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RANS Simulation of Passive Scalar Residence Times and Exchange Processes in Idealized and Natural Stream Systems¹ KEVIN DROST, TRACIE JACKSON, ROY HAGGERTY, SOURABH APTE, Oregon State University — Natural stream systems contain a variety of dead zones characterized by flow separation, a mixing layer, and a recirculation zone. These dead zones play an important role in stream solute transport studies. Previous published work has focused on idealized storage zone geometries studied in laboratory flumes. Using RANS simulations, this study first examines these idealized geometries to determine the appropriate scaling relationships between idealized dead zone geometries and the residence times of a passive scalar. These scaling relationships are then applied to measurements from natural systems. The field-measured geometries are located in Oak and Soap creeks near Corvallis, Oregon. Field measurements for the natural systems included: (a) survey measurements to delineate storage zone morphologies; (b) Marsh-McBirney and acoustic Doppler velocimetry measurements for model boundary conditions and computation of turbulence parameters; and (c) continuous salt injections within storage zones and electrical conductivity measurements at point locations in the main channel and storage zones to quantify exchange rates and residence times.

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