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Volcanic hazard assessment of the southern sector of Guagua Pichincha volcano (Quito, Ecuador)

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Pichincha Volcanic Complex (PVC) is situated 14 km west of Quito, the capital city of Ecuador. Guagua Pichincha volcano, the youngest and still-active edifice of PVC, is an explosive dacitic stratovolcano bisected by a horseshoe-shaped caldera. Over the past 2000 years 3 Plinian eruptions have been recorded at Guagua Pichincha: in the 1st and 10th centuries AD, and in AD 1660. Its most recent eruption occurred in 1999-2001. Our study was aimed at assessing the volcanic hazard for people, agriculture and infrastructures in the southern sector of the volcano, so to identify a low risk area suitable for possible future urban development. A geological map of the area was obtained, focusing mostly on the Holocene volcanic deposits. Field data were used for modeling the Plinian eruption of 970 A.D., which has been regarded as the maximum possible eruption that might occur again in the future. The model has been tested by a numerical program of explosive eruptions, simulating the dispersion of pyroclastic fallout, the formation of pyroclastic flows and their maximum travelling distance as a function of topography. A volcanic hazard map of the area was obtained considering the most probable eruptive scenarios. In addition, the possibility has been evaluated of the occurrence of secondary lahars in the valleys of the study area, considering their topography and assuming that lahars could be generated by rain mobilization of loose tephra accumulated on the steep sides of the valleys. The south area of the Cuchilla El Cinto was identified as the less prone to volcanic hazards and the most convenient for new settlements.