

A new intense lava fountain episode at Voragine crater (Mt. Etna): the event of 3 December 2015

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On 3 December 2015 Voragine crater, one of the five summit craters of Mt. Etna (Italy), produced a powerful lava fountain. The last paroxysmal episodes from this crater had occurred on July 1998 and September 1999; both events had been very intense, the first one classified as subPlinian and the latter causing significant disruption to road traffic due dense tephra sedimentation. Afterward, the Voragine entered in a period of relative quiescence interrupted by short events of Strombolian activity and weak ash emissions. In August 2015 the crater resumed its activity with discontinuous ash puffs that were followed by periods of relatively intense ash blasts in September. In October, this activity was clearly replaced by weak, pulsating Strombolian explosions confined inside the crater, which was several tens of meter deep. Gradually the Strombolian blasts became more continuous and intense and lapilli started to sediment around the crater rim. In the night between 2 and 3 December, the increase of seismic tremor coevally to the Strombolian activity heralded the lava fountain episode. During the paroxysm, that lasted around 40 minutes, vigorous magma jets were also produced by the adjacent Bocca Nuova summit crater, contributing to form a unique eruption column up to at least 7-8 km above the volcano and dispersed to the NE. Lighting was recurrently observed inside the column. Field survey, carried out between 3 and 5 December from a distance of 5 km from the vent, allowed to map the fallout dispersal and collect tephra samples. Estimation of uncertainty associated with ash sampling were also performed. Due to low-intense winds, the fallout mostly affected the area close to the volcanic slopes, but it also reached both the Tyrrhenian Sea to the N and the Ionian Sea to the E, more than 100 km of distance from the crater. Measurements of shape and density on the largest clasts collected within the first km from the Voragine were performed. Furthermore, we measured the density of the fallout deposit on the ground, varying from 0.7 g/cm³ to ~1 g/cm³ between 5 km and 20 km of distance. The values of mass per square meter on the ground have a rapid decline from the proximal to intermediate samples, showing that most of the mass covered an area within the first 20 km from the vent. We finally estimated the total grain-size distribution and a preliminary total erupted mass of ~109 kg, which makes the 3 December paroxysm a large-scale lava fountain episode of the last 20 years.