

POPOCATÉPETL VOLCANO, MÉXICO

(Orthophoto map)

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Background

Popocatepetl volcano is an ice-clad volcano. At ~19° N, its glaciers are, together with the glaciers of the neighboring Iztaccíhuatl and Citlaltépetl volcanoes, the only glaciers found in the intertropical region of the northern hemisphere. Lorenzo (1964) made the first glacier inventory at Popocatepetl (reported glacierised area resulted in 0.720 km²). Delgado (1993) described Ventorrillo and Noroccidental glaciers and four permafrost fields. Delgado (1997) updated the inventory (0.559 km²) and established a database calculating retreat rates for glacier tongue's altitude. Average retreat rate between 1906 and 1968 was nearly 7 m/year. An advance in 1968–1978 was 10 m/year, and retreat in 1978–1982 was 40 m/year. The causes of glacier retreat were associated with an increase of volcanic activity, and response to local and global climatic changes. Huggel and Delgado (2000) studied changes in glacierised area, morphology and ice thickness, and pointed out the importance of volcanic activity as the most likely cause of retreat.

Eruptive activity

On December 1994, Popocatepetl volcano started to erupt and the study of glacier changes acquired importance for debris flow hazard assessment. Julio and Delgado (2003) reported the glacier area for December 2000, determined the equivalent water volume and estimated maximum and minimum laharcic volumes for different ice melting scenarios.

Maps

Several aerial photographs have been taken for monitoring the eruptive activity and the glaciers. Selected aerial photographs were used to make a multi-spatial analysis using digital photogrammetry with the aim of quantifying glacier changes for 1996, 1997, 1999 and 2000.

Results

During 1996–2000 the area lost corresponded to 26% and retreat rate was 139 m²/day. Prior to the eruption, in 1964–1996, the loss in glacierised area was 23% and retreat rate was 12 m²/day.

Conclusions

Before the onset of current activity, the glaciers of Popocatepetl volcano showed a shrinking trend. However, at the end of the year 2000, glacierised area was reduced and thinned remarkably. A glacier-extinction process was underway prior to the eruption but the eruptive activity forced the completion of this process in the year 2000.