Jun 28th, 10:40 AM - 12:00 PM

The Evolving Nested Illinois Groundwater Modeling Architecture (ENIGMA): Automated withdrawal updates for a groundwater flow model

Daniel Abrams
University of Illinois at Urbana-Champaign, dbabrams@illinois.edu

Devin Mannix
University of Illinois at Urbana-Champaign, mannix@illinois.edu

Daniel R. Hadley
University of Illinois at Urbana-Champaign, drhadley@illinois.edu

iEMSs International Congress on Environmental Modelling and Software

9th International Congress on Environmental Modelling and Software
Fort Collins, Colorado, USA, Mazdak Arabi, Olaf David, Jack Carlson, Daniel P. Ames (Eds.)
https://scholarsarchive.byu.edu/iemssconference/2018/

The Evolving Nested Illinois Groundwater Modeling Architecture (ENIGMA): Automated Withdrawal Updates for a Groundwater Flow Model

Daniel B. Abrams[A*], Shelby Ahrendt[A], Daniel R. Hadley[A]
[A] Illinois State Water Survey, University of Illinois, 2204 Griffith Dr, Champaign, IL 61820
**Corresponding author (email: dbabrams@illinois.edu)*

Abstract: The Illinois State Water Survey (ISWS) has a fifty-year history of developing numerical simulations of groundwater flow. Over this time, the underlying geologic framework, conceptualizations of groundwater flow, and numerical modeling code have advanced. Furthermore, many models use transient data sets, such as withdrawals, groundwater recharge, river stages, and observed heads. Model archives created on project completion quickly become out-dated, which is problematic when a new project requires use of a years-old archived model. In addition, stakeholders increasingly desire rapid analyses of at-risk water supplies, requiring a streamlined process to prepare raw data for model use. In addition, such a streamlined processed, if properly scripted, allows for easily reproducible or modifiable assumptions.

To this end, we initiated the Evolving Nested Illinois Groundwater Modeling Architecture (ENIGMA), with the ultimate goal of automating the linkages between the groundwater flow models and the underlying datasets. Currently, ENIGMA automates the process of importing newly reported groundwater withdrawals into the primary regional groundwater flow model of Illinois. This process includes the estimation of unreported pumpage. ENIGMA also imports new head observations from public supply wells and dedicated monitoring wells into the model as calibration targets. After this import, the updated model files are run using MODFLOW-USG, with an automated assessment of model outputs compared to the new calibration targets. ENIGMA makes use of the Python package FloPy and automates the linkages to existing real-time databases at the ISWS. ENIGMA's GUI is designed for most MODFLOW modeling applications; pending review, the code and GUI will be publicly available and downloadable in Fall 2018 at https://www.isws.illinois.edu/illinois-water-supply-planning/groundwater-flow-modeling.

***Keywords**:* Real-time, modelling, monitoring, head-specified, groundwater