CHARACTERISTICS OF THE BEGINNING OF THE 2019 ERUPTIVE CRISIS AT UBINAS VOLCANO (PERU)

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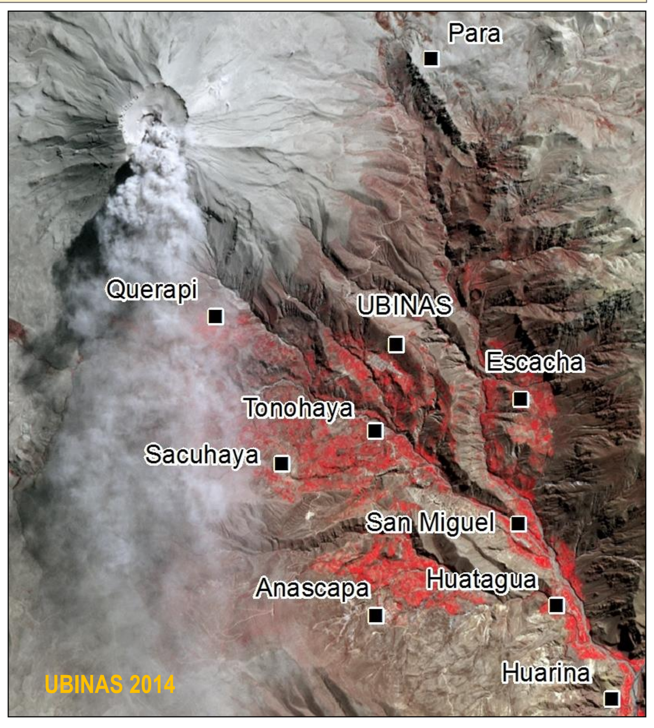
INTRODUCTION

Throughout the last few years in the Central Volcanic Zone, explosive activity of volcanoes has disturbed the daily lives of people and caused damage to the infrastructure and economic activities. In southern Peru, three eruptive cycles of Ubinas volcano (16° 22′ S, 70° 54′ W; 5672-m asl) have impacted agriculture and livestock and forced the evacuation of villages within around ~10 km from the vent. With 26 eruptive cycles in the last 500 years, this composite cone is the most active volcano in Peru.



