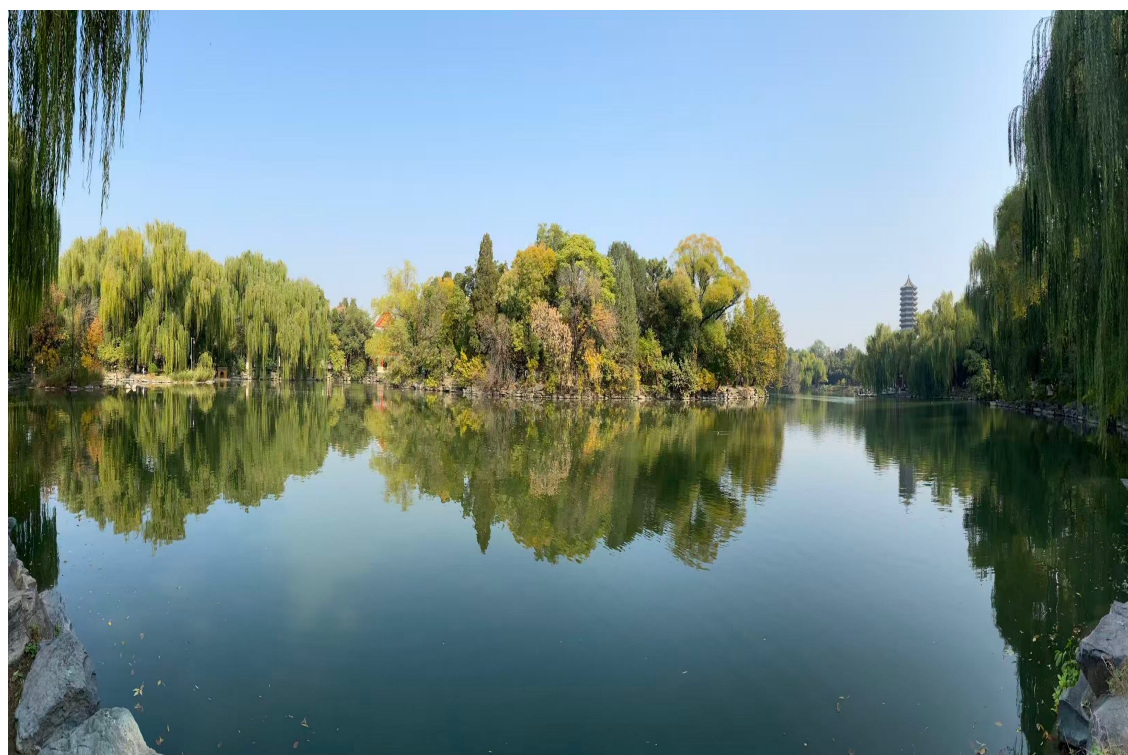




随机偏微分方程青年研讨会



会议时间：2026年4月17日-19日

主办单位：北京大学数学科学学院

会议日程

| 日期 | 时间 | 报告题目 | 主持人 |
|-------|-------------|--|-----|
| 4月17日 | 全天 | 外地来京参会者报到 | |
| 4月18日 | 8:30-9:00 | 会议签到 | |
| | 9:00-9:30 | 尚世界 Stochastic reaction-diffusion equations with super-linear drift | 杨浩 |
| | 9:30-10:00 | 施彦锴 Quantitative exponential mixing for the randomized Chirikov standard map | |
| | 10:00-10:30 | 茶歇（俊采厅） | |
| | 10:30-11:00 | 黄翔宇 Approximation time of opinion dynamics | 王炜 |
| | 11:00-11:30 | 陈慧萍 Optimal rate of convergence for vector-valued Wiener-Itô integral | |
| | 11:30-12:00 | 周书涵 Sharp interface limit for stochastic Allen-Cahn equation with spacetime noise in $d \geq 2$ | |
| | 12:00-14:00 | 午餐（四元厅） | |
| | 14:00-14:30 | 任崇阳 The non-Gaussian to Gaussian transition: pointwise heat kernel estimates and optimal convergence rates | 汪键 |
| | 14:30-15:00 | 陈弈霖 Periodic homogenisation for some singular stochastic PDEs | |
| | 15:00-15:30 | 刘泽霖 Quantitative stochastic homogenization of the dynamic ϕ_2^4 equation | |
| | 15:30-16:00 | 茶歇（俊采厅） | |
| | 16:00-16:30 | 唐斌 Large deviation principles for the stationary solutions and invariant measures of a class of SPDE with locally monotone coefficients | 魏茸 |
| | 16:30-17:00 | 潘天翊 Stochastic partial differential equations on moving domains | |

