

## ESR dating of rhyolites from Kozushima, Japan

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Kozushima is a volcanic island in the Pacific Ocean located about 180 km southwest of Tokyo. Kozushima is composed of at least 16 rhyolitic monogenetic volcanoes (Isshiki, 1982). There are two eruptions whose ages were well determined. One is Tenryo-san lava (838 A.D., historic record) and another is Chichibu-yama pyroclastic surge deposit-A (=Cb-A) (19,140 to 21,860 B.P.,  $^{14}\text{C}$  method: Isshiki, 1989; Suga et al., 1992). Those ages correspond to calibrated ages of about 22 to 26ka based on the calibration by Stuiver et al. (1998). Regarding many other rhyolites, only rough age estimations were reported (e.g., Taniguchi, 1980) and the ages are still uncertain. The present study aimed to elucidate the overall history of volcanism in Kozushima and to cross check the ages determined by ESR method with those by other methods. Samples of 17 rhyolites plus one surge deposit were collected.

In order to determine total accumulated doses, quartz grains were extracted, subdivided into 8-10 fractions, and irradiated by  $^{60}\text{Co}$  gamma rays up to about 900 Gy. Two ESR signals of impurities centers (Al center and Ti-Li center) were observed at 77K. In order to determine natural dose rates, concentrations of  $\text{K}_2\text{O}$ ,  $^{238}\text{U}$ , and  $^{232}\text{Th}$  were measured and converted to dose rates by using the table reported in Adamiec and Aitken (1998).

Regarding Tenryo-san and other young three lavas (previously reported ages were 838 A.D. to several tens of thousand of years), no ESR signal was observed because of too young ages of those samples. The obtained ESR ages are listed below, although they are tentative reports and some may be somewhat revised in the future.

Name of lava	Al center (ka)	Ti-Li center (ka)
Cb-A	26.4 (+1.1 -1.1)	32.5 (+2.7 -2.5)
Jyogo-yama	27.0 (+3.2 -2.6)	24.1 (+3.0 -2.7)
Takodo-yama	22.8 (+2.2 -2.0)	31.6 (+3.2 -3.1)
Ohsawa	27.9 (+3.8 -3.6)	25.8 (+4.4 -4.5)
Matsuyamahana	28.6 (+0.8 -0.8)	29.8 (+1.9 -1.9)
Membo	29.2 (+4.3 -4.0)	30.8 (+1.5 -1.4)
Nachi-san	23.0 (+3.5 -3.0)	29.2 (+2.9 -2.6)
262m-yama	31.0 (+2.6 -2.4)	32.5 (+2.0 -1.9)
Nagahama (Sawajiri-wan) 47.5 (+3.0 -2.9)	40.6 (+4.1 -3.4)	
Awanomikoto	60.6 (+9.6 -8.8)	54.1 (+6.8 -6.4)
Nagahama (Nagumi-wan)	52.9 (+4.5 -4.2)	51.0 (+4.2 -3.8)
Sanuka	#	
Hashiruma	#	
Kannon'ura	63.1 (+14.6 -18.9)	77.9 (+8.5 -7.5)
#=undetermined		

The ESR age of Cb-A (Al center) is fairly close to the calibrated  $^{14}\text{C}$  age. However, there is a discrepancy between the ages of Al center and Ti-Li center. The discrepancy may be partly attributable to the difference of thermal stability between the two centers.

The ESR ages need to be evaluated based on stratigraphical information. The stratigraphical order of eruption of the following three lavas is: Nagahama(Sawajiri-wan), 262m-yama, and Nachi-san (Suga, 1998). The ESR ages are consistent with stratigraphy. It has been thought that the following three lavas (Matsuyamahana, Ohsawa, and Takodo-yama) sequentially erupted in a brief period of time after the eruption of Cb-A (Isshiki, 1982). However, based on our survey, Takodo-yama and Matsuyamahana are covered with Cb-A, whereas Ohsawa is not. Therefore, it is likely that Takodo-yama and Matsuyamahana erupted before Cb-A and Ohsawa erupted after Cb-A. ESR ages of Takodo-yama (Ti-Li center) and Matsuyamahana are older than the  $^{14}\text{C}$  age of Cb-A, which is consistent with stratigraphy. ESR age of Ohsawa is similar to the age of Cb-A, implying a possibility that the eruptions of Cb-A and Ohsawa can be regarded as a series of volcanism. It is known that Kannon'ura is stratigraphically older than Sanuka (Isshiki, 1982). Although ESR age of Sanuka is undetermined, previously reported fission track (FT) age of Sanuka is  $70 \pm 5$  ka (Kaneoka & Suzuki, 1970) and ESR age of Kannon'ura (Ti-Li center) is somewhat older than the FT age. Overall, ESR ages are in good agreement with stratigraphy and overall history of volcanism in Kozushima will emerge shortly.