Qualitative properties of the non-linear flow in porous media and application in engineering

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Abstract

The article is dedicated to the study of long term asymptotic of diffusive capacity, the integral characteristic of the domain with respect to non-linear Forchheimer flow in porous media([1]). Conditions on the boundary are given in terms of two type of boundary conditions: pressure function directly or the total flux and constraints on the trace of the pressure on the boundary. It is proved that if pressure function has a certain pattern at infinity or total flux stabilizes to constant value then the difference between pressure average inside domain and so called pseudo steady state profile on the boundary stabilizes as well. This result can be applied to calculate productivity index of the well, an important characteristic of the well performance. To obtain the main theorem refined comparison of fully transient and 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 in other problems modeled by non-linear diffusive equations. [1], [2] and [3].

References

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