SIMULATING NITRATE TRANSPORT TO THE DEVIL'S SPRINGS COMPLEX USING SWAT-MODFLOW AND MODPATH

Rob de Rooij[1]*, Sagarika Rath*[2]*, Nathan Reaver*[2]*, Dogil Lee*[2]*, Wendy Graham*[1] *and David Kaplan*[3]

[1]Water Institute, University of Florida, Gainesville, Florida, USA

[2]Department of Agricultural and Biological Engineering, University of Florida, Gainesville, Florida, USA

[3]Environmental Engineering Sciences Department, University of Florida, Gainesville, Florida, USA

The overall objective of the USDA-NIFA funded Florida Aquifer Collaborative Engagement for Sustainability (FACETS) project is to gain insights into the tradeoffs between the regional agricultural economy and environmental quality. Within the framework of this project, we have developed a SWAT-MODFLOW model for the Santa Fe River Basin, Florida. The SWAT-MODFLOW code is well-suited for our objective as it is able to simulate crop growth, coupled surface-subsurface flow processes in watersheds as well as nitrate loadings. Nitrate transport through the subsurface can be simulated with SWAT-MODFLOW-RT3D. However, SWAT-MODFLOW-RT3D only provides the spatiotemporal variations in nitrate concentrations and does not provide direct information about source areas or travel times. In this study we provide an alternative approach to simulate nitrate transport in the subsurface based on backwards particle-tracking using MODPATH. Using this approach we can extract useful information from SWAT-MODFLOW models in terms of source areas, pathlines and travel times for nitrate emerging from springs. Here, we track particles backwards starting from the discharge zones associated with the Devil's Springs Complex in the Santa Fe River. We use our modeling approach to simulate changes in spring nitrate concentrations, as well as the time required for changes to manifest, for a variety of alternative land use and land management scenarios.

PRESENTER BIO: Dr. De Rooij is a research assistant scientist working at the Water Institute, University of Florida. His main research interests lie in the development and application of numerical models to complex hydrogeological problems.