Spatial prediction of rainfall-triggered landslide susceptibility during 2006 Typhoon Bilis, the Dongjiang reservoir watershed, China

Jie Dou¹, Takashi Oguchi¹, Yueren Xu²
¹The University of Tokyo, ²China Earthquake Administration
Email: <doujie@csis.u-tokyo.ac.jp>  Web: <http://oguchaylab.csis.u-tokyo.ac.jp/member>

(1) Motivation: Typhoon Bilis attacked southern China in 2006. The typhoon brought about torrential downpour, resulting in landslides, debris flows and mudslides in the Dongjiang reservoir watershed, Hunan Province, China. In this research, we focus on rainfall-induced landslide events caused by tropical cyclones (TCs) and map the landslide hazards using the different statistical models.

(2) Objectives:
- Understand why numerous landslides occurred in the study area.
- Analyze the relationship between the typhoon-induced rainfall, causative factors and the landslide occurrence.
- Conduct the landslide susceptibility mapping (LSM) of the study area using some different models.

(3) Data and methods:
- Data: 30-m AsterGDEM; Quickbird and Cbers satellite images; 1:500000 geological map; and precipitation data from a rain gauge.
- Methods: Certainty factor (CF), statistical index (SI), and logistic regression (LR) models.

(4) Results:
Landslides frequently occurred for the 260–340 mm range of cumulative rainfall, and at the rainfall intensity > 152 mm (Fig. 1). The landslide susceptibility maps obtained by the SI and LR models (Fig. 2) were divided into six susceptibility classes. The results display that most landslides distributed at the susceptible area.

(5) Discussion and conclusions:
- Around the reservoir areas are likely to have received extremely high rainfall due to the orographic effects.
- Torrential precipitation and highly weathered granitic rocks are two main reasons for the landslide occurrence.
- Selected factors such as slope, rainfall, and plan curvature have strong relationships with landslide occurrence.
- The accuracy of susceptibility mapping using the LR model is slightly higher than that using the SI model. These susceptibility maps are useful for sustainable urban development in the future.

Figure 1: Rain gauge precipitation in the Dongjiang reservoir.

Figure 2: LSM maps produced by the SI method (a) and the LR method (b)