



## **Evaluating terrain based criteria for snow avalanche exposure ratings using GIS**

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Snow avalanche terrain in backcountry regions of Canada is increasingly being assessed based upon the Avalanche Terrain Exposure Scale (ATES). ATES is a terrain based classification introduced in 2004 by Parks Canada to identify “simple”, “challenging” and “complex” backcountry areas. The ATES rating system has been applied to well over 200 backcountry routes, has been used in guidebooks, trailhead signs and maps and is part of the trip planning component of the AVALUATOR™, a simple decision-support tool for backcountry users. Geographic Information Systems (GIS) offers a means to model and visualize terrain based criteria through the use of digital elevation model (DEM) and land cover data. Primary topographic variables such as slope, aspect and curvature are easily derived from a DEM and are compatible with the equivalent evaluation criteria in ATES. Other components of the ATES classification are difficult to extract from a DEM as they are not strictly terrain based. An overview is provided of the terrain variables that can be generated from DEM and land cover data; criteria from ATES which are not clearly terrain based are identified for further study or revision. The second component of this investigation was the development of an algorithm for inputting suitable ATES criteria into a GIS, thereby mimicking the process avalanche experts use when applying the ATES classification to snow avalanche terrain. GIS based classifications were compared to existing expert assessments for validity. The advantage of automating the ATES classification process through GIS is to assist avalanche experts with categorizing and mapping remote backcountry terrain.