Second Frontiers in Fluid and Kinetic Partial Differential Equations

Online Conference

June 29 -July 1st, 2026

Beijing Time (UTC +8)

Organizer: Emmanuel Grenier and Quoc-Hung Nguyen, Academy of Mathematics and Systems Science (AMSS), Chinese Academy of Sciences (CAS)
Conference Website: nguyenquochung1241.wixsite.com/qhung

Overview

The *Second Frontiers in Fluid and Kinetic Partial Differential Equations* online workshop brings together researchers to discuss recent advances in the mathematical analysis of problems governed by fluid and kinetic PDEs. These equations model a broad range of physical phenomena, from fluid motion and plasma dynamics to particle interactions and transport processes. The workshop aims to strengthen connections between kinetic theory and fluid dynamics, fostering dialogue across these closely related areas. Topics of interest include the analysis of the Euler, Navier–Stokes, Boltzmann, and Vlasov equations; nonlinear stability; regularity theory; and related PDE models.

By connecting leading experts with early-career researchers in an accessible online format, the conference highlights new developments, encourages collaboration, and explores open problems at the frontiers of fluid and kinetic PDE research.

CONFERENCE ACCESS

Zoom Meeting ID: 373 227 3489 — **Passcode:** PDE2026

Invited Speakers

Tobias Barker
University of Bath

Dongfen Bian
Beijing Institute of Technology

Yann Brenier
Université Paris-Saclay

Alexandru Ionescu
Princeton University

Zhen Lei
Fudan University

Vlad Vicol
New York University

Yi Wang
Academy of Mathematics and Systems Sciences, CAS

Yao Yao
National University of Singapore

Zhifei Zhang
Peking University

Weiren Zhao
NYU Abu Dhabi - New York University

1 Schedule

Note: All times are displayed in **Beijing Time**.

June 29th, 2026	Speaker & Title	Chair
3:00–3:10 pm	**Ping Zhang** (President of AMSS) *Opening Remarks*	Emmanuel Grenier
3:10–4:00 pm	**Alexandru Ionescu** (Princeton University) *On the stability of homogeneous equilibria for the Vlasov-Poisson system*	Quoc-Hung Nguyen
	Break	
4:10–5:00 pm	**Zhifei Zhang** (Peking University) *Asymptotic stability of shear flows at high Reynolds number*	Wang Yi
	Dinner Break	
9:00–9:50 pm	**Yann Brenier** (Université Paris-Saclay) *Solving initial value problems by space-time convex optimization*	Emmanuel Grenier
	Break	
10:00–10:50 pm	**Vlad Vicol** (New York University) *Implosions in compressible flow*	Emmanuel Grenier

June 30th, 2026	Speaker & Title	Chair
2:00–2:50 pm	**Zhen Lei** (Fudan University) *Boundary Layer Theory*	Emmanuel Grenier
	Break	
3:00–3:50 pm	**Dongfen Bian** (Beijing Institute of Technology) *From linear to nonlinear instabilities with application to plasma columns*	Weiren Zhao
	Break	
4:00–4:50 pm	**Yao Yao** (National University of Singapore) *Infinite-in-time growth in 2D and 3D Euler equations*	Guolin Qin
	Dinner Break	
8:00–8:50 pm	**Tobias Barker** (University of Bath) *On Behavior of the Navier–Stokes Equations Beyond the Blow-Up Time and Local Anomalous Dissipation*	Quoc-Hung Nguyen

July 1st, 2026	Speaker & Title	Chair
3:00–3:50 pm	**Yi Wang** (AMSS, CAS) *The time-asymptotic stability of generic Riemann profiles*	Emmanuel Grenier
	Break	
4:00–4:50 pm	**Weiren Zhao** (NYU Abu Dhabi – New York University) *Landau damping for the Vlasov–Poisson equations with weak collisions*	Liutang Xue

Each talk is planned for 50 minutes, including questions. The schedule is designed to accommodate

speakers from Asia, Europe, and North America as much as possible, while keeping the main sessions in the afternoon and evening Beijing time.

