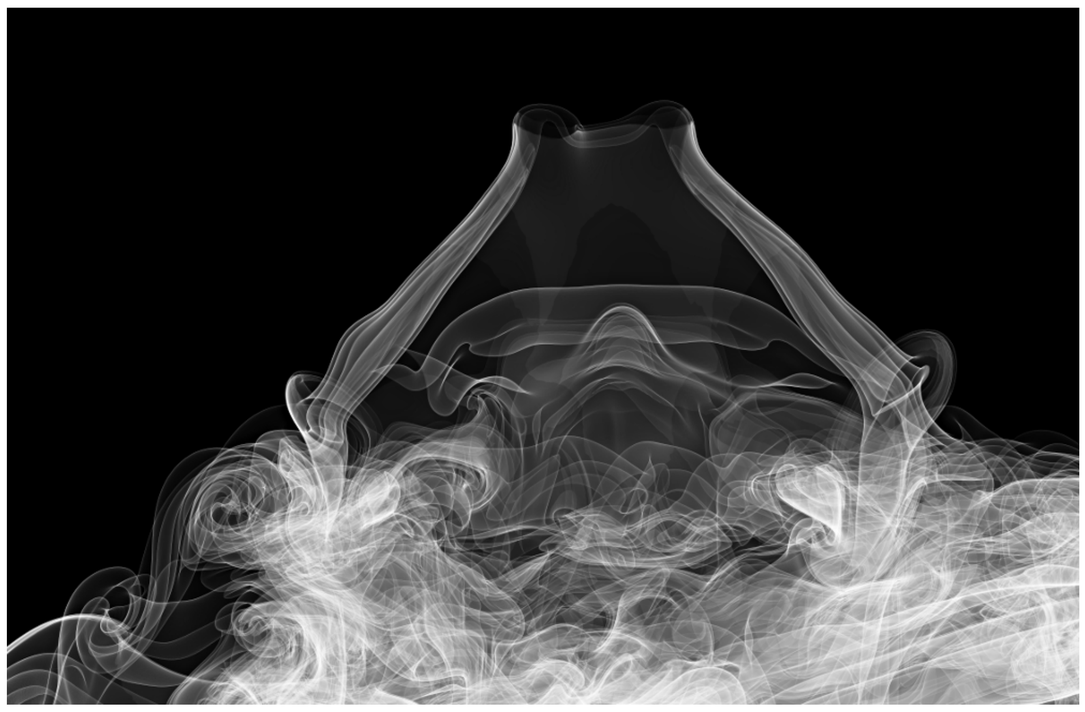

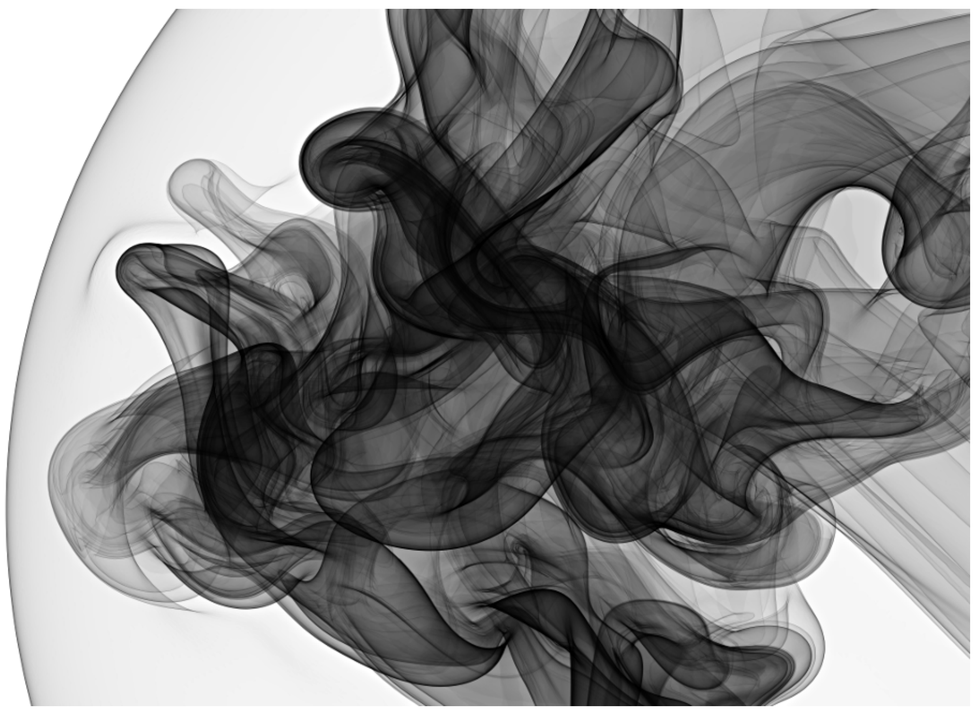

Immaculate Collision

Mark J. Stock

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Immaculate Collision is a series of artworks in UV gel on glass. Each is an isometric semi-transparent rendering of the computational surfaces from a regularized, inviscid, three-dimensional front-tracking vortex method[1,2].

The triangulated vortex sheet surface is persistent, and locally adapts to account for extreme stretching to maintain resolution in both tangential axes. Baroclinic vorticity is generated on the surface in the Boussinesq limit. A Vortex-In-Cell method performs the vorticity-velocity inversion: circulation is interpolated from the triangular elements to the grid (and subsequent velocity at the nodes read from the grid) using a spherical Peskin function with radius 3Δx. Free-space boundary conditions were provided by a vortex treecode calculation on the boundary cells.

The simulations that generated these images began as three to five non-overlapping spherical regions of fluid with radii ranging from 12.8 to 76.8 Δx and Atwood numbers of -1 or +1. The computational volume was typically 256^3, and simulations were stopped after growing to 4M-10M elements.

1. M. Stock, W.J.A. Dahm, G. Tryggvason, (2008). Impact of a vortex ring on a density interface using a regularized inviscid vortex sheet method. *Journal of Computational Physics*, 227/21, 9021-9043.

2. M. Stock (2006). A Regularized Inviscid Vortex Sheet Method for Three Dimensional Flows With Density Interfaces (dissertation). University of Michigan, Ann Arbor.

Mark J. Stock received his Ph.D. in Aerospace Engineering from the University of Michigan in 2006 under Profs. Werner J.A. Dahm and Gretar Tryggvason and currently makes artwork using computational physics research software from his studio near Boston, Massachusetts. He is represented in California by SENSE Fine Art.