THE COMPARISON OF SNOWINESS CHANGES OVER THE MOUNTAINS AND OVER THE PLAINS ACCORDING CAUCASUS AND EAST EUROPEAN PLAIN EXAMPLE

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To compare the snowiness changes in the mountains and over the plain in relation to the general circulation patterns were considered in our investigation.

The database of the snow thickness for the period 1936-1990 was compiled [*Krenke et al., 2000*]. In these base 41 stations over the Great Caucasus ranges and 636 stations over the East European plain were included. The average snow thickness for the winter period (snowiness) was calculated as snow depth averaged over the winter [*Galakhov 1961, Olejnikov 1982, Meshcherskaja et al. 1995, Olejnikov et al., 2000*]. Their interannual changes in different regions in relation to atmosphere circulation were investigation.

Snowiness in the mountains is 6 times and interannual amplitude is seven times more in the mountains. The increase of snow depth has occursing from the NE to the SW over the plain and according for altitude in the mountains (Figs.1 and 2) [*Krenke et al., 2000, Pogorelov 2000*]. The coefficient of variation for the averaged values for all the plain and for all mountain stations is of the order 30%. For the single Caucasian stations with the high snowiness the coefficient of variation is about 30-45%, the maximum deviation is about 90%. For the single stations with the low snowiness the coefficient of variation is about 90-100% with 3-5 times maximum deviation. Snowiness and maximum snow water storage coincide in more than 80% cases. They differ in case of very early or late accumulation of snow.

Over the East European plain with North Caucasian plain the snowiness was low over the period 1966-1977 and high over the period of 1978-1990. The zonal circulation prevailed in the first and the meridional one in the second period. The snowiness trend in 1966-1990 was positive. Cases of the high and low snowiness alternated incoherently over Grate Caucasus. The significant trend is absent. That is the result of different circulation factors of snow accumulation in dependence on the topography.

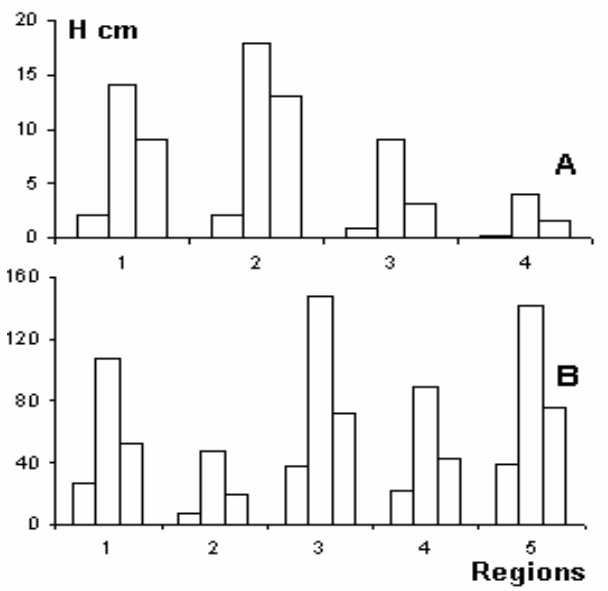

Fig. 1. Regional features of snowiness for the period 1936-1990 (minimum, maximum, mean).

A – East European plain B - Great Caucasus
1 – in total 1 – in total
2 – northern from 50N 2 – the northern slope
3 – southern than 50N 3 – the southern slope
4 - Northcaucasian piedmont 4 – central meridional sector
5 - western meridional sector

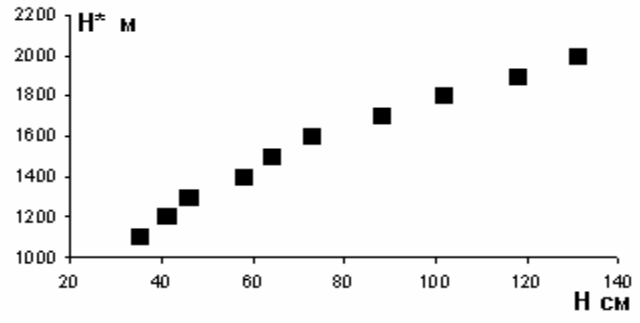

Fig.2. Snow depth (H cm) changed according the altitude (H m) [Pogorelov, 2000]*

The anomalies signs are opposite between the plain and mountains in half of the cases. The same very strong anomaly took place in 1986/87 winter. The anomalies are similar over the whole plain, including Northcaucasian piedmont. Though they differ from the Great Caucasus (Fig.3).

