



Dynamics of the ongoing lava dome eruption and its consequences on the long-term assessment of volcanic hazard.

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The eruptive history of Popocatepetl volcano, located in central Mexico and surrounded by one of the most densely populated regions of the world, include eruptions ranging from low-intensity effusive episodes to major Plinian phases, the last one occurring about 1200 y BP. Since then Popocatepetl has produced only moderate activity. In particular, in the last 500 y, fifteen eruptive episodes have been reported, the last one beginning in 1994 and still ongoing. The analysis of the current lava dome eruption helps to shed some light on the dynamics of the eruption and the internal structure in which it develops, providing some criteria for the assessment of volcanic hazard. During the ongoing eruptive episode, at least 40 distinct lava domes have been emplaced and destroyed in the summit crater of Popocatepetl in a condition of large and persistent passive degassing. Several features of this process offer some insight of the underlying physical process controlling the eruption. One is the exponential distribution of the dome volumes suggesting a self-regulating process of equilibrium between the buoyancy force driven by the volatiles content of the magma in the volcano conduit system, and its capacity to release them. This sets some limits on the volume of the domes emplaced under these conditions. Domes exceeding about 6 million cubic meters may indicate an alteration of the self-regulating character of the process. This is particularly critical in a volcano in which about 20% of the major explosive eruptions have occurred during or after predominantly effusive lava dome eruptions. In addition to the volatile content of magma, among the critical parameters controlling the self-regulating process are the geometry and dimensions of the main volcano conduit and the magma rate of ascent. We estimate that the volcano conduit has an average diameter of about 20 to 22 m, extending to a depth of about 5 km. The current activity may be destabilized if the magma ascent velocity exceeds about 70m/h, leading to a more explosive phase.