

Assessment of Rainfall Runoff and Flood Inundation in the Mekong River Basin by Using RRI Model

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Abstract

Floods have become more widespread and frequent among natural disasters and consisted significant losses of lives and properties worldwide. Flood's impacts are threatening socio-economic and people's lives in the Mekong River Basin every year. The objective of this study is to identify the flood hazard areas and inundation depth in the Mekong River Basin. A rainfall-runoff and flood inundation model is necessary to enhance understanding of characteristic of flooding. Rainfall-Runoff-Inundation (RRI) model, a two-dimensional model capable of simulating rainfall-runoff and flood inundation simultaneously, was applied in this study. HydroSHEDS Topographical data, APPRODITE precipitation, MODIS land use, and river cross section were used as input data for the simulation. The Shuffled Complex Evolution (SCE-UA) global optimization method was integrated with RRI model to calibrate the sensitive parameters. In the present study, we selected flood event in 2000 which was considered as 50-year return period flood in term of discharge volume of 500 km³. The simulated results were compared with observed discharge at the stations along the mainstream and inundation map produced by Dartmouth Flood Observatory and Landsat 7. The results indicated good agreement between observed and simulated discharge with NSE = 0.86 at Stung Treng Station. The model predicted inundation extent with success rate SR = 67.50% and modified success rate MSR = 74.53%. In conclusion, the RRI model was successfully used to simulate rainfall runoff and inundation processes in the large scale Mekong River Basin with a good performance. It is recommended to improve the quality of the input data in order to increase the accuracy of the simulation result.

Keywords : rainfall-runoff, flood inundation, RRI model, the Mekong River Basin

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