Monday 19:00 - 19:10

On off-diagonal behavior of generalized Stokes operators

Luca Haardt

Abstract

Motivated by the theory of elliptic operators, we will study off-diagonal decay estimates of Stokes operators with rough coefficients. These have applications in various fields, including the proof of the Kato square root problem for such operators.

Monday 19:10 – 19:20

Energy-variational solutions for different viscoelastic fluid models

Robert Lasarzik

Abstract

The concept of energy-variational solutions is introduced for a general class of evolution equations. Under certain convexity assumptions, the existence of such solutions can be shown constructively by an adapted minimizing movement scheme. Weak-strong uniqueness follows by a suitable relative energy inequality. Finally, the general result is applied to viscoelastic fluid models without stress diffusion. This is a joint work with Abramo Agosti and Elisabetta Rocca

Monday 19:20 – 19:30

On a compressible fluid-structure interaction problem with slip boundary conditions

Yadong Liu

Abstract

In this talk, I will present a recent project concerning a system describing the compressible barotropic fluids interacting with (visco) elastic solid shell/plate with the Navier-slip type boundary condition. Depending on the reference geometry (flat or not), we show the existence of weak solutions to the coupled system in different situations. Particularly, we give a rigorous justification of the incompressible inviscid limit of the compressible fluid-structure interaction problem with a flat reference geometry, in the regime of low Mach number, high Reynolds number, and well-prepared initial data.

Tuesday 18:00 – 18:10

Regularity of solutions to the Navier-Stokes equation with initial data in BMO^{-1}

Hedong Hou

Abstract

A renowned work (Koch-Tataru, 2001) establishes small-data global existence of mild solutions to the Navier-Stokes equation in BMO^{-1}. Later on, (Miura-Sawada, 2006) and (Germain-Pavlovic-Staffilani, 2007) shows spatial analyticity of the Koch-Tataru solution. But time regularity remains unknown. In this talk, we present a spatio-temporal regularity result of all the mild solutions in the Koch-Tataru space, as well as the long-time behavior of global mild solutions.

Tuesday 18:10 – 18:20

Relative energy method for weak-strong uniqueness of the inhomogeneous Navier-Stokes equations far from vacuum

Stefan Skondric

Abstract

We present a weak-strong uniqueness result for the inhomogeneous Navier-Stokes (INS) equations in $\mathbb{R}^d$ $(d = 2, 3)$ for bounded initial densities that are far from vacuum. Given a strong solution, i.e. a solution satisfying the equation as an identity in L^2, and a *Leray-Hopf* weak solution, we establish that they coincide if the initial data agree. Our proof strategy is based on the relative energy method and new $W^{-1,p}$-type stability estimates for the density. A key point lies in proving that every Leray-Hopf weak solution originating from initial densities far from vacuum remains distant from vacuum at all times.

Tuesday 18:20 – 18:30

From Euler-Poisson to parabolic-elliptic Keller-Segel system

Valentin Lemarié

Abstract

We study on the whole space $\mathbb{R}^d$ the compressible Euler system with damping coupled to the Poisson equation when the damping coefficient tends towards infinity. We first prove a result of global existence for the Euler-Poisson system in the case where the damping is large enough, then, in a second step, we rigorously justify the passage to the limit to the parabolic-elliptic Keller-Segel after performing a diffusive rescaling, and get an explicit convergence rate. The overall study is carried out in "critical" Besov spaces, in the spirit of T. Crin-Barat's work devoted to partially dissipative systems.

Thursday 18:00 – 18:10

Conditional regularity for an elastic shell interacting with the Navier-Stokes equations

Pei Su

Abstract

We are interested in the interaction of a viscous incompressible fluid with an elastic structure, where the structure is located on a part of the fluid boundary. It reacts to the surface forces induced by the fluid and deforms the reference domain to the moving domain. The fluid equations are coupled with the structure via the kinematic condition and the action-reaction principle on the interface. We study the 2D visco-elastic shell interacts with 3D Navier-Stokes equations. Especially in a general reference geometry (the shell deforms along the normal direction of the flexible boundary), we prove a counterpart of the classical Ladyzhenskaya-Prodi-Serrin condition yielding conditional regularity and uniqueness of a solution. This requires additionally the deformation of the shell is Lipschitz continuous.

