SNOW COVER AND FROSTS OF APRIL 2017
ON THE TERRITORY OF THE REPUBLIC OF MOLDOVA

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Abstract: This study investigates the event of a great snowfall on the territory of the Republic of Moldova in the third decade of April, 2017. The mechanical action of weight led harmed the agricultural crops, woody vegetation, electric networks and comunications, deteriorate glass and pellicle greenhouses. The most affected regions of snow and frost were the southern and central ones.

Introduction

During the cold period of the year, on the territory of the Republic of Moldova, there falls just 20-25% from the annual precipitation values. Simultaneously, abundant and very abundant snowfalls from the territory of the Republic of Moldova enclose between may represent dangerous meteorological phenomena with immediately consequences on the environment and human activities, being the subject of warning messages from relevant institutions. Abundant and very abundant snowfalls are frequently associated with the passing of Atlantic cyclones that move on their western path, but also with block ages of south cyclones when anticyclones are positioned against them, thus becoming more violent under relegation conditions (Coșcodan, Boian, Boboc, Cazac, 2010). The thermal characteristics of this anticyclones lead to the creation of snowfall areas, becoming very abundant at the border with the relatively warm front of cyclones. The abundant snowfalls are assigned when snowfall amounts exceed ≥ 7 mm in an interval of ≤ 12 hours. Especially dangerous are considered those very abundant snowfalls that exceed ≥ 20 mm in 12 hours. The most important objectives of this study consist in assessing the synoptical situations, that determine the abundant and very abundant snowfalls, establishing the laws considering their space distribution and also their impact on the natural environment and on human activities in the Republic of Moldova. This will contribute to more adequate forecasts for the prevention of population, economical agents and decision makers, designed to decrease of potential material damages (Cazac, Boian, Volontir, 2008).

1. General data

The main parameters that characterize the layer of snow are: the average date of the first layer of snow, the average date of the last layer of snow, the possible average duration of snow layer; the latest layer of snow, the earliest layer of snow, the average date of appearance of steady layer of snow, the average date

of disappearance of snow layer, the average duration of steady layer of snow. The continuous layer of snow is the layer that maintains on the ground without interruptions, its duration including the period between the average date of its appeareance from the beginning of the cold season and the average date of disappearance from the ending of the cold season. The snow-layer may get the aspect of climatic risk in the following situations: when its height is exceptionally high, when it is blizzard and heaps of snow are being accumulated. As a climatic risk phenomenon, the layer of snow may negatively influence and produce damages. The layer of snow may become a climatic risk phenomenon when it forms in the extraseason, being generated either by very early snow and also by very late snowfalls and when being associated with frost, thus determining frostbites of crops. Another risk is when snow melts suddenly, causing ice on the rivers and floods. For example: significant damages were produced by the thick layer of snow that formed on the territory of the republic in February, 2011 and that persisted for a big part of the month. Its maximum height maintained 25-50 cm thick on the meteorological platforms, a fact that is recorded, on average, in winter, once in 5-15 years. The biggest height of snow layer was recorded at Edineț - 71 cm, Dondușeni – 63, Bârlădeni – 62 cm, Ocnița – 60 cm, a fact that happens once in 20 years. The depth of the snow layer formed in the period of one single and abundant snowfall reached 30-39 cm. On average, the depth of the snow layer formed in an only one abundant and very abundant snowfall reached 10-20 cm.

The greatest depths of snow layer are prevalent in the first and in the second decade of February. In the country, we may rarely find significant depths of snow layer. Just in 10% of the winters the depth of the snow layer gets as high as 50 cm in the northern districts of the republic and 20-30 cm in the center districts and south also. The decadal average depth of the snow layer in February varies on the territory of the republic between 3 and 11 cm. The maximum depth of snow layer on the meteorological platforms has even reached, in some days, as high as 71 cm (28th of February 1973, Briceni). The layer of snow persists on the bigger part of the territory of the republic till the middle of March (12 of March), but in the north, till the 28th of March. Its decadal medium depth ranges between 2 and 11 cm and its greatest depth reached, on the meteorological platforms, in some days, almost 97 cm (Briceni, 10th of March, 1973). The melting process of the snow layer is much more quickly than the process of its forming. On average, in the second and in the third decade of March, the whole territory of the country already clear of snow. In the years with early and warm springs, the melting of the snow layer began on the whole territory of the republic in the first and second decade of February (1950, 1961). The latest date of snow melting was observed at the end of the second decade and in the northern districts even in the middle of the third decade of April (1969, 1972). The snow, as an atmospheric phenomenon, may be encountered on the territory of the country, till the 20th of May (Briceni, 1952),

but this happens very rarely (on average, once in 65 years). The latest date of snow melting in the country is 15-27th of April (1972), the greatest depth reaching in some days 27 cm (Soroca, 3rd of April, 1963) [**1**].

