Geophysical Research Abstracts
Vol. 13, EGU2011-12604, 2011
EGU General Assembly 2011

Devastation caused by mud flow in a narrow valley. Simulation of the event that affected in 2010 the town of Angangueo, Michoacan State, Mexico.

Veronica Ochoa-Tejeda (1,3), Victor Hugo Garduño (2), Jean-François Parrot (3), and Monique Fort (1)

(1) Univ Paris Diderot, Sorbonne Paris Cité, UMR 8586 PRODIG, F-75205 Paris Cedex 13, France (veronikot@yahoo.com.mx; fort@univ-paris-diderot.fr), (2) UMSNH-IIM- Departamento de Geología y Mineralogía, Universidad Michoacana de San Nicolás de Hidalgo (vgmonroy@umich.mx), (3) Instituto de Geografía, Universidad Nacional Autonoma de Mexico (UNAM). Mexico. (parrot@igg.unam.mx)

Mexico is continuously affected by many and frequent natural hazards such as earthquakes, flooding and mass movements. Each year, the number of victims and damages increases drastically. The triggering of numerous landslides by intense precipitations related to hurricanes or tropical depressions is the most common natural hazard that affects regularly this country.
Such an event occurred in February 2010 in the state of Michoacan, and affected the town of Angangueo. Between the 2nd and 5th day of that month, continuous rains were recorded, with a peak of more than 200 mm on February 4. The city was devastated by a huge mudflow causing numerous losses and damages (33 died, 61 disappeared, 5000 moved people, 40% of the urban structures destroyed or damaged).
In relation with this intense meteorological phenomenon, the geomorphological context of the area (a deep and narrow valley) and the nature of the removed material (argillaceous colluvium derived from the alteration of volcanic deposits) appeared as aggravating factors in the development of this catastrophe.
A three-dimensional simulation of this event has been done allowing to study and understand the reasons of the phenomenon, and to define the most vulnerable zones and the incurred risks.
Taking into account field observation and information about the main stages of the event, the simulation is based on the following considerations: a) Landslides occurred upstream of the city, hence creating a temporary dam retaining part of the water flux coming from mountainsides. b) Under the pressure of water flows, the landslide dams breached out and generated a large mudflow composed of a mixture of water and soils derived from slope colluviums. c) During its displacement the mudflow volume increased with contributions from the tributary streams.
Following this scenario, it is possible to calculate the total amount of material involved in the process in taking into account the precipitation rate and the area of the different tributary catchments. In addition, by taking into account the total volume available and simulating the thickness of mudflow, we could estimate the extension of flow and localize the affected zones. From our simulation it clearly appears that zones whose slope aspect is against the flow direction are the more vulnerable zones.