

# THE COMPARISON BETWEEN TWO EARLY BLIZZARD EVENTS OCCURRED IN ROMANIA DURING THE TIME

CIURLĂU DORUȚA<sup>1,2</sup>, SASU MONICA<sup>2</sup>

**ABSTRACT.** - The comparison between two early blizzard events occurred in Romania during the time. The blizzard is the most complex phenomenon that usually occurs during the winter season, the time period between December and February. But, in some specific synoptic conditions, blizzards can occur in November or even March, Moldovan (2003). An early blizzard episode that occurs in October it is an extreme event with severe consequences over people, environment and agriculture. In Romania, since the first synoptic observations are made, the earliest blizzard phenomenon was recorded on October 21, 1931 at Dorohoi (Botoșani County–North Romania) and another one on October 22, 1938 at Sinaia (Prahova County–South-East Romania). At Bucharest the earliest blizzard phenomenon was recorded on October 27, 1912, Bălescu and Beșleagă (1962). In southeastern Romania, the third decade of October 2014 was marked by the Arctic perturbation over Europe and that's why on October 25 was triggered the winter specific phenomenon - blizzard. The time duration of the phenomenon was only 5 to 8 hours, but its consequences over environment and society were significant-the impact on military aviation that could not operate on that day and also the impact on agriculture (cultures with unfinished cycle of vegetation). In this paper is presented a comparison between two early blizzard events: the one in October 1912 and the one in October 2014, using the synoptic interpretation for both cases.

**Keywords:** early blizzard phenomenon; synoptic comparative analysis

## 1. INTRODUCTION

A blizzard is a severe weather condition characterized by low temperatures and strong winds bearing a great amount of snow, either falling or blowing, Bom.gov.au (2012).

Based on the complexity of the phenomenon, several types of blizzard can be distinguished: general blizzard, snow blizzard, ground blizzard, blowing snow. *General blizzard* is usually the most complex phenomenon that includes all the elements: snow, strong wind, dispels and snow transport both on ground and in altitude, sometimes being impossible to distinguish whether there is fresh snowfall or just the snow on the ground being dispelled. *Snow blizzard* is the phenomenon during which snow is associated with high wind speed. *Ground blizzard* is the

---

<sup>1</sup> University of Bucharest, Faculty of Geography, 72000, Bucharest, Romania  
E-mail: [dora.ciurlau@gmail.com](mailto:dora.ciurlau@gmail.com)

<sup>2</sup> National Meteorological Administration, Bucharest, Romania  
E-mail: [sasu.monica@gmail.com](mailto:sasu.monica@gmail.com)

phenomenon, during which the wind is blowing hard, dispelling the snow on the ground, without any fresh snowfall at the same time. Note that not every storm can be considered a climatic risk phenomenon because the wind speed and the amount of snow falling or the snow shattered during snowfall in the air or on the ground varies greatly both in time and space. Often, freshly fallen snow can be shattered by winds at speeds below  $10 \text{ ms}^{-1}$  without being considered a climate risk. These are moderate storms. Their effect is the accumulation of snow around shelters and unveiled crops, which, in the absence of snow, are subject to winter frosts, Lungu and Panaitescu (2010).

Over the years blizzard, which is a complex phenomenon that affects daily activities and environment, represents an important research for forecasters. Since the inauguration of the MetService in Romania (Bucharest, 30 June 1884) was made observations on this phenomenon and beginning with 1950 were archived in a data base.

The blizzard phenomenon is characterized by the time period of its occurrence—the winter season. But, over time, have been reported phenomena that happened in October, November or March. Citing older documents about the blizzard occurred in October, one would be the phenomenon of 13 October 1740. After 1900, the earliest blizzard phenomenon was reported so far in southeastern Romania on October 27, 1912 (eastern Muntenia, coastal Black Sea and Moldova). But, the blizzard episode in October 25, 2014 is now the earliest blizzards in southeastern Romania.

The synoptic comparative analysis that led to the onset of this phenomenon in both October 1912 and 2014 has a real practice importance in research.

In previous climatologically studies, Bălescu and Beșleagă (1962) found that the annual average number of days with blizzard recorded at the Romanian weather stations in October, is between 0.02 (Huși, Galați, Bucharest-Filaret) and 0.12 (Sinaia) (Tab.1). In the time period between 1961 and 2012, in southeastern Romania, there was no blizzard phenomenon recorded in any of weather stations; this is one important reason why the study of synoptic conditions that led to the onset of the phenomenon would be useful to research.

