

Optical theodolite targets installed from remote location for monitoring landslide movements

K. HIGUCHI (1), K. FUJISAWA (1), M. TOHEI (1), H. SAITO (2), K. BANDO (2), H. SHIMOMURA (3), H. KOMATSUZAKI (3), R. KANEKO (4), T. SAKATA (4)

(1) Public Works Research Institute, Japan, (2) KOWA Co., Ltd., Japan,

(3) PASCO Co., Ltd., Japan, (4) RADIC Co., Ltd., Japan (Higuti44@pwri.go.jp / Phone: +81-92-879-6787 / Fax: +81-92-879-6729)

Sediment deposited at the foot of landslides stabilizes them temporarily. Hence, the removal of such sediment when installing emergency measures requires extra caution to avoid reactivating the landslide. It is therefore necessary to monitor the movement of landslides to avoid secondary disasters from a remote location for safety reason as well as to provide a reliable monitoring measure.

One of the major remote monitoring methods is to use a non-prism type optical theodolite, which is generally useful for measuring the ground displacement from observation stations because no measurement target is needed. However, there is some concern that the measurement error is higher than that of an optical theodolite requiring targets, and measurement at night is extremely difficult. In this study, we developed a new method of setting up targets for an optical theodolite remotely from landslides to overcome these problems.

The new method uses a crossbow. By launching an arrow tipped with a capsule containing rose-color painted glass beads of 50 micrometer in diameter, the target on the hill slope is marked when the arrow crashes into the ground. The target shows high laser reflection due to the glass beads and increases visibility from a long distance.

The crossbow was newly developed for this study. Field experiments confirmed that the crossbow could set up targets with an error of ± 50 cm at a distance of 300 m from the launching point.

Further improvement of this new method will help establish safer monitoring systems under emergency dangerous situations where direct monitoring is not possible.