

Examples of rime and hoarfrost threats for human activity in the Western Sudetes, Poland

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Rime is formed as a result of freezing of supercooled droplets of fog on objects, whose surface temperature is below or equals zero. Rime takes the form of an icy precipitate resembling feathers which forms on the windward side of all objects protruding from the surface (e.g. trees branches, rocks). The most favourable conditions for the formation of hoarfrost occur when Poland is in the central part of an anticyclonic situation. Then, the dominating macroscale processes of air subsidence are conducive to cloudless weather with very weak wind. Hoarfrost forms when water vapor changes directly into solid ice.

The aim of the study is to draw attention to rime and hoarfrost as the reasons for the occurrence of selected threats: (1) rime considered as the factor leading to damages taking place in forests and various types of constructions (even buildings) through the weight of rime and glazed ice; (2) layers of surface hoarfrost or rime as a weak layer in the snowpack leading to an avalanche descent.

The largest direct and destructive role of deposit from fog to forest ecosystems occurs at sub-zero air temperature. The total weight of the load of ice in the case of a single tree can reach up to 2000 kilograms. This is backed by the results of rime efficiency measurements on so called Grunow collector. On mountain ridges in the Western Sudetes, atmospheric damage to the forest stand includes 16.4% of the surface. The most spectacular example of the threat posed by the load of rime is the construction disaster that affected in March 2009 the Meteorological Observatory building, located at the Śnieżka summit, at 1,602 metres above the sea level.

At steep slopes where hoarfrost is deposited on the surface of existing snowpack, particularly where the intensity of incoming solar radiation is low and preserves the snow from melting, hoarfrost may become a “weak layer” in the process of snow avalanche triggering. An avalanche accident of such type on the northern slopes of the Western Sudetes is also presented in this paper.