Determination of Inundation Area Based on Flood Hazard for a Global Water Risk Assessment

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In this study, we defined flood risk as expected disaster damage per area considering the probability of occurrence of hazard and vulnerability. More specifically, a hazard was considered to be an extreme geophysical event that can cause a huge flood. The proposed concept of hazard is composed of extreme discharge, saturation deficit (SD) and inundation area related to flood disaster. The purpose of this study was to accurately assess spatial distribution of large-scale flood risk on the global scale. Estimation of a flood periphery is important to determine a fundamental hazard for water risk management. To the end, we especially focused on the development of a methodology to generate inundation areas and depths based on overflow and extreme discharge comparing with ground-rain gauge data at the flood peak. First, the inundation depth was calculated by using the relative height of the river side from HydroSHEDS (Hydrological data and maps based on SHuttle Elevation Derivatives at multiple Scales). SD was then calculated based on the groundwater recharge and discharge of the target grid cells. The extreme discharge was also calculated by using on a distributed TOPMODEL based on rainfall simulated by MRI-AM20km (atmospheric global climate model). Finally, we determined the inundation area and depth for a global water risk assessment considering overflow discharge as well as flood frequency. In this study, we also improved the accuracy of the water extent boundary comparing with SRTM water body dataset (SWBD) and MODIS (Moderate Resolution Imaging Spectrometer) acquired from a regional flood hazard.