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On the use of infrasonic and seismic sensors to determine acoustic emissions of snow avalanches

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Naturally released and artificially triggered snow avalanches induce vibrations, both in the ground and in the air. Acoustic sensors, such as seismometers and infrasound sensors are used in this study to monitor these vibrations. The seismic stations (3D, 1Hz eigenfrequency) were placed near the infrasound sensors (0.1 Hz eigenfrequency). The combination of these two different sensors presents new possibilities in the monitoring of snow avalanches. The distances involved are of the order of 3 km. We present data monitored during the winter season 2009/2010 and 2010/2011 at the Swiss avalanche dynamic test side Vallée de la Sionne. We will show that our results are repetitive for similar avalanches on the same avalanche path. Signal analyses involve time series and frequency content evolution studies. To further explain our results we compare our acoustic data of one natural snow avalanche with avalanche front velocity measurements made by radar. Our goal is to gain more information of the vibrations induced by avalanches in both, the ground and in the air, in order to improve the knowledge of snow avalanche characteristics and for monitoring purposes.