ABSTRACTS

Lundi 23 mai

10h10 - 11h

NAKANISHI Kenji

Wellposedness and scattering for the Zakharov system in four dimensions

This is joint work with Ioan Bejenaru, Zihua Guo and Sebastian Herr. We consider the Cauchy problem for the Zakharov system in four space dimensions, extending the local wellposedness by Ginibre, Tsutsumi and Velo to wider range of Sobolev exponents, together with scattering for small data. We observe distinct phenomena at two extreme points of exponents. One is at the energy space, where our nonlinear estimates suffer from divergence related to the critical Sobolev embedding. We can however prove the results for small data, without any improvement of the estimates, but from the existence in a smaller Sobolev space and the uniqueness in a larger one, together with the conservation law. At another corner point of exponents, the critical space is also intermediate, but we obtain a strong illposedness result in terms of instantaneous exit or non-existence of weak solutions.

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11h30 - 12h20

BIERI Lydia

The Einstein Equations and Gravitational Radiation

In Mathematical General Relativity (GR) the Einstein equations describe the laws of the universe. This system of hyperbolic nonlinear pde has served as a playground for all kinds of new problems and methods in pde analysis and geometry. A major goal in the study of these equations is to investigate the analytic properties and geometries of the solution spacetimes. In particular, fluctuations of the curvature of the spacetime, known as gravitational waves, have been a highly active research topic. A few weeks ago, it was confirmed that advanced LIGO detected gravitational waves. Understanding gravitational radiation is tightly interwoven with the study of the Cauchy problem in GR. I will talk about geometric-analytic results on gravitational radiation and the memory effect of gravitational waves. We will connect the mathematical findings to experiments. I will also address recent work with David Garfinkle on gravitational radiation in asymptotically at as well as cosmological spacetimes.

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14h00 - 14h50

FIBICH Gadi

Necklace solitary waves on bounded domains

The critical power for collapse appears to place an upper bound on the amount of power that can be propagated by intense laser beams. In various applications, however, it is desirable exceed this limit and deliver more power. In this talk I will present new solitary waves of the two-dimensional nonlinear Schrodinger equation on bounded domains, which have a « necklace » structure. I will consider their structure, stability, and how to compute them. In particular, I will show that these solitary waves can stably propagate more than the critical power for collapse.

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15h30 -16h20 **THOMANN Laurent**

Modified scattering for the Gross-Pitaevskii equation

We consider the cubic nonlinear Schrödinger equation with harmonic trapping. In the case when all but one directions are trapped, we prove modified scattering and construct modified wave operators for small initial and final data respectively. Actually, we prove that the asymptotic behavior of the solutions is given by a simpler equation, depending on the resonances of the GP equation, and we exhibit some particular solutions of it.
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Mardi 24 mai

10h10 -11h **DEL PINO Manuel**

Bubbling blow-up in critical parabolic problems.

We construct solutions that blow up in the form of energy invariant, time dependent space scalings of steady states for some problems where such steady states exist. ma.delpino7@gmail.com

11h30 - 12h20 **TOPPING Peter**

Sharp local decay estimates for the Ricci flow on surfaces.

There are many tools available when studying 2D Ricci flow, equivalently the logarithmic fast diffusion equation, but one has always been missing: how do you get uniform smoothing estimates in terms of local L^1 data, i.e. in terms of local bounds on the area. The problem is that the direct analogue of the geometrically less-useful L^p smoothing estimates for p>1 are simply false. In this talk I will explain this problem in more detail, and show how to get around it with a new local decay estimate. I also plan to sketch the proof and/or give some applications. No knowledge of Ricci flow will be assumed. Joint work with Hao Yin.
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14h00 -14h50 **SMETS Didier**

Leapfrogging vortices for the Gross-Pitaevskii equation

We will present a rigorous derivation of the leapfrogging mechanism for the 3D axisymmetric Gross-Pitaveskii equation (joint with R.L. Jerrard), and point out the difficulties that arise in the related context of the incompressible Euler equation.
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15h30 -16h20 **DELORT Jean-Marc**

Almost global solutions for the capillarity wave equation with small periodic data.

