

Temporal-spatial heterogeneity of volcanic eruption records in Japan

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Under-recording of events must be taken into account in estimating recurrence rates of explosive eruptions using volcanic eruption record. In the Large Magnitude Explosive Volcanic Eruptions (LaMEVE) database (Croweller et al., 2012, Brown et al., 2014), Japanese events account for about 39 % of the entire set of eruptive events (Kiyosugi et al., 2015). An analysis [k1] of the Japanese eruption events show an inverse correlation between VEI and degree of under-reporting suggesting that even larger VEI eruptions are under-recorded in the Quaternary. For example, 89 % of VEI 4 events, 65-66 % of VEI 5 events, 46-49 % of VEI 6 events and 36-39 % of VEI 7 events are missing from the record at 100 ka, 200 ka, 300 ka, and 500 ka, respectively (Kiyosugi et al., 2015). Comparison of frequencies of Japanese and global eruptions suggests that under-recording of the global database is 7.9-8.7 times larger than in the Japanese dataset (Kiyosugi et al., 2015).

In addition to the analysis of the entire Japanese eruption events, temporal-spatial heterogeneity of the dataset must be considered in modeling the under-recording of events. The main mechanisms of under-recording are absence of historical records, erosion and alteration of tephra deposits, burial of tephra deposits by younger deposits and disappearance of the source volcano itself due to burial or erosion. Therefore, under-recording of events varies temporally and spatially, reflecting geological and historical backgrounds. For example, an analysis of the Japanese eruption events suggest that many large eruptions are missing in the Izu-Bonin arc because the volcanic arc consists of small volcanic islands where wide-spread tephra deposits are less likely preserved. Understandings of the under-recording in different geological settings improve the estimation of recurrence rate of volcanic eruptions. Furthermore, Koyama (1999) pointed out that the historical record of Japanese volcanic eruptions increases in two time periods (from the end of the 7th century to A.D. 887 and from the beginning of the 17th century to the present) due to political and social background in Japan at those times. Because frequency of the recent eruption events, which includes the historical records, is an important factor to model under-recording of events, detailed study of the temporal heterogeneity is required.

I will show results of analyses of the temporal-spatial heterogeneity of Japanese eruption events. Because the Japanese events account for about 39 % of the entire set of eruptive events, analysis of the Japanese data contributes to understanding the under-recording of events and estimating recurrence rate of the global dataset.

Reference:

- Brown et al (2014) Journal of Applied Volcanology, 3:5.
Croweller et al (2012) Journal of Applied Volcanology, 1:4.
Kiyosugi et al (2015) Journal of Applied Volcanology, 4:17.
Koyama (1999) Journal of Geography, 108(4), 346-369 (in Japanese).

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