Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

HDS27-P03 Room:Convention Hall Time:May 24 16:15-17:30

Extracting small scarps to predict potential sites of deep-seated landslides

Masahiro Chigira[1*], Tsou ChingYing[1], Ryuzo Yokoyama[2], Michio Shirasawa[2], Tatsuro Chiba[3], Kazuya Funakoshi[3], Yukiko Sakurai[4]

[1]Disaster Prevention Research Institute Kyoto University, [2]Yokoyama Geo-Spatial Information Laboratory Co. Ltd., [3]Asia Air Survey Co. Ltd., [4]Aero Asahi Corporation

Typhoon Talas 2011 induced many deep-seated landslides in the Kii Mountains. Ten landslides had been surveyed by airborne laser altimetry before the landslide events by the Ministry of Land, Infrastructure, Transportation, and Tourism and Nara prefectural government, which made it possible to analyze detailed topography. There were few landslides that had detailed topographic data beforehand. Topographic analysis clarified that these deep-seated landslides had been preceded by eyebrow-shaped small scarps along their future crowns, which suggests that such small scarps are the clues to predict potential landslide sites. Most of these scarps are too small to be easily identified on aerial photographs.

We made several types of images from high-resolution DEMs and compared their possibility to identify precursory small scarps for three landslides in Otoh in Gojo, Nara (Shimizu, Akatani, and Nagatono). The images were a slope image, a 3-D slope image, a 3-D red image, and a curvature image.

The precursory scarps were 35-43 degrees with a horizontal length of 7-57 m along slope lines. Horizonta length and vertical height are close because the slope angle is near 45 degrees. These scarps are identified by the change in slope angles, and are not easily recognized because of larger sizes. The Shimizu landslide had one small scarp and the Akatani and the Nagatono landslides had more than one scarps.

We found no big difference among the images we made to detect precursory scarps. The slope image and the 3-D red image could not tell us the slope direction in some cases. The 3-D slope image had no such troubles, but must be observed with stereoscopic glasses so could not be annotated on it. It could not be used with other images on GIS. Identifying precursory small scarps could not be made automatically, but could be made manually in a practical sense. Appropriate images help this process.

Keywords: Deep-seated landslide, Air-borne laser altimetry, Gravitational slope deformation