Special Session 34: Recent Advances in Evolutionary and Stationary Problems on Unbounded Domains and Related Topics

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The last decades there is a growing interest to study problems defined on unbounded domains or all R^N. A great number of analytical, geometrical and numerical methods have been developed, to attack such problems. We intend to present some resent achievements on elliptic, parabolic and hyperbolic equations and systems defined on unbounded domains.

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Hadamard differentiability and bifurcation results for some nonlinear Schrödinger equations

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Consider a function F: $\mathbb{R} \times H \to H$, where H is a real Hilbert space and $F(\lambda, 0) = 0$ for every $\lambda \in \mathbb{R}$. We give conditions for bifurcation of the equation $F(\lambda, u) = 0$ from the trivial line of solutions, in the case where F is Hadamard differentiable with respect to its second argument. Next, we show how these conditions can be used to obtain results for some nonlinear Schrödinger equations on $\mathbb{R}^N$, with bounded potential. We consider nonlinear terms of the form $\eta^{-1} f(\eta u)$, where $\eta > 0$ is a measurable function and f is of class C^1 on $\mathbb{R}$ with bounded derivative.

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On the problem of converegence for the compressible Navier-Stokes equations

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We discuss the problem of convergence to equilibria for various models of a compressible viscous fluid both on bounded and unbounded domains. The structure of equilibrium set is examined.

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Antimaximum Principle for Problems Defined on the Whole Space and Applications

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We study how the antimaximum principle -introduced by Clément and Peletier in 1979, extends to some problems (with weights or potentials) defined on the whole space $\mathbb{R}^N$ and can even be improved . We also give some some applications.

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Two remarks on solutions of Gross-Pitaevski equations on Zhidkov spaces

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The study of the existence of solitary waves for Gross-Pitaevski equations leads to a nonlinear Schrodinger equation on the entire space supplemented with non standard boundary conditions at the infinity. We follow here the framework developped by C. Gallo to solve the Cauchy problem in suitable Zhidkov spaces. We prove some energy equality that allow us to derive the global well-posedness in $\mathbb{R}^2$. We would like to point out that the problem of global well-posedness of these equations in $\mathbb{R}^N$, $N = 2, 3$, has been solved by P. Gérard in some suitable energy space.

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Local energy decay for a perturbed wave equation

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I will talk about the uniform local energy decay result for a perturbed wave equation in an exterior region of a star-shaped obstacle. The main contribution of my talk is to present a new simple way to derive such a decay result. My result will be a kind of generalization of that obtained by Professor Morawetz.

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On the dynamics of a degenerate damped semilinear wave equation: The non-compact case.

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We consider a damped semilinear wave equation with a variable, generally non-smooth diffusion coefficient, which may vanish at some points or be unbounded. In order to define an asymptotically compact semigroup, we investigate conditions on the degenerate coefficient, alternative to those which give rise to the compactness of various embeddings of the naturally involved weighted Sobolev space. In the compact case, we also comment on the existence of stationary solutions for the problem with a saturable nonlinearity.

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Non-existence of global solutions to frac-diff wave equations

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Using the test function method (Mitidieri and Pohozaev) , we show the non-existence of global solutions to wave equations with spatio-temporal fractional dampings posed on unbounded domains.

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Indefinite quasilinear elliptic problems on unbounded domains

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We study the existence and regularity of non-negative solutions for a class of indefinite quasilinear elliptic problems on unbounded domains in the presence of subcritical and supercritical nonlinearities.

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Global Existence and Blow-up results for a quasilinear wave equation on $\mathbb{R}^n$.

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We study on the initial-bountary value problem for some degenerate non-linear dissipative wave equations of Kirchhoff type. If the initial data $\{u_0, u_1\}$ are small and $||\nabla u_0|| > 0$, then the unique solution exists globally and has certain decay properties. We also study global existence and blow-up results of the solution for a non-degenerate nonlinear wave equation with a dissipative term $M(r) \in C^1([0,\infty))$, even when the initial energy is positive.

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Large-Time Behaviour of Solutions to Quasilinear Parabolic Equations on a Half-Line

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We study the long–time behaviour of solutions to a quasi-linear parabolic problem on a half-line. The main result lies in showing the existence of a positive solution that converges to the travelling wave of solution to the stationary problem on the whole line. The main tools used here are the Zero Number Theory and the Concentration Compactness Principle. This result is a generalization of a result know for semilinear parabolic equations.

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