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MEAN AND EXTREME DATA OF PRODUCING THE SNOW LAYER AND ITS DURATION IN THE WEST PLAIN AT THE NORTH OF THE MURES RIVER

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Résumé: ***Les données moyennes et extrêmes de production de la couche de neige et sa durée dans la Plaine de l'Ouest au nord du Mures.*** Dans le travail ci-joint on a analysé les données moyennes et extrêmes de production de la couche de neige dans la période 1961-2000. Sur la base de celles-ci on a établi la durée moyenne et maximale possible de la couche de neige. La couche de neige la plus hâtive a été enregistrée dans la dernière décade du mois d'octobre dans le nord de la plaine et dans la première décade du mois de novembre dans le centre et le sud. La couche de neige la plus tardive a été enregistrée à la fin de la première décade du mois d'avril dans le sud de la plaine et dans la dernière décade du même mois dans le centre et le nord de celle-ci. A l'exception de quelques cas, les données extrêmes de production de la couche de neige ont été signalées dans la deuxième moitié de la période analysée, à commencer par l'année 1982. En conclusion, les hasards générés par la présence de la couche de neige en extra saison ont augmenté les dernières années. Les neiges hâtives d'automne et celles tardives de printemps qui génèrent la couche de neige ont augmenté du point de vue du nombre et se sont décalés de plus en plus par rapport à leur date moyenne d'apparition.

Mots-clés: couche de neige, date de production, durée, hasard, plaine.

Introduction

Snow layer is discontinuous on the plain areas in the West of the country, during winter. The shelter given to these regions by the mountain frame of the Carpathians brings to very rare blizzards and a quite uniform snow layer (Măhăra, 1977).

The duration of the snow layer depends on the length of the time interval with negative soil and air temperatures and also on precipitation fallen as snow-form.

Data and methods

In the present work, the mean and extreme data of producing snow layer have been analyzed for the territory of the West Plain at the North of the Mures River, between 1961 and 2000. Based on that, the mean and maximum possible duration of the snow layer has been established.

The meteorological data used in the present work were taken from the archives of the National Meteorology Administration. Data from 3 weather stations located in the North, center and South of the analyzed territory have been used, with long observation sequences.

Results and discussions

1. Mean data of producing the snow layer and its possible mean duration

In the West Plain situated to the North of the Mures River, *the first snow layer* deposits, *as a mean date*, in the last decade of November in the Someşului Plain and in the

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first decade of December in the Crişurilor Plain (table 1). *The last snow layer* is recorded *on average*, at the end of February in the South of the analyzed territory, in the first decade of March in the center and the beginning of the second decade of March in the North. We can observe the latitudinal disposal of the mean data of occurrence and disappearance of the snow layer, linked to the distribution of the mean air temperature values over the plain.

Mean data of producing the snow layer and its possible mean duration, in the West Plain at the North of the Mures River (1961-2000).

Table 1

STATION	*Mean date of the*		*Possible mean duration*	
	fist snow layer	*last snow layer*	*with a snow layer*	*without a snow layer*
Satu Mare	27.11	11.03	105	260
Oradea	06.12	06.03	91	274
Arad	08.12	28.02	83	282

The possible mean duration with a snow layer, calculated according to the mean date of occurrence of the first and last snow layer is 83 days in the South of the plain, 91 days in the center and 105 days in the North. Within this interval of about 3-3.5 months, between late November and early March, snow layer can produce every year.

The possible mean duration without a snow layer is 260 days to the North of the territory and rising toward the center and South, to 282 days. It represents the mean time interval when the snow layer is missing over the entire surface of the West Plain at the North of the Mures River.

2. Extreme data of producing the snow layer and its maximum possible duration

The earliest and the latest snow layer are the result of some accidental, extreme weather situations. They usually have an evanescent character and melt rapidly under the day time warmness or warm air masses advections. These data are most important for climatology analysis, as they are climatic hazard situations. The extreme moments of producing a snow layer many times give negative effects on vegetation, by affecting the natural cycle of the plants. Therefore, they are forced to abruptly reduce their cycle in the autumn and in spring, the snow layer, often associated with soil surface frost, produces plants frostbites. The extreme data of occurrence of the first and latest snow layer are considered dangerous, the more shifted from the mean date of producing snow layer they are (Berbecel et al., 1970; Bogdan, Niculescu, 1999; Gaceu, 2001).

The earliest first snow layer was recorded in the last decade of October in the North of the plain and in the first decade of November in its center and South part (table 2). So, the earliest snow layer was recorded on *October 23rd 1991* in Satu Mare.

The latest last snow layer occurred at the end of the first decade of April in the South of the plain and in the last decade of the same month in its center and North part. So, the latest snow layer was recorded in Satu Mare as well, on *April 28th 1982*, respectively in Oradea a day before, on April 27th 1982.

