

Snow avalanche synchronicity in the Făgăraș Mountains. A regional tree-ring analysis

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Snow avalanches are natural hazards prepared and triggered by a combination of climatic and topographic features. Avalanche paths with similar topographic settings and located in the same region are supposed to display a common period with major snow avalanche events. As historical data on past snow avalanches is generally scarce, a series of proxies are used for building avalanche chronologies. Dendrogeomorphology, the analysis of tree-rings, proved to be a reliable tool in century long avalanche reconstructions. However, very few tree-ring based studies focus on the inter-path synchronicity of snow avalanches and those who analyze this feature report low or no synchronicity regarding major event years.

The present study reconstructs snow avalanche chronologies for 17 forested paths located in the central northern part of the Făgăraș Mountains, Southern Carpathians, Romania. A total number of 956 affected trees were sampled and analyzed and more than 3600 growth disturbances were dated. The results reveal a mean return period of 4,5 years for major avalanche events in the region. By comparing the reconstructions on each path, several years show high inter-path synchronicity. In 1988, 1997 and 2005, 80% of the analyzed paths experience major events and more than 50% in 1967, 1992 and 2002. Reviewing the dendrogeomorphic literature this situation is rather unusual. However, the similar topographic and climatic settings of the analyzed paths advocate for a synchronous behaviour of avalanches. In addition, the results of several other studies undertaken in various mountain ranges of the Southern Carpathians (Parâng, Bucegi, Șureanu, etc.) show that major event years identified in Făgăraș are present in other regions of the Southern Carpathians as well. This suggests a common climatic trigger or specific synoptic conditions favouring major snow avalanche events in a larger region. The identification of such conditions would be of utmost importance to update the risk management in areas with intense winter tourism activities, hiking or off-piste skiing.