SIMULATING NITRATE CONCENTRATIONS AT THE OUTLET OF THE SUWANNEE RIVER BY COMBINING SWAT-MODFLOW WITH MODPATH

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To manage coastal food webs and fisheries in the Suwannee River estuary, it is desirable that we can predict how changes in land use and climate will affect the quantity and quality of water in the Suwannee River. For this purpose, we have developed a SWAT-MODFLOW model for the Suwannee River Basin. However, although this model can handle nitrate transport in surface waters and soils, it cannot simulate nitrate transport in the groundwater domain. SWAT-MODFLOW-RT3D is a model that solves this shortcoming. It simulates solute transport in the groundwater domain by solving the standard advection-dispersion equation. Alternatively, we propose to simulate nitrate transport in the groundwater domain with backwards particle-tracking using MODPATH. The main advantage of our alternative approach is that we can simulate the age and source components of groundwater being discharged along river reaches. Furthermore, our alternative approach avoids the typical problem of excessive numerical dispersion when trying to solve the advection-dispersion equation using a coarse spatial discretization. This problem is particularly limiting for our model domain as our domain has a large spatial extent. To be efficient our approach based on backwards particle-tracking assumes that the nitrate concentrations in groundwater discharged to the river reaches do not change significantly across short time intervals. We discuss the validity of this assumption.

PRESENTER BIO: Rob de Rooij is a Research Assistant Scientist at the Water Institute. He has extensive experience with developing and applying numerical models for challenging hydrogeological problems.