Texas Tech University - Department of Mathematics and Statistics
Seminar in Applied Mathematics

Time Asymptotic of Diffusive Capacity for any Degree of Nonlinearity of Forchheimer equation

AKIF IBRAGIMOV

Texas Tech University

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ABSTRACT.

We study the long term asymptotic of the diffusive capacity, the integral characteristic of a domain of the flow with respect to a nonlinear Forchheimer equation of arbitral polynomial with non-negative constant coefficients. Conditions on the boundary are given in terms of the total flux and constraints on the pressure trace on the boundary or given pressure distribution. We prove that, if the total flux is stabilizing, then the difference between the pressure average inside the domain and the pressure average on the boundary is stabilizing as well. This result can be used for calculating the productivity index of the well, an important characteristic of the well performance. In the case of Dirichlet boundary data we assumed there convergence to PSS boundary profile. To obtain the main theorem, a refined comparison of the fully transient pressure with the pseudo-steady state pressure (the time derivative of pressure is constant) was performed. These results can be effectively used in reservoir engineering and can also be applied to other problems modeled by nonlinear diffusive equations. These are joint results with E.Aulisa, Lydia Bloshanskaya, and Luan Hoang.