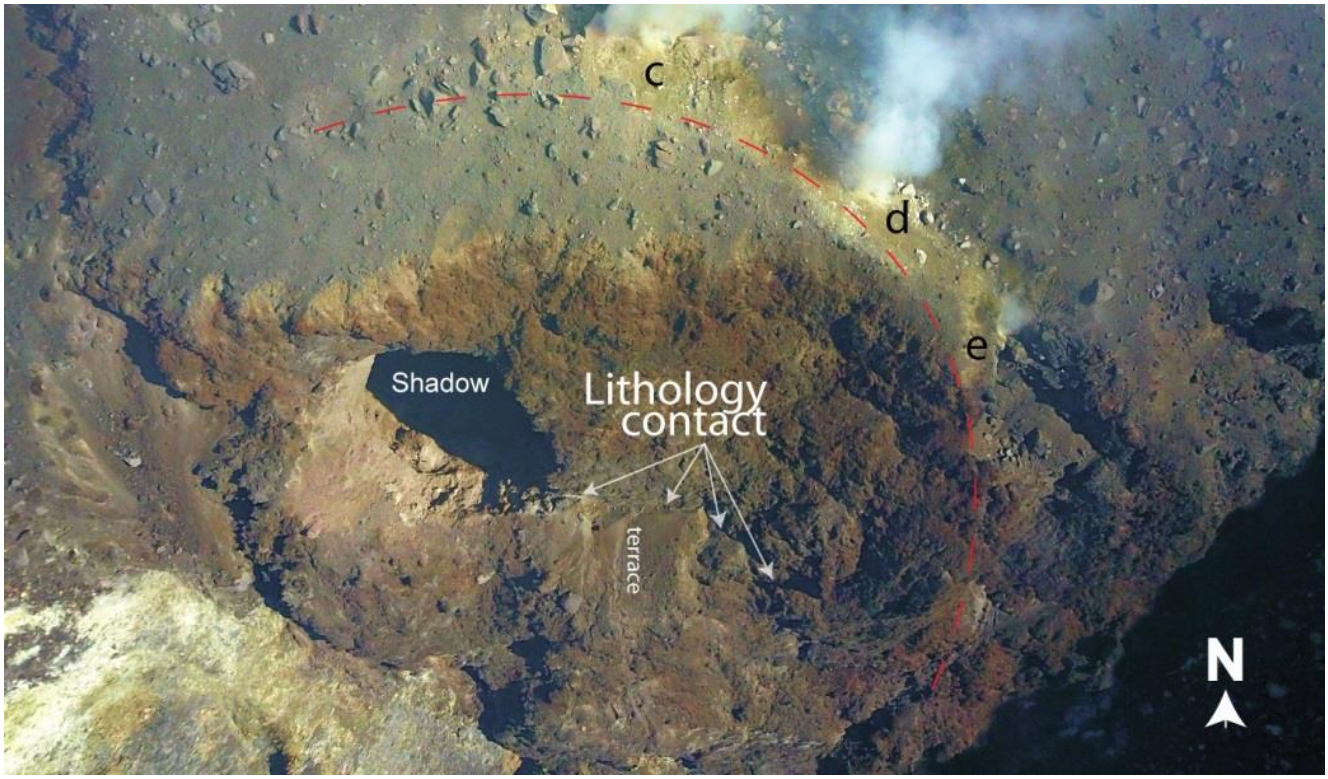
Supplementary Material

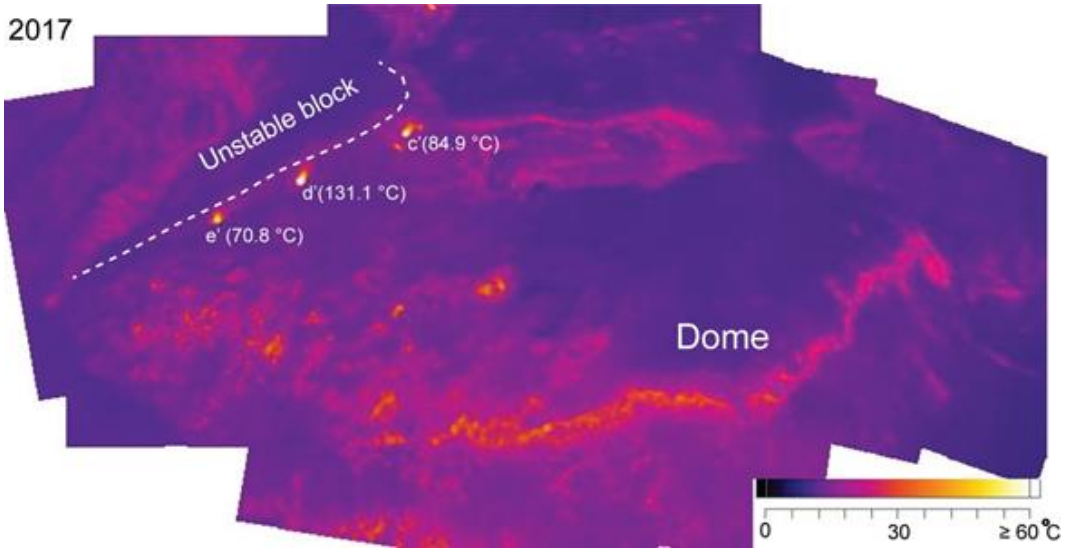
Supplement 1.

Aerial image of southern sector of the Merapi dome in 2017 shows detail the lithology contact and the small low inclined terrace. Image is not scaled.



Supplement 2

Photomosaic of thermal images acquired in September 2017 shows that the dome surface has average apparent temperature of ~10 °C. Three thermal fractures (c', d', and e') at the horseshoe-shaped structure were clearly identified with maximum apparent temperature of 84.9 °C, 131.1 °C, and 70.8 °C, respectively. The apparent temperature of thermal fracture C has increased from 30.6 to 70.8 °C between 2014 and 2017 which may indicate formation of a new thermal fracture.



Supplement 3

Simulation of pyroclastic block and ash flows of small unstable dome sector collapse scenario shows that the flows mechanism is restricted along the Gendol valley. The maximum run out distance reaches 3.5 km from the summit and the hazard zone is ~1.3 km^2.