The distribution of Ikezuki tuff (Onikobe-Ikezuki tephra) in Shinjo and Mukaimachi basin, NE Japan

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Within Shinjo basin in Yamagata prefecture, some of pyroclastic flow deposits are intercalated in gravel layer of Quaternary Systems. Especially the oldest and thickest pumice tuff (Torigoe tephra) in upper Yamaya formation is corresponded to Ikezuki tuff (Onikobe-Ikezuki tephra: O-Ik) distributing in Naruko-Onikobe area at the eastern side of the Ou Backbone range in Miyagi prefecture. From an eruption age of O-Ik, pyroclastic flow deposits and upper Yamaya formation in this basin are thought to be younger than 0.3 ka. Matu’ura (2003) devided pyroclastic flow deposits over Torigoe tephra (O-Ik) into four tephra layers (Sakekawa, Izumikawa, Emakawa and Ushikuguri in ascending order). Large-scale pyroclastic eruption is only from both Naruko and Onikobe caldera since 0.3 ka around Shinjo basin. Though three large-scale pyorclastic flow deposits (Shimoyamasato, Nisaka, Yanagisawa tuff in ascending order) are observed after O-Ik within Naruko-Onikobe area, there is a possibility that only Shimoyamasato tuff distributes in Shinjo basin because Ushikuguri tephra, which is the youngest pyroclast, is covered with Dokusawa tephra (0.1 Ka). However four pyroclastic flow deposits are not correlated with Shimoyamasato tuff in previous studies, and the source of their flow deposits are unknown. Thus to clarify the source caldera of pyroclasts in Shinjo basin, we studied the pyroclastic flow deposits within both Shinjo and Mukaimachi basin based on the field survey and petrological studies (volcanic glass and mineral compositions analysis, bulk chemistry of essential pumice fragments). In consequence we report that Torigoe tephra is not O-Ik and all pyroclasts in upper Yamaya formation are older deposits than O-Ik tephra. In this study to avoid confusion, we use “Shinjo tuff” as a newly name, not Torigoe tephra.
From the field survey pyroclastic flow stratigraphy was identified to be nearly similar to one of Matsu’ura(2003) except for one flow unit. Shinjo tuff, is the oldest and resemble to O-Ik, thickly distributes in all area of Shinjo basin. Although Emakawa tephra has as a same distribution as Shinjo tuff, the thickness decreases from north to south. No pyroclastic deposits are corresponding to Simoyamasato tuff as same as previous studies. Within Mukaimachi basin we could observe that Shimoyamasato tuff overlay the O-Ik. Though Gravel layer under O-Ik intercalates one pyoroclastic density current, five pyroclastic flow deposits within Shinjo basin are not present.
Shinjo tuff has similar features to O-Ik in field occurrence. Additionally volcanic glass compositions and heavy mineral assemblages using for tephra identification are nearly same between two pyroclasts, and Shinjo tuff was assumed to be same deposit as O-ik. But this study has determined to be two distinct pyroclasts from the difference of below three features.
1. Stratigraphy: though both O-Ik within Naruko-Onikobe area and Shinjo tuff was assumed directly to cover with the same volcanic ash layer, it was found that their ash layers are another deposits because they have distinct glass chemical composition. In addition O-Ik within Mukaimachi basin is covered by Simoyamasato tuff, while Shinjo tuff within Shinjo basin is overlain by other tuff.
2. Modal composition of heavy minerals: the contents of heavy mineral in Shinjo tuff are significantly lower than one of O-Ik.
3. Bulk chemical compositions of essential pumice fragments: despite of the effect of alternation two pyroclasts are distinguished in major element compositions, and are clearly divided in trace element composition, especially HFSE and Y which is not affected by the alternation.
O-Ik exists within Mukaimachi basin, not within Shinjo basin in the western side from source caldera. This

distribution implies that the flow path of O-Ik was limited by the western wall of Mukaimachi caldera. No distribution within Mukaimachi basin of five pyoroclastic flow deposits observed in Shinjo basin indicates that all pyrocalasts in upper Yamaya formation was older than O-Ik, this is very important to construct the evolution of Shinjo basin. Moreover it is possible from this insight that tuff in Yamaya formation were erupted from other caldera, not Naruko and Onikobe caldera. Especially the thickness changes of Emakawa tephra and Shinjo tuff might suggest that former tuff was derived from Sanzugawa caldera located on northern part of Shinjo basin, and later tuff was from Mukaimachi caldera.

Keywords: Ikezuki tuff, Shinjo tuff, Mukaimachi caldera

