The approaches to quantify surface water-groundwater interactions through coupled models.

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Abstract

Scientists have extensively studied surface water (SW) and groundwater (GW), which were traditionally considered separate, thus allowing for independent study. However, due to topographic, soil geology, and climatic factors, they interact in complex ways. Understanding and quantifying the exchange processes between SW and GW is important for effective water resource management. These interactions occur through two main pathways: GW flowing into streams (gain streams) and stream water infiltrating the ground (loss streams). The flow direction depends on hydraulic pressure, with gain segments having higher GW piezometric heights than stream stages, and loss segments having lower GW piezometric heights. Identifying interaction sites is of great interest because water is pumped from the aquifer for agriculture, aquaculture, and industry. Some of the water used, whether from SW or GW, returns to the aquifer through recharge and percolation. Therefore, a SW-GW model is necessary, particularly one that describes hydrological and hydrogeological characteristics spatially and temporally. I have chosen to combine two models: HYPE for SW, known for its comprehensive flow and water quality simulations, and MODFLOW for GW, recognized for its robust subsurface flow modeling. Integrating their beneficial functions will enhance their application. My study focuses on the Choushui River basin, where I am initially implementing this hybrid approach.

Keywords: Couple models, HYPE model, MODFLOW, Surface water-groundwater interactions, Choushui river.