

Identification of Ata Torihama tephra in the northwest Pacific based on glass-fission track ages and geochemistry of glass shards

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Ata-Torihama tephra(Ata-Th) consists of Torihama fallout pumice (Tr P), Torihama pyroclastic flow(Tr pfl) described by Ui(1971) in Kyushu, southwest Japan, and their co-ignimbrite ash associated with Tr pfl(Machida et al., 1983; Nagaoka, 1988; Machida, 1991; Suzuki and Hayatsu, 1991). This widespread ash reaches as far as central Japan. Furthermore, some tephra beds are similar to Ata-Th and have been found in the northwest Pacific(Aoki et al., 2000; Sukanuma et al., 2006), identifications being based on the major element composition of their glass shards. The eruptive ages of Ata-Th have been estimated by some environmental proxies in pelagic sediment in addition to a zircon-FT age of 240±40 ka(Danhara et al., 1995).

Ideally, correlations of distal tephra beds should be crosschecked by a few geochemical characters obtained by different methods. I can show that the trace-element composition of individual glass shards analyzed by LA-ICP-MS(laser ablation inductively-coupled plasma mass spectrometry) is one of the most powerful tools for correlation of distal tephra beds in the northwest Pacific.

Fission-track dating is the best method to measure the numerical age of volcanic glass shards. Two methods have been developed for the correction of spontaneous track density, required because of partial track fading(Westgate, et al., 2006). One is the isothermal plateau fission-track(ITPFT)dating method. Glass samples for ITPFT are heated at 150 Celsius degrees for 30 days. The other method is the diameter correction fission track (DCFT) method. The spontaneous track density in glass samples for a DCFT age determination is corrected by reference to differences between the average track diameter of the spontaneous and induced tracks.

Ata-Th correlatives in sedimentary cores, MR01-K02, PC1 and MR00-K05, PC1 in the northwest Pacific, are correlated to fallout pumice units (UT2157 at Onejime) and pyroclastic flow deposits (UT2156, UT2154 at Onejime, UT1204 at Yagoshi, and UT1198 at Kogashira).

Glass-ITPFT and -DCFT ages of Ata-Th (marine correlative and type samples) are ca. 210 ka. Errors are less than 10 % by weight-meaning. Ata-Th has an extensive distribution in Pacific and these precise age estimates will add to its importance as a time-marker for paleoenvironmental studies.