

Texas Tech University. Applied Mathematics Seminar.

Generalized Forchheimer equations for porous media: Part IV

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ABSTRACT. We study generalized Forchheimer equations for slightly compressible fluids in porous media subjected to the flux condition on the boundary. We derive estimates for the pressure, its gradient and time derivative in terms of the time-dependent boundary data. For the stability, we establish the continuous dependence of the pressure and pressure gradient on the boundary flux and coefficients of the Forchheimer polynomial in the momentum equation. In particular, we show the asymptotic dependence of the shifted solution on the asymptotic behavior of the boundary data. In order to improve estimates of various types, we prove and utilize suitable Poincaré-Sobolev and nonlinear Gronwall inequalities, as well as obtain Gronwall-type inequalities from a system of coupled differential inequalities. We also introduce additional flux-related quantities as controlling parameters of fluid flows for large time in case of unbounded fluxes. This is joint work with Akif Ibragimov.