Preservation of cosymmetry by finite-difference approximations for filtrational convection problems

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Nonlinear dynamical systems possess coexisting regimes and attractors. It was established recently by V. Yudovich that cosymmetry as well as symmetry may lead to continuous families of the same type of regimes. For instance, for the filtrational convection problem of viscous fluids in a porous medium, a number of one-parameter families were observed with spectrum varying over the family. It was shown that these families cannot be an orbit of an operation of any symmetry group.

The study of different discretizations of partial differential equations with respect to the preservation of cosymmetry (B. Karasozen, V.G. Tsybulin, PLA **262** (1999), 321-329) displays that the family of equilibria degenerates if an inappropriate approximation is used.

We are interested in an accurate computation of cosymmetrical equations and apply a combined spectral-finite-difference method and a finite-difference approach (regular and staggered mesh) to the planar problem of filtrational convection in porous media (Darcy convection). We investigate transformations of stationary regime families when the Rayleigh number varies.