Temporal changes in debris flow characteristics and topography in a debris-flow initiation zone in Ohya landslide, Japan

*Fumitoshi Imaizumi[1], Yuichi S. Hayakawa[2], Norifumi Hotta[3], Haruka Tsunetaka[4], Satoshi Tsuchiya[1], Okihiro Ohsaka[1]

1.Faculty of Agriculture, Shizuoka University, 2.Center for Spatial Information Science, The University of Tokyo, 3.Faculty of Life and Environmental Sciences, University of Tsukuba, 4.Graduate School of Life and Environmental Sciences, University of Tsukuba

Understanding of the debris flow behavior in the initiation zone is essential for the development of mitigative measures, such as warning systems and structures. Volume and surface topography of sediment storage in the initiation zones change with time affected by the sediment supply from hillslopes as well as the evacuation of sediment by occurrence of debris flows. However, influences of such changes on characteristics of the debris flow are not well understood because of a lack of field data. To clarify interactions between accumulation conditions of sediment storage and debris flow characteristics in the initiation zone, we conducted field observations in the Ohya landslide, central Japan, using video cameras and water pressure sensors. We also analyzed DEMs obtained by TLS (Territorial Laser Scanning, 12 periods) and airborne LiDAR (Light Detection and Ranging). Comparison of slope gradient maps calculated from DEMs with different resolutions (from 0.1 to 10 m) showed that 5 m is the best grid size to extract typical geomorphic units, such as rock slopes, talus slopes, and channels. Areas of talus slopes and channels were larger and gradient of channel was steeper when total volume of storage was higher. Flows that monitored by our video-camera system could be classified as either flows comprising mainly muddy water, or flows comprising mainly cobbles and boulders. Flows comprising mainly muddy water are turbulent and are characterized by black surfaces due to high concentrations of silty shale, whereas muddy water is almost absent at the surface of flows comprising mainly cobbles and boulders. The former flow is considered as fully saturated debris flow which can travel on gentler channels, while the latter flow is considered as partly saturated debris flow which is typical on steep channels. The former flow was predominant phase of the debris flow when only small volume of storage existed in the initiation zone, while the latter flow was predominant phase when volume of storage was large. Thus type of flow is likely affected by volume of channel deposits.

Keywords: debris flow, TLS, airborne LiDAR

©2016. Japan Geoscience Union. All Right Reserved.