

SNOWSTORM SPELLS OF JANUARY-FEBRUARY 2012: GENESIS, MANIFESTATION AND EFFECTS IN BUZĂU COUNTY LOWLAND

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ABSTRACT. *Spells of snowstorm: January-February 2012. Genesis, manifestation and effects in Buzău County lowland.* The year 2012 featured a high incidence of extreme climatic events, especially between January and August, with severe weather spells (waves of cold, snowstorm, ice rain, abundant rainfalls, heat waves and canicula). The amplitude, duration and intensity of four successive episodes of snowstorms (January 24 - February 15, 2012) affected large areas in the east and south of Romania, particularly the North Bărăgan Plain. This paper is aimed at assessing the general and local synoptic conditions associated with extreme snowstorm (wind speed, heavy snowfall and local snow accumulations), as well as severe local effects felt in the lowland area of Buzău County.

Keywords: snowstorm, dangerous weather phenomenon, Bărăgan Plain, met warnings, damage, aggravating factors.

1. INTRODUCTION

One of the most dangerous weather phenomenon registered in the winter of 2011-2012 was the snowstorm. The amplitude, duration and intensity of four successive episodes affected large areas in the east and south of Romania, particularly the North Bărăgan Plain. The Bucharest National Weather Forecast Centre of the National Meteorology Administration (NMA) issued 17 warnings (yellow and orange codes) of heavy snowfalls, snowstorms and frost, for the January 24 - February 15, 2012 interval. The damages caused justifies the listing of this phenomenon under extreme natural events considered as main threats on the territory of Buzău County, beside flood-triggering excess precipitation, landslides or earthquakes,. As a matter of fact the year 2012 featured a high incidence of extreme climatic events, especially between January and August, with severe weather spells (waves of cold, snowstorm, ice rain, abundant rainfalls, heat waves and canicula).

This paper is aimed at assessing the general and local synoptic conditions associated with extreme snowstorm (wind speed, heavy snowfall and local snow accumulations), as well as severe local effects felt in the lowland area of Buzău County.

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2. GENESIS AND CLIMATIC CHARACTERISTICS

Snowstorm, the most outstanding mesoscale phenomenon in Romania, could be termed severe, especially in the Extracarpathian regions. It is engendered, under the influence of the Carpathian Mountains and the Black Sea, by airflow advections coming mainly from the east and north-east, active on the ground as the East-European Anticyclone couples to a pressure low moving from the central-east Mediterranean Basin, over the Balkan Peninsula, towards the west of the Black Sea. At the same time, an upper-level trough hovers over central Europe from the Scandinavian Peninsula to the Mediterranean Sea. The cold air moving from the Russian Plain is blocked by the Carpathian orographic barrier and the Black Sea acting as thermal barrier. In these conditions, the cold air is pushed towards the Romanian Plain. Ever greater cloudiness (through forced updraught of warm air over the cold air), wind speed increasing progressively to over 30-40 m/s. Snowstorm is thus the work of heavy snowfall associated with high winds which carry or blow the snow, violently invading largely the east and south of Romania. The Bărăgan Plain is one of the most snowstorm-vulnerable areas (annual average 5-6 days and over 4 consecutive days/year) (Bălescu, Beșleagă, 1962).

Vulnerability increases from north-west to south-east, from average to maximum, an assertion sustained by the frequency of snowstorm days, snowpack depth and significant, usually north and north-east, wind speeds (>16 m/s). The one-day snowstorm-cumulated water equivalent is of 4-7 l/m².

3. SUCCESSIVE SNOWSTORM EPISODES IN 2012

In the winter of 2011-2012, snowstorming began with frosty weather, brought in by a wave of cold on January 17-20, that affected large areas, particularly in the south and east of the country, and was followed by four successive snowstorm episodes:

- **episode one** (January 25-27, 2012) heavy snowfalls yellow-and-orange code warnings had been issued on the 24th, 25th at 9:00 a.m and on the 26th at 6.00 p.m (Fig. 1 b,c); gusty wind (80-90 km/hr), reduced visibility (<50 m), snowpacking, frosty weather at night and in the morning. This picture was the outcome of a well-developed Mediterranean Cyclone centred over the Aegean Sea and extended over the southern half of the Mediterranean Basin and the whole of the Balkan Peninsula. Subsequently, the cyclone covered also the south-west Black Sea Basin. The cyclone was coupled to the East-European Anticyclone high-pressure ridge which became ever more active (Fig. 1 a).

