



Cities on Volcanoes 9
November 20-25, 2016
Puerto Varas, Chile

'Understanding volcanoes and society: the key for risk mitigation'



Lahars triggered by the 2015 Hurricane Patricia at Volcán de Colima, México.

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Keywords: Colima, lahar, hurricane, numerical modeling, flo-2d

In the morning of the 23 October 2015, Hurricane Patricia hit the coast of Colima State to become a tropical storm with more than 260 mm of rain accumulated in 24 hrs. First lahars were detected in the afternoon. Based on data acquired at La Lumbre ravine monitoring station, at approximately 2 PM a muddy stream flow formed on the main channel. First pulses of a hyperconcentrated flow were detected around 5 PM which progressively increased in flow discharge and sediment concentration. Several front waves were observed, and two main debris flow pulses arrived at 6:30 and 7 PM, with 6 m-depth fronts. Several damages were provoked by this lahar on the SW volcano flank. Close to La Becerrera village more than 2 km of the interstate road and a small bridge were destroyed. The event was simulated to understand the temporal variation of flow discharge of the observed lahar, especially for the two main debris flow pulses that were responsible of mayor damages. The Flow-2d code was used, with a 10 m-DEM obtained from a SPOT 5 stereoscopic pair acquired in November 2014. Rainfall in the upper basin was inferred using data collected by the closest available rain gauge, and infiltration parameters are based on in situ measurement. Simulated discharge obtained at the monitoring site rapidly increases at ~ 5 PM, the first main peak appears at ~6:30 PM, followed by the maximum peak at 7 PM. Simulation shows that the arrival time of the two main observed debris flow pulses is controlled by the basin discharge. This outcome has important implication for hazard assessment during extreme hydrometeorological events: knowing that the triggering of subsequent surges of large and



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long duration lahars is mainly controlled by rainfall and hydrology at

catchment scale can help in developing real time early warning systems.