

Validity of thickness of Aso-4 tephra fall deposit of the Uwa Basin, western Shikoku

*Chisato Nakamura¹, Tomohiro Tsuji², Michiharu Ikeda³, Naoki Nishizaka⁴, Kozo Ohnishi⁴, Masayuki Sakakibara^{5,6}

1. NAIBA Co. Ltd., 2. Graduate School of Science and Technology for Innovation, Yamaguchi University, 3. Shikoku Research Institute INC., 4. Shikoku Electric Power Co. Ltd., 5. Faculty of Collaborative Regional Innovation, Ehime University, 6. Research Institute for Humanity and Nature

The volume of tephra related to the Aso-4 eruption of about 89 ka is estimated to be more than 400 km³ (Machida and Arai, 2003). It was calculated using an isopach map based on a thickness of 15 cm on eastern Hokkaido. Takarada (2019) recently compiled an isopach map based on previous study data and estimated the volume of the Aso-4 tephra. It is shown that the Aso-4 eruption volume was larger than previously thought. An estimate of the volume of the Aso-4 tephra requires reliable thickness measurements from proximal areas (e.g., Kyushu and Shikoku Islands) to distal them (e.g., Hokkaido Island). In some cases, tephra layers consist of primary and secondary volcanoclastic deposits, which are defined as the “direct” products of volcanic eruptions and the “reworked” products of the former, respectively. This is a problem in evaluating the thickness of tephra layers. Because of an estimate of the volume greatly changes by thickness data, it is necessary to interpret the distinction thickness of primary tephra layers.

The high-quality thickness data of the Aso-4 tephra fall deposit in core UT from the Uwa Basin on western Shikoku was reported to be a 31-cm-thick by Tsuji et al. (2018). The Uwa Basin is in a relatively short distance from Kyushu Island volcanoes. Because tephra of eruption events of various scales are likely to be recorded, many tephra layers are reported in the thick sediments which continuously deposited for 0.7 Myr sediments from the Uwa Basin (e.g., Tsuji et al., 2018).

It is desirable to evaluate the thickness data of the Aso-4 fall deposit with multiple cores from the Uwa Basin. In this study, we obtained the thickness of the Aso-4 fall deposit in the core UT-iwk which sampled at about 500 m north of the core UT to examine the validity of the Aso-4 fall deposit thickness from the Uwa Basin. The thickness of the Aso-4 fall deposit of the core UT-iwk was 20–30 cm, slightly thinner than the core UT. The determination methods of the thickness of primary fall deposits are (1) observation of sedimentary structures by utilizing half cores and surface peel specimens, (2) existence of accidental clasts, and (3) measurement of grain size change of volcanic glass shards. Overall, the Aso-4 fall deposit in the core UT-iwk doesn't exhibit lamination and includes a minor amount of accidental clasts (<5%). The bottom layer is characterized by a concentration of large pumices; the maximum pumice size of 3 mm. The lower part consists mostly of coarse phenocrysts and pumices. The upper part is weakly sorted; the average size of volcanic glasses decreases slightly towards the top. These detailed descriptions allow the getting of the thickness of primary tephra layers.

Additionally, the core B1 was sampled at a point about 1 km northwest of the core UT. The thickness of the Aso-4 fall deposit in it was about 30 cm (Soyama et al., 2012, Soyama et al., 2013). The bottom altitudes of the Aso-4 fall deposit in the core UT, the core B1, and the core UT-iwk is 206.00 m, 206.93 m, and 206.17 m, respectively. The thicknesses of the Aso-4 fall deposit in all cores have a range of 20–30cm-thick in three sites with about the same altitude. These data suggest the thickness of the Aso-4 fall deposit in western Shikoku is estimated to be 30 cm. The thickness data is useful in calculating the

volume of the Aso-4 fall deposit.

Machida, H. and Arai, F. 2003. Atlas of Tephra in and around Japan (revised edition).

Soyama C., Sakakibara M., Ikeda M. and Tsuji T. 2012 Volcanic petrology of Aso-4 tephra in Unomachi core samples, western Shikoku, southwestern Japan. Programme and abstracts the Volcanological Society of Japan, P56, 155.

Soyama C., Sakakibara M., Sano S., Ikeda M. and Tsuji T. 2013. Volcanic petrology of Aso-4 tephra (ca. 90 ka) in western Shikoku, southwest Japan. Proceeding of 1st International Seminar of Environmental Geoscience in Asia, 1-5.

Takarada S. 2019. Estimation of Eruptive Volume of the Aso-4, Aira and Toya eruptions. Programme and abstracts the Volcanological Society of Japan, A3-14, 46.

Tsuji T., Ikeda M., Furusawa A., Nakamura C., Ichikawa K., Yanagida M., Nishizaka N., Ohnishi K. and Ohno Y. 2018. High resolution record of Quaternary explosive volcanism recorded in fluvio-lacustrine sediments of the Uwa basin, southwest Japan. Quaternary International, 471, 278-297.

Keywords: Aso-4, tephra fall deposit, thickness, Uwa Basin