

Abstract Submitted
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An approach to address numerical stiffness in the simulation of cavitating flows¹ MRUGANK BHATT, KRISHNAN MAHESH, University of Minnesota — A numerical approach based on the preconditioning and the dual-time stepping methodologies is proposed for LES of cavitating flows at low Mach numbers. The methodology is based on a fully compressible homogeneous mixture model as discussed in Gnanaskandan and Mahesh (IJMF. vol. 70, April 2016) which has shown promising results for capturing sheet to cloud cavitation. The goal of the present work is to allow the method to simulate wetted conditions, incipient cavitation, and cavitation inception regimes that typically require low free-stream nuclei, which imply predominantly low Mach number regions in the water. The numerical formulation of the preconditioning equations is discussed in detail. The method is used to simulate (i) cavitation inception over the unsteady flow over a cylinder at $Re=200$, and (ii) the wetted conditions over a marine propeller at $Re=894000$ using LES. Overall, a significant saving in the total run-time as compared to the original solver is obtained, without compromising accuracy.

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