

Determining the Critical New Snow Depth for a Destructive Avalanche By Considering the Return Period

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Snow avalanche danger assessment for avalanche paths threatening a highway or a residential area is usually related to new snow depth. Given the extensive protection work in the Alps, the avalanche control service (also called avalanche commission) responsible for danger assessment will usually monitor the avalanche situation throughout the winter, but only become active in case of a major snow fall. Related safety concepts describing the procedures and measures to be taken in a given danger situation are therefore typically based on threshold values for new snow. By analysing the avalanche occurrence of a major avalanche path, we show that the return period of an avalanche to, for example, the road is about 5 years, whereas the return period for the corresponding new snow depth is substantially smaller, in our case slightly less than 2 years. Similar proportions were found for a number of other avalanche paths with different snow climate. The return period of the critical new snow depth is typically about 2-5 times smaller than the return period of the avalanche. This proportion is expected to increase with increasing return period. Hence, based on the return period of an avalanche path a first estimate for the critical new snow depth can be made. With a return period of the critical new snow depth of 1-2 years, avalanche prediction for individual avalanche path becomes very challenging since the false alarm ratio is expected to be high.