

## ”Run away or hide”: Teaching material for learning the behavior to protect the life from ballistic fragment

HAYASHI, Shintaro<sup>1\*</sup> ; SAITO, Mizuki<sup>1</sup>

<sup>1</sup>Akita Univ. Col. Edu.

### <Lesson of Ontake-san eruption>

Ontake-san has begun to erupt quietly without a clear presage at 11:52am on September 27th, 2014. A lot of ballistic rock fragments have fallen soon (about 11:55: ”Document Ontake-san large-scale eruption” and Yamakei new publication). There was size of 60 centimeters for the rock which broke through a roof of the mountain lodge (Volcanic Eruption Prediction Liaison Council, Ontake-san geological observation team, 2014). It was so high-density (Kaneko et al., 2014) that more than 10 holes by ballistic fragment were distributed over the area of 4 m x 4 m about 500 m from a crater. Energy of the explosion is equivalent to several tons of TNT gunpowder (Taniguchi and Ueki ,2014). The initial velocity of ballistic fragment is as high as 100 m/ second (Kaneko et al., 2014). 57 people were sacrificed and 6 persons were missing.

### <”Run away or hide.” behavior>

”Run away or hide.” behavior is written on survivor’s notes from Ontake-san. For example one survivor put a knapsack on his head and sat down behind the large rock. Such behavior is efficient to raise the survival rate.

### <Experimental system>

We developed an teaching experiment material to educate ”Run away or hide.” behavior. It was used in several classes of elementary schools.

The volcanic model is made from papier-mache with a crater on the top part. The air introduced from a side pipe and comes off from a crater. Ballistic rock fragments of papier-mache fall in the reach of the radius 2m approximately.

Keywords: eruption, ballistic fragment, phreatic eruption, evacuation, analogue experiment