Thursday 18:10 – 18:20

On energy-variational solutions for hyperbolic conservation laws

Thomas Eiter

Abstract

We discuss the notion of energy-variational solutions for a class of hyperbolic conservation laws. This solution concept is derived by introducing a weighted energy defect into a variational formulation. If the weight is chosen in a suitable way, a general existence result can be derived via a time-discretization scheme based on a sequential minimization. We discuss additional properties like weak-strong uniqueness and convexity of the solution set, and we compare energy-variational solutions with dissipative weak solutions.

Thursday 18:20 – 18:30

Dynamics of vortex cap solutions on the rotating sphere

Emeric Roulley

Abstract

We analytically study the existence of periodic vortex cap solutions for the homogeneous and incompressible Euler equations on the rotating unit 2-sphere, which was numerically conjectured 30 years ago. Such solutions are piecewise constant vorticity distributions, subject to the Gauss constraint and rotating uniformly around the vertical axis. The proof is based on the bifurcation from zonal solutions given by spherical caps.

Thursday 18:30 – 18:40

On the reachable space for the time-dependent Stokes system

Adrien Tendani Soler

Abstract

The general problem of reachable spaces can be summarized as follows: *For a given controlled system. Given an initial state u_i and a time $T > 0$, describe the space $R(u_i, T)$ of final states u_f that can be reached from u_i at a time T.* Determining the reachable space $R(u_i, T)$ of controlled systems is one of the main problems of control theory. Giving a precise characterization of the states which can be reached in a certain time $T > 0$ is particularly difficult in the case of parabolic systems: even for the heat equation with constant coefficients in one dimension and controlled from the boundary, the characterization complete reachable space, in terms of Bergman spaces, has only been obtained very recently. Based on recent work, I will present results on the reachable space for the Stokes system where new difficulties appear linked to the non-locality of the pressure and the propagation of the zero divergence condition.

Thursday 18:40 – 18:50

Recent Advances on the Analysis of some Plasma models in two and three dimensions

Haroune Houamed

Abstract

I will report some recent results on the global-in-time well-posedness of the Euler–Maxwell equations and the Navier–Stokes–Maxwell equations, in two and three dimensions of space, respectively, when the speed of light is sufficiently large. Moreover, I will highlight our findings about the asymptotic behavior (in strong topologies) of the global solution, and, lastly, briefly discuss some ongoing and open problems.

Thursday 18:50 – 19:00

On the high compressible limit for the Navier-Stokes-Korteweg model with density dependent viscosity

Matteo Caggio

Abstract

The talk is devoted to the regime of high Mach number flows for compressible barotropic fluids with density dependent viscosity. The Korteweg model as an isothermal model of capillary fluids is considered. A weak-strong uniqueness analysis is also discussed.

Thursday 19:00 – 19:10

Localization of helical vortex filaments

Martin Donati

Abstract

It is conjectured that in the 3D incompressible Euler equations, concentrated vortex filaments should move at the first order of approximation according to the binormal curvature flow equation. Except for two specific cases, the straight filament and the vortex ring in axisymmetric flows, this conjecture is completely open in general. We proved that for flows with helical symmetry, vorticity concentrated around a helical vortex filament also moves according to the binormal curvature flow equation, answering this conjecture in an other particular case.

Thursday 19:10 – 19:20

Asymptotic limit of the compressible Navier-Stokes system on domains with rough boundaries

Kuntal Bhandari

Abstract

We will present the asymptotic behavior of solutions to the compressible Navier-Stokes system considered on a sequence of spatial domains, whose boundaries exhibit fast oscillations with amplitude and characteristic wave length proportional to a small parameter. Imposing the full-slip boundary conditions we show that in the asymptotic limit the fluid sticks completely to the boundary, provided the oscillations are non-degenerate.