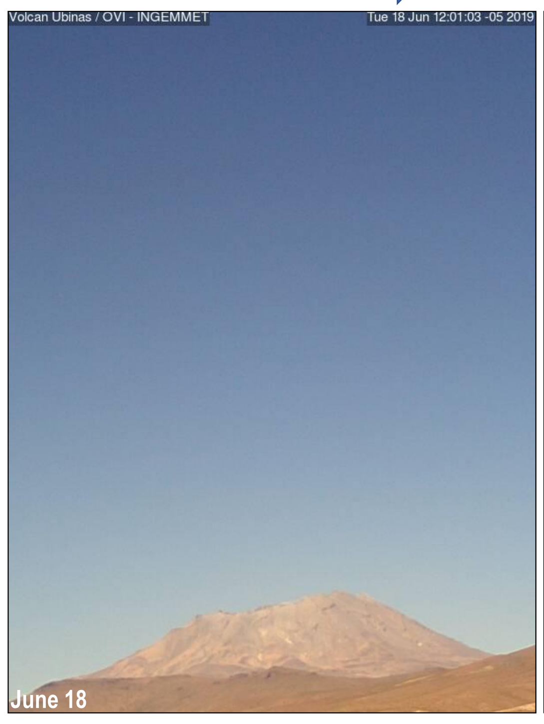
THE ONGOING ERUPTIVE PERIOD

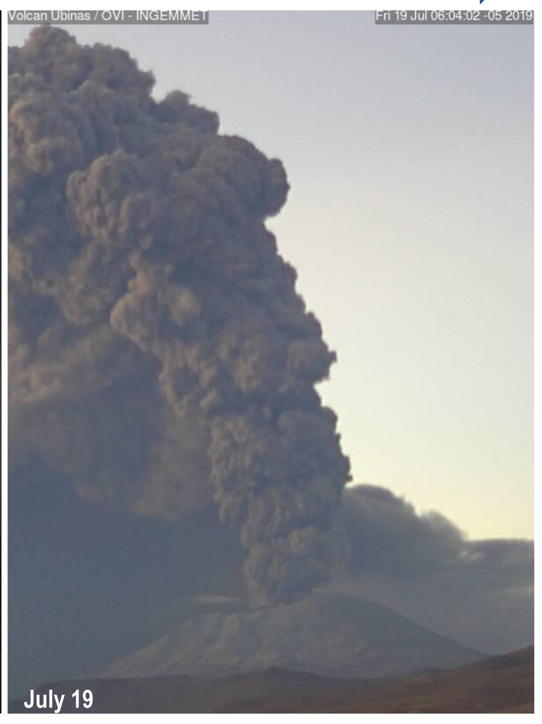
On June 24th 2019, a new vulcanian eruptive cycle started with minor emissions of tephra and aerosols. Activity increased on July 19 with an explosion beginning at 2:30 AM (local time).

