A trajectory analysis of a rockfall on a steep slope at Mt. Fuji to determine the possible source area of the falling rock

*Taishi Sakurada[1], Ryodo Hemmi[2], Yasuhiro Ishimine[3], Hideaki Miyamoto[1]

1. The University of Tokyo, 2. The University Museum, The University of Tokyo, 3. Mount Fuji Research Institute, Yamanashi Prefectural Government

Rockfalls are among the most active geologic events found on Earth, Mars, and the Moon. A newly detached mass of rock falling from a steep-slope often rolls down a slope until its break. It occurs most frequently in mountains or steep areas, especially crater and valley walls on Mars and the Moon (Bickel et al., 2020; Senthil Kumar et al., 2019). It is a kind of the fastest type of landslide often initiated by repeated freezing and thawing on Earth, while most extraterrestrial ones are likely caused by shaking induced by impacts (Bickel et al., 2020; Brown & Roberts, 2019). Complete monitoring of the phenomena is usually challenging, so the incidents are often recognized by the newly-formed tracks or debris fragments along the slope.
On September 9th, 2019, a rockfall occurred on the north-eastern flank of Mt. Fuji. No fatality or injured is involved with minor damage to a building reported. A notable characteristic of this incident is the clear boulder tracks along the rockfall route, which shows significant similarities to those found on Mars and the Moon. Thus, we studied the scale, distributions, and the possible route of the rockfall based on the field images obtained by Yoshikage Inoue (manager of Taishikan hut) and his observations, drone-based images, satellite images, as well as numerical modeling with a digital elevation model.
Our preliminary study shows that a boulder of a couple of meters in size may have detached from a region higher than 3,600 meters altitude and fall to the area of altitudes between 3,250-3400 meters, resulting in leaving 11 to 14 boulder tracks of about 30m intervals before it hit the other boulder, which would make the falling rock jump and fly more than 300m with a velocity of no less than about 50m/s. We find that the initial location of the boulder is essential in determining the exact route of a high-velocity boulder, which may imply that the boulder track analysis can be a useful method to determine the source area or the velocity of the boulder of a rockfall event.

References

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