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| | 17:00–17:30 | 孙伟舰 Level 2.5 large deviation for time-periodic diffusion processes on compact manifolds | |
| | 17:30–19:30 | 晚餐（农园餐厅三楼） | |
| 4月19日 | 9:00–9:30 | 杨赛赛 Strong convergence for Euler–Maruyama and Wong–Zakai approximations of SDEs with Holder continuous drift | 陈萍 |
| | 9:30–10:00 | 徐文 Near optimal controls for partially observed stochastic linear quadratic problems | |
| | 10:00–10:30 | 茶歇（俊采厅） | |
| | 10:30–11:00 | 刘子愉 Exponential mixing for the stochastic Allen–Cahn equation with localized white noise | 陈云峰 |
| | 11:00–11:30 | 万桀豪 Exponential ergodicity for the damped nonlinear wave equation driven by multiplicative noise | |
| | 11:30–12:00 | 王鹏宇 L^2 -solutions to stochastic reaction-diffusion equations with superlinear drifts driven by space-time white noise | |
| | 12:00–12:30 | 午餐（四元厅）、离会 | |

会议地点：北京大学智华楼四元厅

用餐地点：北京大学农园餐厅三楼

报告信息：

Stochastic reaction-diffusion equations with super-linear drift

报告人：尚世界

In this talk, we consider the stochastic reaction-diffusion equations with logarithmic super-linear drift, driven by Brownian motion or space-time white noise. We will present recent progress on the global existence and uniqueness of solutions to these equations on both bounded and unbounded domains.

Quantitative exponential mixing for the randomized Chirikov standard map

报告人：施彦锴

We study a randomized variant of the Chirikov standard map on \mathbb{T}^2 , driven by alternating shear flows with i.i.d. random phases. Unlike the deterministic setting where stable elliptic islands obstruct global mixing, we prove that random phase perturbations ensure quantitative exponential mixing. To rigorously quantify the mixing rate, we translate the problem into the ergodic theory of the associated two-point Markov process. Crucially, we abstract this approach into a systematic method applicable to a broader class of incompressible random dynamical systems. The key idea relies on constructing an explicit Lyapunov function and verifying a small set condition; the exponential correlation decay then follows from a quantitative Harris theorem.

Approximation time of opinion dynamics

报告人：黄翔宇

We consider L^p -energy minimization dynamics on finite connected graphs. Given initial opinion profile on each vertex, at each step, the dynamics choose uniformly random vertex, and update its value by minimizing the L^p -energy. The case $p = 2$ is an asynchronous version of the dynamics introduced by deGroot in 1974 as a model for

non-Bayesian social learning. We are interested in the case for general $p > 1$. One of the case $p = \infty$ is also called the Lipschitz learning. In this talk, I will show the number of steps to reduce oscillation of values in dynamics for $p > 1$, specifically for $p = \infty$.

Optimal rate of convergence for vector-valued Wiener-Itô integral

报告人：陈慧萍

We investigate the optimal rate of convergence in the multidimensional normal approximation of vector-valued Wiener-Itô integrals whose components all belong to a fixed Wiener chaos with coinciding orders. By combining Malliavin calculus, Stein's method for normal approximation and the method of cumulants, we obtain the optimal rate of convergence with respect to a suitable smooth distance. As an application, we derive the optimal rate of convergence for complex Wiener-Itô integrals.

Sharp interface limit for stochastic Allen-Cahn equation with spacetime noise in $d \geq 2$

报告人：周书涵

We consider the stochastic Allen-Cahn equation with noise that is white in time and smooth in space. We prove that its sharp interface limit is given by a stochastic mean curvature flow driven by spacetime noise, extending existing results on space-independent noises. In the spatially dependent case, a basic difficulty is that even formulating the limiting motion becomes nontrivial. This is due to a rough term that depends nonlinearly on both the solution and its gradient. The key idea is to remove this term through a nonlinear transformation based on rough characteristics, which reduces the problem to a random parabolic equation.

The non-Gaussian to Gaussian transition: pointwise heat kernel estimates and optimal convergence rates

报告人：任崇阳

We aim to establish uniform pointwise estimates for the densities of a family of α -stable processes with respect to the stability index $\alpha \in (0, 2]$, and then quantify the difference between the heat kernels of non-local and local operators, showing that it is controlled by the rate $2 - \alpha$. These two results are new to the literature. As an application, we derive the total variation and Kantorovich distances between the transition probabilities (and invariant measures) of anomalous and normal diffusion, achieving the optimal rate $2 - \alpha$. The results on transition probabilities are novel, while those on invariant measures significantly extend the existing literature.

Periodic homogenisation for some singular stochastic PDEs

报告人：陈弈霖

We consider periodic homogenisation problems for singular stochastic PDEs, which are natural models that combine renormalisation and homogenisation. It is natural to ask how these two singular limiting procedures interact with each other. We report on some of our recent understanding towards this direction. This is based on joint works with Benjamin Fehrman and Weijun Xu.

