Geophysical Research Abstracts
Vol. 16, EGU2014-6630, 2014
EGU General Assembly 2014

A fluvial and pluvial probabilistic flood hazard analysis for Can Tho city, Vietnam

Heiko Apel, Oriol Martinez, Do Thi Chinh, and Nguyen Viet Dung

GFZ German Research Center for Geoscience, Section 5.4 Hydrology, Potsdam, Germany (hapel@gfz-potsdam.de, +49 331 2881570)

Can Tho city is the largest city and the economic heart of the Mekong Delta, Vietnam. Due to its economic importance and envisaged development goals the city grew rapidly in population size and extend over the last two decades. Large parts of the city are located in flood prone areas, and also the central parts of the city recently experienced an increasing number of flood events, both of fluvial and pluvial nature. As the economic power and asset values are constantly increasing, this poses a considerable risk for the city. The the aim of this study is to perform a flood hazard analysis considering both fluvial and pluvial floods and to derive probabilistic flood hazard maps. This requires in a first step an understanding of the typical flood mechanisms. Fluvial floods are triggered by a coincidence of high water levels during the annual flood period in the Mekong Delta with high tidal levels, which cause in combination short term inundations in Can Tho. Pluvial floods are triggered by typical tropical convective rain storms during the monsoon season. These two flood pathways are essentially independent in its sources and can thus be treated in the hazard analysis accordingly. For the fluvial hazard analysis we propose a bivariate frequency analysis of the Mekong flood characteristics, the annual maximum flood discharge Q and the annual flood volume V at the upper boundary of the Mekong Delta, the gauging station Kratie. This defines probabilities of exceedance of different Q-V pairs, which are transferred into synthetic flood hydrographs. The synthetic hydrographs are routed through a quasi-2D hydrodynamic model of the entire Mekong Delta in order to provide boundary conditions for a detailed hazard mapping of Can Tho. This downscaling step is necessary, because the huge complexity of the river and channel network does not allow for a proper definition of boundary conditions for Can Tho city by gauge data alone. In addition the available gauge data around Can Tho are too short for a meaningful frequency analysis. The detailed hazard mapping is performed by a 2D hydrodynamic model for Can Tho city. As the scenarios are derived in a Monte-Carlo framework, the final flood hazard maps are probabilistic, i.e. show the median flood hazard along with uncertainty estimates for each defined level of probabilities of exceedance. For the pluvial flood hazard a frequency analysis of the hourly rain gauge data of Can Tho is performed implementing a peak-over-threshold procedure. Based on this frequency analysis synthetic rains storms are generated in a Monte-Carlo framework for the same probabilities of exceedance as in the fluvial flood hazard analysis. Probabilistic flood hazard maps were then generated with the same 2D hydrodynamic model for the city. In a last step the fluvial and pluvial scenarios are combined assuming independence of the events. These scenarios were also transferred into hazard maps by the 2D hydrodynamic model finally yielding combined fluvial-pluvial probabilistic flood hazard maps for Can Tho. The derived set of maps may be used for an improved city planning or a flood risk analysis.