

## 国際共同研究 中間報告 ( 課題番号 : 30W-03 )

課題名 : A comparison study on the earthquake-induced flowsliding phenomena occurring in Chinese loess and Japanese pyroclastic deposited areas

(地震による中国レス地域および日本の火山降下物堆積地域における土砂流動化現象に対する比較研究)

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研究期間 : 平成 31 年 4 月 1 日 ~ 令和 2 年 3 月 31 日

研究場所 :

Research Center on Landslides, DPRI, Kyoto University;

Landslides triggered by the 2016 Kumamoto earthquake in Minami Aso area

Loess landslides triggered by the 1920 Haiyuan earthquake and the 2009? Earthquake in Gansu

共同研究参加者数 : 15 名 (所外 8 名, 所内 7 名)

- ・大学院生の参加状況 : 8 名 (修士 6 名, 博士 2 名) (内数)
- ・大学院生の参加形態 [現地調査, 打ち合わせの参加, 実験研究の実施と結果分析]

### 平成 30 年度 実施状況

To compare the earthquake-induced flowsliding phenomena occurring in Chinese loess and Japanese pyroclastic deposited areas, field trip was first conducted on a landslide triggered by the 2012 Gansu Nanbu earthquake on Yongguang area, Gansu Province, China. There are two sub-slides occurring on the downstream parts of a loess slope. Both of them were fluidized with rapid movement. The displaced materials from one slide had a traveling distance of about xx km; while these materials from another landslide travelled along the valley with a travel distance of about xx km. Four people were killed by the landslides. To understand the initiation and movement mechanisms of these landslides, we made detailed examination on the geotechnical properties of the soil layers on the source area by measuring the in-situ density and moisture content. We also conducted ERT survey to measure the moisture/water content distribution. We also took sample from the source area and sent to Kyoto University for examining their shear behaviors under different initial states (such as initial stress state, density, and saturation degree). Literature review had also been conducted on those landslides triggered by the 1920 Haiyuan earthquake with focus on examining their distribution and features.

Secondly, field survey was also conducted on those landslides triggered by the 2016 Kumamoto earthquake on Minami Aso area. The features of some typical landslides occurring on the pyroclastic deposits during the earthquake were examined. The most catastrophic landslide occurred on Takano area had been examined in details. With the conduction of countermeasures on this landslide area, a fresh lateral section along the sloping direction of the slope was outcropped. This section enabled us to made detailed investigation on the formation of tephra layers of the slope and the geotechnical properties of each layers. Samples were taken from each layer for measuring the in-situ density, water content and permeability. The electric resistivity of each layer was also measured on the field. These values of electric resistivity provide basic information for further electric resistivity topography survey, which will be conducted in next fiscal year for identifying the variation of soil layer moisture with progress of rainfall.

### 令和 元 年度 実施計画

Following items will be conducted in 2019.

- Drained and undrained shear tests will be conducted on the samples taken from these landslides in Chine and in Japan. The samples will be prepared to have different initial water contents and will be sheared under different stress states. Through these tests, it is expected that the initiation and movement of landslides in differing scales will be clarified.

- Electric Resistivity Topography (ERT) survey will be conducted on the loess slope in China and also on the slope on Takanodai area, Ninami Aso, Japan. The survey will be conducted matching the rainfall event. The ERT data before, during and after the rainfall event will enable us to understand the variation of moisture content within the soil layers with progress of rainfall, and then to have better assessment on the slope stability of these slopes during rainfall.
- Further field survey on those coseismic landslides in Chinese loess area and in Japanese pyroclastic deposits area will be conducted.
- Comparison on the features of the landslides in Chinese loess area and in pyroclastic deposits area in Japan will be continued and analyzed. Finally results will be summarized in papers for possible publication on international journals.