



## **Automatic identification, localisation and volume estimation of rockfalls occurring in the Dolomieu crater, Piton de la Fournaise volcano, la Réunion Island.**

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The permanent seismic network set up on the Piton de la Fournaise volcano by the Observatoire Volcanologique du Piton de la Fournaise (OVPF) is particularly well suited to studying seismic signals generated by slope instabilities related to volcanic activity. Hundred seismic signals generated by rockfalls that occurred in the Dolomieu crater are studied to assess the links between the processes that trigger the rockfalls, their intrinsic properties and the associated seismic signals. For the study of these processes and the spatio-temporal evolution of the rockfall activity over a long period of time, it is necessary to have automatic methods to process the large amount of data available. We present a method which aims to automatically discriminate seismic signals generated by rockfalls from those recorded by the OVPF seismological network. A kurtosis-based automatic picking method makes it possible to precisely pick the onset time and the final time of the rockfall generated seismic signals, despite their peculiarity. We then established localisation methods based on these precise picking, and a surface wave propagation model computed for each station from a Fast Marching Method. These methods have successfully localized rockfalls which were directly observed. This set of methods makes it possible the study of a database of 12422 rockfalls that occurred during a period going from May 2007 to May 2011, from the Dolomieu crater floor collapse to the end of the UDNERVOLC project. This study reveals that the number and moreover the volume of the rockfalls is an important information to take into account to determine whether an intrusive process will end as a summit eruption or not.