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Snow avalanche characterization by quantitative study of the generated seismic signals

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Seismic signals generated by snow avalanches of different type and size obtained at the experimental site Vallée de la Sionne (SLF, Switzerland) since the 1999-2000 winter season to date were analyzed. Three different sections on the avalanche seismic signals where identified. Signal ONSET (SON), signal BODY (SBO) and Signal Tail (STA) were identified in the seismic signals obtained in two different seismic stations placed in the centre and at the end of the avalanche path, respectively. These sections were identified by the analysis of time series and spectrograms and indicate the position of the avalanche with respect to the sensor and might be useful for avalanche detection. The detailed time series and frequency analysis of these sections provides information on the trajectory of the different branches of the avalanche which complement the cartography obtained subsequent to the avalanche. Reproducibility was obtained. The length, average and maximum amplitudes, and density of energy of the total avalanche and its sections were obtained for different avalanches. The average speed of the different segments of the avalanches was obtained through determination of the arrival time of seismic signals and the avalanche profiles obtained from the DTM. The average speeds range from 40 m/s for dry-mixed avalanches in the upper part of the track to 3 m/s for wet-dense avalanche in the lower part. Differences in the speed depending on the type of the avalanche flux were detected. In terms of time duration the maximum value obtained is 515s for a large/wet-dense flux avalanche whereas it is 190 s for a large/dry-mixed avalanche.