We prove that the capillarity waves equation in one dimension and finite depth has solutions over time intervals of length $c_N\epsion^{-N}$ for any N, if the Cauchy data are of small size ϵ and space periodic, and if the gravity, or the surface tension, is taken outside a subset of zero measure. The proof relies on normal forms and on the use of the reversibility of the equation. This is joint work with Massimiliano Berti.
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Mercredi 25 mai

10h10 - 11h00 **VISAN Monica**

Symplectic non-squeezing for the cubic NLS on the plane

We prove that the flow of the cubic NLS in two dimensions cannot squeeze a ball in L^2 into a cylinder of lesser radius. This is a PDE analogue of Gromov's non-squeezing theorem for an infinite-dimensional Hamiltonian PDE in infinite volume. It is joint work with R. Killip and X. Zhang.

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11h30 - 12h20 **BIZON Piotr**

Blowup for supercritical equivariant wave maps

We consider equivariant wave maps from R^{d+1} into S^d for d\geq 3. Using mixed analytic and numerical tools we describe the dynamics of generic blowup and the threshold for blowup. We hope that our plausibility arguments will stimulate rigorous studies of this problem. This is joint work with Pawel Biernat and Maciej Maliborski.

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14h00 -14h50 **VEGA Luis**

Remarks about the self-similar solutions of the Vortex Filament Equation.

I will review some of the properties of the self-similar solutions of the Vortex Filament Equation. This equation is also known as either the Localized Induction Equation or the binormal flow and is related to the 1d Schr\"odinger map and the 1d cubic non-linear Schr\"dinger equation. After looking at the uniqueness and asymptotic behavior of these solutions, I will recall the method developed with V. Banica to continue the solution once the singularity (a corner) is created. Issues concerning the lack of the preservation of linear momentum and the no-continuity of some critical Besov norms will be considered. Finally I will mention some recent work done with F. De La Hoz about the evolution of a regular polygon.

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15h00 -15h50 **FAOU Erwan**

Some Landau damping results for the HMF model and its discrete time approximation.

We consider solutions of the Vlasov-HMF model starting in a small Sobolev neighborhood of a spatially homogeneous stationary state satisfying a linear stability criterion and prove a scattering result (Landau damping). We then consider time discretizations of these solutions based on splitting methods between the linear and non-linear part of the equation and we prove that the numerical solutions converge weakly to a modified state which is close to the continuous one. We also prove that our numerical scheme is uniformly convergent, with a convergence rate of order one for Lie splittings, and two for Strang splittings. We will also consider the case of non-homegeous states for which action-angle variables can be used.

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16h20 -17h10 **BERTI Massimiliano**

Quasi-periodic standing wave solutions of gravity-capillary water waves

We prove the existence of Cantor families of small amplitude time quasi-periodic standing wave solutions (i.e. periodic and even in the space variable x) of a 2-dimensional ocean with infinite depth under the action of gravity and surface tension. In addition we prove that these solutions are linearly stable. Joint work with Riccardo Montalto.

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Jeudi 26 mai

10h10 -11h **HADZIC Mahir**

Nonlinear stability of expanding stars in the mass-critical Euler-Poisson system

The gravitational Euler-Poisson system is a fundamental astrophysics model of a Newtonian star. We first give a brief overview of the existing results on the free-boundary compressible Euler-Poisson system. We then study the question of nonlinear stability of homogeneous expanding star-solutions discovered by Goldreich and Weber in 1980's in the mass-critical gravitational Euler-Poisson system. We show that these solutions are nonlinearly stable with respect to small perturbations. We thus construct a new class of global-in-time solutions, which are not homogeneous and therefore not encompassed by the existing works.The problem is mass-critical with respect to an invariant rescaling and the nonlinear analysis is carried out in suitably chosen similarity coordinates. We present some interesting open questions at the end. This is a joint work with Juhi Jang.

