Avalanche distribution in the Caucasus

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The Caucasian mountains are the most risky avalanche region of the USSR. Comparison for maps of snow-cover distribution with a map for evaluating the relief as an avalanche formation condition and the analysis of extensive actual data show that the avalanche active territory of the Greater Caucasus is about 91497 km$^2$. Only 26510 km$^2$ of the territory, with the relief favourable for the formation of avalanches, are not subjected to the avalanche activity because of the lack of the sufficient amount of solid precipitation.

Individual parts of the avalanche-active territory differ greatly in the avalanche development. In our opinion, the existing methods of classification according to the degree of avalanche risk are of little use for practical application and comparative characterization of various avalanche-risky regions. The ratio of the areas (K) affected by avalanches to the area of the estimated region is proposed to become an easily determined and sufficiently substantial quantitative characteristics of the avalanche risk, which might be used when comparing different mountain regions as well. Six categories of different degrees of avalanche development have been defined.

While determining the lower boundary of the avalanche-risky territory it has become clear that the well-known methods of deciphering aerial photographs and topographic maps do not give a real picture. This is particularly true for the regions with no arborial vegetation. Thus, field studies and a joint analysis of the relief features and snow-cover depth are required. The results of this investigation show that the lower boundary elevation is 550-1250 m for the northern slope of the West Caucasus, 50-750 m for the southern slope, 1100 - 1300 m for the northern slope and 350 - 1200 m for the southern slope of the Central Caucasus. This value varies in the wide range of 900 - 1650 m for the river valleys of the East Caucasus. It is from 600 to 1000 m for the northern and north-eastern slopes.

The boundary of the zone of systematic avalanches is everywhere higher than the lower possible boundary of
the avalanche activity. Time of beginning and ending of avalanche risky period varies greatly in the studied territory. As a result, the duration of the period may change from 2 - 3 days at the lower boundary of the avalanche movement zone to 200 - 300 days and more for the regions with snow covers of longer duration.

Evaluation of the lowest elevations with the occurrence of avalanche cones gives a more realistic picture of the scale of development of avalanche activity in the given mountain country. Special consideration given to the problem is fully justified.

Without comprehensive studies, for example, it might have been difficult to assume the existence of the avalanche cone at 50 m a.s.l. at the southern seaside of the Caucasus, not far from the Black Sea health resort of Gagry, which is in fact in the subtropical region.

Density or number of avalanche centers for one kilometer of the valley bed is from 1 - 2 to 7 and more, depending on the relief type. Frequency of avalanching varies from 1 to 11 - 12 times a winter. Avalanches with the movement period of over 30 years are most frequent on the northern slope of the Central Caucasus (13 %) and the southern slope of the East Caucasus (7 %).

The increase with height in the amount of snow carried out by avalanches is influenced both by the size of the snow catchment area and the precipitation vertical belting which, in its term, depends upon the slope orientation towards the moisture-laden air flows and prevailing winds, slope exposure to direct solar radiation. Avalanches can carry out 30-64 % of snow accumulation from the slopes into the debris cone and tracks of avalanche ravines.

Each region of the studied territory is characterized by distinct regularities of avalanching time. 59 avalanches of the total number of those recorded occur in the West Caucasus in February and March. Two maxima have been observed in the avalanche regime in the East Caucasus - early in winter and late in spring.

The greatest part of the recorded avalanches (55 %) occur in the highlands (2000 - 4000 m). Most of the avalanching is accompanied by snowfalls and snow-drifts (56-64 %). The number of avalanches decreases more than twofold in the thaw period and foehns (18 - 24 %). The rest of the avalanching occurs during cold snaps and rainy weather.