A numerical method for miscible two-fluid flow at a large density ratio SIINA HAAPANEN, Stanford University — A computational algorithm for direct numerical simulation of a binary system of miscible fluids at a large density ratio is described. The flow is three-dimensional, with two of the three spatial dimensions periodic. A pseudo-spectral discretization is used in the periodic directions, and an eigth order compact finite difference scheme is utilized in the non-periodic direction. The Mach number of the flow is small, and the equations of motion are integrated forward in time using a fractional step method. A constant coefficient elliptic equation (Poisson equation) is solved to determine the pressure. The method is applied to test problems including the Rayleigh-Taylor instability and a miscible two-fluid shear flow. The accuracy of the method, and its stability at a large density ratio of the fluids are discussed.

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