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Dynamic three-dimensional simulations of densely-packed fluid loaded cloth in a complex geometry DENIZ T. AKCABAY, WILLIAM W. SCHULTZ, DAVID R. DOWLING, Dept. of Mechanical Engineering, University of Michigan, Ann Arbor MI, 48109 — This talk presents three-dimensional simulations of the fluid-structure interaction that occurs inside the washtub of a modern clothes washing machine. The results are based on the numerical solution of the incompressible Navier-Stokes equations on a Cartesian grid using Peskin's Immersed Boundary Method for the cloth-fluid coupling, and a weighted domain-mapping method to represent the complicated moving boundaries of the agitator and washtub. Cloth pieces are modeled as impermeable flexible isotropic elastic plates. Results from simple benchmarking studies with theoretical and experimental results for the individual cloth and complex geometry models are presented. A variety of simulation studies involving complicated mixing patterns that result from mechanical excitation from a realistic agitator are shown and analyzed. The effects of cloth size, bending stiffness, and load density on the resulting motion of individual pieces of cloth and on the bulk flow within the machine are analyzed. [Sponsored by Whirlpool Corporation]

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