



A first approach to the numerical modeling of lahars at Tacaná Volcanic Complex, Chiapas, México

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The Tacaná Volcanic Complex (TVC) is an alignment with NE-SW direction of 4 main volcanic structures (from oldest to newest): Chichuj volcano, Tacaná volcano, las Ardillas dome and San Antonio volcano. It is a 4060 m high complex located at the border between Mexico and Guatemala. The TVC is considered an active volcano because it has experienced several eruptions during the Holocene (Macías et al., 2015), and two phreatic events in 1949 and 1986 (De la Cruz et al., 1989). The TVC is drained by the Coatán and Suchiate rivers, which flow towards the Pacific Ocean. The city of Tapachula, Chiapas (~250,000 inhabitants) is located at 35 km from the TVC along the Coatán River, it was settled on top of ancient lahar terraces (Murcia and Macías, 2014). In 2005, the city was partially destroyed by floods from the Coatán River that were triggered by Hurricane Stan and cut the main communication roads to Guatemala and Central Mexico. Nonetheless, this type of catastrophic events has been recorded in ancient times as documented in the ceremonial center of Izapa, which was flooded by lahars during the 1950 years B.P. eruption of the TVC. Considering these precedents, we present the preliminary results of the numerical modelling of lahars at the TVC by using the LaharZ code. Five possible scenarios were considered based on field deposits and similar events reported at other similar volcanoes (i.e. Volcán de Colima, México). The initial volumes simulated were: $V_1=0.5 \times 10^6$; $V_2=1 \times 10^6$; $V_3=2 \times 10^6$; $V_4=4 \times 10^6$ and $V_5=10 \times 10^6$ m³. During the simulations, the origin coordinates (10 points around the main drainages of the edifice) and the Heim coefficient (e.g. 0.3, 0.2 and 0.4, respectively) was also varied. The input DEM for simulations was a raster file of ALOS-PALSAR Global Radar Imagery of 12.5 m resolution.

Preliminary results show that simulation runs for all the origin points on the northern flanks of the TVC, develop lahars that flow into the Coatán River. The largest lahar is capable to reach Tapachula. On the other hand, the simulated lahars on the southern flanks of the TVC flow into the Cahoacán, Mixcun and Suchiate rivers. The most voluminous lahars also may impact Tapachula. These results should be analysed further in order to generate an adequate hazard map zonification. These results will be compared with other numerical simulations (e.g. FLO-2D) to enhance the overall results and to improve the hazard map that will serve as a tool for decision making, future planning and the upgrade of the evacuation plans.