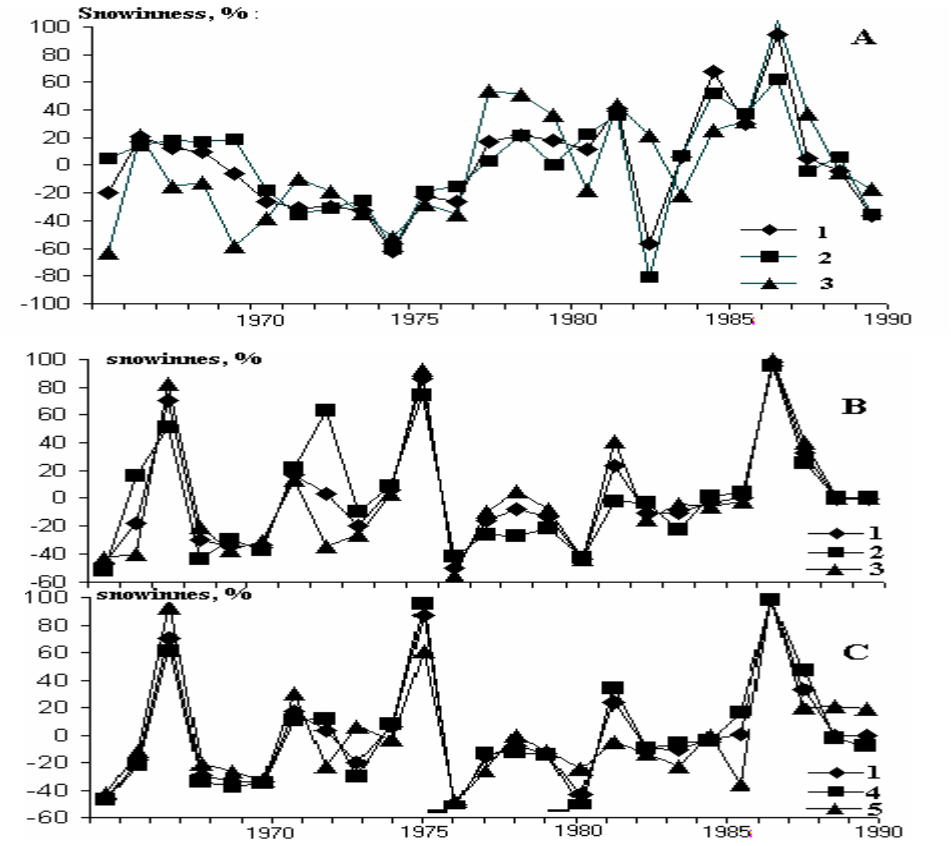

Fig. 3. Interannual snowiness variability (1966-1990)

A – East European plain B - Great Caucasus
1 – in total 1 – in total
2 – southern from 50N 2 – the northern slope
3 – Northcaucasian piedmont 3 – the southern slope
4 – central meridional sector
5 - western meridional sector

Some atmospheric circulation patterns according to B. Dzerdzeevsky were selected in 1966-1990:

western Lows – 1a; 5a; 5b; 7bw; 8bw; 11a; 11b; 11c; 12d;

southern Lows – 1b; 5d; 7aw; 8a; 9b;12bw; 12cw;

Arctic intrusions – 4a; 8bw; stationary Highs – 5b; 13w.

Synchronous positive anomalies over the plains and in the mountains are related to the strong southern intrusions. High snow years only over the plain – Arctic intrusions, only in the Caucasus – stationary High over the plain and deviation of western lows to the south. In the high snowiness years over the Great Caucasus the frequency of the southern lows or the blocking high over the East European plain is above the average. During the blocking highs the western lows are concentrated the high southern periphery. In the half of years the anomalies signs for Caucasus and the plains are opposite. This has to lead to the

mutual compensation of melted run-off anomalies related to mountains and plash parts of the North Caucasian river basins.

Conclusions

Snowiness changes are similar over the whole East European plain, including North-Caucasian piedmont. However they differ from the mountains: the anomalies signs are opposite in the half of the cases. During the last decades there is the positive trend of the snowiness over the plain. In the mountains the intensive oscillation are marked only.

The big snowiness over the plain is determined by the Arctic intrusions, the western or very strong southern Lows. The considerable snowiness in the great Caucasus is determined by the southern Lows or by western ones, whose tracks are deviated to the south by the great highs over the East European plain.

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