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# *Notes on a New Geologic Map of Santiaguito Dome Complex, Guatemala*

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## ABSTRACT

**A new geologic map of Santiaguito is presented, updating information from 1972 and reflecting continual growth of an active volcanic dome complex. The dome has been marked by unsteady extrusion of dacite lava, which has formed 34 time stratigraphic dome units as well as fragmental deposits that consist of dome-collapse debris, talus, and sediments. The dome is now mainly covered by blocky lava flows, and its overall composition is changing toward lower silica content.**

## INTRODUCTION

Santiaguito began to form in 1922 (Sapper, 1926) and has been continuously building ever since. The dome extrusion followed a plinian eruption of similar but slightly more silicic dacitic magma in 1902 (Sapper, 1903; Rose, 1972; Williams and Self, 1983). The first geologic map (Rose, 1972) shows 14 units of the dome by age plus talus alluvium and stream deposits. It depicted a dome complex marked by four distinct vents: El Caliente, La Mitad, El Monje, and El Brujo. Each of the four vents consisted of endogenous and exogenous units. The pattern of extrusion moved progressively westward over the course of 50 years. The volcano showed unsteady extrusion, with each of the vents marked by a spurt of extrusion lasting several years (Rose, 1973, 1987; Harris et al., 2003; Barmin et al., 2002).

Only 10 of the 14 units mapped in 1972 units are still exposed at the surface; four have been covered by subsequent lava flows and talus. Between 1972 and 1977, volcanic activity was marked by extrusion at both the El Brujo and Caliente vents (Rose, 1987). Our new map shows 20 units erupted between 1977 and 2006, all exogenous flows. During this time, activity was marked by vertical explosions from an apparently cylindrical conduit (Bluth and Rose, 2004) accompanied by lava that flowed from the conduit and fed lava flows which spilled out of the conical summit (~2500 m asl) and formed units that are dated by repeated field observations. These lava flows are all similar dacitic block flows which move slowly and conserve heat (Anderson et al., 1995; Harris et al., 2002). Moderate dome and lava flow collapses that produce hazardous block and ash flows (Rose et al., 1977; 1989) occurred several times during this period, and 4 people were killed by one block and ash flow in 1990. The unsteady nature of the extrusion was measured by thermal remote sensing (Harris et al., 2002; 2003; 2004) and modeled with numerical flow simulation (Barmin et al., 2002). More frequent observations of the vent and its heat flow suggest that the lava composition is becoming slightly more mafic and the extrusion rate may be decreasing.

Below the dome, an alluvial fan deposit reaches toward the coastal plain; it consists of debris derived from the lava dome, including talus, block and ash flows, lahars, and flood deposits (Harris et al., 2006). Overall, the dome volume is estimated to be ~1.74 km$^3$, including ~0.47 km$^3$ of volcanogenic sediments in the alluvial fan, and the extrusion rate is 0.69 m$^3$/s

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since 1922 and 0.56 $m^3/s$ since 1954 (K. Durst, 2009, personal commun.), although the daily extrusion rates deviate markedly from these averages.

## STRUCTURAL ELEMENTS

In addition to the geologic map, we have produced a map that also contains structural elements, such as photo lineaments and flow features, seen on orthophotos. These features likely represent faults, flow folds and fractures, spine boundaries, and other dome features. They have not been fully confirmed by ground observations and are presented here for their possible value for hazard information.

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