Geophysical Research Abstracts
Vol. 14, EGU2012-13312, 2012
EGU General Assembly 2012

Climate and floods in the Mekong delta: uncovering GCM uncertainty

J. Delgado (1), N. Dung (2), B. Merz (1), and H. Apel (1)

(1) German Research Center for Geosciences, Hydrology, Germany (jdelgado@gfz-potsdam.de), (2) Southern Institute for Water Resources Research, Ho Chi Minh City, Vietnam

Generalized Circulation Models (GCMs) are an essential tool to estimate flood hazard under climate change (CC) scenarios. However, they often have to be used in combination with spatial and temporal downscaling methods and bias correction algorithms. In the lower Mekong river, the very strong and very weak flood seasons correlate with respectively strong and weak monsoon winds in the same season. Here, we correlated the parameters of the non-stationary flood frequency distribution with seasonal monsoon intensity. In Southeast Asia, monsoon intensity is well described by averaging zonal wind velocity in regions defined in the literature, which makes it straightforward to derive the same index from GCM results with no need of downscaling.

The method for regressing the shape parameter of the extreme value distributions is based on the assumption that the variance of both the monsoon index and the annual maximum discharge time series are related and non-stationary. A fraction of the shape parameter of the extreme value distribution could be explained by the monsoon variance. The model obtained is statistically significant.

The objective of this work was to quantify the uncertainty caused by future climate predictions of GCMs in a flood hazard assessment in the Mekong delta. The hydrological load was calculated with the method described above and a Monte Carlo approach. We used 15 different well known GCMs and estimated the 100-year flood into the Mekong delta at Kratie for 2050 with different CC scenarios. After excluding 8 GCMs due to their inability to predict the Southeast Asian monsoon in the 20th century, a range of results from 54000 cumecs to 82000 cumecs was obtained for high emission scenarios (95% confidence interval). A narrower range of 55000 to 71000 cumecs was the result for low emission scenarios.

However, the most relevant result was the confidence interval (CI) of the 100-year flood discharge estimation derived from the ensemble approach. The corresponding CI for the single model approach can only be derived theoretically. The results of this work showed that, for the Mekong delta, the use of GCMs for flood hazard assessments under CC is possible without downscaling techniques or bias corrections. The influence of the choice of the GCM was also shown by the 20th century validation. In addition to this, we recommend avoiding single model approaches.