June 18: No emissions

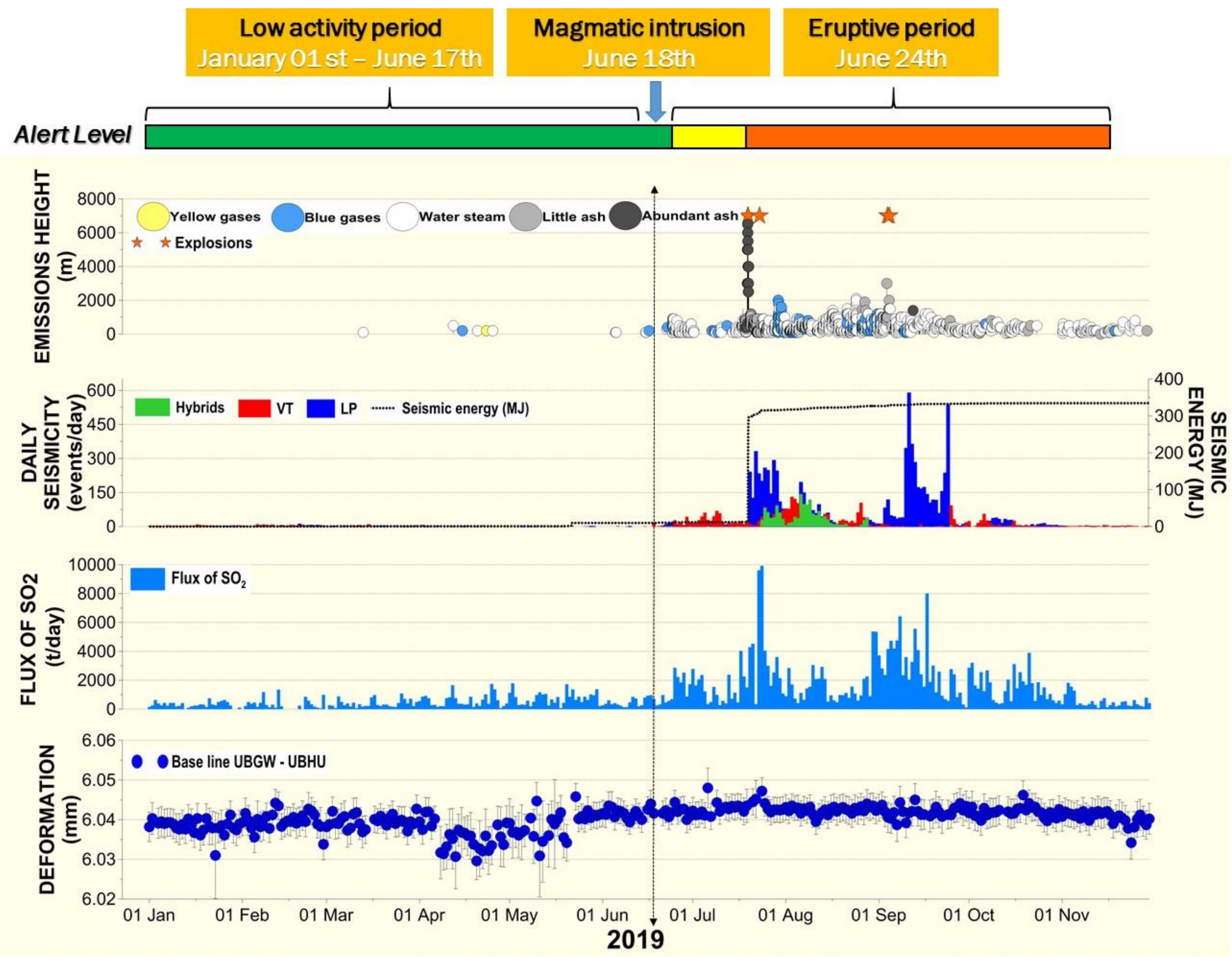
June 24: Ash emissions

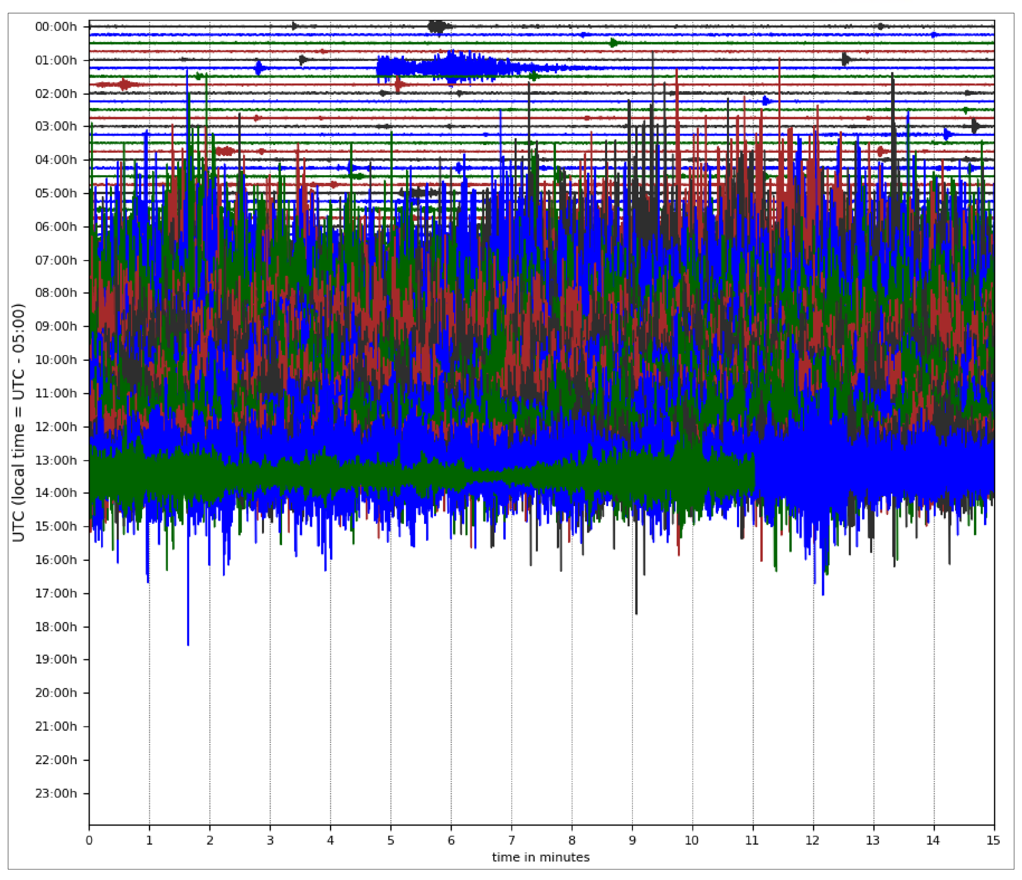
July 19: Explosion and tephra emissions





The activity of Ubinas has changed from April to June. These changes were observed in seismicity, deformation, and SO_2 fluxes previous to the eruption. The first change was associated with a small inflation starting in April to May, this activity was followed by an increase in the volcano-tectonic seismicity and emission fluxes of SO_2. Explosive activity with increasing seismicity (predominance of LP-type signals) started on July 19th. Hybrids and VT-type seismicity was accompanied with high flux SO_2 emissions reaching as much as 9600 tons/day.

