Tephrostratigraphy after 35 ka Kutcharo Pyroclastic flow deposits-I (KP-I) in eastern Hokkaido

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In eastern Hokkaido, many tephra layers associated with post-Kutcharo caldera volcanoes (Mashu, Atosanupuri and Nakajima volcano) are recognized above KP-I (34,690 yBP; Ito et al., 2007), which is the latest large-scale pyroclastic flow deposits from Kutcharo caldera. Although these tephra layers were described by previous studies in each district, their correlations and source volcanoes are not determined. We carried out widely and systematically geological survey around Kutcharo caldera. In addition, we determined glass chemistry of juvenile materials in these tephras.

In the Konsen district, east of the caldera, tephra layers were divided into several tephra formations (T. F.) by previous studies; Nakashumbetsu T.F. (Nu-a˜Nu-r), Chanai T. F. (Ch-a˜Ch-d) and Mashu T. F. (lower: Ml-a˜Ml-e, upper: Ma-l˜Ma-b), which was derived from Mashu volcano located on eastern rim of Kutcharo caldera. Pumice fall deposits, which are dominant in Nakashumbetsu and Chanai T. F., are composed of aphyric and dense pumice (white ˜brown-colored) and often include gray pumice, scoria or lithics (Nu-p, -n, -l, -i, -h, -f, -d, Ch-d, -a). On the other hand, Nu-g, -e, -a, -q and Ch-c consist of porphyritic and vesicular pumice (white-colored) or ash. Nu-g is characterized by containing many isolated crystals. Nu-q is very coarse sand-size pumiceous ash layer. In the Shari district, north of the caldera, Yambetsu Pumice layer (YmP), Higashikayano Pumice layer (HkP), Toyozumi Pumice layer (TyP), Yellow Ash (Y-ash), Nakashari Pumice layer (NaP), Ma-f ˜i and Ma-b were recognized above KP-I. YmP, HkP and NaP are composed of mainly aphyric and dense pumice. These features are similar to those of pumice falls dominant in Nakashumbetsu and Chanai T. F.. In addition, TyP is similar to Nu-g in terms of containing many isolated crystals.

In TiO2-K2O diagram, volcanic glass compositions of these tephras are clearly divided into three groups (low-K, medium-K and high-K group). Nu-p, -n, -l, -i, -h, -f, -d, Ch-d, -a, YmP, HkP and NaP show low K2O content (TiO2=0.4-0.9 wt. %, K2O=0.4-0.9 wt. %), and Nu-g, -e, -a and Ch-c show medium K2O content (TiO2=0.2-0.8 wt. %, K2O=1.6-2.5 wt. %). Only Nu-q shows high-K2O content (TiO2=0.1-0.5 wt%, K2O=4.2-4.9 wt. %), which cannot be seen in any known tephra from volcanoes in eastern Hokkaido.

Low-K group tephras are similar to the products of Mashu volcano (Ma-b ˜Ma-l) with respect to lithofacies and glass chemistry. This type of magmatism (K2O ˜0.9 wt. % in glass composition) in Kutcharo volcanic area has been limited to the Mashu and adjacent Nishibetsu-dake volcano during this period. Therefore, the low-K group described in this study would derive from this area. It is possible that the low-K magmatism at the eastern rim of Kutcharo Caldera might have begun soon after KP-I eruption. Petrological features of medium-K group are similar to those of the proximal pyroclastic deposits around Atosanupuri and Nakajima volcano. It suggests that medium-K group derives form Atosanupuri and/or Nakajima volcano. In these tephras, TyP can be correlated with Nu-g based on geological data and glass compositions. Nu-q can be correlated with Ohachi-daira Pumice fall deposits (30,050 yBP; Nakamura et al., 2000) that erupted from Daisetsu volcano in central Hokkaido by glass chemistry. Nu-g and Nu-q will be useful key beds to establish stratigraphy in eastern Hokkiado.