

2019  
CHAPTER

# ICMC SUMMER MEETING ON DIFFERENTIAL EQUATIONS

4-6 FEBRUARY 2019 | SÃO CARLOS-SP, BRAZIL  
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## SESSIONS:

- ✓ Boundary Perturbations of Domains for PDEs and Applications
- ✓ Computational Dynamics in the Context of Data
- ✓ Dispersive Equations
- ✓ Elliptic Equations
- ✓ Evolution Equations and Applications
- ✓ Fluid Dynamics
- ✓ Linear Equations
- ✓ Nonlinear Dynamical Systems
- ✓ Ordinary/Functional Differential Equations
- ✓ Poster Session

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## Eigenvalues of the Neumann Laplacian in $S^1$ -invariant regions in $\mathbb{R}^3$

Marcus M. Marrocos, Antônio L. Pereira  
Universidade Federal do ABC, Brazil

In this work we are concerned with the multiplicity of the eigenvalues of the Neumann Laplacian in regions of  $\mathbb{R}^3$  which are invariant under the natural action of  $S^1$ . We give a positive answer (in the Neumann case) to a conjecture by V. Arnold on the transversality of the transformation given by the Dirichlet integral to the stratification in the space of quadratic forms according to the multiplicities of the eigenvalues. We show that, generically in the set of  $S^1$ -invariant,  $C^2$ -regions, the action is irreducible in each eigenspace  $\text{Ker}(\Delta + \lambda)$ .

## Locally periodic unfolding operator for highly oscillating rough domains

Ravi Prakash, S. Aiyappan, A. K. Nandakumaran  
Universidad de Concepción, Chile

This presentation aims to explain the locally-periodic oscillating domain via unfolding operators. A three dimensional rough domain  $\Omega_\varepsilon$ ,  $\varepsilon > 0$  a small parameter, has been considered for the study where the boundary is rapidly oscillating with high amplitude. There are few articles with locally-periodic boundary oscillations with small amplitude. But, we do not see any literature with high-amplitude ( $O(1)$ ) locally-periodic oscillating domains. This is an attempt to study problem in locally periodic rough domains with an eye towards the general oscillating domains without periodicity. We develop locally-periodic unfolding operators to study our problems. M. Ptashnyk has developed an unfolding operator to study PDEs with locally-periodic coefficients. The development of these unfolding operators motivated us to develop unfolding operators for locally-periodic oscillating domains with high amplitude. We consider a non-linear inhomogeneous Robin boundary value problem posed on this domain to demonstrate the utility of this new operator.

## Continuity of attractors of parabolic equations with nonlinear boundary conditions and rapidly varying boundaries. The case of a Lipschitz deformation

Simone Mazzini Bruschi, Gleiciane S. Aragão, José M. Arrieta  
Universidade de Brasília, Brazil

We analyze the asymptotic dynamics of nonlinear parabolic equations with nonlinear boundary conditions when the boundary of the domain varies very rapidly as a parameter  $\varepsilon$  goes to zero. Considering a uniformly Lipschitz deformation we prove the upper semicontinuity of attractors. Moreover, if every equilibrium of the limit problem is hyperbolic we also prove the continuity of local unstable manifolds and the lower semicontinuity of attractors  $\varepsilon = 0$ .