**Tabel 1. The absolute frequency of the days when blizzard occurred in October (Bălescu and Beșleagă, 1962)**

The weather station	Dorohoi	Cămpulung Moldovenesc	Fălticeni	Cotnari	Huși	Trigu Oena	Tecuci	Brașov	Sinaia	Sihăreț	Bucharest Filaret
The absolute frequency	0.04	0.1	0.07	0.05	0.02	0.02	0.02	0.05	0.12	0.05	0.02

## 2. DATA AND METHODS

For this study have been used meteorological data provided by the Romanian National Meteorological Administration (NMA) from weather stations located in eastern and south-eastern Romania.

The synoptic analysis of the two blizzard episodes was based on:

- The Global Model GFS maps ([www.wetter3.de](http://www.wetter3.de); [www.wetterzentrale.de](http://www.wetterzentrale.de)) for the first studied case, October 1912;

- Numerical weather models, such as the spectral limited-area ALARO model—the new version of the ALADIN model (Aire Limitée Adaptation dynamique Développement InterNational) and the global European Centre ECMWF spectral atmospheric model were analyzed for the presence of the early blizzards in October 2014 over South and South-Eastern Romania.

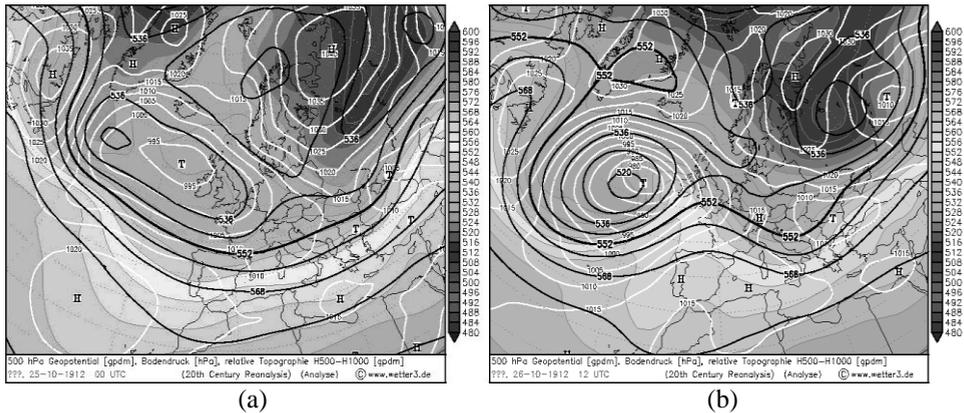
## 3. RESULTS AND DISCUSSIONS

In order to a blizzard form, are three things needed: the air needs to be cold at the surface (below freezing) to form the snow, the atmosphere has to have a lot of moisture to form the clouds and precipitation, and a good amount of lift to cause the warm air to rise over cold air (warm air is needed to also form clouds and cause precipitation).

In this point of the paper, by synoptic analyses of both extreme events (1912 and 2014), it be demonstrate that the weather conditions were favorable an early blizzard happened.

