UFRJ

Universidade Federal do Rio de Janeiro

INSTITUTO DE MATEMÁTICA

# Analysis/PDE Group.

## Lunch time seminar: Focusing in fundamental analysis of Nonlinear Partial Differencial Equations, and numerical algorithms for the solutions

March 2017

**CT - Bloco C - Sala 116 (12h:00 - 13h:00)**

### Date 16; Gerando Huaroto (IM-UFRJ)

**Title:** The IBVP for a fractional type degenerated heat equation

**Abstract:** The main purpose is to study the existence of solutions for an initial-boundary value problem (IBVP) driven by a degenerated fractional heat type equation.

### Date 23; Juliana Pimentel (FABC)

**Title:** Longtime behavior of reaction-diffusion equations with infinite-time blow-up

**Abstract:** We account for the longtime behavior of solutions for a class of reaction-diffusion equations. In particular, we address those with global well-posedness but exhibiting blow-up in infinite time. The existence of unbounded trajectories requires the introduction of some objects interpreted as equilibria at infinity, yielding a more complex orbit structure than that appearing on dissipative systems. Under this setting, we still manage to extend known results and obtain a complete decomposition for the related unbounded global attractor. This is based on joint works with C. Rocha and A. N. Carvalho.

### Date 30; Álvaro Coutinho (COPPE-UFRJ)

**Title:** A Residual Based Variational Multiscale Model for Sediment Transport: Towards the Simulation of Non-Dilute Turbidity Currents

**Abstract:** Numerical models can help to push forward the knowledge about complex dynamic physical systems. The modern approach to doing that involves detailed mathematical models. Turbidity currents are a kind of particle-laden flows that are a very complex natural phenomenon. In a simple way, they are turbulent driven flows generated between fluids with small density differences carrying particles. They also are one mechanism responsible for the deposition of sediments on the seabed. A detailed understanding of this phenomenon, including uncertainties [1], may offer new insight to help geologists to understand reservoir formation, a strategic knowledge in oil exploration. We present a finite element residual-based variational multiscale formulation applied to the numerical simulation of particle-laden flows in a Eulerian-Eulerian framework. Thus, the mathematical model results from the incompressible Navier-Stokes equation combined with an advection-diffusion transport equation. When sediment concentrations are high enough, rheological empirical laws close the model, describing how sediment concentrations influence the mixture viscosity [2]. The aim of this work is to investigate the effects on the flow dynamics of some these
empirical laws. We use two configurations for numerical experiments [3]. The first is a lock-exchange configuration in a tank and the second employs a channel with sustained current. Both numerical experiments are inspired in complex laboratory tests. We show how turbulent structures and quantities of interest, such as sediment deposition, are affected by the different empirical rheological laws. This is a first attempt towards model selection in particle-laden flows with complex rheological laws.