COUPLING GROUNDWATER FLOW MODELING WITH GEOPHYSICAL MAPPING TO ASSESS WATER AVAILABILITY IN THE MISSISSIPPI ALLUVIAL PLAIN

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The Mississippi Alluvial Plain (MAP) is one of the most important agricultural regions in the United States, and crop productivity relies on groundwater irrigation from a system that is poorly understood. Withdrawals from the Mississippi River Valley alluvial aquifer have resulted in substantial groundwater-level declines and reductions in baseflow in streams within the MAP. Accurate assessments of water availability in the MAP region are important for making well-informed management decisions about agricultural sustainability, establishing best practices to ensure future crop production, and predicting changes to the regional water system over the next 50-100 years. To provide stakeholders and managers with information and tools to better understand and manage available water resources, a regional water-availability project focusing on the MAP was funded by the U.S. Geological Survey's Water Availability and Use Science Program (WAUSP). The MAP project couples groundwater flow modeling with geophysical mapping to improve the characterization of the alluvial aquifer water resources. The initial work leverages an existing groundwater flow model and evaluates improvements in model forecasts gained as uncertainty of the model inputs decreases, where model inputs evaluated include aquifer recharge, groundwater/surface-water exchange, hydrogeologic framework, and aquifer properties. To improve the cost efficiency of future data collection, potential additional data are evaluated within the groundwater flow model for their ability to reduce uncertainty in model forecasts. This type of analysis, known as data worth analysis, is being used to prioritize geophysical mapping efforts so that the data collected is most valuable to model-simulated future conditions. Such analyses can be repeated as necessary as new societal concerns arise and as new understanding of the MAP system is gained. By coupling the modeling and mapping through this iterative process, an improved representation of the alluvial aquifer water resources will be available to more accurately represent groundwater flow in the system.