### 3.1 The first studied case, October 25-27, 1912

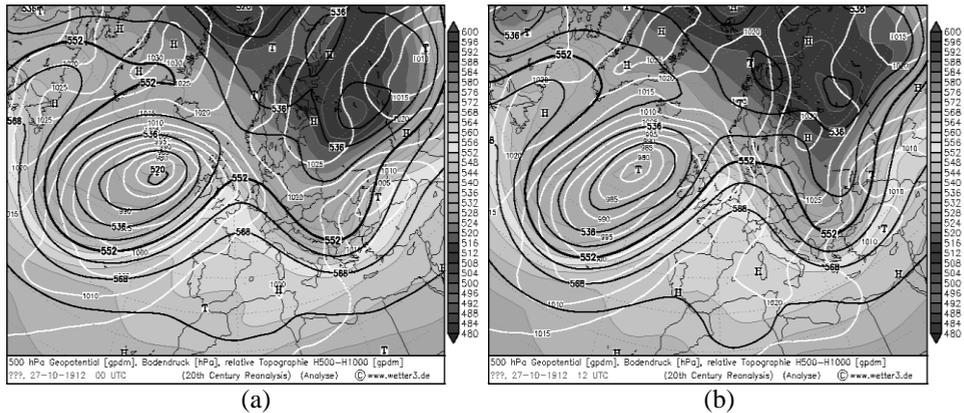
The early blizzard phenomenon on October 1912 had the lifetime from its inception along a propagating frontal trough to cyclogenesis, occlusion and decay of 3 days between 25<sup>th</sup> and 27<sup>th</sup>. The surface weather map at 0000UTC, 25 October 1912 show an area of high atmospheric pressure, formed over Iceland and having the center across West England. This area crossed the Western Europe reaching the North of Mediterranean Sea having values less than 985hPa. In Fig.1a it can be seen the synoptically conditions that influenced this early blizzard. The northern part of Europe was dominated by the East European anticyclone whose center was above the White Sea and North-West Russia. This anticyclone reached southern latitudes to our country. The next day, 36 hours later (26 October 1912, 1200UTC) (Fig.1b), few nuclei were formed at the surface being independent one of each other. One of them extended over northern Balkan Peninsula, Romania and the western half of the Black Sea. Meanwhile, the anticyclone occupies the northern half of Europe and moved reaching our country. The altitude warm air masses over Black Sea reached the surface cold air masses over Romania. Those provided a consistent picture of the cyclogenetic process over Black Sea by low values of temperatures and high quantity of precipitation.



**Fig.1. Surface weather maps and maps of 500 hPa data at 00:00 UTC, 25 October 1912 (a) and 12:00 UTC, 26 October 1912 (b) (GFS maps)**

The severe cold weather with characteristics of a winter season (strong wind that blew the snow), was due to the high values of the both horizontally and vertically thermal and pressure gradients.

The early blizzard phenomenon on October 1912 lasted 10 to 15 hours affecting the South and South-East Romania. The maximum intensity of this extreme event was occurring in the morning of October 27, 1912 as the Fig. 2 shows (the area of a high atmospheric pressure over Romania).

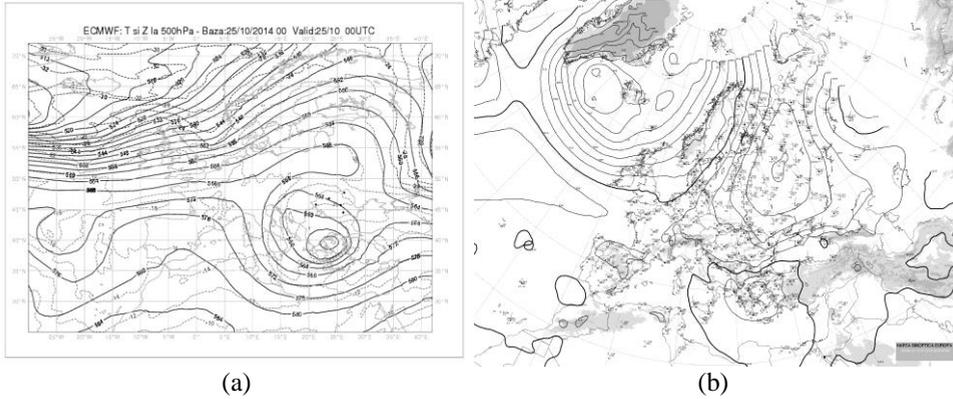


**Fig. 2. Surface weather maps and maps of 500 hPa data at 00:00 UTC (a) and 12:00 UTC (b), 27 October 1912 (GFS maps)**

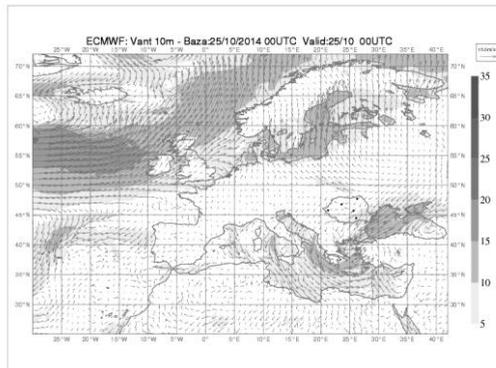
### 3.2. The second studied case, October 25, 2014