Table 1: Time Zone Conversion Table, June 29–July 1, 2026

Beijing / Singapore	Abu Dhabi	Romania	Paris	UK	New York
03:00 PM	11:00 AM	10:00 AM	09:00 AM	08:00 AM	03:00 AM
04:00 PM	12:00 PM	11:00 AM	10:00 AM	09:00 AM	04:00 AM
05:00 PM	01:00 PM	12:00 PM	11:00 AM	10:00 AM	05:00 AM
08:00 PM	04:00 PM	03:00 PM	02:00 PM	01:00 PM	08:00 AM
09:00 PM	05:00 PM	04:00 PM	03:00 PM	02:00 PM	09:00 AM
10:00 PM	06:00 PM	05:00 PM	04:00 PM	03:00 PM	10:00 AM

All times are on the same calendar date. During June 29–July 1, 2026, Romania is on EEST, Paris is on CEST, the UK is on BST, and New York is on EDT.

2 Abstracts

Speaker: Tobias Barker (University of Bath)
Title: On Behavior of the Navier-Stokes Equations Beyond the Blow-Up Time and Local Anomalous Dissipation

Abstract: In the first part, I will discuss results concerning absence of (interior) local anomalous dissipation in the 2D inviscid limit in the presence of boundaries. The implications for local balance laws for the limiting 2D Euler solution will also be discussed. Joint work with Milton C. Lopes Filho and Helena J. Nussenzveig Lopes (Universidade Federal do Rio de Janeiro).
In the second part, I will discuss quantitative classification of potentially singular 3D Navier-Stokes solutions at any given time in the region of potential blow-up times. The quantitative lower bounds prior to any potential blow-up time (and in the open vicinity of it) are in principle amenable to numerical testing.

Speaker: Dongfen Bian(Beijing Institute of Technology)
Title: From linear to nonlinear instabilities with application to plasma columns

Abstract: This talk addresses the problem of proving the nonlinear instability of an equilibrium starting from its linear instability when there is no existence theory for the corresponding equations. We design a general method based on the use of analytic functions to overcome this difficulty and apply it to the classical problem of the stability of a plasma column in magneto- hydrodynamics (MHD) as an illustration.

Speaker: Yann Brenier (Université Paris-Saclay)
Title: Solving initial value problems by space-time convex optimization

Abstract: I will present a way to solve the Cauchy problem for nonlinear evolution PDEs by space-time convex optimization based on their weak formulation. One of the simplest example is the quadratic porous medium equation for which the Aronson-Benilan inequality is sharply used to prove that the strategy works for arbitrarily long time intervals. A similar result holds true for the Burgers equation. For the more challenging Euler equations of incompressible fluids, the concept of subsolution (in the sense of convex interation theory) plavs a crucial role. Finallv. I will mention how the Einstein equations in vacuum can be considered in that framework

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Speaker: Alexandru Ionescu (Princeton University)
Title: On the stability of homogeneous equilibria for the Vlasov-Poisson system

Abstract: I will talk about several results, in collaboration with Benoit Pausader, Xuecheng Wang, and Klaus Widmayer, on the global nonlinear asymptotic stability of certain homogeneous equilibria among solutions of the Vlasov-Poisson system.
In particular, I will discuss a proof of nonlinear Landau damping in optimal Gevrey-3 spaces in the confined case $(x, v) \in \mathbb{T}^d \times \mathbb{R}^d$, and a result on the existence and injectivity of nonlinear scattering operators for this system.

Speaker: Zhen Lei(Fudan University)
Title: Boundary Layer Theory

Abstract: The Prandtl equation is fundamental in boundary layer theory. In this talk we present recent progress on global regularity of unsteady equation and sharp asymptotic stability of steady equation. Based on joint work with Prof. Hao Jia (Univerisity of Minnesota) and Dr. Cheng Yuan (Fudan University).

