. et al. 1984: Opšte karakteristike raspodele padavina u Jugoslaviji. SHMZ, Prilog uz karte Atlasa klime Jugoslavije, 2. Beograd.
- Vujević, P. 1953: Podneblje FNR Jugoslavije. Arhiv za poljoprivredne nauke 6–12. Beograd.

