

ASPECTS REGARDING THE MEAN THICKNESS OF THE SNOW LAYER IN ȚARCU MOUNTAINS

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Abstract

In this paper, meteorological data were analyzed regarding the decadal mean and monthly mean thickness of snow layer, for the period 1961-2007, at the weather station Țarcu. The study involved the analysis of the length, the mean and maximum decadal and monthly thickness of snow layer, as well as the tendency of the phenomenon. The result was that the largest multiannual decadal mean thicknesses are recorded between the second decade of December and the first decade of May (28.1-71.5 cm), with a maximum in the first decade of March (71.5 cm). The largest decadal mean thicknesses rose up to values of 100-200 cm. In the February-April period, the snow has greater thicknesses than in December-January. During the years 1961-2007, the monthly mean thickness of snow layer had upward trend in November, March, February and downward trend in December.

Key words: snow layer, decade, decadal mean thickness, trend, climate.

INTRODUCTION

Țarcu weather station is located at an altitude of 2180 m, on Țarcu Peak (2190 m altitude) in the mountain massif of the same name. Along with the station Omu Peak (2504 m), they are regarded as the most important high-altitude mountain stations in the Southern Carpathians. The cold season remains a large part of year on Țarcu Peak, making the snow layer to measure large thickness. In this case, it becomes an important risk factor that contributes to the occurrence of avalanches, which can capture tourists on the mountainous paths. It adds the high speeds of wind recorded here, which also contribute to increasing the character of risk of this mountain peak.

The thickness of snow layer depends on the amounts of solid precipitation fallen, the air and soil temperature, the snowing nature (calm or blowing), the density of snow, the morphology of the landform (altitude, exposition, fragmentation) etc. (R.P.R. Climate/Clima R.P.R., vol.I, 1962; The climate of Romania/Clima României, 2008).

MATERIAL AND METHODS

In this paper, meteorological data were used and analyzed regarding the decadal mean and monthly mean thickness of snow layer, for the period

1961-2007, at the weather station Țarcu. The study involved the analysis of the length, the mean and maximum thickness of snow layer, as well as the tendency of the phenomenon. Thus, the monthly decades in which the snow layer with the greatest thicknesses occurred were analyzed. The maximum values of the decadal and monthly mean thicknesses were highlighted, as well as the years in which such values were recorded. The annual periods with increases or decreases of the thickness of snow layer were emphasized and linear trends of monthly mean thicknesses of snow layer were analyzed.

All the meteorological data used in this paper come from the database of the National Meteorological Administration in Romania.

RESULTS AND DISCUSSION

On Țarcu Peak, during the period 1961-2007, the snow layer found optimal formation conditions throughout the months of the year and in all decades, except *the second decade of July*. In this decade there was not snow layer in any year of the analyzed period. Also, in the third decade of July it has recorded only once, in 1980.

The great length of snow layer at Țarcu weather station is due to the high altitude of the station, which favors maintaining of snow on the ground because of the low temperatures during the year; it adds the large amounts of rainfall.

During the year, the thickness of snow layer increases from August until *the first decade of March*, when records a maximum, then slightly decreases until the first decade of July. The snow layer completely disappears from the ground in July, when the higher temperature helps melting it. It usually disappears in mid-June and reappears at the beginning of September, during this period its occurrence on Țarcu Peak being quite exceptionally.

The largest ***multiannual decadal mean thicknesses*** of snow layer are recorded, at the weather station Țarcu, in the period between *the second decade of December* and *the first decade of May* (15 decades, meaning 5 months a year). During this period, the decadal mean thicknesses grow to values of 28.1-71.5 cm (Tab. 1).

The greatest thickness of snow layer is reported – as was said before – in *the first decade of March* (71.5 cm), followed by the second decade of the same month (70.4 cm). Large decadal mean thicknesses, with values of over 60 cm, are found in the period between the second decade of February and the second decade of April (7 decades, meaning over 2 months a year).

So, we notice that the largest thicknesses of snow layer are recorded in March, then in February, April, January, December and May, which means in the winter-spring seasons. This is due to the lower air and soil temperature during these months, which contributes to the maintaining of

the snow layer. Moreover, in the February-April period, the snow has greater thicknesses than in December-January, because of its accumulation from the previous months. This is also noticed from the values of monthly mean thickness of snow layer, which are higher in the February-April period (59.5-69.7 cm) than in December-January (27.9-49.6 cm) (Tab. 2).