In relation to these two dates, *the maximum possible duration of the snow layer*, which is the annual maximum interval in which soil can be covered with snow, can be established. This interval comprises 157 days to the South of the plain and grows towards the center and North, where it comes to 188 days. Compared to the mean possible duration of the snow layer, which is about 3-3.5 months a year, the maximum possible duration gets to about 5-6 months a year. It is a theoretical duration which shows that, in totally

exceptional situations, in the hardest winters that could happened in the West of the country, the snow layer might last up to a half year.

Beside these data, other ones, more important in the climatology analysis can exist. Like *the latest first snow layer* which occurred in the last decade of December in Satu Mare and in the last decade of January in Oradea and Arad. *The earliest last snow layer* was recorded at the end of the first decade of January in the South, in the second decade of the same month in the center and in the first decade of February to the North, in Satu Mare. We can notice once again the latitudinal distribution of the values, given by air and soil temperature distribution, they depend on.

We can also notice that, except a few cases, *the extreme data of producing the snow layer were recorded in the second half of the analyzed period, beginning with the year 1982*. Technically, the maximum possible duration of producing a snow layer shifted, starting with that year. We can say that *the hazards generated by this phenomenon have grown during the last years*. The early, autumn snowfalls and the late, spring ones which generate a snow layer *have shifted more and more compared to their mean producing date*, leading to greater economy risks. In this respect, it is worth mentioning the later, spring snow layer in April, recorded at the stations Satu Mare and Oradea only in the second part of the analyzed period and missing in the first part.

Extreme data of producing the first and the last snow layer, in the West Plain at the North of the Mures River (1961-2000).

Table 2

STATION	Date of the first snow layer		Date of the last snow layer	
	The earliest	The latest	The earliest	The latest
Satu Mare	23.10.91	28.12.82	03.02.74	28.04.82
Oradea	01.11.88	29.01.98	15.01.90	27.04.82
Arad	05.11.95	30.01.98	10.01.90	10.04.68
STATION	Maximum possible duration with a snow layer	Duration of the snow layer with a high safety degree	No. of days in which the first snow layer can form	No. of days in which the last snow layer can melt
Satu Mare	188	38	67	85
Oradea	178	-	90	103
Arad	157	-	87	91

The time interval during the latest first snow layer and the earliest last snow layer, gives us *the duration of the snow layer with a high safety degree*. Table 2 shows that in Arad and Oradea this duration is zero, the earliest last snow layer melting before the latest first snow layer. Namely, in the Crişurilor Plain winters with no snow layer at all can occur (like the winter of 1972 at the stations Chişineu-Criş and Holod). These would be the warmest and driest winters ever recorded in the West of the country. In Satu Mare on the contrary, the duration rises up to 38 days, which is more than a month, in the interval December 28th-February 3rd, having a high safety degree regarding the snow layer formed on the soil surface.

The time interval in which the first snow layer can occur is included between the end of October and the end of December in the North of the Someşului Plain and between the beginning of November and the end of January in the Crişurilor Plain. This interval lasts 87 days in the South, 90 days in the center of the analyzed territory and only 67 days in the North, in Satu Mare where, because of the lower temperatures and richer precipitation, the first snow layer produces earlier and with a higher probability.

The time interval in which the last snow layer can melt is between half January or beginning of February and half or end of April. It lasts more in Oradea (103 days) and less in Satu Mare (85 days) because of the stability of the snow layer, which is higher here.

In the light of these theoretical values, in the interval 1961-2000 in the West Plain at the North of the Mures River, the longest lasting snow layer went up to ***167 days*** in the North (5.5 months), 149 days in the center and 130 days in the South of the plain. That was *the maximum duration* of the snow layer, which differs from the maximum possible one (157-188 days). Those values occurred in the winters of 1981-1982 at Satu Mare (13.11-28.04) and Oradea (30.11-27.04) and of 1995-1996 at Arad (5.11-13.03). In December 1981 precipitation went over 100 mm all over the plain and the years 1995-1996 were very rainy, too.

The shortest duration of the snow layer was only ***5 days*** in Arad (30.01-3.02.1998), 52 days in Oradea (29.01-21.03.1998) and 63 days in Satu Mare (28.12.1982-28.02.1983). This *minimum duration* of the snow layer is much lower than the mean possible one, but gets over the one with a high safety degree.

We can observe once more that *the extreme durations (maximums and minimums) of the snow layer* produced in the interval 1961-2000, *were also recorded in the second half of the analyzed period, beginning with the year 1982*.

Conclusions

In the interval 1961-2000, in the West Plain at the North of the Mures River, the earliest snow layer was recorded in the last decade of October in the North of the plain (October 23rd 1991 at Satu Mare) and the first decade of November in the center and South of the plain. The latest snow layer produced at the end of the first decade of April in the South of the plain and the last decade of the same month in its center and North (April 28th 1982 at Satu Mare).

Except for a few cases, *the extreme data of producing the snow layer were recorded in the second half of the analyzed period, starting with the year 1982*. Therefore, the hazards generated by the presence of snow layer off-season, has increased in the last years. The early, autumn snowfalls and the late, spring ones that generate a snow layer, *have increased in number and have shifted more and more compared to their mean producing date.*

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