ABSTRACTS

COURSES

Rupert FRANK (California Institute of Technology)
A microscopic derivation of Ginzburg-Landau theory (1)

CARLOS KENIG (University of Chicago)
Soliton resolution for the energy critical wave equation

Nader MASMOUDI (Courant Institute of Mathematical Sciences)
Stability of the 3D Couette Flow

We will discuss the dynamics of small perturbations of the plane, periodic Couette flow in the 3D incompressible Navier-Stokes equations at high Reynolds number.
For sufficiently regular initial data, we determine the stability threshold for small perturbations and characterize the long time dynamics of solutions near this threshold.
For rougher data, we obtain an estimate of the stability threshold which agrees closely with numerical experiments.
The primary linear stability mechanism is an anisotropic enhanced dissipation resulting from the mixing caused by the large mean shear; the main linear instability is a non-normal instability known as the lift-up effect.
Understanding the variety of nonlinear resonances and devising the correct norms to estimate them form the core of the analysis we undertake.
This is based on joint works with Pierre Germain and Jacob Bedrossian

Benoît PAUSADER (Brown University)
Asymptotic behavior for the cubic nonlinear Schrodinger equation on product spaces

We will consider the model case of the defocusing cubic nonlinear Schrodinger equation. When the initial data are smooth and compactly supported, solutions are global and exhibit a relatively simple behavior. When one weaken these assumptions, the behavior can become more complicated.

Michela PROCESI (Universita di Roma 1)
Recurrent and diffusive dynamics for the NLS equation on tori

Small solutions of the NLS equation on tori may exhibit very different qualitative behavior. In order to illustrate this phenomenon, I will discuss various classes of special solutions for the NLS on the circle and on the two dimensional torus. On the one hand I shall prove existence of stable and unstable quasi-periodic solutions, on the other hand I shall study solutions which transfer energy to high Fourier modes. This analysis relies on the rich combinatorial structure of the Birkhoff Hamiltonian of the NLS.

Robert STRAIN (University of Pennsylvania)
On the Vlasov-Maxwell System in the Whole Space

Daniel TATARU (University of California at Berkeley)
Two dimensional water waves

TALKS

Stefano BIANCHINI (SISSA)
Concentration of entropy dissipation for scalar conservation laws

Rémi CARLES (CNRS - IMAG Montpellier)
Finite and infinite loss of regularity for nonlinear Schrodinger equation

Stephen GUSTAFSON (University of British Columbia)
Near-classical soliton dynamics for NLS with potential

Motivated by the more general problem of classifying NLS dynamics in the presence of a potential, we consider the case of a (suitably) small, repulsive potential, and for certain nonlinearities, classify solutions near the 'pinned' ground state according to classical trajectories. Joint work with K. Nakanishi.

Joachim KRIEGER (EPFL)
On stability of type II blow up solutions for the critical NLW.

I will discuss a recent result on conditional stability for a class of type II blow up solutions for the critical focussing NLW on R^{3+1}. This is joint work with W. Schlag.

Hans LINDBLAD (Johns Hopkins University)
The free boundary problem for a slightly compressible liquid

Hiroshi MATANO (School of Science, University of Tokyo)
Soliton resolution for the critical nonlinear heat equation

Natasa PAVLOVIC (Univ. of Texas at Austin)
On the Boltzmann equation in the non-cutoff case

The Boltzmann equation models the evolution of a rarefied gas, in which particles interact through binary collisions, by describing the evolution of the probability density of particles. The equation balances transport operator with a collision operator, where the latter is a bilinear integral with an angular kernel that is non-integrable in many models. For a long time the equation was simplified by assuming that this kernel is integrable (so called Grad's cutoff), with a belief that such an assumption does not affect the equation significantly. However, it has recently been observed that a non-integrable singularity carries regularizing properties, which motivates further analysis of the equation in this setting. We study behavior in time of tails of solutions to the homogeneous Boltzmann equation in the non-cutoff regime, by examining the generation and propagation in time of L^1 and L^∞ exponentially weighted estimates and the relation between them. For this purpose we introduce Mittag-Leffler moments, which can be understood as a generalization of exponential moments. We show how the singularity rate of the angular kernel affects the order of the tails that can be propagated in time.

The talk is based on joint works with Alonso, Gamba, Taskovic and with Gamba, Taskovic.

Robert PEGO (Carnegie Mellon University)
Euler sprays and optimal transport

Svetlana ROUDENKO (George Washington University)
Going beyond the threshold: blow-up and scattering in the focusing NLS equation

Gigliola STAFFILANI (Massachusetts Institute of Technology)
Recent developments on certain dispersive equations as infinite dimensional Hamiltonian systems

Tai-Peng TSAI (University of British Columbia)
Forward Self-Similar and Discretely Self-Similar Solutions of the 3D incompressible Navier-Stokes Equations

For 3D incompressible Navier-Stokes Equations in the whole space, the existence of forward self-similar solutions with *large* data was only shown recently by Jia and Sverak. They are of interest since they may not be unique, corresponding to stationary or Hopf bifurcations for the associated Leray equations. In this talk I will present 3 constructions, all based on a priori bounds but obtained in different ways.
The first is that of Jia and Sverak based on Holder estimates near initial time for local Leray solutions of Lemarie-Rieusset. This approach was adapted by myself to construct discretely self-similar (DSS) solutions either with DSS factor sufficiently close to 1 or with axisymmetric data. These solutions are necessarily regular. This method is not applicable in the half space due to lack of the LR theory.
The second construction is by Korobkov and myself, which also works in the half space. In the half space the local Leray solution theory is not known, and we get an a priori H^1 bound by using Leray's classical contradiction argument and reducing the problem to a Liouville problem of Euler equations in the half space. This construction does not work for DSS solutions.
The third construction is by Bradshaw and myself. It is a weak solution theory, based on a new explicit a priori bound for the Leray equations. It works for SS and DSS solutions with any weak L^3 data and no restriction on the DSS factor. It is also valid in the half space. Such solutions may not be regular and are good candidates for the failure of eventual regularity.
Finally I will show that the third construction also gives Rotated SS/DSS solutions for general weak L^3 data. The nonexistence problem of *backward" rotated self-similar solutions in weak L^3 was proposed by Grisha Perelman and is still open. I will present the relevant backward problems briefly.

Nicola VISCIGLIA (Universita di Pisa)
On the Growth of Sobolev norms for 3d cubic NLS

Sijue WU (University of Michigan)
On two dimensional gravity water waves with angled crests

In this talk, I will survey the recent understandings on the motion of water waves obtained via rigorous mathematical tools, this includes the evolution of smooth initial data and some typical singular behaviors. In particular, I will present our recently results on gravity water waves with angled crests.