Speaker: Vlad Vicol (New York University)
Title: Implosions in compressible flow

Abstract: The compressible Euler equations are the fundamental model of gas dynamics. These PDEs admit a remarkable class of singularities known as implosions: a subset of the primary flow variables (density, velocity, pressure) become unbounded at a single point in space-time. Unlike shock singularities, where the solution remains bounded but develops infinite gradients, implosion singularities represent a strong blowup of the solution itself. Understanding the existence and stability of such singularities is a fundamental problem in gas dynamics. In this talk, we survey a number of recent results on Euler implosions.

Speaker: Yi Wang (Academy of Mathematics and Systems Sciences, CAS)
Title: The time-asymptotic stability of generic Riemann profiles

Abstract: The talk is based on our recent developments on the time-asymptotic stability of generic Riemann profiles, which are the viscous version of generic inviscid Riemann solutions including the composite of viscous shock profile, centered rarefacton wave and even viscous contact discontinuity, to some typical viscous conservation laws, such as barotropic/full compressible Navier-Stokes equations, and non-convex scalar viscous conservation laws/viscoelastic system.

Speaker: Yao Yao (National University of Singapore)
Title: Infinite-in-time growth in 2D and 3D Euler equations

Abstract: In this talk, I will discuss two results on infinite-in-time growth in 2D and 3D incompressible Euler equations. For the 2D Euler equation on the whole plane, we construct the first example giving superlinear growth of the vorticity gradient for smooth compactly supported vorticity (joint with In-Jee Jeong and Tao Zhou). For the 3D axisymmetric Euler equation without swirl, we establish some upper and lower bound for the radial moment of vorticity, and prove that under some sign and symmetry conditions, all solutions must have their vorticity L^p norm growing to infinity with some power-law rate for all $p >= 1$. To the best of our knowledge, this is the first result to establish power-law L^p-norm growth for smooth, compactly supported initial vorticity in $\mathbb{R}^3$. (joint with Khakim Egamberganov).

Speaker: Zhifei Zhang (Peking University)
Title: Asymptotic stability of shear flows at high Reynolds number

Abstract: We study the asymptotic stability of shear flows in the high Reynolds number regime. In particular, we consider Sobolev perturbations of canonical shear profiles such as Couette and Kolmogorov flows and investigate their optimal asymptotic stability threshold. The analysis reveals a delicate competition between inviscid mechanisms—such as phase mixing and inviscid damping—and viscous effects, including enhanced dissipation driven by shear-induced mixing.

Speaker: Weiren Zhao (NYU Abu Dhabi - New York University)
Title: Landau damping for the Vlasov-Poisson equations with weak collisions

Abstract: In this talk, I will introduce the recent result about the optimal stability threshold for the Vlasov-Poisson equation with weak Fokker-Planck collision. We prove that if the initial perturbation is of size $\nu^{\frac{1}{2}}$ in the critical weighted space $H^{\log}_x L^2_v(\langle v\rangle^m)$, then the solution remains the same size in the same space. Moreover, a space-time type Landau damping holds, namely, $\|E\|_{L^2_t L^2_x} \lesssim \nu^{12}$; and a point-wise type Landau damping holds, namely, $\|E(t)\|_{L^2} \lesssim \nu^{1/2}\langle t\rangle^{-N}$ for any $N > 0$ for $t \geq \nu^{-1}$. We also prove that there exists initial perturbation in $H^1_x L^2_v(\langle v\rangle^m)$ with size $\nu^{12-32\epsilon_0}$ with any $\epsilon_0 > 0$, such that the enhanced dissipation fails to hold in the following sense: there is $0 < T \ll \nu^{-13}$ such that

$$\|f_{\neq}(T)\|_{L^2_x L^2_v} \gtrsim \frac{1}{\nu^{\delta_1}}\|f_{\neq}(0)\|_{H^1_x L^2_v}$$

with some $\delta_1 > 0$. We solve the open problem raised in [Bedrossian; arXiv: 2211.13707] about the sharp stability threshold in lower regularity spaces. The main idea is to construct a wave operator $\mathbf{D}$ with a very precise expression to absorb the nonlocal term, namely,

$$\mathbf{D}[\partial_t g + v\cdot\nabla_x g + E\cdot_v \mu] = (\partial_t + v\cdot\nabla_x)\mathbf{D}[g].$$

Acknowledgments

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