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Sediment budget analysis from Landslide debris and river channel change during the extreme event - example of Typhoon Morakot at Laonong river, Taiwan

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Taiwan, due to the high seismicity and high annual rainfall, numerous landslides triggered every year and severe impacts affect the island. Typhoon Morakot brought extreme and long-time rainfall for Taiwan in August 2009. It further caused huge loss of life and property in central and southern Taiwan.
Laonong River is the largest tributary of Gaoping River. It's length is 137 km, and the basin area is 1373 km2. More than 2000mm rainfall brought and maximum rainfall exceeded 100mm/hr in the region by Typhoon Morakot in Aug, 2009. Its heavy rains made many landslides and debris flew into the river and further brought out accumulation and erosion on river banks of different areas. It caused severe disasters within the Laonong River drainage.
In the past, the study of sediment blockage of river channel usually relies on field investigation, but due to inconvenient transportation, topographical barriers, or located in remote areas, etc. the survey is hardly to be completed sometimes. In recent years, the rapid development of remote sensing technology improves image resolution and quality significantly. Remote sensing technology can provide a wide range of image data, and provide essential and precious information. Furthermore, although the amount of sediment transportation can be estimated by using data such as rainfall, river flux, and suspended loads, the situation of large debris migration cannot be studied via those data. However, landslides, debris flow and river sediment transportation model in catchment area can be evaluated easily through analyzing the digital terrain model (DTM) .
The purpose of this study is to investigate the phenomenon of river migration and to evaluate the amount of migration along Laonong River by analyzing the DEM before and after the typhoon Morakot. The DEMs are built by using the aerial images taken by digital mapping camera (DMC) and by airborne digital scanner 40 (ADS 40) before and after typhoon event. The results show that lateral erosion of the Laonong River caused by the typhoon seriously, especially in Yushan National Park, and midstream region. However, lateral erosion in downstream region is not so obvious. Meanwhile the siltation depth resulted from the Typhoon Morakot is larger in upstream region than in midstream and downstream regions. The amount of landslide debris created by Typhoon Morakot was too excessive to be transported. Materials just siltated in the upstream in place, same as in the middle stream area. Because of the amount of river slope erosion and sediment collapse in the downstream region is less than in upstream and midstream region, the amount of river erosion slightly larger than the amount of river siltation.
The goals of this project are trying to decipher the sliding process and morphologic changes of large landslide areas, sediment transport and budgets, and to investigate the phenomenon of river migration. The results of this study provides not only geomatics and GIS dataset of the hazards, but also for essential geomorphologic information for other study, and for hazard mitigation and planning, as well.