INVESTIGATION OF PARALLEL SCALABILITY AND SPEEDUP FOR COMPUTATION OF STREAM FLOW RIVER NETWORKS MADE OUT OF HUNDREDS OF THOUSANDS OF REACHES

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RAPID (Routing Application for Parallel computation of Discharge) is a river network model that allows computing river flow in very large river networks. The routing equations used in RAPID are based on the traditional Muskingum method and are hence quite simple. However, the computations performed in RAPID use matrices and are easily adapted to a parallel computing environment. Therefore, despite simple physics, RAPID is a valuable tool to study the influence of network connectivity and domain decomposition on parallel computations. In this study, RAPID is implemented on several large river networks of different sizes: the San Antonio and Guadalupe River Basins (5175 reaches), the Texas Gulf Coast Hydrologic Region (68,143 river reaches), and the Mississippi River Basin (using two network of sizes 211,476 and 1,295,536). Preliminary results show that large domains benefit from parallel computing much more than smaller ones, as expected. Additionally, computations within very large domains can also benefit from parallel computing through speedup of computations given that the domain is large enough to allow decoupling of computations, even for simple routing equations. Such results will benefit computing schemes of higher complexity.