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Localized Solutions of Generalized Wave Equations. Boussinesq Paradigm

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ABSTRACT: The long-time evolution of the solution of 1d nonlinear dispersive system, a particular case of energy consistent Boussinesq Paradigm Equation (BPE) is considered. For critical values of the initial conditions the behavior of the solution trails tends to adopt a self-similar shape similar to the Airy-function coherent structures. The 2d Boussinesq equation with so-called cubic-quintic (3-5) nonlinearity is investigated. The result shows the 2d wave decades algebraically, while the 1d wave – exponentially. Several approaches for the investigation of 2d BPE are realized – four finite difference methods, one spectral and one quasi-spectral method. The numerical implementation is based on efficient numerical methods, techniques, and algorithms as well as on operator splitting, functional expansions and integral transformations. A critical analysis of their applicability and authenticity both quantitative and qualitative is carried out.

Michail Todorov graduated in 1984 and received Ph.D. degree in 1989 from the St. Kliment Ohridski University of Sofia, Bulgaria. Since 1990 he has been Associate Professor and Full Professor (2012) with the Department of Applied Mathematics and Computer Science by the Technical University of Sofia, Bulgaria. He has worked as a Senior Research Fellow in the Joint Institute for Nuclear Research at Dubna, Russia (2004) and as a Visiting Professor, a Visiting Scholar, and a Visiting Consultant in the University of Texas at Arlington, USA (2008, 2009 and 2011) and Texas A&M University at Commerce, USA (2011), Sabbatical Professor at Southeastern Louisiana University at Hammond (2013). Since 2000 he has been also part-time employed instructor on Computer Science and Technology in the St. Kliment Ohridski University of Sofia, Bulgaria. In 2004-2008 he was part-time employed instructor on Theoretical Electrodynamics in the Paisii Khilendarski University of Plovdiv, Bulgaria. For the last few years his primary research areas have been mathematical modeling, computational studies, and scientific computing of nonlinear phenomena including soliton interactions, nonlinear electrodynamics, nonlinear optics, mathematical biology and bioengineering, and astrophysics.

Dr Todorov is an editor of ten peer reviewed books in the Conference Proceedings Series by the American Institute of Physics, Melville, NY, Guest-Editor in *Wave Motion* and Springer Proceedings. He is a coordinator, chair and/or special session organizer of more than 35 conferences on Applied Mathematics, Dynamical Systems and Differential Equations in Bulgaria, Russia, USA, and Taiwan.

More information one can find visiting his homepage at http://2014.eac4amitans.eu/MTodorov/index1.htm