

Identification of the source caldera for the Pliocene pyroclastic flow deposit in NE Japan based on apatite trace-element compositions

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It is known that a lot of calderas were formed on the Northeast Japan during Pliocene period. Such dense caldera-forming volcanic activity resulted in frequent intercalations of volcanoclastic deposit in the Pliocene sedimentary strata and deep-sea cores around Northeast Japan. However, most of these Pliocene volcanoclastic deposits have not been identified their source volcanoes. The Hirosegawa Tuff Member, consisting of a pair of Pliocene pyroclastic fall and flow deposits, is known as the widely traceable volcanoclastic deposits in the eastern part of central Northeast Japan. The source volcano of the member remains being not identified because of the poorly preservation of volcanic glass of the member in some locations as well as sporadic distributions of the member attributed to the tectonic uplift and erosion since Pliocene. Trace-element compositions of apatite phenocrysts are useful in tephrochronology because they change in response to various conditions of magma when they crystallize. In addition, apatite is highly tolerant to burial diagenesis and welding processes, its trace-element compositions are powerful tool for correlation of pre-Quaternary tephra, although this method has not become widely used so far. Here we analyzed trace-element compositions of apatite and U-Pb ages of zircon for the Hirosegawa Tuff Member and pyroclastic flow deposits of the Pliocene Calderas around Sendai, and demonstrate that the Hirosegawa Tuff Member mapped in previous studies is different volcanic ejecta depending on areas. Furthermore, these analyses identify the source volcano of the Hirosegawa Tuff Member at the type section to be the Shiroishi Caldera located 50km south of the type section.

Keywords: Apatite, zircon, tephrochronology, Pliocene, pyroclastic flow deposits