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203-6 - 2021 EXPLOSIVE ERUPTION AT LA SOUFRIÈRE, ST. VINCENT: CONSTRAINTS ON ERUPTION TRIGGERS FROM MONITORING AND PETROLOGY

Wednesday, October 13, 2021
9:25 AM - 9:40 AM
Oregon Convention Center - A106

Abstract

In late December 2020, a new lava dome began extruding in the summit crater of La Soufrière, a stratovolcano on the Eastern Caribbean island of St. Vincent. This is the first volcanic activity since an explosive eruption in 1979, which ended with the formation of a lava dome. On April 9, 2021, the style of the 2020/2021 eruption transitioned to an explosive phase, with multiple Vulcanian and sub-Plinian events. Between the onset of activity and April 22, 2021, >30 explosive events occurred. Seismicity, deformation, gas emissions, and water chemistry were monitored by the UWI Seismic Research Centre (UWI-SRC). During the effusive phase, a minor amount SO_2 was measured by MultiGAS in February and water samples from the Wallibou Hot Springs on the volcano flanks did not record a hydrothermal chemical signature. To evaluate possible explosive eruption triggers, we have begun petrologic investigations of scoria clasts from different phases of the eruption. Samples collected on April 11th in the Sandy Bay area are basaltic-andesite (52.8-54.2 wt% SiO_2) and have a crystal-rich mineral assemblage of plagioclase + clinopyroxene + olivine + orthopyroxene + titanomagnetite, with abundant microlites. Crystals have a remarkably pristine morphology, with sharp edges and no evidence of alteration and/or disequilibrium, either in isolated crystals or in the abundant glomerocrysts. Plagioclase phenocrysts span a broad compositional range, with cores and unzoned crystals from An_{58-96}. Common normally zoned plagioclase crystals have relatively thick (20-50 um) sodic rims (An_{58-69}) and microlites are slightly more sodic (An_{52-60}). Pyroxenes are typically unzoned, although a few phenocrysts are normally zoned, with compositional ranges of Mg# 0.84-0.62 for cpx and Mg# 0.71-0.58 for opx. Pyx microlites range from Mg# 0.53-0.64. Two-pyroxene thermometry yields temperatures of 980-1010˚C. Olivine has a composition of Fo_{59-87} and the phenocrysts are unzoned. The lack of reverse zoning in any minerals suggests that magma mixing did not play a significant role in triggering the explosive phase. To investigate the influence of volatiles on the system, we are exploring mineral hygrometry and magma ascent rates and storage conditions by looking at crystal size distribution to determine microlite density and diffusion profiles in minerals.

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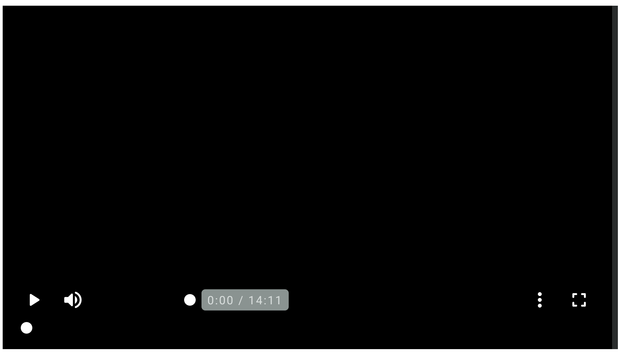

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