Automatic landslides detection on Stromboli volcanic Island

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Landslides occurring in active volcanic islands play a key role in triggering tsunami and other related risks. Therefore, it becomes vital for a correct and prompt risk assessment to monitor landslides activity and to have an automatic system for a robust early-warning.

We then developed a system based on a multi-frequency analysis of seismic signals for automatic landslides detection occurring at Stromboli volcano.

We used a network of 4 seismic 3 components stations located along the unstable flank of the Sciara del Fuoco.

Our method is able to recognize and separate the different sources of seismic signals related to volcanic and tectonic activity (e.g. tremor, explosions, earthquake) from landslides. This is done using a multi-frequency analysis combined with a waveform patter recognition. We applied the method to one year of seismic activity of Stromboli volcano centered during the last 2007 effusive eruption. This eruption was characterized by a pre-eruptive landslide activity reflecting the slow deformation of the volcano edifice.

The algorithm is at the moment running off-line but has proved to be robust and efficient in picking automatically landslide. The method provides also real-time statistics on the landslide occurrence, which could be used as a proxy for the volcano deformation during the pre-eruptive phases.

This method is very promising since the number of false detections is quite small (<5%) and is reducing when the size of the landslide increases. The final aim will be to apply this method on-line and for a real-time automatic detection as an improving tool for early warnings of tsunami-genic landslide activity. We suggest that a similar approach could be also applied to other unstable non-volcanic also slopes.