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A Novel Application of Fully Combined Watershed and Ground-Water Models

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This paper suggests a novel approach of integrating the quasi-distributed watershed model SWAT with the fully-distributed ground-water model MODFLOW. Since SWAT model has semi distributed features, its groundwater component hardly considers distributed parameters such as hydraulic conductivity, storage coefficient. Equally difficult is the detailed representation of groundwater head distribution and pumping rate etc. To solve these problems, the method of exchanging characteristics of the hydrologic response units(HRUs) in SWAT with cells in MODFLOW by a fully coupled manner is newly proposed. The linkage is completed by considering the interaction between stream network and aquifer to reflect boundary flow. This approach is applied to Gyungancheon watershed in Korea. This application demonstrates the combined model enables an interaction between saturated zone and channel reaches, which plays an essential role in the runoff generation in the Gyungancheon watershed. Also, the combined model is able to represent water transfer by pumping which is modeled by SWAT and MODFLOW simultaneously. The comprehensive results show that the reliability of groundwater discharge and total runoff of watershed is greatly enhanced.