Geophysical Research Abstracts
Vol. 13, EGU2011-1090, 2011
EGU General Assembly 2011

Numerical modelling of the tsunami triggered by the Güìmar debris avalanche, Tenerife (Canary Islands): comparison with field-based data

Thomas Giachetti (1,4), Raphaël Paris (1,4), Karim Kelfoun (2,5,6), and Francisco José Pérez-Torrado (3)

(1) Clermont Université, Université Blaise Pascal, GEOLAB, BP 10448, F-63000 CLERMONT-FERRAND, (2) Clermont Université, Université Blaise Pascal, Laboratoire Magmas et Volcans, BP 10448, F-63000 CLERMONT-FERRAND, (3) Departamento de Física (Geología), Universidad de Las Palmas de Gran Canaria, 35017-Las Palmas de Gran Canaria, (4) CNRS, UMR 6042, GEOLAB, F-63057 CLERMONT-FERRAND, (5) CNRS, UMR 6524, LMV, F-63038 CLERMONT-FERRAND, (6) IRD, R 163, LMV, F-63038 CLERMONT-FERRAND

The Güìmar sector collapse (Tenerife, Canary Islands, ∼0.83 Ma) and its associated tsunami are tentatively reproduced using a two-fluid numerical code. Two rheologies are successively used to simulate the landslide propagation: the Mohr-Coulomb frictional law and a constant retarding stress, according to two hypothesis concerning the significance of the offshore mapped deposits : 1) they are the direct results of a single collapse event or 2) they result from a collapse followed by remobilization. The 44 km3 subaerial destabilization spread out eastwards into the sea, creating simulated waves of initial amplitudes comprised between 390 and 500 m after our simulations. The waves then propagate all around the island of Tenerife and reach Gran Canaria coasts, located at ∼70 km from the scar, in ∼495-525 s. In the simulations, water enters the Agaete Valley on Gran Canaria ∼600 s after the onset of collapse, reaching up to 7.5 km inland and altitude >500m at some points. In this valley, the simulated waves inundate all the locations where tsunami deposits were identified, with wave amplitude reaching a maximum of 150 m at these particular places. The directions of maximum kinetic energy as a function of time of the simulated waves are consistent with the current directions recorded by the cobble fabrics present in the runup and backwash layers of the tsunami deposits at the unique outcrop for which this kind of data are available. It is thus likely that tsunami deposits were initially present uphill in the valley and higher on its flanks, but were subsequently eroded and reduced to small patches, as previously proposed. This study also shows that the major source of uncertainties when reproducing landslide-triggered tsunamis is linked to the way the landslide happens (volume involved, collapse in one go or by retrogressive failures...), the importance of the rheology chosen to simulate the landslide propagation or the height of sea-level being only crucial when dealing with more detailed observations.