



Quilotoa volcano - Ecuador: An overview of young dacitic volcanism in a lake-filled caldera

Minard L. Hall, Patricia A. Mothes

Instituto Geofísico, Escuela Politécnica Nacional, Quito, Ecuador

Abstract

Quilotoa volcano, an example of young dacitic volcanism in a lake-filled caldera, is found at the southwest end of the Ecuador's volcanic front. It has had a long series of powerful plinian eruptions of moderate to large size (VEI = 4–6), at repetitive intervals of roughly 10–15 thousand years. At least eight eruptive cycles (labeled Q-I to Q-VIII with increasing age) over the past 200 ka are recognized, often beginning with a phreatomagmatic onset and followed by a pumice-rich lapilli fall, and then a sequence of pumice, crystal, and lithic-rich deposits belonging to surges and ash flows. These unwelded pyroclastic flows left veneers on hillsides as well as very thick accumulations in the surrounding valleys, the farthest ash flow having traveled about 17 km down the Toachi valley. The bulk volumes of the youngest flow deposits are on the order of 5 km³, but that of Q-I's 800 yr BP ash-fall unit is about 18 km³. In the last two eruption cycles water has had a more important role.

Upon Quilotoa's low-relief volcanic edifice, three calderas are recognized; the formation of the oldest one predates the Q-IV cycle and the others occurred during the Q-II and Q-I cycles. Dacite lava domes are common along the present caldera rim and most were emplaced at the end of the Q-II cycle; older domes of dark dacite belong to the Q-III and IV cycles. The explosive onset of the Q-I cycle expelled as much as 250 million m³ of the lake's water, resulting in large debris flows that scoured the eastern flanks of the edifice and descended the Toachi river.

Little variation in the mineralogy and chemistry of Quilotoa's eruptive products is observed, suggesting that the source is a homogeneous magma body at shallow depth. Both the pyroclastic material and the domes are composed chiefly of gray porphyritic dacites carrying large phenocrysts of plagioclase, amphibole, biotite, and occasionally quartz.

Available in:

Journal of Volcanology and Geothermal Research, 2008, vol. 176, no 1, p. 44-55.

DOI: <https://doi.org/10.1016/j.jvolgeores.2008.01.025>

<http://www.sciencedirect.com/science/article/pii/S0377027308000425>