On Saturday, 25 October 2014 the gentle rain was transformed into a dangerous storm with high winds, lower temperatures and heavy snow. Europe was crossed by a vast ridge, the Mediterranean Cyclone that overnight continued to intensify having values of 552gpdm at 500hPa level (Fig. 3a) and rapidly pressure falls at the surface (Fig. 3b). The center of this ridge was situated South-West

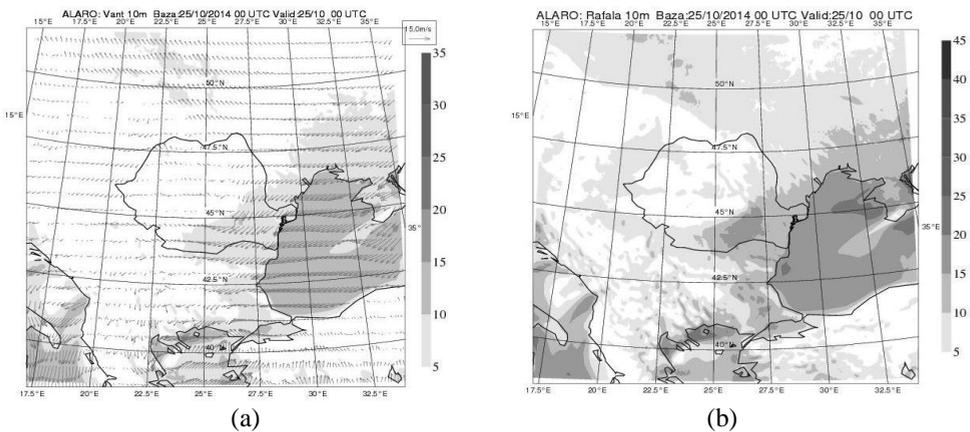
Romania and during the day, cyclone drifted slowly eastward across Romania (see the wind direction in Fig. 4).



**Fig. 3.** 500hPa temperature and geopotential at 00:00 UTC, 25 October 2014 (ECMWF maps) (a) and surface weather map at 00:00 UTC, 25 October 2014 (National Meteorological Administration database)



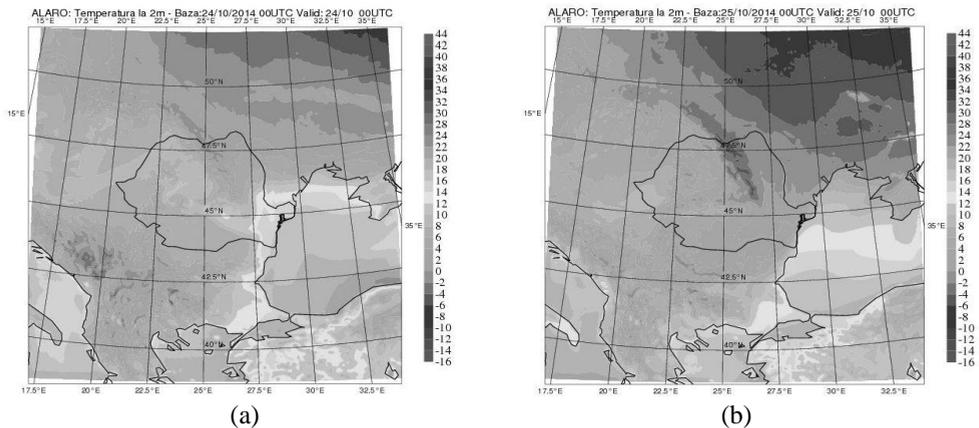
**Fig. 4.** Wind speed and direction at 10m at 00:00 UTC, 25 October 2014 (ECMWF map)



**Fig. 5.** Wind speed and direction at 10m (a) and wind gust (b) at 00:00 UTC, 25 October 2014 (ALARO maps)

In our country, the weather conditions for an early blizzard were favorable with heavy snow and strong wind reaching values of 10 to 15 ms<sup>-1</sup>, locally 20 ms<sup>-1</sup> (Fig. 5a and b).

The pressure structure caused a sudden cooling over Romania and the temperature values recorded at the weather station had deviation up to 14° C lower than the climatologically norms. This cooling it can be seen also in the differences between 2m temperature at 0000UTC, 24 October 2014 and 2m temperature at 0000UTC, 25 October 2014 (Fig. 6a and b).



