Geophysical Research Abstracts
Vol. 13, EGU2011-4448, 2011
EGU General Assembly 2011

Flood Risk Assessment Using Inundation Depth Model and ALOS Images: A Case Study In Kabul River, Pakisatn

Kwak Youngjoo, Hasegawa Akira, Inomata Hironori, and Fukami Kazuhiko
ICHARM under UNESCO, PWRI, Tukuba, Japan (kwak55@pwri.go.jp)

Recently, large-scale water-related disasters have been more frequent in Asia than the region's annual average because of extreme meteorological events. In complex areas such as large basins there are many factors having negative influence on flooding. Therefore, risk assessment should take into account possible flood scenarios as well as the spatial distribution of potential casualties and damage within areas that might be affected.

The purpose of this study was to estimate the number of the population and damage potentially affected or caused by flooding with each additional meter of flood inundation depth (FID). Moreover, the authors predict the flood extent of current and future risks based on the huge and severe flood caused by the abnormally heavy rainfall from late July to early August 2010 in Pakistan. In this study, flood risk was defined based on expected disaster damage caused by a hazard in a given area considering the occurrence probability of the hazard and the vulnerability of the area. A quantitative assessment of flood hazard was conducted by using GIS-based flood hazard parameters. The inundation areas were determined by the combination of two parameters: FID data and ALOS images at the flood peak. First, FID data were estimated based on the flood periphery calculated by using a model with a simplified geomorphologic algorithm rather than a complicated flood algorithm and simulation. Next, integrated analysis using FID data and ALOS/AVNIR/PALSAR images was conducted to predict disaster damage caused by a hazard in a given area considering the occurrence probability of the hazard and the vulnerability of the area. The volume of overflow discharge was determined by the inundation areas and depth at the flood peak using ALOS images. Finally, we estimated the daily runoff and overflow discharge of each grid. The estimation method was validated before being applied to estimate the population by comparing flood peripheries resulting from extreme discharges estimated based on current, near-future and end-of-the-21st MRI-AM20km data. An extreme discharge was calculated by BTOP model. In the BTOP model, the hydrological data were used to conduct 25-year simulations based on the datasets of present-day (daily data from 1980 to 2004), near future (daily data from 2015 to 2039) and end-of-the-21st century (daily data from 2075 to 2099).

The authors developed a model based on a concept of flood hazard due to extreme discharge in climate change scenarios and FID data indicating the depth due to overflowing the banks of a river, which was defined as the accumulated level index. The study found that integrated risk analysis was possible to identify inundation zones and predict flood disaster damage caused by a hazard in a given area considering the occurrence probability of the hazard and the vulnerability of the area. To consider regional flood risk assessment, the authors improved accuracy in identification of flood-vulnerable areas and eliminated disparity of flood risk assessment using integrated risk parameters. Although heavy rain events and typhoons may behave highly unpredictable due to ongoing climate change, this developed approach can be a very useful tool in emergency response efforts since it can conduct extreme value analysis and predict when and in what size a flooding event may occur.