



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

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



Lowering Vulnerability of Quito's Water Supply to Future Cotopaxi Eruptions

Patricia A. Mothes^{1*}, Ximena Hidalgo², Marco Castro Delgado², Cristiana Torres J², Eduardo Vasquez² and Daniel Andrade¹

¹Instituto Geofísico, Escuela Politécnica Nacional, Casilla 1701-2759, Quito Ecuador ²Dept. of Civil and Environmental Engineering, Escuela Politécnica Nacional, Casilla 1701-2759, Quito Ecuador

Keywords: Vulnerability of infrastructure, Quito's water supply, Cotopaxi volcano, lahar modeling, Peak Lahar discharges

Owing to seismic unrest at Cotopaxi volcano in 2001-2002, Quito's municipal water supply provider, EMAAP, contracted professionals of the Escuela Politecnica Nacional in 2003 to determine lahar scenarios for Cotopaxi's northern drainage. The evaluation included assessing peak discharge, inundation heights, areas and travel times for past and future Cotopaxi lahars flowing down the Pita, Salto, Santa Clara and San Pedro rivers. Extensive fieldwork determined the parameters of the last important lahar, that of 26 June, 1877. These data provided the inputs for modeling and also determining the rheological parameters for those lahars. Several programs were employed: Flow 2D, FlowWave, LaharZ and Hec-Ras. The modeling results demonstrated that Quito's water supply was at high risk since the main conduits crossed at ground level several principal river channels where lahar peak discharges in 1877 had been up to 50,000 m³/sec. To lower the vulnerability of conduit crossings overpasses were designed. However, since the volcano quieted down and there were no visible superficial manifestations, the work by EMAAP to secure the water supply's safety was not completed. With Cotopaxi's more energetic unrest in 2015, both public demand, official scrutiny as well as further testimony from lahar experts resulted in the implementation of the construction of overpasses to transport the 1 meter diameter water pipes over river channels where the probability of future lahar transit is high. Although more than 10 years had passed since the original studies were undertaken, we believe that it is significant that these works to lower the vulnerability to Quito's water supply were undertaken. Altogether more than 2 million people benefit from such positive actions.