

Density-scaled balanced continuum surface force model with a level set based curvature interpolation technique

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Abstract

We propose a level set based algorithm of the density-scaled balanced CSF (continuum surface force) model [Yokoi (2013; 2014)] and show that the proposed CSF model can reduce spurious currents (an error due to surface force calculation) more than the standard balanced CSF model without using the density-scaling. The density-scaled balanced CSF model is combined with a fluid framework which consists of the CLSVOF method [Sussman et al. (2000), Yokoi (2002)], THINC/WLIC scheme [Xiao et al. (2005), Yokoi (2007)], CIP-CSL (constrained interpolation profile conservative semi-Lagrangian) method [Yabe et al. (2001), Xiao et al. (2002)] and VSIAM3 (volume/surface integrated average based multi-moment method) [Xiao et al. (2005)]. The numerical results show that the proposed CSF model, especially the level set based curvature interpolation technique, play a key role in numerical simulations of free surface flows with complex interface geometries (i.e. droplet splashing).

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