1145-35-209 **Xueping Zhao*** (xzhao@email.sc.edu), 800 State Street, Apt. 260, West Columbia, SC 29169, and **Qi Wang**. *A Second Order Fully-discrete Linear Energy Stable Numerical Scheme of a Binary Compressible Viscous Fluid Model.*

A thermodynamically consistent hydrodynamic phase field model of binary compressible fluid flow mixtures derived using the generalized Onsager Principle, which warrants not only the variational structure, but also the mass, linear momentum conservation, and the energy dissipation law in the isothermal case. We present a linear, second order fully discrete numerical scheme to solve this mathematical model on a staggered grid. The fully discrete scheme respects a discrete energy dissipation law. We present the scheme in two dimensional space for simplicity. Results apply to a 3D case as well. We prove the unique solvability of the linear scheme rigorously. We present several numerical examples, including phase separation due to the spinodal decomposition of two polymeric fluids and the calculation of the equilibrium states of a gas-liquid mixture, to show the convergence property, stability and efficiency of the new scheme. (Received August 19, 2018)