Geophysical Research Abstracts
Vol. 14, EGU2012-7157, 2012
EGU General Assembly 2012

Assessment of Flood Risk and Future Change due to Climate Change in Asia-Pacific Region Based on MRI-GCM Model

Y.J. Kwak (1), K. Takeuchi (1), K. Fukami (1), and J. Magome (2)

(1) ICHARM under UNESCO, PWRI, Tsukuba, Japan (kwak55@pwri.go.jp), (2) ICRE, University of Yamanashi, Kofu, Japan

There is a worldwide concern about increasing flood risk in large river basins due to climate change. Changes in temperature, radiation, rainfall, soil moisture and CO_2 concentrations all affect their watershed systems and land use, which then affect the water balances in the basins. Thus it is needed to develop effective global flood risk assessment methodologies. Although available climate models have limitations and do not have a resolution fine enough for accurate application at the river-basin level, the authors made an attempt to find a relationship between climate change and flood risk under extreme events.

The purpose of this study was to estimate potential flood inundation areas (both future and present) and compare future changes with present simulations on a given hazard area in the Asia-pacific region. Flood simulation was derived from a global-scale study on a river basin in a continent, and flood risk for flood mapping was from a GIS analysis of a case study in the Asia-pacific region located between latitude 50N to 10S and longitude 50E to 145E.

This paper presents a new methodology that is simple and practical to account for the possibility that a flood may be caused by one or more potential parameters. A flood hazard is characterized by inundation area, location (lowland around rivers), intensity (extreme values), frequency and probability (floods with the 50-year return period). This study suggested the potential and also general characteristics of global hazards with significant limitations of current models for continental-scale flood risk assessment by using the flood inundation depth (FID) based on Manning's steady, uniform flow resistance formula and an extreme scenario during 25-year simulations based on the BTOP model using precipitations from the MRI-GCM3.1S and 3.2S models for 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).

This study found that integrated risk analysis was possible to identify inundation areas and predict future change in flood disaster risk caused by a hazard in a given area considering the occurrence probability of the hazard.The study found that inundation areas may be larger in the end of the 21st century than in the near future. The change rate of inundation area based on the MRI-GCM3.2S model was found to increase by 5.1% while that based on the MRI-GCM3.1S model showed roughly a 4% increase.

For future regional flood risk assessment, the authors will improve accuracy in identification of flood-vulnerable areas and calibrate flood risk assessment by using integrated risk parameters. Overall, it is important that climate change must be carefully considered when estimating flood hazards and risks.