



Monitoring snow avalanches in the medium range by a network of infrasonic arrays: first results

giacomo ulivieri (a), emanuele marchetti (a), maurizio ripepe (a), nathalie durand (b), barbara frigo (b), igor chiambretti (c), and valerio segor (d)

(a) University of Florence, Department of Earth Science, Firenze, Italy (gulivieri@unifi.it), (b) Fondazione Montagna sicura – Montagne sûre, Courmayeur (AO), Italy, (c) AINEVA, Trento, Italy, (d) Regione Autonoma Valle d’Aosta, Assetto Idrogeologico dei Bacini Montani, Quart (AO), Italy

Monitoring of small-to-medium sized avalanches activity represents a crucial parameter to compare predictions and real effects. However, at present natural avalanche activity is mainly based on field observations, which have a limited range and are possible only during the daylight.

Since 2009, the Department of Earth Sciences of University of Florence in collaboration with the Regione Valle d’Aosta is using the infrasonic array technology for near real-time monitoring of natural and artificial avalanche activity in the Alpine area. The results obtained during the last 3 years indicate that small-to-medium sized snow avalanches can be detected in the short-to-medium range distance (2-6 km). However, despite single array analysis allows to recognise many natural (microbarom, earthquakes, avalanches) and artificial (airplane, explosions) infrasound sources by using apparent velocity criterion, any unique identification and precise location of infrasonic sources is not possible without any additional information. In order to solve this problem, the monitoring system is upgraded by installing two additional arrays.

In fact, a network of 3 arrays is operating since December 2012 around the MonteRosa and Cervino international ski resorts on the related massifs. Each infrasonic array consists of 4 infrasonic sensors deployed in triangular geometry and ~150 m of aperture. Data are sampled at 100 Hz and transmitted in real-time to Department of Earth Sciences in Florence for near real-time (<2 minutes) processing.

The network has improved the capability in locating avalanches sources in a medium range distance (from 6 km to more than 10 km). In fact, the 3 arrays are covering an area of ~ 250 km². Efficiency of source location and sensitivity of this infrasonic array network are tested by using artificial triggered avalanches: avalanches can now be located with a precision of ~ 1 km. Information on geographical position, origin time and infrasonic energy will be supplied to Avalanche Warning Service of Aosta Valley in near real-time.

The research is supported by the Operational programme Italy - France (Alps – ALCOTRA) - Project "Map3 – Monitoring for the Avalanche Prevision, Prediction and Protection".