2019 CHAPTER

ICMC SUMMER MEETING
ON DIFFERENTIAL EQUATIONS

4-6 FEBRUARY 2019 | SÃO CARLOS-SP, BRAZIL

summer.icmc.usp.br

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

SCIENTIFIC COMMITTEE:

José M. Arrieta
(Universidad Complutense de Madrid/Spain)
Tomás Caraballo
(Universidad de Sevilla/Spain)
Alexandre Nolasco de Carvalho
(USP/Brazil)
Shui-Nee Chow
(GaTech/USA)
Djairo G. de Figueiredo
(UNICAMP/Brazil)
John Mallet-Paret
(Brown University/USA)
Hildebrando Munhoz Rodrigues
(USP/Brazil)
Yingfei Yi
(University of Alberta/Canada and JLU/China)

USP ICMC USP SÃO CARLOS CAPES CNPq FAPESP

The Cauchy problem for Schrödinger-type equations in Gelfand-Shilov spaces

Marco Cappiello, Alessia Ascanelli
University of Turin, Italy

We consider the initial value problem

$$\begin{cases} P(t,x,\partial_t,\partial_x)u(t,x) = f(t,x) \\ u(0,x) = u_0(x) \end{cases}, \qquad (t,x) \in [0,T] \times \mathbb{R}^n \tag{11}$$

where

$$P(t,x,\partial_t,\partial_x) = \partial_t - i\triangle_x + \sum_{j=1}^{n} a_j(t,x)\partial_{x_j} + b(t,x). \tag{12}$$

It is well-known that when the coefficients a_j, b and the Cauchy data f, u_0 are all real valued, smooth and uniformly bounded with respect to x the Cauchy problem (11) is L^2-well-posed, while if a_j are complex valued suitable decay conditions for $|x| \to \infty$ are needed on the imaginary part of the coefficients in order to obtain either H^∞ or Gevrey well posedness with a certain loss of derivatives. It is also known that a decay at infinity of the initial data has a smoothing effect on the regularity of the solutions of (11). Here we treat the case when the initial data belong to the Gelfand-Shilov space $\mathcal{S}_s^\theta(\mathbb{R}^n)$, (resp. $\Sigma_\theta^s(\mathbb{R}^n)$) defined as the space of the smooth functions f satisfying

$$\sup_{x\in\mathbb{R}^n} \sup_{\alpha\in\boldsymbol{N}^n} C^{-|\alpha|}\alpha!^{-\theta} e^{c|x|^{\frac{1}{s}}} |\partial^\alpha f(x)| < \infty,$$

for some (resp. for all) $C, c > 0$, with $s > 1, \theta > 1$, and prove a result of existence and uniqueness of the solution of (11) with precise information both on the regularity and on the behavior of the solution for $|x| \to \infty$.

Schrödinger operators with point interactions

Nataliia Goloshchapova
Universidade de São Paulo, Brazil

Let $L_{X,\alpha}$ be the operator associated in $L^2(\mathbb{R})$ with the differential expression

$$\mathfrak{L}_1 = -\frac{\mathrm{d}^2}{\mathrm{d}x^2} + \sum_{j=1}^{m_1} \alpha_j \delta(\cdot - x_j), \quad 1 \le m_1 \le \infty,$$

for any fixed sets $X = \{x_j\}_{j=1}^{m_1} \subset \mathbb{R}, \alpha = \{\alpha_j\}_{j=1}^{m_1} \subset \mathbb{R}$. We will discuss some spectral properties of the operator $L_{X,\alpha}$. In particular, we intend to give a brief overview of the boundary triplets approach and its applications in our case.

Moreover, if we have time, we will mention some results about spectral properties of the operator associated in $L^2(\mathbb{R}^d)$, $d \in \{2,3\}$, with the differential expression

$$\mathfrak{L}_d = -\Delta + \sum_{j=1}^{m_d} \alpha_j \delta(\cdot - x_j), \quad \alpha_j \in \mathbb{R}, \quad x_j \in \mathbb{R}^d,$$

in the case of finite m_d.