Table 1

Multiannual decadal mean thickness and the largest decadal mean thickness of snow layer (cm), at the weather station Țarcu (1961-2007)

Month	August			September			October		
Decade	D1	D2	D3	D1	D2	D3	D1	D2	D3
Mean	0.04	0.01	0.09	0.32	0.57	0.30	0.63	0.84	2.48
Max.	1.4	0.3	1.8	3.5	14.2	4.8	16.7	6.6	18.1
Month	November			December			January		
Decade	D1	D2	D3	D1	D2	D3	D1	D2	D3
Mean	3.2	6.8	13.8	19.3	28.1	35.5	46.1	48.4	53.8
Max.	28.3	64.1	50.2	74.2	139.5	139.5	157.3	150.1	193.5
Month	February			March			April		
Decade	D1	D2	D3	D1	D2	D3	D1	D2	D3
Mean	58.6	65.8	69.3	71.5	70.4	67.6	62.7	61.3	54.3
Max.	177.9	168.4	180.8	190.6	205.7	186.8	163.3	196.3	148.2
Month	May			June			July		
Decade	D1	D2	D3	D1	D2	D3	D1	D2	D3
Mean	30.6	12.8	3.6	1.22	0.34	0.03	0.07	-	0.02
Max.	121.7	105.5	30.9	41.4	6.8	0.9	2.0	-	0.8

The decadal mean thicknesses are greater in May (3.6-30.6 cm) than in November (3.2-13.8 cm). From the second decade of June until the second decade of October, the snow layer measures less than 1 cm, on average.

At the weather station Țarcu, during the years 1961-2007, the largest decadal mean thicknesses rose up to values of 100-200 cm (Tab. 1). These high values were recorded between *the second decade of December and the second decade of May* (105.5-205.7 cm), so all in the winter-spring months. The largest decadal mean thicknesses decrease from the end of May (about 30 cm) until July-August (0.3-2 cm), then start to increase slightly towards the months of autumn (about 4-65 cm) and beginning of winter (about 75 cm).

The maximum values of the decadal mean thicknesses were recorded in *the second decade of March 2006 (205.7 cm)*, then in the second decade of April 2006 (196.3 cm), the third decade of January 2000 (193.5 cm), the first decade of March 2006 (190.6 cm), the third decade of March 2006 (186.8 cm), the third decade of February 2006 (180.8 cm) etc.

We notice that the maximum values occurred in the year 2006. The decadal mean thicknesses exceeded 100 cm in this year, between the third

decade of December 2005 and the second decade of May 2006 (105.5-205.7 cm), i.e. for 5 months. March, April and February 2006 had the thickest layer (monthly mean thicknesses between 166.1 and 194.1 cm). Moreover, between the third decade of February and the second decade of May, the maximum thicknesses of the period 1961-2007 were recorded, for these decades.

2000 was another year with high values. The decadal mean thicknesses exceeded 100 cm in this year, between the third decade of December 1999 and the second decade of April 2000 (104.5-193.5 cm), i.e. for 4 months. February, January and March 2000 had the thickest layer (monthly mean thicknesses between 158.0 and 174.1 cm). Between the first decade of January and the second decade of February, the maximum thicknesses of the period 1961-2007 were recorded, for these decades.

The multiannual monthly mean thickness of snow layer increases from August-September till March, when records a maximum, then decreases till summer months, when snow on the ground is melting (Tab. 2).

Table 2

Multiannual monthly mean thickness of snow layer (cm) at the weather station Țarcu
(1961-2007)

Month	August	Sept.	Oct.	Nov.	Dec.	Jan.
Mean	0.05	0.40	1.35	7.9	27.9	49.6
Month	Febr.	March	April	May	June	July
Mean	64.3	69.7	59.5	15.3	0.53	0.03

Figures 1-3 shows the monthly mean thicknesses of snow layer in the period 1961-2007. The charts of the months of summer and beginning of autumn, when snow is lacking in many years, were not exposed, being considered less representative.

Generally, the charts of the months are similar, emphasizing the same periods of increases or decreases of the thickness of snow layer. One can see the periods of years with rougher winters 1963-1968, 1975-1979, 1983-1988 and 1995-2006, for the months of January-May. For the months of October-December, these periods are staggered by one year back. Among these periods with abundant snows are interposed intervals of years with thinner snow layer: 1961-1962, 1969-1974, 1980-1982, 1989-1994, the years 2002, 2004 and 2007. It also notes the winters of 2005/2006 and 1999/2000, when the mean snow layer exceeded 150 cm in several months or the winters of 1964/1965 and 1966/1967, when the mean layer exceeded 120 cm.

At Țarcu weather station, during the years 1961-2007, the monthly mean thickness of snow layer had *upward trend in November, March, February* and very slightly upward trend in October. In January, April and May the trend was constant, and in *December* was *downward* (Fig. 1-3).

