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Recent Progress in Nonlinear PDE's and Applications

Guest Editors:

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ABSTRACTED

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“Recent Progress in Nonlinear PDE’s and Applications”

Preface

This volume of Turkish Journal of Mathematics consists of 8 papers on various areas of Partial Differential Equations and Applications. Four papers are devoted to the mathematical problems of hydrodynamics:

G. Sergein’s paper is devoted to the problem of regularity of solutions of the 3D NavierStokes equations, where the author describes an approach to study local regularity of a weak solution to the Navier-Stokes equations, satisfying the simplest scale-invariant restriction.

M. Jin, Q. Jiuand, and H. Yu establish the existence of a unique global in time solution of the Cauchy problem for the 3D incompressible axisymmetric Hall-Magneto-Hydrodynamic equations with only horizontal viscosity for the velocity vector field and vertical diffusion for the magnetic vector field.

A. Ibragimov, Z. Sobol, and I. Hevage show, by using modeling of stochastic processes, a finite speed of propagation. This is achieved under the assumption of a suitable decrease of the diffusion for small concentrations of degenerate Einstein model of Brownian motion of the particles.

E. Çelik, L. Hoang, and T. Kieu obtain a priori estimates for the solutions of the generalized Forchheimer flows of slightly compressible fluids in rotating porous media in terms of the physical parameters, the initial and boundary data; emphasizing the case of unbounded data.

One paper is devoted to the finite-dimensional behavior of semigroups generated by nonlinear dissipative evolutionary PDE’s:

A. Kostienko and S. Zelik develop the theory of attractors for semigroups with multidimensional time and apply their framework to dissipative nonlinear PDE’s in unbounded domains.

Three papers are devoted to the study of nonlinear wave and dispersive equations:

H. A. Erbay, S. Erbay, and A.K. Erkip establish the local well-posedness of the Cauchy problem for, and investigate the limit behavior of solutions to, the Cauchy problem in the limit as the kernel function of the convolution integral approaches to the Dirac delta function.

A. Azaiez, M. Benjemaa, A. Jrajria, and H. Zaag introduce an explicit spatial and temporal discrete discontinuous Galerkin finite-element numerical method to approximate the solution of one-dimensional nonlinear wave equations. In particular, they show that the numerical blow-up time tends toward the theoretical one as the discrete mesh tends to zero.

Aya Khalidi, A. Ouaoua, and M. Maoun obtain sufficient conditions for a finite-time blow-up of solutions to a quasilinear nonlinearly damped wave equations.

We would like to thank the authors for their interesting contributions, and the referees for their help in selecting the suitable papers for this special issue. Most importantly, we are thankful to the production staff at the TÜBİTAK and the Editor-in-Chief of the Turkish Journal of Mathematics for their cooperation and assistance.

Guest Editors: *Varga K. KALANTAROV* (İstanbul) and *Edriss S. TITI* (Cambridge)

March 17, 2023