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The spatial distribution of two surface hoar events in the Chilkat and Takhinsha Mountains of southeast Alaska

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Understanding the spatial distribution of weak layers is a significant challenge for avalanche forecasters. Thus, improving our understanding of the processes that dictate the formation and persistence of surface weak layers across large areas is critically important for improving backcountry avalanche forecasting accuracy. For this work, heli-skiing guides mapped unburied surface hoar and near-surface facets across the Chilkat and Takhinsha Mountains of southeast Alaska during two major formation events of the 2010 season. After burial, we monitored weak layer persistence and avalanche activity. Our study area encompasses 900 km^2 of rugged, glaciated, alpine terrain, at elevations ranging from 300 m to 2000 m. Guides collected information on crystal attributes and terrain characteristics at each location, and used handheld GPS units to reference locations. Incorporating the data into a Geographic Information System (GIS) proved to be invaluable for managing and visualizing observations. For example, the GIS allowed the creation of surface condition maps that we used operationally in guide meetings and in the helicopter for making run decisions. Data analyses quantified observed patterns. In particular, we often found that surface hoar crystal size lessened with decreasing elevation, possibly due to stronger katabatic winds in valley bottoms. Additionally, we observed areas of inhibited surface hoar formation and persistence which may have resulted from the influence of synoptic inflow and outflow drainage winds. By better understanding the distribution of surface hoar and near-surface facets, this work provides insights into improved backcountry forecasting of avalanche conditions over large areas.