A PARTICLE-TRACKING APPROACH TO ANALYZE THE AGE AND SOURCE COMPONENTS DURING TRANSIENT STREAM FLOW CONDITIONS

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Stream water is essentially a mixture of water molecules that have converged along different flow paths, Therefore stream water consists of time-variant source and age components and these components provide useful insights into the hydrodynamic functioning of a catchment. Moreover, they also provide practical information about how contaminant and nutrient transport within a watershed. Lagrangian particle-tracking schemes are well suited to simulate these age and source components.

We developed a transient coupled surface-subsurface flow model for the Santa Fe River Basin. Using the simulated flow fields, a particle-tracking scheme is used to simulate the source and age components in the Santa Fe River at multiple points along streamflow hydrographs. It is shown that the simulated travel time distributions (TTD's) in the Santa Fe River are highly transient. During significant rain events, the streamflow is characterized by a larger fraction of relatively young water due to surface runoff from the confined region. During dry periods the streamflow is characterized primarily by older water from the Upper Floridan aquifer. Our findings correspond well to what is found from end-member mixing analysis based on stream chemistry and from isotopic dating estimates of the age of water emanating from Santa Fe River springs. As such, the particle-tracking results provides further confidence in the underlying hydrologic model and to our overall understanding of flow and transport processes in the Santa Fe River Basin.

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