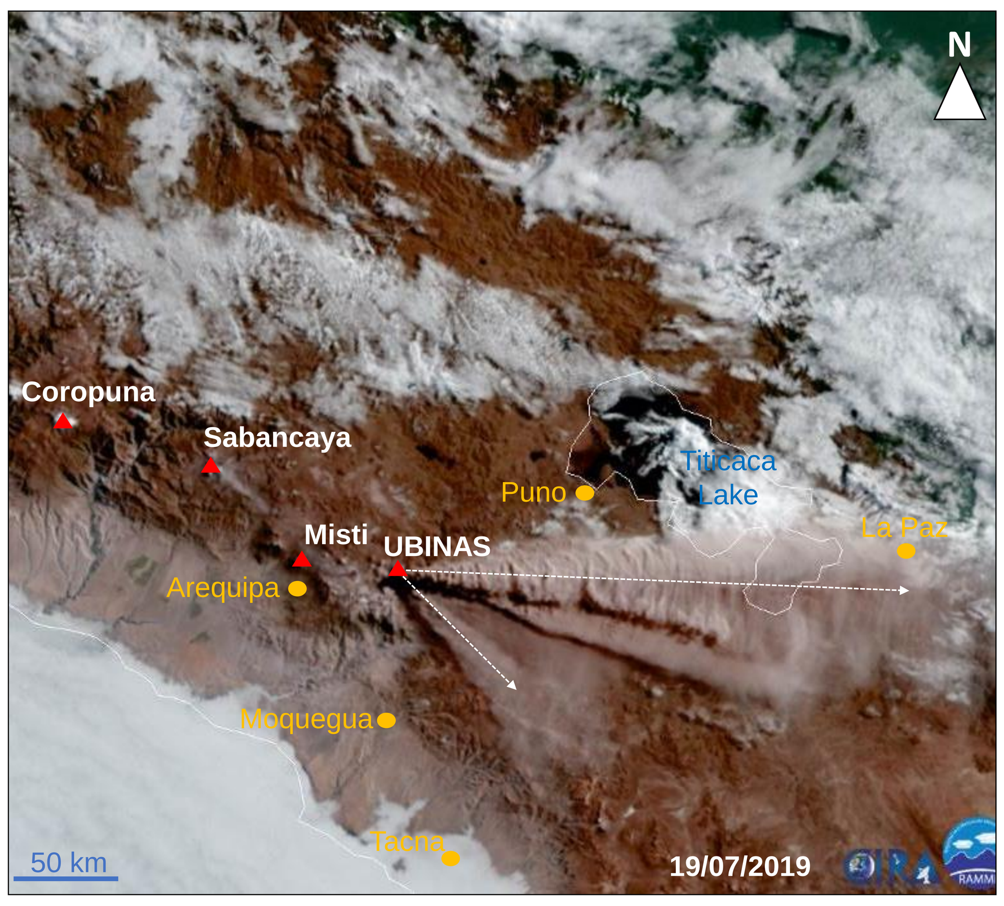


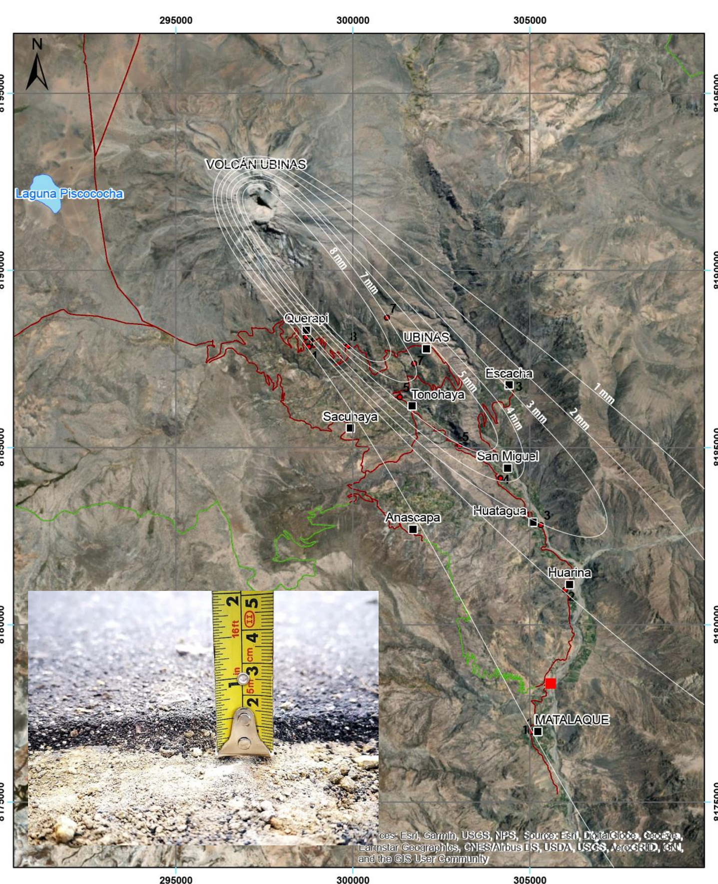


TEPHRA DEPOSITS

The major explosion and tephra emission occurred on July 19th. Two clearly differentiated and wind-controlled volcanic plumes were observed. Initially, the plume reached 6500 m above the summit and the main dispersion axis was ESE, dispersing ash as far as 300 km away to the villages of Jesús de Machaca and Catacora, Bolivia. A simultaneous 1200-m-high secondary plume developed later in the eruption and was dispersed to the SE, reaching more than 100 km away into the Tacna region (Peru).

Just after the tephra fall on July 19, deposit thicknesses were measured along the secondary dispersion axis, where the nearest populated and most impacted areas are located. The accumulation of lapilli and ash during the July 19 eruption reached 7 mm in the village of Ubinas, 5 mm in Tonohaya, 4 mm in San Miguel, 3 mm in Escacha and San Miguel, and 1 mm in Matalaque, ~20 km away. Fine ash accumulation was also reported at the Quellaveco mine, 90 km to the SE.

