Geophysical Research Abstracts
Vol. 19, EGU2017-14462-5, 2017
EGU General Assembly 2017

Seismic monitoring of the bedload transport in La Réunion Island rivers during tropical cyclones

Alicia Gonzalez (1,2), Fabrice. R Fontaine (1,2), Arnaud Burtin (2), Guilhem Barruol (1,2), Alain Recking (3), Jean-Lambert Join (1,2), Eric Delcher (1,2)

(1) Laboratoire GéoSciences Réunion, Université de La Réunion, 97744 Saint Denis, France. alicia.gonzalez@univ-reunion.fr, fabrice.fontaine@univ-reunion.fr, (2) Institut de Physique du Globe de Paris, Sorbonne Paris Cité, CNRS (UMR 7154), Université Paris Diderot, 1 rue Jussieu, 75238 Paris Cedex 05, France., (3) IRSTEA, ETNA, Domaine universitaire 2 rue de la Papeterie, BP 76, 38 402 Saint-Martin-d'Hères cedex, France.

La Réunion Island, located in the western Indian Ocean, undergoes heavy annual precipitations during the rainy season (Dec to Apr) and particularly during tropical depressions and cyclones. Large rainfalls that affect this volcanic island modify the stream dynamic and control the sediment transport and the very active erosion. However, in situ characterization of sediment transport is difficult during high water stage, requiring indirect observation such as seismic noise.

In order to monitor spatial and temporal variations of the river's bed-load during tropical cyclones from the high-frequency seismic noise in La Réunion, we deployed a temporary seismic network of 9 three-component broadband seismometers along two rivers: Rivière des Pluies and Rivière du Mât, both located on the northern side of the island. Seismic data are supplemented by meteorological and hydrological stations installed in these experimental watersheds. They provide valuable data such as precipitations, water discharge and water level. We also characterized the stream morphology and the bed surface grain size distribution to set the current characteristics and we aim to repeat this analyze after each flood event in order to quantify the effect of the flood episode on the sediment transport.

We present the results of the signature of the cyclone Bejisa which passed close to the island in January 2014 recorded at three broadband seismic stations, among which two are located near instrumented streams: station SALA installed close to the Rivière du Mât and the permanent GEOSCOPE seismic station RER installed in a 4.7 km long tunnel close to the Rivière de l'Est. The third station MAID is used as a reference station since it is located on a summit (2.190 km altitude) and far from any active river. We observe a significant increase of the precipitation as the cyclone eye was at 300 km to the island and the associated increase of the water discharge clearly generates a sudden increase of the seismic signal power spectral density above 1 Hz. Comparison between the high-frequency seismic signals measured at the three stations and the hydrological and meteorological data allow us identifying the characteristics of the river bedload.