ASYMPTOTIC PROFILE FOR A TWO-TERMS TIME FRACTIONAL DIFFUSION PROBLEM

GIOVANNI GIRARDI

It is well known that differential equations with fractional derivatives turned out to be suitable to describe in a very good way various physical phenomena in areas like rheology, biology, engineering, mathematical physics, etc. One of the open problems in this field is finding some easy and effective methods for solving such equations. Such problem becomes even more difficult when multiple fractional in time derivatives are involved in the equation. In this talk we consider the Cauchy-type problem associated to the time fractional partial differential equation:

$$\begin{cases} \partial_t u + \partial_t^\beta u - \Delta u = g(t,x), \quad t > 0,\ x \in \mathbb{R}^n, \\ u(0,x) = u_0(x), \end{cases}$$

where the fractional derivative ∂_t^β is in Caputo sense. We provide a sufficient condition on the right-hand term $g(t,x)$ to obtain a solution in $\mathcal{C}_b([0,\infty), H^s)$. We exploit a dissipative-smoothing effect which allows to describe the asymptotic profile of the solution in low space dimension. As a corollary of this latter result, we investigate a class of nonlinear perturbations of the problem, for which global-in-time small data solutions exist and we show that their asymptotic profile is independent on the nonlinear perturbation.

References

[1] M. D'Abbicco, G. Girardi, *Asymptotic profile for a two-terms time fractional diffusion problem*, accepted for publication in Fractional Calculus and Applied Analysis.

Università degli Studi di Bari
Email address: giovanni.girardi@uniba.it