

## Characteristic behavior of ground tilt motions associated with repeated small explosions at Stromboli volcano

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Stromboli volcano in Italy is a typical volcano where intermittent small eruption (Strombolian eruption) occurs. We report characteristic behavior of tilt records associated with small intermittent eruptions and its temporal change before the activity transition to flank lava effusion on August 7, 2014.

We installed 3 tiltmeters near the summit crater of Stromboli volcano from the end of May 2014. We obtained continuous tilt records with a sampling frequency of 100Hz. Down-sampled data of 1 Hz are analyzed from June 1 to July 30 divided each 15 days. To extract volcano deformation associated with small explosion from tilt records, we firstly applied 6h high-pass filter for noise removal, and then smoothed them by 50s low-pass filter. As a result, the signals associated with VLP seismic signal, which is rapid uplift and the following subsidence toward the active crater, are repeatedly observed. In addition, gradual uplift toward the active crater which has a few hundred second durations were observed, as reported in Genco and Ripepe [2010]. We extracted these three ground deformations as follows. First, we performed 20s - 100s band-pass filter on the north component of a station RFR. Secondly, we determined the onset time and end time of VLP signal by imposing a low threshold amplitude level. Finally, we extracted tilt signals that have a long interval time and a high amplitude level. The extracted tilt signals are characterized by azimuth from the north and amplitude of the tilt vector. We examined the parameters' distribution at each observation site every a half month.

Rapid uplift and subsidence tilt motion of PZZ (ESE direction from the crater) and RFR (SSE from the crater) point to the active crater, while those of CPL (NE from the crater) deviate about 30 degrees north from the crater. This suggests that the pressure source generating rapid uplift and subsidence associated with small explosion is not approximated as a point source but has a finite size. Direction of the gradual uplift prior to small explosion has large variation in the azimuth, but the directions averaged every two weeks are almost same to the average directions of rapid uplift and subsidence. During the observation period from June to July, there is no significant temporal change of averaged azimuth in any site or deformation phenomenon.

These results suggest the gradual uplift prior to small explosion and rapid deformation associated with small explosion averagely share an almost same pressure source. Although transition phenomenon of flank lava effusion occurred in the beginning of August, 2014, the pressure source location did not change significantly for time scale of two weeks.

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