Snow avalanche research and forecasting with GIS and geospatial sciences

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Geographic information systems (GIS) and geospatial sciences have been used effectively in data collection and snow avalanche related research for over 50 years. Improved processors and programs have provided more user-friendly data collection and management applications, and the modern digitization of avalanche atlases allows for consistent recording and easy identification of avalanche events and their locations. Historic weather records and observations of snow pack properties (depth, SWE, stratigraphy) can be efficiently correlated with observations of avalanche activity when records of both weather and avalanche activity are managed digitally. Weather data is stored with a spatial attribute to help account for spatial variability, and allow for correlation with topography derived from a digital elevation model (DEM). A majority of avalanche and weather data is collected in areas of high use, such as highways, towns, or ski areas. Therefore, there are few complete and thorough temporal records of avalanche activity and weather data, and spatially complete records are non-existent as remote locations between areas of concentrated use are rarely observed. Remote sensing instruments have been used to record avalanche activity data in backcountry areas, and satellites are used to collect a variety of snowpack properties. Avalanche forecasting applications using statistical correlation of avalanche activity and weather data have been explored in many regions, but these analyses are only exploratory and used as an expert aid in forecasting. Further exploration of creating more temporally and spatially complete datasets may lead to more thorough and meaningful analyses in snow-avalanche research.