**Fig. 6.** 2m temperature at 00:00 UTC for 24 October 2014 (a) and 25 October 2014 (b) (ALARO maps)

### 3.3 The similarities and differences of both early blizzard episodes

This paper discusses two episodes of severe weather through a synoptic comparison of weather conditions that led to early blizzard formed and developed.

Taking into account the synoptic context for both of the extreme events, the main characteristic was the area of high atmospheric pressure at the North and East Romania and the area of low pressure at the West and South Europe that cross the Balkan Peninsula and reached Romania.

Being a comparison between two early blizzard phenomena, the results are the similarities and differences of the episodes.

#### **The similarities are:**

- The October 2014 blizzard was produced by a strong low-pressure system similar to condition identified in October 1912 blizzard.
- The mature phase of the synoptic system featured 500hPa height of 552gpm over Romania in 2014 and 558gpm in 1912.
- The atmospheric blocking was present in both studied cases highlighted by the 558gpm isohypses present at 500hPa maps.
- In both early blizzard episodes the meteorological conditions were the same: strong wind, blowing snow and low temperatures.

- The time duration for first episode was 10 to 15 hours and 5 to 8 hours in the second studied case, so, for both, a small period of time.

**The differences are:**

- The position of the anticyclone over the North-East Europe in October 1912 is different that the position of the same anticyclone situated between two cyclones in October 2014.

- The day before the blizzard episode in October 1912 was characterized by the area of low pressure that had few nuclei and one of them was situated westward the Black Sea.

- In the day before the blizzard episode in October 2014, the South-East Europe ridge didn't get the Black Sea.

## **CONCLUSIONS**

The character of climatic risk phenomenon, which we attribute to blizzards, is very well emphasized by the consequences produced. Due to high wind speed and the amount of fallen snow during blizzards, there are numerous consequences - sometimes very serious – on the environment and economy.

It is known the fact that on the territory of Romania, the largest annual average number of days with blizzard has been recorded during the time in eastern and southern regions "the highest annual average values are recorded here, between five and seven days", Bălescu and Beșleagă (1962), because of the sewage effect caused by the orographic barrier of the Curvature Carpathians and the thermal barrier represented by the Black Sea.

An early season blizzard in October causes severe infrastructure damage and economic losses to businesses and agricultural communities. Such early blizzard episodes occur when the Mediterranean cyclones cross Balkan Peninsula and reach the vicinity of Romania, on a path leading across the western Black Sea acting as an area of high pressure to the East. The Mediterranean cyclone was recharged with moisture above the Black Sea and in contact with cold mass air over much of the country has led to blizzard.

During the years, the earliest blizzard phenomenon in Romania was reported at Dorohoi in 21<sup>st</sup> of October 1931, but for Bucharest the earliest blizzard was the one that reported in 27<sup>th</sup> October 1912 since last year when on 25<sup>th</sup> October 2014 a new record have set.

The paper represents a comparison between two early blizzard events made by analyzing the synoptic conditions when each event occurred. For both cases, the synoptic situation over Europe was similar: North Europe was influenced by the Iceland trough and the Mediterranean Cyclone located in South and South-East Europe that contributed to the occurrence of both extreme winter events which last few hours but with huge consequences in economy and agriculture.



a)

b)

*Images from the early blizzard day, October 1912 (a) and October 2014 (b)*

### **Acknowledgments**

My appreciation goes to PhD Marinică Ion, Mrs. Vilciu Constanța and Mrs. Ionescu Alina.

### **REFERENCES**

1. Bălescu, O. and Beșleagă, N. (1962), *Viscoalele în Republica Populară Română*, CSA, IM, Bucharest.
2. Lungu, M. and Panaitescu, L. (2010), *Blizzard – Venture hydrometeor in Dobrogea*, Present environment and sustainable development, nr. 4
3. Moldovan, F. (2003), *Fenomene climatice de risc*, Echinox Press, Cluj-Napoca.
4. \*\*\* (2008), *Clima României*, Romanian Academy Press, Bucharest.
5. \*\*\* (2005), *Geografia României V*, Romanian Academy Press, Bucharest.
6. \*\*\* (2012), Bom.gov.au. Retrieved, Blizzard definition, Weather Words, Australian Government Bureau of Meteorology
7. <http://www.meteoromania.ro> accessed on November and December 2014 and January 2015
8. <http://www.wetter3.de> accessed on November 2014
9. <http://www.Wetterzentrale.de> accessed on November 2014