

Eruptive gap during the Last Glacial Maximum at Nevado de Toluca Volcano, Mexico.

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The Nevado de Toluca Volcano (NdT) is a 4600 m a.s.l. stratovolcano, situated 80 km SW of Mexico City and 20 km S of Toluca town, at the boundary between the central and eastern sectors of the Trans Mexican Volcanic Belt (TMVB). The activity at NdT started 2.6 Ma ago and was dominated by the extrusion of mainly andesitic lava flows and domes that ended approximately 1.2 Ma ago. After a long period of quiescence, characterized by erosive processes and sector collapse, the magmatic activity re-started at 42 ka BP (Macias et al., 1997). The Pleistocene–Holocene period was characterized by different eruptive phases, including five dome collapses dated at (14C ages) 37, 32, 28, 26.5 and 13 ka (Macias et al., 1997) and four plinian eruptions at 36, 21.7 (Lower Toluca Pumice), 12.1 (Middle Toluca Pumice) and 10.5 ka (Upper Toluca Pumice) (Macias et al., 1997; Arce et al., 2003; Capra et al., 2006). The eruptive sequence is topped by a surge deposit dated at ~3.3 ka B.P.

By comparing the occurrence of the eruptive events during late Pleistocene–Holocene with a high-resolution paleoclimate record from Guatemala, no eruptive activity is recorded in the stratigraphic record of the volcano during the Last Glacial Maximum (22,000–18,000 cal BP, LGM). During this period, extensive moraine deposits have been documented on the volcano slope, up to 3400–3600 m a.s.l. Because the last eruptive activity previous to this period was the Lower Toluca Pumice, a plinian eruption that originated a 20 km-high column, and no large dome collapse activity is found afterward (only the 13 ka El Refugio block-and-ash flow, limited to the NE flank), we assume that the volcano shape was similar to the present, with an open crater but probably at a higher altitude, since the actual shape is due to the ~10.5 ka catastrophic Upper Toluca Pumice plinian eruption that emitted more than 8 km³ of magma. Under this scenario, and considering the stratigraphic record, it is clear that during the LGM the volcano was quiescent or only suffered very minor eruptions that deposited material on the glacier and was subsequently eroded and remobilized. The stratigraphic record of the volcano shows very large eruptions whose deposits are spread all over the slopes up to 30 km from the vent. Therefore, even with the presence of an extended glacier, a large eruption with such characteristics should have been preserved on distal areas. We suggest a correlation between a very low eruptive phase of the volcano and the presence of a glacier during the LGM. An important issue to resolve would be to estimate the glacier thickness and evaluate how it could have affected the magmatic pressure on the conduit up to the magma chamber. This is an ongoing project and some preliminary results will be presented, including a stratigraphic record of epiclastic sedimentation during the LGM at Nevado de Toluca Volcano.