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Monitoring of avalanche generated infrasound

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The detection of avalanches as they occur, no matter what weather conditions, is essential for every avalanche hazard mitigation program. Recent studies indicated already that snow avalanche generate acoustic noise in the low frequency infrasound spectrum (2-8Hz). These infrasound signals have the ability to propagate kilometers from the avalanche source thus monitoring is possible from a location unaffected by the avalanche activity.

However wind noise is recognized as one of the major obstacles of this endeavor. Wind creates pressure perturbations that affect infrasonic sensors and introduce noise in acquired data, which confounds identification of an avalanche-generated signal.

Therefore this study focuses on a spatial wind noise reduction filter made of porous garden hoses in a star configuration covered by snow. Moreover in comparison to this system data is monitored with an infrasound sensor sheltered by a weather-housing. This arrangement is located in a ski resort (Lech am Arlberg, Austria) where naturally and artificially released avalanches occur. In addition avalanche signals are monitored in France and Switzerland. The aim is to specify the avalanche signal out of interferences to provide a basis for automated signal processing through the use of digital filtering, frequency analysis, and weighted threshold decision-making. As the infrasonic avalanche signals are nonlinear and non-stationary they are analyzed by adopting the HHT approach and in comparison the conventional FFT method. The final goal is the development of an automatic warning system for avalanches.