Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Five-mode model of thermal vibrational convection in a cold water near its density maximum VADIM SHARIFULIN, Institute of Continuous Media Mechanics UB RAS, Perm, Russia, DMITRI LYUBIMOV, Perm State University, Perm, Russia — Thermal vibrational convection in a fluid with temperature inversion of density, e.g. the cold water near its density maximum is studied. High frequency vibration case is considered. Equations for average and pulsation components of the velocity and temperature field are derived by averaging method. Linear stability of a conductive state of cold water in a horizontal layer with rigid conductive boundaries subjected to the vertical vibrations is analyzed. The Lorenz-like five-mode dynamical system is constructed for the investigation of non-linear behavior of the fluid. The diagram of the existence of different regimes (conductive state, single-layer and double-layer steady flows, chaotic regimes) in the parameter space is obtained. It is found that, similar to the case of usual fluid with linear temperature dependence of density, absolute stabilization is observed under strong enough vibrations, moreover, the closer the point of temperature inversion of the density to the layer midplane the lower vibration intensity is needed to achieve the absolute stabilization.

Vadim Sharifulin
Institute of Continuous Media Mechanics UB RAS, Perm, Russia

Date submitted: 30 Jul 2007 Electronic form version 1.4