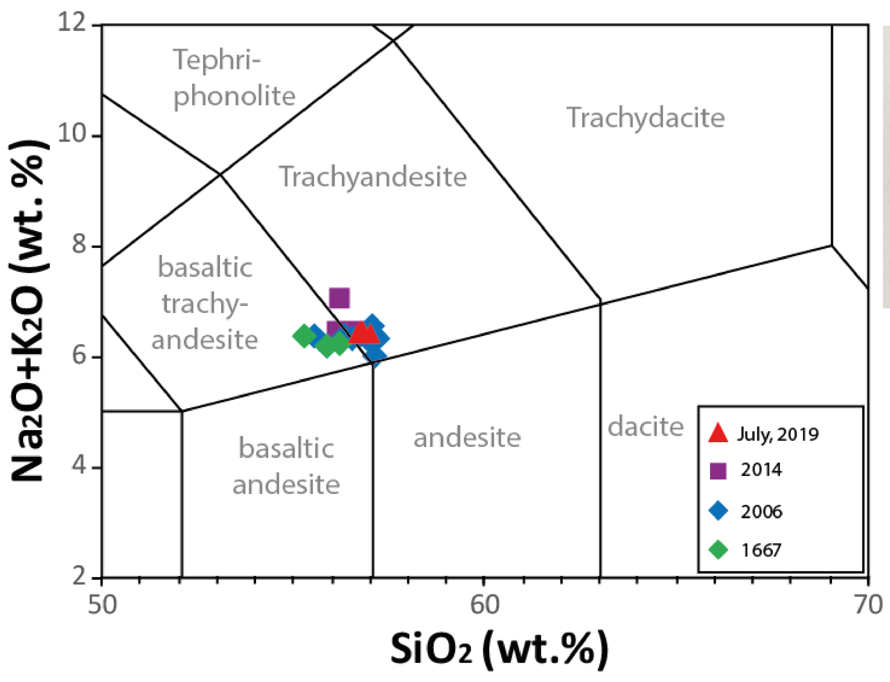


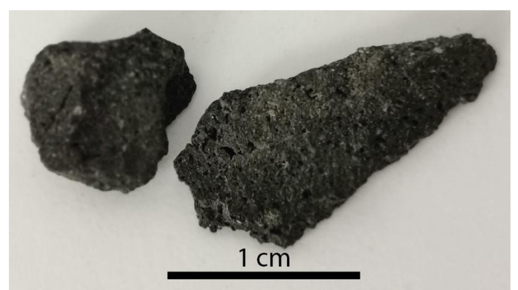


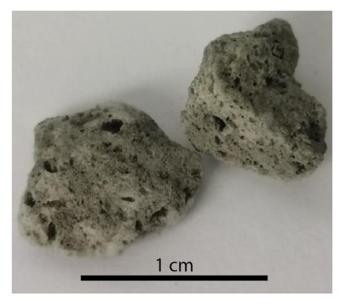
CHARACTERISTICS OF THE ERUPTIVE PRODUCTS

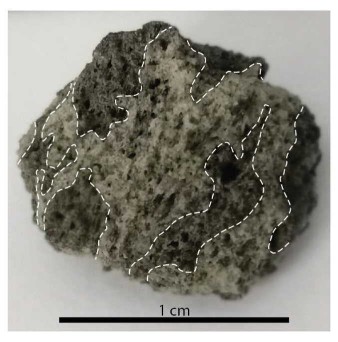
Collected samples show angular to sub rounded shapes, with sizes that reach 2-cm diameter at 3.2 km from the vent. Three types of juvenile clasts are distinguished; dark- and light-gray scoria and dense, dark-gray lithics. Rare juvenile clasts have bands of dark and light material.

Whole-rock chemical analyses indicate trachyandesite compositions, which are similar to material emitted during the 2013-2017, 2006-2009 and 1667 eruptions.