The interval's synoptic picture (*source: www.wetter3.de*) justifies the quantity of water (0.2-1.5 mm/hr) contained in solid precipitation; the wind blew from north-east, north, here-and-there from south-east; snowpack water equivalent was of 4-20 kg/m². As a result, large pressure and thermal values, mostly in the south-east of Romania, associated with stronger wind gusts (>60-70 km/hr) and significant amounts of precipitation in the south-east of the country (first mixt, then storm snow), multi-annual values in excess.

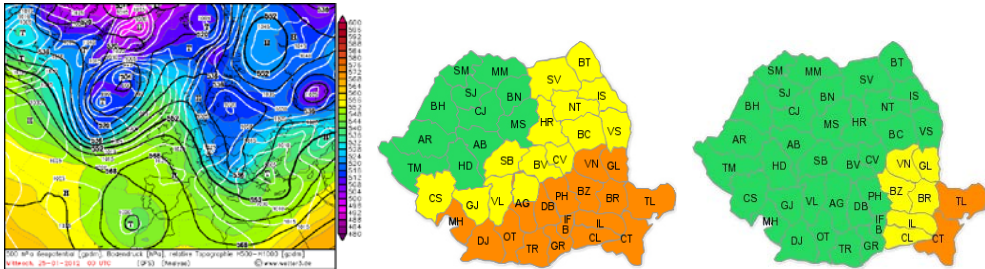


Fig. 1a. Atmospheric pressure on the ground, geopotential field in the medium troposphere and map of relative topography (1,000 – 500 hPa) on January 25, 2012, 00 UTC (<http://www.wetter3.de>); b, c. warnings on January 25, 26, 201 (www.meteoromania.ro).

Next came a brief spell of cold weather. An orange-code warning was issued for January 30, 11.00 a.m.-February 3 interval of frosty weather with minimum temperatures of $-27 \dots -17^{\circ}\text{C}$ and wind gusts of 40-50 km/hr. Record-high daily temperature in the towns of Râmnicu-Sărat (-6.1°C on January 29 and -7.5°C on January 30) and Buzău (-9.7°C on February 2).

- *episode two* of lower amplitude (yellow code warning issued on February 2, 2012) took place against the background of a Mediterranean Cyclone over the Balkane Peninsula, shifted more to the south than in the previous episode, simultaneously with the repositioning of the centre of the North-European Anticyclone. This was followed by stronger winds (gusts $>50-60$ km/hr) and important quantities of precipitation in the south-east, initially storm snows, then sleet and rain even, freezing into glaze (Fig.2a, b).

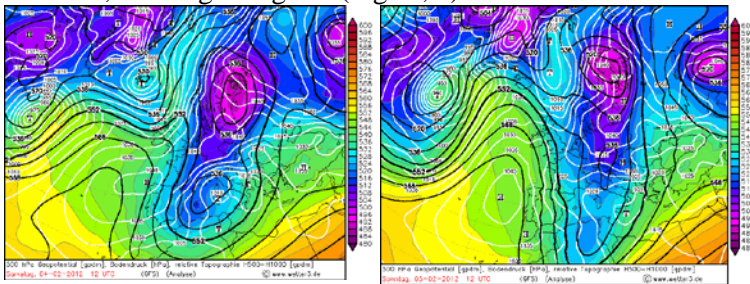


Fig. 2a, b. Atmospheric pressure on the ground, geopotential field in the medium troposphere and map of relative topography (1,000 – 500 hPa) on February 4, 5, 2012, 00 UTC (<http://www.wetter3.de>).

In Buzău County, a yellow-code warning was issued for February 2, 10.00 a.m. and February 5, 2012; snowfalls covered larger areas, a fresh snow layer of $>20\text{cm}$, was deposited, gusty wind $>50-60$ km/hr indicate snowstorming conditions.

According to www.wetter3.de, the water amount (mm/hr.) from solid and liquid precipitation was of 0.02-1.5 mm/hr, and 0.2-0.5 mm/h, respectively; south and south-east wind, snow-layer water equivalent 5-15 kg/m^2 .

- *episode three*, featuring the severest snowstorm of winter 2011-2012, started on February 6-8, 2012. A typical synoptic situation of a Mediterranean low

(west of Greece) coupled to an East-European Anticyclone, which accounts a very high temperature-pressure gradient at Romania's latitude (Fig. 3a, b, c).

The snowstorm begun on February 2 reached maximum intensity on the 6th - 7th interval, featuring less abundant snowfall, but very much drifted due to previous deposition of ice. Strong north-east wind blows (gusts > 70-80 km/hr) were registered, as well as a visibility reduction under 50 m (Fig. 3a).

