



Skier triggering of backcountry avalanches with skilled route selection

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Jamieson (2009) provided numerical estimates for the baseline probabilities of triggering an avalanche by a backcountry skier making fresh tracks without skilled route selection as a function of the North American avalanche danger scale (i.e. hazard levels Low, Moderate, Considerable, High and Extreme). Using the results of an expert survey, he showed that triggering probabilities while skiing directly up, down or across a trigger zone without skilled route selection increase roughly by a factor of 10 with each step of the North American avalanche danger scale (i.e. hazard level). The objective of the present study is to examine the effect of skilled route selection on the relationship between triggering probability and hazard level.

To assess the effect of skilled route selection on triggering probability by hazard level, we analysed avalanche hazard assessments as well as reports of skiing activity and triggering of avalanches from 11 Canadian helicopter and snowcat operations during two winters (2012-13 and 2013-14). These reports were submitted to the daily information exchange among Canadian avalanche safety operations, and reflect professional decision-making and route selection practices of guides leading groups of skiers. We selected all skier-controlled or accidentally triggered avalanches with a destructive size greater than size 1 according to the Canadian avalanche size classification, triggered by any member of a guided group (guide or guest).

These operations forecast the avalanche hazard daily for each of three elevation bands: alpine, treeline and below treeline. In contrast to the 2009 study, an exposure was defined as a group skiing within any one of the three elevation bands, and consequently within a hazard rating, for the day (~4,300 ratings over two winters). For example, a group that skied below treeline (rated Moderate) and treeline (rated Considerable) in one day, would receive one count for exposure to Moderate hazard, and one count for exposure to Considerable hazard.

While the absolute values for triggering probability cannot be compared to the 2009 study because of different definitions of exposure, our preliminary results suggest that with skilled route selection the triggering probability is similar all hazard levels, except for extreme for which there are few exposures. This means that the guiding teams of backcountry skiing operations effectively control the hazard from triggering avalanches with skilled route selection. Groups were exposed relatively evenly to Low hazard (1275 times or 29% of total exposure), Moderate hazard (1450 times or 33 %) and Considerable hazard (1215 times or 28 %). At higher levels, the exposure reduced to roughly 380 times (9 % of total exposure) to High hazard, and only 13 times (0.3 %) to Extreme hazard. We assess the sensitivity of the results to some of our key assumptions.