

Tephrostratigraphy Concerning Resedimentation of Tephtras

Tomohiro Tsuji¹, Michiharu Ikeda¹, Akira Furusawa², Kiyoshi Ichikawa³, Makoto Yanagida³, Naoki Nishizaka⁴, Yuki Ohno⁴

¹Shikoku Research Institute Inc., Japan, ²Furusawa Geological Survey Co. Ltd., Japan, ³Hanshin Consultants Co. Ltd., Japan, ⁴Shikoku Electric Power Co. Inc., Japan

E-mail: t-tsuji@sken.co.jp

The identification and establishment of widespread tephra is very important not only in understanding volcanic processes but in its application to related fields of geology. Tephrostratigraphies are usually established based on focusing mainly on marine and/or lacustrine deposits which are good for preserving tephtras, whereas resedimented tephtras are also easily preserved. So the identification of the resedimentation of tephtra has to be done carefully but has not been examined in detail. Then we described and analyzed tephtras in a 120 m long core drilled at Uwa basin (UWA core) in western Shikoku Island to establish tephrostratigraphy taking in to the consideration of resedimentation of tephtra.

Kyushu Island has six famous calderas which have produced many wide spread tephtras and continue to be active now. Shikoku Island, being directly east of Kyushu, is a potentially favorable location for studying the volcanic history of Kyushu, because tephtras are typically carried northeastward or eastward from Kyushu by the prevailing westerly winds. The Uwa basin, an inland basin formed in the upper region of the Hijikawa River in western Shikoku, provides an excellent research opportunity in that preserves continuous lacustrine deposits as well as many tephtras.

We found some tephtras that resembled the petrological characteristics in some horizons in the UWA core, so we tried to identify whether they are resedimented or not based on their sedimentary structure and contamination of exotic materials.

In each tephtra sample, bulk grain composition, heavy mineral composition, morphology type of volcanic glass shards, refractive indices of volcanic glass shards and heavy mineral phenocrysts as well as chemical composition of volcanic glass shards were examined. Grain-size analyses in some tephtras were also conducted to check the contamination of exotic material. Fission Track dating of zircon of three tephtras were measured by Kyoto Fission-Track Co. Ltd.

Based on Fission Track dating, the sediments have been deposited successively since about 800 ka. We recognized 76 tephtras including tephtric sediments and identified 20 of them as original deposit layers. The thickest tephtra is the Aira-Tn (AT) tephtra which is 180 cm thick; however, most of it was resedimented. Thus, the thickness can be modified a few times thicker or thinner from the original. These results suggest that the estimation of accurate thickness and number of tephtras must be considered to evaluate past volcanic activities.

We successfully correlated 14 tephtras with previously identified widespread tephtras mainly derived from Kyushu such as AT, Aso-4, K-tz, Ata, Aso-ABCD, Aso-3, Aso-2, Ata-Th, Aso-1, Ng-1, Kakuto (Kkt), Oda, Shimokado and Shoubu. In addition, some unknown local tephtras which have never fallen in the Osaka and Boso region could be included in the UWA core. This high-resolution tephrostratigraphy is an essential key to clarify the eruptive history of the Kyushu volcanic region.