Taisho mud flow as a cohesive debris flow at the 1926 eruption of Tokachidake volcano, central Hokkaido.

Shimpei Uesawa[1]; Naomichi Miyaji[2]

[1] Nihon Univ; [2] Geosystem Sci.,Nihon Univ.

http://www.geo.chs.nihon-u.ac.jp/disast/index.html

Debris avalanche and mud flow (named Taisho mudflow) on the 1926 eruption of Tokachidake volcano in central Hokkaido melted snow on the slope of mountain, and flowed down to the Kamifurano and Biei town killing 144 peoples on these town (Tada and Tsuya,1927). However the snow melting systems are not revealed in detail. Taisho mudflow deposit (Cm) is composed of three flow deposits called Cmda-upper (CDU), -middle (CDM), -lower (CDL: Uesawa and Miyaji,2005). In this study, we show the components and granulometric characteristics of these deposits, and estimate temperature to melt snow on the slope.

CDL is composed of the hydrothermally altered andesitic lava fragments and the breccia, which has 10 cm in average, from gray to white color, and of the sandy matrix which also made from the same. We can see some patchwork structures that are made of very hdrothermally altered blocks which is about 15 cm in this unit. These facts show CDL belong to the debris avalanche deposits. Moreover, this deposit has pipe structures which may have gushed out snow melted water to the surface with about 5 cm wide and 60 cm long passing from inner to upper of CDL. Matrix of CDL under 22.6mm in diameter is very poorly sorted and has abundant white clays under 0.004mm in diameter of about 7 wt%. These clay minerals are identified as amorphous opal by the X-ray diffraction (XRD) and the differential thermal analysis (DTA). The central crater cone must have been an acidified condition before the collapse, as pH of soil water extracted from CDL show low value (pH=3.7).

CDM lack gravel in boulder size. The content of white clays in its matrix is about 3 wt%. CDM at higher altitude (1450m in height), has cross-lamination structure, and at lower altitude (1200m in height) has many gravels over 8mm in diameter.

CDL and CDM are composed of gray fragments of 65 vol%, white fragments of 30 vol% and others of 5 vol%. While Cm is composed of white fragments of 60 vol%, gray fragments of 40 vol%, and others of 5 vol%. Cm must have many white fragments than CDM and CDM, because the density of white fragment is lower than gray fragment. As the ratio of clay to total sand, silt,and clay fractions is over 15 % in Cm deposit, Cm is classified to cohesive debris flow in which the clay content is more than 3-5% of the total sand, silt, and clay fractions (Crandell, 1971; Scott et al,1995;Vallance and Scott,1997 etc.).

Central crater cone collapsed at the 1926 eruption must have been hydrothermally altered heavily, and have made numerous clay minerals. These minerals must be amorphous opals made under the strongly acidified condition. CDL with abundant clay minerals must be a debris avalanche deposit made by the collapse at May 24, 1926. Pipe structures in the CDL show that the deposit has enough temperature to melt snow. CDM and a part of CDL flowed into the river may have changed to Cm containing river water. This type of very hydrothermally altered debris avalanche is called Wet debris avalanche, and it often changes to cohesive debris avalanche which flow down twice length as long as normal debris avalanche.