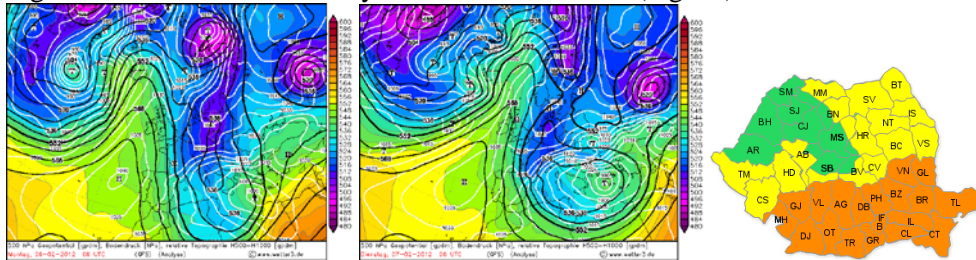


Fig. 3a, b. Atmospheric pressure on the ground, geopotential field in the medium troposphere and map of relative topography (1,000 – 500 hPa) on February 6, 7, 2012, 00 UTC (<http://www.wetter3.de>; <http://www.meteoromania.ro>).

In Buzău County, a yellow-code warning was issued for the February 2, 10.00 a.m. – 3-5, 2012 interval, the snowfall area expected to expand, a fresh > 20 m – deep layer set on, gusty wind (>50-60 km/hr), basically snowstorm conditions. A new orange-code warning of severe snowstorm was expected between February 2 (6.00 p.m.) and 8 (10.00 a.m.) was extended to 10.00 p.m. Snowfall and heavy snowstorm reached a peak on February 6 (2.00 p.m.) and 7 (6.00 p.m.), with gusty winds (70-80 km/hr) and a visibility reduction under 50 m.

A yellow-code warning of frosty weather was issued, with temperatures of -25°C and -15°C and negative maxima between February 8 (2.00 a.m.) and 12 (10.00 a.m.).

- **episode four** (February 12-14) had a pressure low on the Black Sea that brought strong temperature-pressure gradients all over Romania (Fig. 4a).

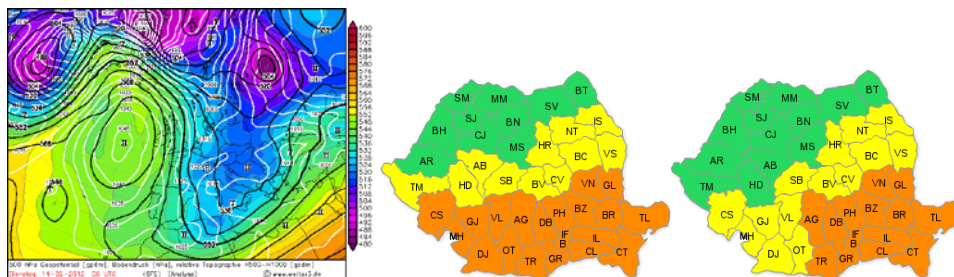


Fig. 4a. Atmospheric pressure on the ground, geopotential field in the medium troposphere and map of relative topography (1,000 – 500 hPa) on February 14, 2012, 00 UTC (<http://www.wetter3.de>); b, c. warnings on February 13, 14 2012 (www.meteoromania.ro).

The quantity of water contained in solid precipitation was of 0.2-1.0 mm/hr, the wind blew from east, east-north-east and here-and-there from south-east, while the snow layer water equivalent was of 25-50 kg/m² (source: *www.wetter3.de*).

Consistent snowfalls in the study area were triggered by the significant moisture contribution by the Black Sea, the fresh snowlayer exceeding 25-30 cm (50 cm even), snowpack thickness having the highest values registered that winter. Looking at the wind speeds of previous episodes, this time gusts surpassed >70-80 km/hr. Three yellow/orange-code warnings were issued for successive intervals over February 12-14 (Fig. 4 b, c).

What was specific about the snowstorm of winter 2011-2012 was the succession of four episodes which led to snowpack piling up and persisting for one-month-and-a half, also sustained by low temperatures. Although snowpack depth and wind speed did not match the 1943-1954 record, justifying orange-code warnings, yet lengthy snowstorm episodes had catastrophic effects.

