Oral | Symbol S (Solid Earth Sciences) | S-VC Volcanology

[S-VC50_2AM2]Dynamics of volcanic eruptions and igneous activities

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Fri. May 2, 2014 11:00 AM - 12:45 PM 315 (3F)

This session discusses the dynamics of volcanic and igneous activities such as magma accumulation, magma ascent in volcanic conduits, and dispersion of volcanic products. In order to understand such multi-scale phenomena, the researches of microscopic and macroscopic scales and the techniques that combine the different scales are required. We aim to discuss the latest approaches as well as the recent observations, laboratory experiments and analyses numerical simulations from the viewpoint of cross-cutting research.

12:30 PM - 12:45 PM

[SVC50-P05_PG]Moment tensor representation of elliptical volume sources

3-min talk in an oral session

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Keywords:moment tensor, volumetric source, volcano seismology, magma

A moment tensor inversion is a powerful tool to extract source information from seismic and geodetic observations. However, widely-used moment tensor representation for volumetric sources has been limited to a few basic geometries such as a sphere, a flat crack, and a cylinder. These sources give particular diagonal component ratios: (M_1:M_2:M_3)=(1:1:1) for a sphere, (1:1:3) for a crack, and (2:2:1) for a cylinder. When different component ratios are obtained from the inversion analysis, they are interpreted as combination of these simple geometries without considering internal pressure balance.Although the moment tensor representation for elliptical sources was obtained 30 years ago (Davis, 1986), the solution has been rarely applied in volcanology. We consider two disadvantages of Davis (1986). The one is that the theories to relate the actual volume change to moment tensor have been proposed but not unified , which has caused some confusion. The accompanying paper (Ichihara et al., 2014, this meeting) presents a unified explanation based on the representation theorem and makes a clear link among volume change, geometry, and moment tensor. In this context, we have confirmed the applicability of Davis (1986) to the observed moment tensor.The other disadvantage is that researchers have to search in the numerical table to find a geometry fitting to the observed moment tensor. Here we develop a facilitative tool that diagnoses the diagonal part of observed moment tensors to given the aspect ratios and the apparent compressibility. In addition, if the density and the compressibility of the internal material are given, the tool estimates mass change inside the source, which is an important parameter in volcanology. This tool will provide a reference model satisfying pressure balance and help improving the volumetric source modeling beyond the conventional kinematic summation of simple sources.