1046-35-1129 **Diane Denny*** (diane.denny@tamucc.edu), Department of Mathematics and Statistics, Texas A&M University-Corpus Christi, Corpus Christi, TX 78412. *A uniqueness result for equations modeling the flow of a viscous, barotropic fluid under periodic boundary conditions.* Preliminary report.

We study the initial-value problem for a system of nonlinear equations that models the flow of a viscous, barotropic fluid under periodic boundary conditions. The system includes a parabolic equation for the velocity, an algebraic equation (the equation of state) for the pressure as a function of the density, and the equation $\nabla \cdot \mathbf{v} = 0$. We prove the existence of a unique classical solution $\rho(\mathbf{x}, t)$, $\mathbf{v}(\mathbf{x}, t)$ for the time interval $0 \leq t \leq T$, provided $\|D\mathbf{v}_0\|_s$ is sufficiently small, where $\mathbf{v}_0$ is the initial velocity data. The density ρ satisfies $\rho(\mathbf{x}_0, t) = \rho_0(\mathbf{x}_0, t)$ at a chosen point $\mathbf{x}_0$ in the domain, where ρ_0 is the initial iterate for an iteration scheme. (Received September 14, 2008)