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Comparison of seismic and infrasound wave fields generated by snow avalanches

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Snow avalanches are a source of waves that are transmitted through the ground and the air. These wave fields are detected by seismic and infrasound sensors. During the winter seasons 2008 -2016, a good quality database of avalanches was obtained at the VdlS test site with an accurate instrumentation. These avalanches were both natural and artificially triggered and were of varying types and sizes. Distances involved were 0.5 -3 km. Seismic signals were acquired using three seismometers (3-components, 1Hz) spaced 600 m apart along the avalanche track. One infrasound sensor (0.1Hz) and one seismometer (3-components, 1Hz) were placed one next to the other with a common base of time on the slope opposite the path. The database obtained enables us to compare the different signals generated. Differences in the frequency content and shape of the signals depending on the type and size of the avalanche are detected. A clear evolution of the recorded seismic signals along the path is observed.
The cross correlation of the infrasound and seismic signals generated by the avalanches allows us to determine different characteristics for powder, transitional and wet avalanches concerning their wave fields. The joint analysis of infrasound and seismic waves enables us to obtain valuable information about the internal parts of the avalanche as a source of each wave field.
This study has repercussions on avalanche dynamics and on the selection of the appropriate avalanche detection system.

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