

## The history of volcanic eruption based on tephrochronology at Plio-Pleistocene in Japan :2 Chronology of pyroclastic flow deposits in southern Kyushu

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The frequency and the scale of the large volcanic eruption in the Japanese Islands are one of the important problems in the forecast of the long-term geosphere stability. The restoration of the history of the large volcanic eruption in the late Pleistocene has been examined by the correlation with the pyroclastic flow deposit and the distal fine ash (For example, the Ito pyroclastic flow deposit and the comparison with the AT volcanic ash of 30ka : Machida and Arai, 1974, etc). However, an older age, a lot of source volcano cannot be specified and the evaluation at the scale and age of a volcanic eruption are difficult.

In tephrochronology, identification and the comparison of the tephra based on the chemical composition analysis of major and trace elements of the volcanic glass from the 1990's (Yoshikawa, 1990). As a result, the comparison accuracy of an older pyroclastic flow deposit and the tephra in the remote place improves. It has come to obtain information on the large volcanic eruption the widespread tephra correlation at 5 Ma-1Ma in central Japan (Mizuno, 2000; Tamura and Yamazaki, 2004 and Satoguchi and Nagahashi, 2012). Mizuno (2001) showed that the source volcano area of the widespread tephra was definable to Chubu Sangaku, Kyushu, and Tohoku region from the element characteristic of a trace element of volcanic glass of the pyroclastic flow deposit to some degree. Tamura and Yamazaki (2015) reported on a petrology feature, the eruption scale, the source and the age of the tephra about 36 widespread tephra layers of 5Ma-1Ma. The Tohoku origin tephra layers are concentrated on 2Ma-1Ma and the Chubu Sangaku origin tephra concentrates on 3Ma-1.5Ma. The other side, in Kyushu and Hokkaido, there are a lot of Pliocene-early Pleistocene pyroclastic flow deposits to which the comparison with the distal tephra is not done. For the construction of the volcanic eruption, we are to advance the tephra research on Hokkaido and Tohoku where information is especially little. This study has correlated with pyroclastic flow deposits distributed in southern Kyushu and widespread tephra Pliocene and early Pleistocene.

In the late Pleistocene, the volcanic eruption was gushed in southern Kyushu and, a large amount of pyroclastic flow was gushed. As a result, the old age pyroclastic deposits are hidden under a cover, and it is difficult of tephrochronology of the pyroclastic flow deposit at early Pleistocene and Pliocene of southern Kyushu (Miyaji and 1987). Mizuno et al.(2017) examined the comparison with widespread tephra that the feature of the Kyushu origin and pyroclastic flow deposits in southern Kyushu. The Sendai pyroclastic flow deposit (Snd: Ohta, 1971) correlated with Habutaki1-MT2 tephra (Hbt: 2.9Ma: Tomita and Kurokawa, 1999; Tamura et al., 2016) and the Akune1 pyroclastic flow deposit (Akn1: 3.3Ma: Miyaji, 1987) correlated with Tsuchimaru2 tephra (Yoshikawa, 1975), Biroku1 tephra (Yoshikawa, 1988), TenjinikeL2 tephra (Yoshikawa and Ozaki, 1986) . In southern Kyushu, the volcanic eruption was active in about 3Ma. This research investigated, described the pyroclastic flow deposits of the Koriyama Formation at Yaeyama area, Kagoshima Prefecture and tried to correlate with two pyroclastic flow deposits and the widespread tephra at Plio-Pleistocene.

The Miyawaki pyroclastic flow deposits (Myk: Uchimura et al., 2007) is thickness of about 5m and white fine grain, unremarkable pumice in the type locality. Myk is contains hornblende, orthopyroxene and a small amount of biotite and clinopyroxene. The K-Ar age of Myk is  $2.88 \pm 0.16$ Ma,  $2.71 \pm 0.16$ Ma (Uchimura et al., 2007). The new tephra found in Yamanouti village, Sendai City is called Ymn is thickness of about 10cm and white fine grain. Ymn mainly consists of glass shard bubble-wall type with hornblende and orthopyroxene as phenocrysts. The chemical composition of the glass phase in these tephras, Myk is characterized as poor in CaO (0.9%) and rich in  $K_2O$  (4.3%) and Ymn is characterized as rich in CaO (1.6%) and poor in  $K_2O$  (3.4%).

There are Sunasaka tephra (Sns: Yokoyama et al., 1979) of the Kobiwako Group and Mori tephra (Wada, 1978) of the Tokai Group as a similar tephra to the age and the chemical composition of the glass phase of Myk. However, biotite is not contained in Sns and Mori. The problem remains in the correlation. As for Asashiro-Tomoda2 tephra (Ass: 2.6Ma: Tamura et al., 2008), a chemical composition of the glass phase and mineral composition is similar to Ymn. Ass exists in the upper Hbt1 in central Japan such as Osaka, Kobiwako and Hokuriku Groups. The possibility that Ymn is compared with Ass is high. A further investigation will be hoped for in the future.

Keywords: Widespread tephra, Plio-Pleistocene, History of volcanic eruption, Southern Kyusyu, Pyroclastic flow deposit, Chronology