4. DAMAGES IN BUZĂU COUNTY

Considered to be one of the severest extreme climatic events in Romania, the snowstorm winter 2011-2012 represents a natural hazard record with numerous implications for the environment and society alike. Nevertheless, the collaboration between the local administration, Inspectorate for Emergency Situation (ISU), constabulary (gendarmery), Mobile Emergency Service for Resuscitation and Extrication (SMURD), County Ambulance Service (SAJ) Buzău, representatives of the Church and the assistance given by various NGOs, private companies and individuals did much to diminish the effects of those events. There were no hypothermia-induced death, or people directly affected by the snowstorm. Yet, lack of water, food, and sources of heat left three people dead and numerous psychically traumatised.

There were cases when timely intervention by the authorities was delayed by 3-4 m deep snowdrifts around the households which stood facing the snowstorm; in some places the snow was 7-8 m deep (Boldu and Balta Albă villages).

A number of 60 people had no shelter (in the towns of Râmnicu Sărat and Buzău), 680 were given temporary shelter, 300 persons blocked in trains (Buzău and Râmnicu Sărat) were sheltered and fed, 1,600 medical emergencies were solved by SAJ Buzău and SMURD (using either airlifted, or autoamphibian equipments).

Direct and indirect damage estimations made by the Buzău Prefecture specialists for the January 25-February 20, 2012 period revealed that the most losses suffered Glodeanu-Siliștea, Podgoria and Puiești communes (300,000-450,000 EURO), and particularly the lowland sector where many localities have been affected (Figs 5, 6). *Direct damage* caused by heavy snowfalls involved the transport network (road and rail, electricity, and gas), public and private buildings and goods, agriculture (crops and animal effectives), costs required by disaster-related services. Most heavily affected were the field crops: rape 100%, winter wheat and barley 30-40%; perennial crops: fruit-trees and vine; animal losses:

sheep (36%), fowl (27%), swine, goats and cattle (37%). Damages to dwelling-houses and household annexes, both public and private, were registered on the edge of snowdrift-affected localities.

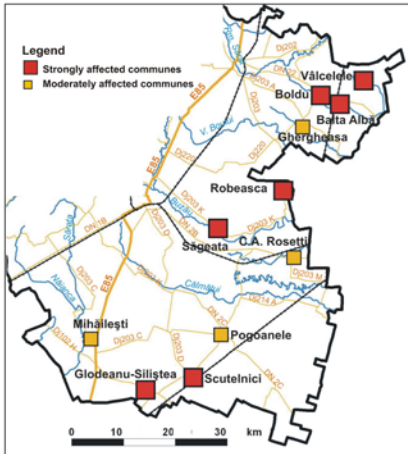


Fig. 5. Magnitude of affected communes (source: ISU Buzău).

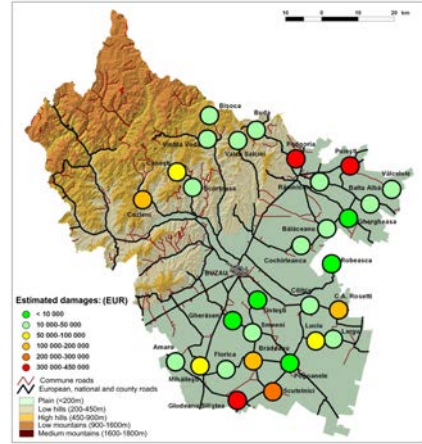


Fig. 6. Estimated damage (source: Buzău Prefecture).

Indirect losses (difficultly quantifiable) involved especially transportation detours and thus delaying supply and distribution of immediately-needed goods.

Post-event statistics worked out by ISU and Buzău Prefecture show that worst damaged were the settlements located south of the European Highway E85, due to the precarious condition of communal roads that blocked the traffic and communication (access to isolated settlements was restricted between January 25 and February 20, and February 13-15, 2012: 52 communes including 197 villages and one town including 2 component villages had no road traffic, telecommunication, and electricity) (Fig. 7a).

