Eruptive process and correlation of Towada-a tephra

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1. Introduction

Towada-a tephra (To-a: Machida et al., 1981) was erupted from Towada caldera at AD 915 and it is an important marker tephra in Northeastern Japan.

Eruptive process and correlation of To-a are still sweeping because vertical variations of chemistry are not well known. Thus we examined vertical variations of chemistry of volcanic glass shards and refractive indices of orthopyroxene in To-a.

2. Correlation of depositional units

To-a at Oshimizugawa is composed of Oyu-1, -2, -3 and Kemanai pyroclastic flow deposits (KmFl). Volcanic glass shards of To-a are divided to high-Na and low-Na groups ([high-Na group] Oyu-1, Oyu-2, upper part of KmFl, [low-Na group] Oyu-3, lower and middle part of KmFl). Orthopyroxene of Oyu-1 shows clear spike in refractive indices (gamma) ranging from 1.706 to 1.710. In contrast, Orthopyroxene of other units ranges widely.

To-a at Shimeitei is composed of Oyu-1, surge deposits and KmFl. Volcanic glass shards of To-a are divided to high-Na and low-Na groups ([high-Na group] Oyu-1, lower and upper part of surge deposits, [low-Na group] Oyu-3, uppermost part of surge deposits and KmFl). Orthopyroxene of Oyu-1 shows clear spike in refractive indices (gamma) ranging from 1.707 to 1.709. In contrast, Orthopyroxene of other units ranges widely. Surge deposits are correlated to Oyu-2 according to chemistry of volcanic glass shards.

3. Eruptive process

Eruptive process estimated from depositional units of To-a is as follows:

First, pumice fall deposits (Oyu-1) was produced from a plinian column. Next, surge deposits (Oyu-2) was occurred by interaction between magma and external lake water. Furthermore, resurgent plinian column produced pumice fall deposits (Oyu-3). Lastly, eruption column produced Kemanai pyroclastic flow deposits.

4. Correlation between To-a and ash at far distance from source

To-a at far distance from Towada caldera (Mt. Iwate and Miyagi Prefecture) is grayish-white fine ash layer. Chemistries of volcanic glass shards are low Na. These chemistries are similar to Oyu-3 or KmFl around Towada caldera. Fine ash at far distance is not correlated to Oyu-3 which is several cm but to KmFl. This shows that co-ignimbrite ash which was associated with KmFl, was scattered over Northeast Japan.