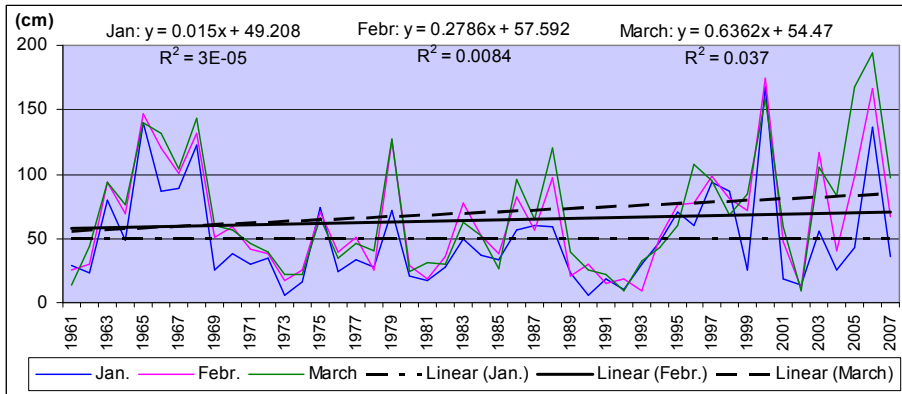


Fig. 1. Monthly mean thickness of snow layer and its linear trend, in the January-March period, at the weather station Țarcu (1961-2007)

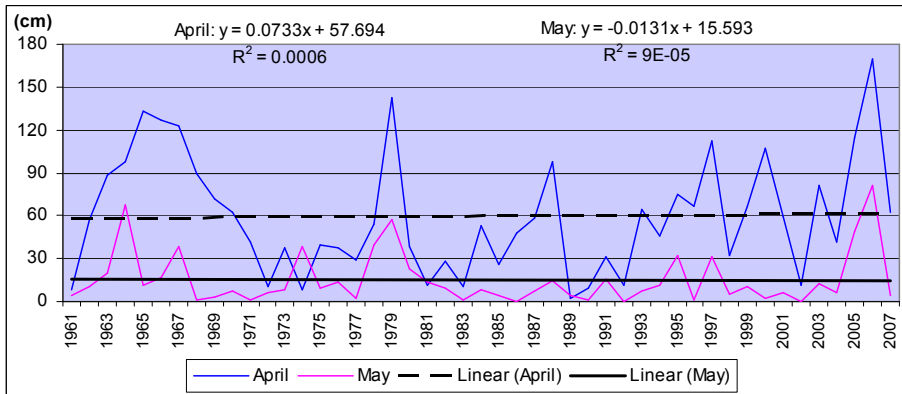


Fig. 2. Monthly mean thickness of snow layer and its linear trend, in the April-May period, at the weather station Țarcu (1961-2007)

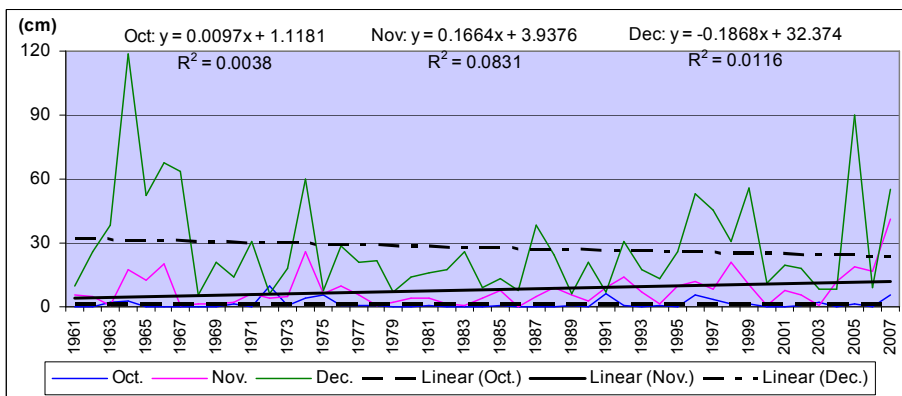


Fig. 3. Monthly mean thickness of snow layer and its linear trend, in the October-December period, at the weather station Țarcu (1961-2007)

CONCLUSIONS

At Țarcu weather station, the snow falls as a thick blanket, which in some years measures thicknesses of up to 2 m, on average.

The largest multiannual decadal mean thicknesses of snow layer are recorded between the second decade of December and the first decade of May (28.1-71.5 cm), with a maximum in the first decade of March (71.5 cm). The largest decadal mean thicknesses rose up to values of 100-200 cm. The thickest snow layer is recorded in March, then in February, April, January, December and May, which means in the winter-spring seasons.

During the years 1961-2007, the monthly mean thickness of snow layer had upward trend in November, March, February and very slightly upward trend in October. In December the trend was downward.

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