



A distributed water circulation model for assessing human interaction in agricultural water use of the Monsoon Asia

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This paper describes the development of a distributed water circulation model that characterizes and assesses human interaction, such as in unique water uses for agriculture in the Mekong River Basin. A high proportion of water is used for agriculture in Monsoon Asia given the various types of paddy irrigation utilized there, and the distinct dry and wet seasons in the region. The proposed model incorporates those characteristics and reproduces the mechanism of the water cycle in that region. The model is also used to analyze the effects of water cycle changes on food production. The use of agricultural water in rain-fed paddies of the basin is first classified as three types of practices: using only rainfall, temporarily using supplementary water, and using floodwater. Irrigated paddies are also classified into six types based on the major types of irrigation and facilities employed. Secondly, the model consists of four sub-models used to calculate potential evapotranspiration, simulate cropping patterns and planting/harvesting areas, estimate the use of agricultural water, and analyze runoff components and the water balance, respectively. Thirdly, the mechanism of storing water in paddies is introduced to explain the delays and peaks in runoff. Fourthly, actual evapotranspiration is estimated based on estimated water content in the root zone, one of the three layers modeled (root, unsaturated, and saturated zones). Finally, model simulation was conducted for the years 1999 through 2003 and volumes of calculated

discharge were compared with observed data at key points in the basin, showing a high degree of accuracy.