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A Consistent Adaptive-resolution Smoothed Particle Hydrodynamics Method WENXIAO PAN, WEI HU, Univ of Wisconsin, Madison, XIAOZHE HU, Tufts University, DAN NEGRUT, Univ of Wisconsin, Madison, UNIV OF WISCONSIN, MADISON COLLABORATION, TUFTS UNIVERSITY COLLABORATION — We seek to accelerate and increase the size of simulations for fluid-structure interactions (FSI) by using adaptive resolutions in the spatial discretization of the equations governing the time evolution of systems displaying two-way fluid-solid coupling. To this end, we propose an adaptive-resolution smoothed particle hydrodynamics (SPH) approach, in which spatial resolutions adaptively vary according to a recovery-based error estimator of velocity gradient as flow evolves. The second-order consistent discretization of spatial differential operators is employed to ensure the accuracy of the proposed method. The convergence, accuracy, and efficiency attributes of the new method are assessed by simulating different flows. In this process, the numerical results are compared to the analytical, finite element, and consistent SPH single-resolution solutions. We anticipate that the proposed adaptive-resolution method will enlarge the class of SPH-tractable FSI applications.

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