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Exploring multi-scale spatial patterns in historical avalanche data, Jackson Hole Mountain Resort, Wyoming

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ABSTRACT. Many ski areas, backcountry avalanche centers, highway departments, and helicopter ski operations record and archive daily weather and avalanche data. This paper presents a probabilistic method that allows avalanche forecasters to better utilize historical data by incorporating a Geographic Information System (GIS) with a modified meteorological nearest neighbors approach. This nearest neighbor approach utilizes evolving concepts related to visualizing geographic information stored in large databases. The resulting interactive database tool, Geographic Weather and Avalanche Explorer, allows the investigation of the relationships between specific weather parameters and the spatial pattern of avalanche activity. We present an example of this method using over 10,000 individual avalanche events from the past 23 years to analyze the effect of new snowfall, wind speed, and wind direction on the spatial patterns of avalanche activity. Patterns exist at the slide path scale, and for groups of adjacent slide paths, but not for either the entire region as a whole or when slide paths are grouped by aspect. Since wind instrumentation is typically located to measure an approximation of the free air winds, specific topography around a given path, and not simply aspect, is more important when relating wind direction to avalanche activity.