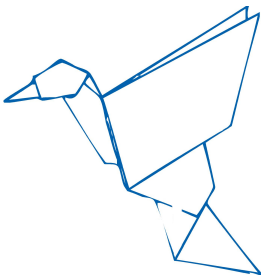

Bilbao Workshop on Theoretical Fluid Dynamics

Schedule

9:30 – 10:00	Presentation	
10:00 – 10:50	Eduard Feireisl	*On well/ill posedness of some systems in PDE in fluid dynamics*
10:50 – 11:20	Coffee break	
11:20 – 12:10	Rafael Granero	*Asymptotic models for wave propagation*
12:10 – 13:00	Elisabetta Rocca	*Recent results on tumor growth models*
13:00 – 14:30	Lunch	
14:30 – 15:20	Christophe Lacave	*Lagrangian trajectories and uniqueness for 2D Euler*
15:20 – 16:10	Giulio Schimperna	*On the long-time behaviour of some tumor growth models*
16:10 – 16:40	Coffee break	
16:40 – 17:30	Francisco Gancedo	*Recent results on the evolution of incompressible sharp fronts*

Abstracts

FRANCISCO GANCEDO
University of Seville, Spain

Title: *Recent results on the evolution of incompressible sharp temperature fronts*

Abstract: In this talk we consider the dynamics of sharp temperature fronts evolving by incompressible flows. We study two main convection models: Boussinesq and Surface Quasi-geostrophic (SQG) equations. For Boussinesq we show local-in-time and global-in-time regularity results. For SQG models we show blow-up scenarios and conditional regularity results.

RAFAEL GRANERO
University of Cantabria, Spain

Title: *Asymptotic models for wave propagation*

Abstract: In this talk we will present some new asymptotic models for wave propagation in different physical situation. In particular, we will consider the case of water waves in the small steepness regime and the case of surface waves in a porous medium. Finally, if time permits, I will also present a new asymptotic model for the propagation of hydromagnetic waves. These waves describe the motion of a cold plasma (consisting of singly-charged particles) in a magnetic field.

CHRISTOPHE LACAVE
University of Grenoble–Alpes

Title: *Lagrangian trajectories and uniqueness for 2D Euler*

Abstract: Before 2000, the well-posedness theory for the 2D Euler equations was established only for smooth domains (at least $C^{1,1}$), which is not natural compared to the regularity of weak solutions. Although this restriction does not exist for the Leray solution to the Navier-Stokes equations, standard technics for 2D-Euler need L^p continuity of the Riesz transform. The existence is now established for very irregular domains, and we will discuss about recent results concerning uniqueness. These results are in collaboration with E. Miot, C. Wang and A. Zlatos.

ELISABETTA ROCCA
University of Pavia, Italy

Title: *On the long time behavior and optimal control of a tumor growth model*

Abstract: The subject of the talk is a joint work with Cecilia Cavatera and Hao Wu.
We investigate the long-time dynamics and optimal control problem of a diffuse interface model that describes the growth of a tumor in presence of a nutrient and surrounded by host tissues. The state system consists of a Cahn-Hilliard type equation for the tumor cell fraction and a reaction-diffusion equation for the nutrient. The possible medication that serves to eliminate tumor cells is in terms of drugs and is introduced into the system through the nutrient. In this setting, the control variable acts as an external source in the nutrient equation.
First, we consider the problem of "long-time treatment" under a suitable given mass source and prove the convergence of any global solution to a single equilibrium as time goes to infinity.
Second, we consider the "finite-time treatment" that corresponds to an optimal control problem. Here we allow the objective cost functional to depend on a free time variable, which represents the unknown treatment time to be optimized. We prove the existence of an optimal control and obtain first order necessary optimality conditions for both the drug concentration and the treatment time. One of the main aim of the control problem is to realize in the best possible way a desired final distribution of the tumor cells, which is expressed by the target function. By establishing the Lyapunov stability of certain equilibria of the state system (without external source), we show that this target can be taken as a stable configuration, so that the tumor will not grow again once the finite-time treatment is completed.

GIULIO SCHIMPERNA
University of Pavia, Italy

Title: *On some mathematical models for tumor growth*

Abstract: My talk will be devoted to present some mathematical results on diffuse interface models for tumor growth. These models involve a (possibly multi-component) Cahn-Hilliard equation describing the evolution of the various cell types, coupled with a Navier-Stokes or Darcy law for the macroscopic flow velocity, and possibly with other relations for additional significant variables (like for instance the concentration of a nutrient or drug). I will present some result on existence and regularity of solutions, and long-time behavior of solution trajectories.