2. Results and discussion

The genetical causes that determine the appearance of snow layer in April are dynamic, being a consequence of the interference between the general movement of the atmosphere and the active surface that influences the character of snow deposition. The territory of the Republic of Moldova is affected by the cyclogenesis of the Mediteranean Sea and the Black Sea. The Circulation trajectories of the Mediterranean cyclones, sometimes reactivated above the Black Sea, sometimes become more violent, often crossing the territory of the country and precipitations (Boian, 2006).

As a particular cause, we must mention the very abundant snowfalls from 20-21st of April, 2017. Towards the end of the second decade of April 2017, in Central Europe, a cyclone was generated, firstly in the Mediteranean Sea, and then, in the period of 18-20 of April, 2017, it crossed over the Balkans and arrived in the region of the Black Sea. Moreover, a very cold mass of air, of arctic origin, penetrated through the central-northern area of the continent and it was consequently drawn in by this cyclone in the south-eastern part of the continent [**7**].
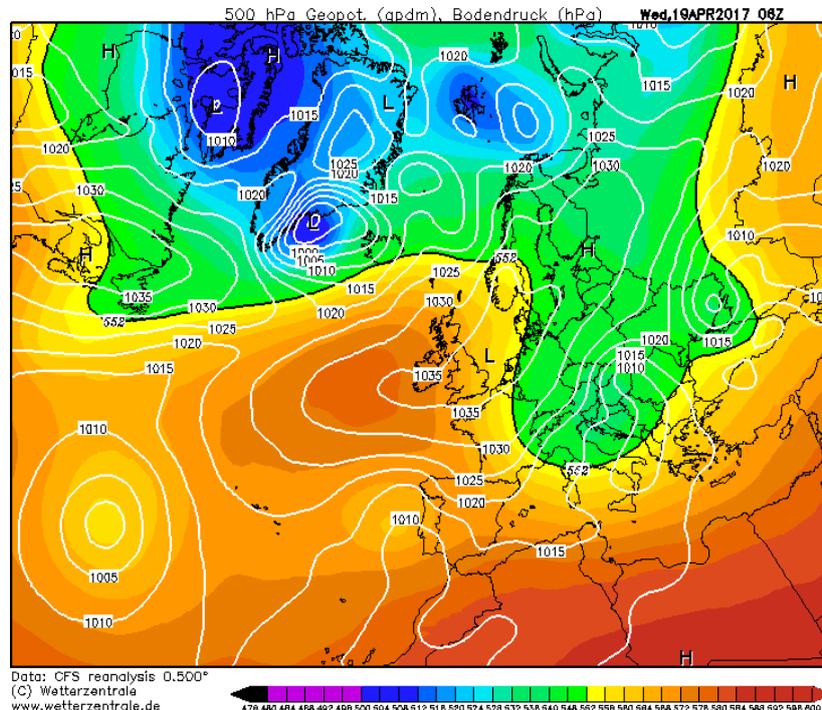
Fig. 1 The synoptic situation over Europe in the date of 19/04/2017, 06:00 AM UTC
(according to http://www.wetterzentrale.de)

In 20-21st of April, almost the entire territory of the Republic of Moldova (except for the extreme northern districts) was covered by snow layer, this fact actually happening once in 20-30 years). Its depth measured on the meteorological platform reached 15-50 cm, and 57 cm at the Meteorological Station in Chișinău, a fact that was noticed in of the month April for the first time out of the whole period of instrumental investigation. During the isolated snowfalls, there were also recorded wind intensifications up to 20 m/s (the Meteorological Station of Cahul). As a consequence of this heavy snowfall, telecommunicational lines were seriously been, causing electricity shutdowns in more than 800 localities from 16 districts for a period of 1-5 days and more, and also phone lines break-ups. Automobiles traffic was interrupted for 1-3 days. In the southern part of the republic, some house roofs were blown away. As a result of the snow storm from 20-21 of April, 2017, in Chișinău city, the material damages were immense: 250 cars and 150 houses were damaged and many institutional roofs were simply blown down. Over 10 thousands of trees were uprooted. According to a preliminary the damages mounted up to 50-70 millions of lei. This abundant snowfall also affected about 80% of the decorative trees and shrubs in the collection and exhibition of the Botanical Garden, fact that determined its closing.

The total duration of snow and sleet falling during the period of 20-21st of April was about 25-30 hours in the center and southern districts of the republic, and 37 hrs in Chișinău city.

During the April snowfall there were also frosts recorded. The most intensive frost occurred on the 19th of April when the temperature of isolated air decreased up to -3ºC, on the surface of the ground up to -1..-5ºC and at a height of 2 cm from the surface of the ground up to -1..-7ºC, a phenomenon that happens in medium once in 3-10 years.

