Abstract Submitted
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Detailed modeling of sloshing in satellites tank at low Bond numbers[1] MATHIEU LEPILLIEZ, SEBASTIEN TANGUY, University of Toulouse, INTERFACE TEAM — Consumption of ergols is a critical issue regarding the whole lifetime of a satellite. During maneuvers in mission phases, the Helium bubble used to pressurize the tank can move freely inside, thus generating movement of the center of mass, and sloshing which can disrupt the control of the satellite. In this study we present numerical results obtained from CFD computation, using an Immersed Interface Method to model the tank with a level-set approach for both liquid-gas interface and solid-fluid interface. A parametric study is proposed to observe the influence of the Bond number on resulting forces and torques generated on the tank. One can observe different steps during the maneuvers under microgravity: the first part is dominated by accelerations and volume forces, which flatten the bubble on the hydrophilic tank wall. When the forcing stops, the bubble bounces back, generating sloshing by moving under the influence of inertia and capillary effects. Finally viscous effects damp the sloshing by dissipating the kinetic energy of the bubble. Those results are compared to actual in-flight data for different typical maneuvers on forces and torques, allowing us to characterize the period and damping of the sloshing.

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