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ストロンボリ火山の噴火に伴う広帯域地震波形の特徴と分類
Variation of VLP signals accompanying eruptions at Stromboli volcano, Italy

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Stromboli volcano in Italy, one of the most active and famous volcano in the world, has been the target field of volcanology to understand eruption dynamics. From aspect of volcano seismology, broadband seismic observations have revealed that VLP(very-long-period) signals (10˜sec) are dominant among the seismic signals accompanying eruptions at Stromboli volcano (e.g. Neuberg et al., 1994). Chouet et al. (2003) demonstrated that inflation-deflation-inflation sequence of moment components, which represent inclined crack, is dominant at VLP signals observed at Stromboli volcano. The estimated force system was considered to represent the rise and ejection of gas slug, which causes repressurization of crack corresponding second inflation. However, most previous researches have analyzed a few VLP events having specific waveform characteristics, that were typical among their temporary observation data for days or weeks.

We have conducted broadband seismic observation at Stromboli volcano since May 2014. From 4 month long broadband seismic record, most VLP events seem to have similar waveform characteristics mentioned in Chouet et al. (2003) (inflation-deflation-inflation sequence). However, we recognized there are several waveform types prior to main first inflation phase.

1. Gradual inflation (10 ˜30 sec) prior to main inflation
2. Having small deflation phase (˜5 sec) during gradual inflation (type 1)
3. Gradual deflation (10 ˜30 sec) prior to main inflation
4. Combination of type 2 and 3
5. Short deflation (˜5 sec) prior to main inflation
6. No main inflation phase (Only downward pulse)

As described above, there are certain groups of VLP events which have deflation phase prior to main first inflation phase. Even if amplitude of deflation phase is small, such deflation process cannot be explained by the simple gas slug rising model. Moreover, some VLP events (type 6) have no inflation phase at the onset. Particle motion analysis for onset and first inflation phase shows events in type 1, 2, 5, 6 have common azimuthal direction (NW-SE direction), while events in type 3, 4 have slightly different direction. Since Stromboli volcano has several active vents on the northwest direction from our seismic station, these differences of azimuthal motions may reflect the difference of vents where eruptions were taken place. Another remarkable feature is about the transition of occurrence frequency of each type. For example, occurrence frequency of type 6 has decreased at the beginning of Aug. 2014. Those days correspond to the period that amplitude of RMS (root-mean-square) of high frequency (>3 Hz) has decreased. Also transition of eruption style has been reported at that period, from intermittent Strombolian eruptions to lava outflow and effusive eruptions.

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