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Gazex explosion wavefield study at Obertauern: a measure to avoid unexpected snow avalanche releases

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The Gazex explosions are used to artificially purge selected slopes of accumulated snow. However, it is highly undesirable that these explosions trigger avalanches in the neighbouring areas. This study addresses this question using the real life experiment conducted at the Obertauern Gazex installation in Austria on the 11th of April of 2007.

A seismic array composed of 6 vertical geophones and two 3D seismometers were deployed at Gamsleiten slope in Obertauern. The array was deployed along a straight line on a 38-42 degrees inclination slope. The closest and the farthest sensors from the Gazex were placed at 132,5 m and 370 m, respectively. Once the area was evacuated and the ski station closed, three independent Gazex detonations were triggered, produced by 0.8 m^3 of gas. The generated seismic and acoustic wave field was recorded at 200 Hz by the deployed array of 6 geophones and 2 seismometers. At the experiment time the slope was partially covered with wet snow and a thick frozen snow crust on the top layer. The snow pack presented some discontinuities: in some parts, the underlying soil was exposed whereas in other parts more than 1 m thick of snow covered the slope.

Time, time-frequency evolution, particle motion and peak ground acceleration (PGA) analysis of the data was performed. The obtained results showed that the acoustic waves generated presented higher amplitudes than the generated seismic waves. Maximum amplitudes were observed in the horizontal components of the records highlighting the importance of 3D behaviour of the phenomena that must be taken into ac-

count when performing measurements in this type of experiments. In general, strong attenuation with distance of the seismic and acoustic waves was observed. However, unexpected high amplification of the acoustic waves at a distance of 219 m from the Gasex explosion was observed indicating the importance of considering local effects (ground heterogeneities, geometry. . .).

From the recorded data the PGA (Peak Ground Acceleration) values along the profile were calculated. Apart, a critical limit for the PGA values from theoretical stability analysis of the forces acting on the snow slab was also estimated. The comparison of the measured PGA values with the estimated critical limit shows that the former are at all times below the measured PGA values, as it should be.

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