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Shock Waves in Dense Fluids: An Anisotropic Temperature Theory with Delays FRANCISCO J. URIBE, Universidad Autonoma Metropolitana, WILLIAM G. HOOVER, CAROL G. HOOVER, Ruby Valley Research Institute — In this work we analyze a recent phenomenological hydrodynamic theory proposed recently by Hoover et al. [arXiv:1005.1525v1] to study shock waves in dense fluids. The theory incorporates anisotropic temperature and relaxation for the fluxes and temperature, following the ideas by Maxwell, Cattaneo, and Krook. For the steady case we analyze the points at which the vector field is infinite (singularities of the field) and obtain conditions for non–existence of a shock profile connecting the two relevant equilibrium points (non–existence of heteroclinic connections). The conditions for non–existence of heteroclinic orbits are then related to the nature of the critical (equilibrium) points and the bifurcations of the system. The results are tested using several numerical methods to solve the hydrodynamic equations for the non–steady and steady problems.

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