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Textural insights into the evolving lava dome cycles at Santiaguito lava dome Guatemala

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Structures and textures of lava domes reflect underlying magmatic and eruptive processes and provide evidence of how eruptions initiate and ultimately how dome collapse-driven pyroclastic flows are triggered. This study has revealed remarkable cycles in lava extrusion style driven by extrusion rate at Santiaguito Lava Dome, Guatemala. By examining the eruptive lava morphologies and textures we aim to constrain the processes behind the changing lava types. In addition, we explored the historical record to constrain the temporal relationships and effusion rates between the morphologies. Pore shapes and sizes within the lava preserve a degassing and outgassing history where the crystal size and proportion are consistent. We attribute the observed differences in pore shapes to be reflecting shallow inflation, deflation, flattening or shearing of the pore volume. Effusion rate and duration of the eruption define the amount of time available for cooling, degassing and outgassing prior to and during extrusion, driving changes in pore textures. Big explosions and collapse events trigger hotter, less degassed vesicular lava to erupt by clearing the upper conduit of overlying cooler more degassed material. Over time as the extrusion rate increases blocky lava flows of increasing length (?4km) develop and further degassing and outgassing occurs down flow. Pore pressurisation generates frequent small (?10m) and infrequent large (?4km) block and ash flows from the flow toes. Spines preserve a history of pore deflation and outgassing, with porous zones facilitating shear of the dense lava and extrusion coincides with lower extrusion rates at the beginning and end of an eruption cycle. The sequence of lava types varies in each distinctive eruption cycle, and is dominantly explained by temporal changes in effusion rate and instantaneous dome summit collapses. Each lava type presents a unique set of hazards and understanding the morphologies and dome progression is imperative in hazard forecasting.