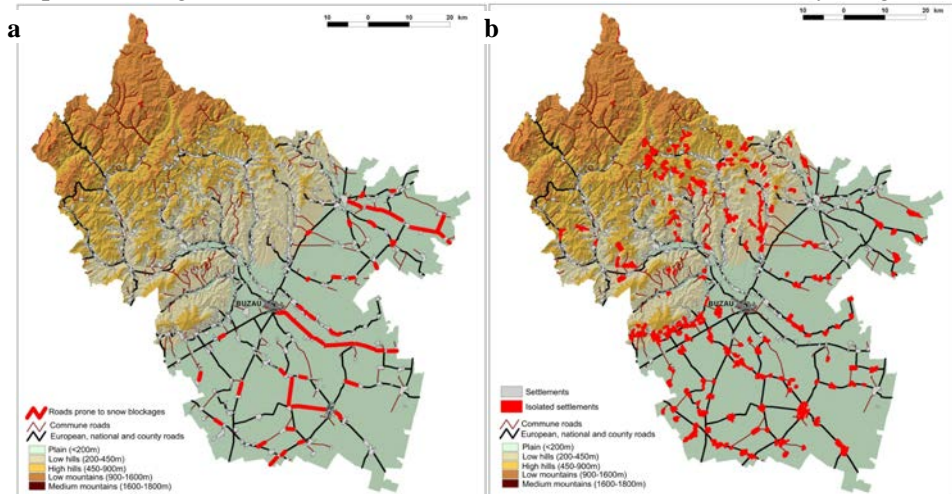


Fig. 7a. Road sections liable to being snow-blocked (source: ISU Buzău); **b, affected localities in the critical period of February 13-15, 2012** (source: Buzău Prefecture).

In the interval February 14-17, 2012 was declared state of alert in the communes of Valea Râmnicului, Puiesti, Râmnicelu and Bisoca (Fig. 7b).

Rails traffic was severely impaired especially on February 7 and 8. School activities were disrupted, while between February 6-8 and 14-15 all the 624 schools in the county (26 high-schools and 598 general schools) were closed down.

Disfunction in the electricity transport grid were also registered: 25 lines fully affected, and 10 partially impaired, 386 damaged substations, 8 columns, 35 brackets and numerous conductors torn by heavy wind, snowfall and ice deposition (source: Electrica Company Report Febr.7, 2012). Electricity disruptions affected 32 settlements, including 35,000 people in Buzău Town.

5. DAMAGES. AGGRAVATING FACTORS

What had contributed to aggravating snowstorming effects and related damages was the destruction, or inadequate location of protection belts and removal of preexisting snow fences. Their presence would have reduced wind speed by 30-50%, protect communication routes, preserve the snowpack on the field and thus contribute to a 20% higher crop yield, etc.

As known, the peak interval of protection belt-covered areas was 1937-1961, subsequently they would shrink progressively and mostly after 1989. A number of laws (289/2002), MAAP orders (636/2002) and government decisions (548/2003; 155/2004) were issued to effectively diminish snowstorm effects.

The negative experience of other historical snowstorm episodes (e.g. 1954) led to more recommendations for avoiding the snowdrifting of dwelling-houses, for example, building annexes at houses lying right in the way of the "Crivăț" wind; the population and the local authorities were obliged to plant protection belts (acacia) in the north-eastern part of localities, to acquire special snow-removal equipment, to have and handle adequate logistics, etc.

6. CONCLUSIONS

The January-February 2012 snowstorm spells represent a typical situation of hazardous winter phenomena in the Bărăgan Plain, which has the highest snowstorm-related vulnerability in Romania. The boundary, as it were, of severe snowstorm was situated south of the European Highway E 85, the localities of this plain sector being the ones most affected and isolated between February 13-15, 2012.

The typical genetic conditions, expounded in this paper, the manifestation, magnitude and consequences of the snowstorm were enhanced by severe weather cooling in the wake of very cold advections from the north, north-east and east, local temperature inversions and particularly cold nights. The situation was extremely severe in the east and south of Romania. After the snowstorm had subsided (February 25 – March 3, 2012), minimum negative temperatures continued (-9°...1°C), so that snowpack melting was a very slow process and flooding was avoided.

No red-code warnings, like in Bulgaria (wind speed > 125 km/hr, snowpack > 50 cm/24 hrs) where the situation was similar to that of winter 1953-1954 in Romania.

The 2012 snowstorm lasted longer because of the cumulative effect of successive episodes. However, the population perceived it as less severe than the 1954 event (especially in areas missing protection belts).

Insured persons received no damage compensations, because no clause of snow (snowstorm) or wind-induced risks was contained in the contract.

The episodes of snowstorm (January 25 – February 20, 2012) caused in Buzău County damages of 9.6 million Euro, compared to the losses incurred by the landslides and floods of 2005 (a historic high of excess of precipitation in Romania) between April 10 - May 30 (3.6 mill. Euro), August 14-25 (6 mill. Euro), and October 19-28 (14 mill. Euro).



Fig. 8. Glodeanu-Silișteu, 7.02.2012



Fig. 9. Snow-removal equipment (Boldu)

Since episodes like the January-February 2012 snowstorm have a high occurrence frequency and generally low magnitude, but may develop high and very high magnitudes with long return periods (>50 years), listing them among compulsory insurance and prevention/intervention/recovery procedures is an imperative necessity.

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