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ADVANCED DISCRETIZATION AND SOLUTION METHODS FOR COUPLED MULTIPHYSICS TRANSPORT PHENOMENA

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ABSTRACT

Computational simulations of transport phenomena in coupled multiphysics systems set particularly high standards for the robustness, accuracy, and efficiency of the underlying numerical methods. The requirement for computing well-resolved solutions in an efficient manner calls for the use of robust, accurate and possibly adaptive spatial and temporal discretizations that comply with physical constraints and guarantee nonlinear stability. Due to the large size and complex structure of the resultant algebraic systems, advanced solution techniques are required to achieve high performance in simulations of advanced technology and scientific applications. This minisymposium will explore the recent trends in the design of advanced methods for coupled multiphysics transport phenomena problems. Systems of interest will include, but not be limited to, fluid flow with transport, reacting flows, fluid-structure interactions, shock-hydrodynamics with transport, and magnetohydrodynamics. Participants are encouraged to address one or more computational challenges related to

(1) the design of novel discretization methods capable of resolving the multiple time- and length-scales of complex transport phenomena using robust, accurate and adaptive numerical approximations,

(2) the compatibility of high-order discretizations to the continuous mathematical model (e.g. positivity/monotonicity preservation and other constraints / involutions), and

(3) the robustness, efficiency, and scalability of strongly coupled implicit methods for large algebraic systems, including the iterative treatment of nonlinearities and constraints.

The organizers are proposing to invite enough speakers to fill at least 2 minisymposium sessions with presentations on the challenging topics described above.