1063-35-104   **Akif Ibragimov*** (`akif.ibraguiomov@ttu.edu`), Texas Tech University, Department of Mathemat, Broadway and Boston, Lubbock, TX, Lubbock, TX 79409-104, **Luan Hoang** (`luan.hoang@ttu.edu,`), Texas Tech University, Department of Mathemat, Broadway and Boston, Lubbock, TX, Lubbock, TX 79409-104, and **Eugenio Aulisa** (`eugenio.aulisa@ttu.edu`), Texas Tech University, Department of Mathemat, Broadway and Boston, Lubbock, TX, Lubbock, TX 79409-104. *On qualitative analyses of non-linear Forchheimer flows in porous media and application.*

Within frame work of the degenerate parabolic equation of second order we study the non-linear flows in porous media for compressible fluids Motivated by problems in the reservoir engineering we investigate Lyapunov type stability of the non-linear flows with respect to the Dirichlet and Neumann boundary data. Original system of hydrodynamic and state equations is reduced to non-linear parabolic equation of the second order with coefficients, degenerating as gradient of the pressure converges to infinity. Weighted monotonicity properties of the non-linear potential vector field associated with degenerating conductivity have been proved. Obtained monotonicity property used for long time comparison of the solutions with different boundary data. Accurate asymptotic estimate of the solution at infinity have been proved for so called boundary dominated regimes, corresponding to both Dirichlet and Neumann conditions. Some of the mathematical results are explicitly interpreted for class of traditional engineering problems. (Received August 12, 2010)