USING SEISMIC DATA AND MODELLING TO BETTER CONSTRAIN THE DYNAMICS OF ROCKFALLS IN THE DOLOMIEU CRATER, PITON DE LA FOURNAISE, LA REUNION

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The seismic and photogrammetric networks of the Piton de la Fournaise volcano (La Reunion Island), maintained by the OVPF, are well appropriate for the study of seismic signals generated by rockfalls occurring in the Dolomieu crater. In particular it makes it possible to relate the rockfall dynamics recorded by the cameras with the time change of the seismic energy [1, 2]. Furthermore, the availability of the videos enables us to better constrain our numerical models by fixing the starting location and the path taken by the rockfalls. The aims of this study are to better extract the information contained in the seismic signals, and to better constrain the physical characteristics of rockfalls. Simulations of rockfalls on 2D and 3D topographies obtained by laser-scanner survey of the crater are performed using the thin layer depth-averaged code SHALTOP developed within a collaboration between IPGP and LAMA, Marne-la-Vallée [3]. On one hand, a detailed comparison of the simulated dynamics with the movies of several rockfalls (Fig. 1) makes it possible to identify the different phases of the flow (initial collapse, impacts and interaction with the topography, stopping phase) and to relate them to the observed seismic signal. On the other hand, comparing the work rate, potential and kinematic energy changes calculated using the numerical models of rockfalls with the generated seismic power during the rockfall propagation down the slope of the Dolomieu crater (Fig. 1) gives information on physical parameters. In particular we test the effect of the friction law (constant friction and volume or velocity weakening friction) on the simulated force and work rate to investigate if the signature of the friction law may be identified on seismic records.

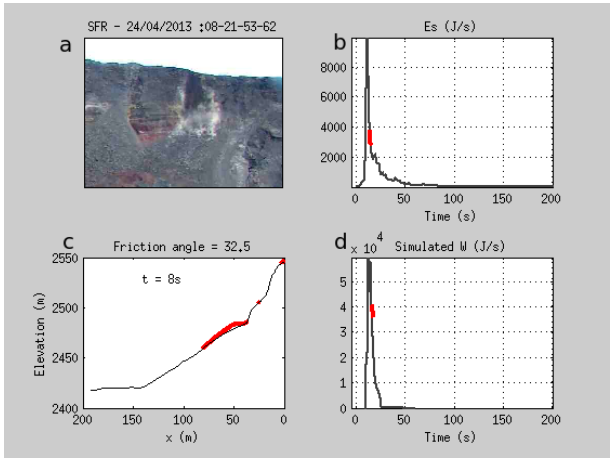

Figure 1. Comparison between the video, the seismic energy and the numerical simulation results. a) Picture of a rockfall occurring inside the Dolomieu crater. b) Observed seismic energy. c) Position of granular mass at time t=8s of the simulation. d) Computed power loss from the simulation.

References

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