Another frost episode also occurred on the 20-21st of April when the temperature of isolated air decreased up to -1°C. These isolated frosts (especially in the center and in the south of the country) greatly harmed the blooming of fruit crops and walnut trees.

According to the data presented by the national Agricultural and Food Divisions, on the whole, there were 34.4 thousands of ha of agricultural lands, including:
• Vegetable crops - 122.4 ha;
• Field crops - 19.4 thousand ha;
• Multiannual crops, including vines - 14.9 thousand ha;
• Other, including:
• Greenhouses – 28.326 m^2
• Watermelon -15.69 ha

• Grain storage - 105.00 m^2

In Chișinău area, the most affected sector was Râșcani district. In the evening of 20th of April, 2017 an exceptional situation was announced in Chișinău and on the second day, an emergency mode situation was called forth. The decisions were taken at the sessions of the Commission for Exceptional Situations in the capital-city [**9**].

The most efficient measures to diminish the damages produced by the abundant and very abundant snowfall consist of the preparation and prior provision of intervention teams and in ensuring adequate stocks of fuel and food reserves. During any abundant and very abundant snow; they recommend the following: respecting the authorities instructions, avoiding leaving the buildings; permanent adaptation of vehicle speed to road conditions; the use of the illumination-warning system on all road categories; avoiding tiring activities, such as pushing the car or walking in deep snow, to prevent hypothermia and an increase in heart disease; vehicle insurance with snow chains, shovel, scraper, tow rope, spare fuel.

Of particular importance for diminishing the mentioned risk is to assess the spatial distribution of the abundant and very abundant snowfalls and of the synoptic and meteorological conditions, which determine their occurrence, by also taking into account the characteristics of the active surface. This will allow the development of necessary forecasts for the early warning of the population, economic agents and decision-makers in order to develop rigorous measures designed to mitigate possible damages that may be caused by these phenomena.

We would like to mention that the Hydro-meteorological State Service of the Republic of Moldova preventively forecasted the massive snowfall for the 20-21st April 2017 as early as the 17th of April, and issued the yellow warning code[**8**].
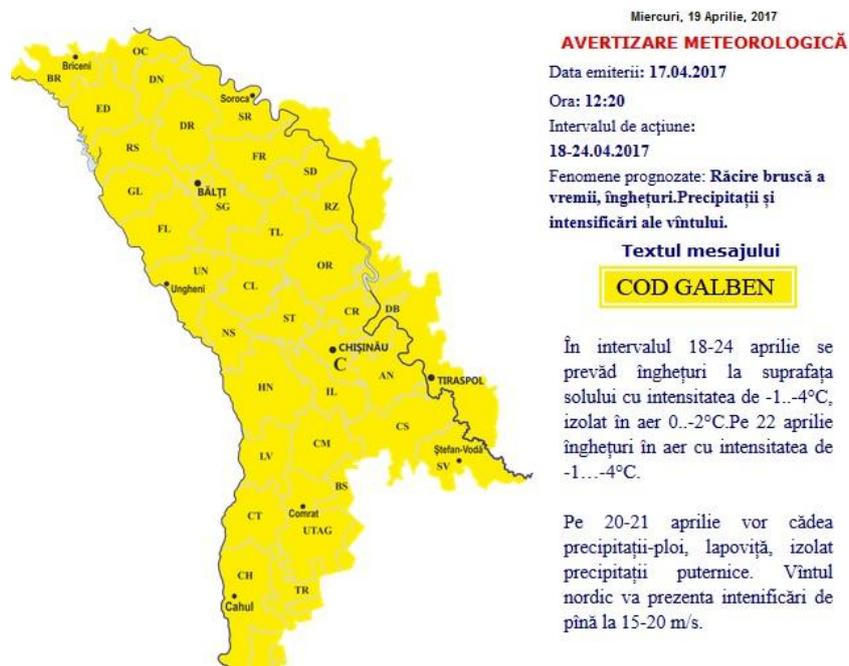
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Fig. 2. Yellow code given by HSS on 17/04/2017 (according to www.meteo.md)

3. Conclusions

We may say that the complexity of the weather conditions occurring during the 20-21st April 2017 period influenced the national forest fund and caused some serious damages to the environment. Also, unfavorable conditions have been created for road traffic, significant damage has been caused to the objects of national economy and agricultural crops, as well as to the communications and electric wires. The abundant and the very abundant snowfalls are most frequently occurring with the passage of some blackage processes of southern cyclones by the anti-cyclones placed across their path, which, under relegation conditions, become more and more violent. On April 20-21st, 2017, almost everywhere on the territory of the Republic of Moldova (except the extreme northern districts) a deep snow layer was formed, which, in this period, may occur once in 20-30 years.

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