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11h30 - 12h20 **MIZUMACHI Tetsu**

Stability of line solitons for the KP-II equation

The KP-II equation was derived by Kadmotsev and Petviashvili to explain stability of line solitary waves of shallow water. In this talk, I will show stability of 1-line solitons for perturbations in the class
$(1+x^2)^{-1/2-0}H^1(\mathbb{R}_{x,y}^2)$.

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14h -14h50 **D'ANCONA Piero**

Equivariant wave maps on a class of rotationally symmetric manifolds

Joint work with Qidi Zhang (Shanghai).
We study a class of rotationally invariant manifolds, which we call admissible, on which it is possible to prove smoothing and Strichartz estimates for the wave equation. This class includes asymptotically flat manifolds but also perturbations of real hyperbolic spaces $\mathbb{H}^{n}$ for $n\ge3$, and other manifolds with non vanishing curvature at infinity. Among other results we can prove the global existence of equivariant wave maps from admissible manifolds to general targets, for small initial data of critical regularity $H^{\frac n2}$.

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15h -15h50 **OH Sung-Jin**

Global regularity and scattering for energy critical geometric wave equations

I will present recent results, and report on some new progress, concerning global regularity and scattering for geometric wave equations in the energy critical case. The emphasis will be on the Maxwell-Klein-Gordon equation and the Yang-Mills equation in (4+1)-dimensions. This talk is based on joint work with D. Tataru.

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16h20 -17h10 **IVANOVICI Oana**

Dispersion estimates for the wave and the Schrodinger equations outside strictly convex obstacle

We consider a (general) strictly convex domain in R^d of dimension d>1 and we describe dispersion for both wave and Schrödinger equations with Dirichlet boundary conditions. If d=2 or d=3 we show that dispersion does hold like in the flat case, while for d>3, we show that there exist strictly convex obstacles for which a loss occur with respect to the boundary less case (such an optimal loss is obtained by explicit computations). This is a joint work with Gilles Lebeau.

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Vendredi 27 mai

10h10 -11h00 **KOCH Herbert**

A continuous family of energies for the Korteweg-de Vries equation and the cubic nonlinear Schrödinger equation

The KdV equation and the cubic NLS equation are known to have an infinite number of conserved energies. I will explain the construction
of a continuous family of conserved energies interpolating the classical energies.

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11h30 -12h20 **PONCE Gustavo**

On special regularity properties of a class of dispersive equations

This talk is concerned with special properties of solutions to the IVP for the k-generalized KdV equation \pa_tu+\pa_x^3u+u^k\pa_xu=0 on the line. We shall discuss results concerning well posedness, unique continuation and propagaion of regularity, and compare them with similar results for other nonlinear dispersive models (in particular Benjamin Ono equation). This is joint work with P. Isaza and F. Linares.

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14h -14h50 **CRAIG Walter**

Birkhoff normal form for nonlinear wave equations

Many theorems on global existence of small amplitude solutions of nonlinear wave equations in ${\mathbb R}^n$ depend upon a competition between the time decay of solutions and the degree of the nonlinearity. Decay estimates are more effective when inessential nonlinear terms are able to be removed through a well-chosen transformation. Most wave equations that arise in a physical context can be considered as Hamiltonian PDEs, that is, partial differential equations that can be formulated as a Hamiltonian system. In this talk, we construct Birkhoff normal forms transformations for the class of wave equations which are Hamiltonian PDEs and null forms, giving a new proof via canonical transformations of the global existence theorems for null form wave equations of S. Klainerman, J. Shatah and other, in space dimensions $n \geq 3$. The critical case $n = 2$ is also under consideration. These results are work-in-progress with A. French and C.-R. Yang.

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15h30 -16h20 **KLAINERMAN Sergiu**

The problem of stabiliy of Kerr under axilly symmetric perturbations"

I will talk about about a recent result, in collaboration with A. Ionescu, concerning partial nonlinear axisymmetric perturbations of Kerr and will also give a progress report on my recent work with J. Szeftel on axi-symmetric polarized perturbations.

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