Louisiana Groundwater Study and Complex Groundwater Modeling

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Abstract

Louisiana has more than 10 freshwater aquifer systems, many of which cross state boundaries. Pumping wells can go as deep as 3,000 feet. The annual groundwater pumping rate in Louisiana is around 1,600 million gallons every day, which is the 14th place in nation. Agriculture is the biggest groundwater user (more than 55% of total groundwater withdrawal), followed by public supply, and then industries. Overpumping has significantly lowered groundwater level in many aquifers, which causes saltwater intrusion and land subsidence. Some aquifers have groundwater level decline as much as 200 feet. To better manage Louisiana's groundwater resources, an unprecedented data campaign was launched in 2014 to compile statewide well logs as the principal geological data for the purpose of statewide groundwater modeling. The "big geological data" prompt two technical challenges: (1) how to construct a high-fidelity groundwater model from hundreds of thousands of well logs? and (2) how to calibrate a high-fidelity groundwater model? This presentation will discuss these challenges and why the data campaign matters to study groundwater. Particularly, the study will present the solutions that may help mitigate the urgent saltwater intrusion problem in Baton Rouge. Moreover, the big geological data and techniques for high-fidelity groundwater model development may also lead groundwater studies to a new direction in visualization of aquifer structures and three-dimensional printing technology.