TLS-based change detection on rock surface around Kegon Falls, Nikko, Japan

*Yuichi S. Hayakawa[1]

1. Faculty of Environmental Earth Science, Hokkaido University

Bedrock erosion at knickpoints is an essential process of fluvial dissection in volcanic regions, while the fluvial erosion at knickpoints also triggers deformations of surrounding steep slopes. Long-term (century or millennial scales) landform developments of eroding knickpoints may be investigated with remaining geomorphological features, but short-term (less than decadal) changes in bedrock landforms have long been limited to be examined because of the lack of precise measurements in a spatiotemporal framework. However, the terrestrial laser scanning (TLS) approach enables to detect recent changes in the morphology of bedrock cliffs surrounding a waterfall. Three-dimensional point cloud data were firstly obtained in 2011 for a waterfall named Kegon Falls in Nikko region, central Japan, and the continous measurement by TLS have been performed for 10 years. The bedrock of Kegon Falls comprises jointed andesite lava and conglomerates, which are vulnerable to weathering and rockfalls. Point cloud comparisons revealed the volume of bedrock deformation caused by small rockfalls and weathering on the rock surface. Small rockfalls and weathering often appeared in a relatively lower portion of the cliff with columnar joints, while large rockfalls are observed in the upper portion of the cliff with platy joints. Following the latest major rockfalls of the waterfall in 1986 that caused 8-m recession of the waterfall lip, it appears that more minor but noticeable changes have also continued to the present.

Keywords: lidar, three dimensions, erosion, weathering, waterfall, rockfalls