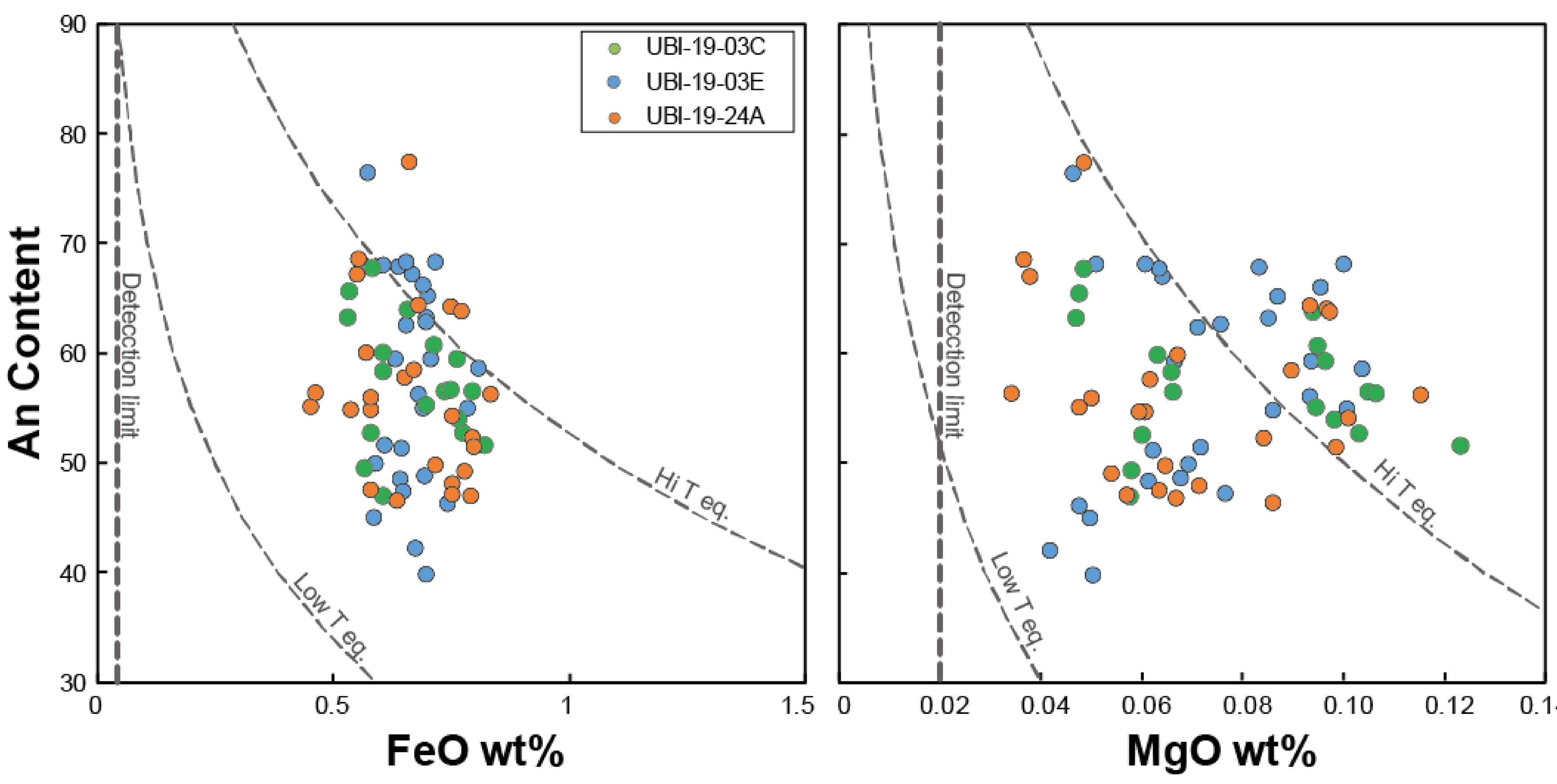


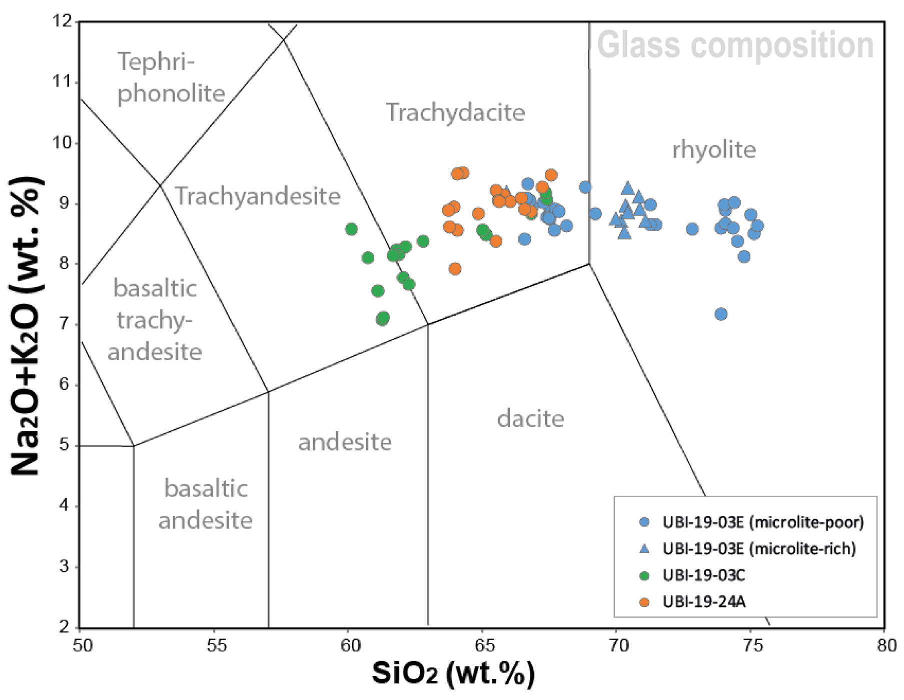




Microprobe analysis suggest that despite the similar whole-rock compositions, some compositional differences exist in the groundmass. Microprobe analyses indicate two types of glass in samples collected from the July 19th eruption; trachyandesite (UBI-19-03C) and rhyolite (UBI-19-03E). Glass from July 22nd (UBI-19-24A) suggest an intermediate composition between the other groups emitted during the previous days.

On the other hand, An contents of plagioclase versus FeO wt.% and MgO wt.% cluster together as a high-temperature group (Hi T eq. line; 1000C) with no apparent differences among the collected samples.





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