Quantitative stochastic homogenization of the dynamic ϕ_2^4 equation

报告人：刘泽霖

We consider the stochastic homogenization problem for the ϕ_2^4 equation in three different settings: on the torus $\mathbb{T}_{M^2}^2 = \mathbb{R}^2 / (M\mathbb{Z}^2)$, on a smooth bounded domain $\mathcal{D} \subset \mathbb{R}^2$ (with Dirichlet boundary condition), and in the plane \mathbb{R}^2 . In each case, we show

that the two limiting procedures of renormalization and homogenization commute, and establish quantitative homogenization estimates in the probabilistic Orlicz spaces where the coefficient field resides. Due to the boundary layer effects, the Dirichlet problem attains a distinct rate of homogenization convergence compared with the other two settings. This is a joint work with Prof. Hao Ge.

Large deviation principles for the stationary solutions and invariant measures of a class of SPDE with locally monotone coefficients

报告人：唐斌

We establish the well-posedness of stationary solutions for a class of SPDEs with locally monotone coefficients, and prove the Freidlin--Wentzell large deviation principle (LDP) for these stationary solutions. The LDP for the associated invariant measures then follows via the contraction principle, avoiding the need to construct the quasi-potential and verify the Dembo--Zeitouni uniform LDP over bounded sets. By working directly with stationary solutions, we bypass these technical difficulties, providing a simpler and more widely applicable framework. As applications, our results cover a range of concrete SPDEs, including the stochastic 1D Burgers-type equation, stochastic 2D Navier--Stokes equations, stochastic 3D hyperdissipative Navier--Stokes equations, among others.

Stochastic partial differential equations on moving domains

报告人：潘天翊

We introduce a nonhomogeneous monotonicity framework for stochastic partial differential equations (SPDEs) on evolving domains. As applications, we study the stochastic Stefan problem on moving hypersurfaces and the stochastic Navier--Stokes

equations on time-dependent domains. This work lays the foundation for further research on SPDEs on manifolds with time-dependent Riemannian metrics.

Level 2.5 large deviation for time-periodic diffusion processes on compact manifolds

报告人：孙伟舰

We consider the diffusion processes with time-periodic coefficients on compact Riemann manifolds. We prove the joint large deviation principle for the empirical measure and empirical current defined by stochastic line integrals, and the rate function is shown explicitly. Using the contraction principle, we obtain the large deviation principle of rotation numbers and three types of entropy flow, and several Gallavotti-Cohen-type duality relations are established.

Strong convergence for Euler–Maruyama and Wong-Zakai approximations of SDEs with Holder continuous drift

报告人：杨赛赛

In this talk, we consider numerical approximations of the stochastic differential equation (SDE) with Holder continuous drift. Moreover, We establish the strong rate of convergence for both the Euler–Maruyama and Wong-Zakai approximation schemes. Our technique is based on the Zvonkin transformation and the regularity of the solution to the associated Kolmogorov equation.

Near optimal controls for partially observed stochastic linear quadratic problems

报告人：徐文

In this talk, I will discuss stochastic control problems under partial observation, where the controller does not have direct access to the full state information and must make

decisions based only on noisy observations. Such problems lie at the intersection of stochastic filtering and stochastic control: filtering is used to estimate the unobservable state from the available observations, while control is designed on the basis of this incomplete information. I will first introduce the general framework and some basic ideas in this area, and then focus on our recent results on partially observed stochastic linear-quadratic control problems. This work is joint with Jingrui Sun, Jiaqiang Wen and Jie Xiong.

Exponential mixing for the stochastic Allen–Cahn equation with localized white noise

报告人：刘子愉

We study the stochastic 1D Allen–Cahn equation on a bounded domain driven by localized white noise. We prove that the associated Markov process admits a unique invariant measure and is exponential mixing. The main challenge lies in the interaction between localized nature of the noise and non-trivial global dynamics of the system. To overcome this, our approach relies on two ingredients from blue PDEs control theory: stabilization for the linearized system and global steady-state controllability for the nonlinear equation. The stabilization result is derived using weak observability and the Fenchel–Rockafellar duality, while the global controllability relies on quasi-static deformations combined with global dynamics of the unforced system.

Exponential ergodicity for the damped nonlinear wave equation driven by multiplicative noise

报告人：万桀豪

In this presentation, we focus on the stochastic damped nonlinear wave (SdNLW) equation given by

$$\partial_{tt}u + \gamma \partial_t u - \Delta u + f(u) = \xi(u),$$

within a bounded domain $D \subset \mathbb{R}^3$ subject to the Dirichlet boundary condition. Specifically, the function $f(u)$ represents a nonlinear term featuring sub-critical nonlinearity, and $\xi(u)$ stands for a smooth (in the spatial variable) multiplicative Gaussian noise that depends on the solution u . We prove that under certain appropriate conditions on nonlinear term and noise term, the solution of this equation admits a unique ergodic measure and law of any solution converges to this unique ergodic measure at an exponential rate when measured in the dual-Lipschitz norm.

L^2 -solutions to stochastic reaction-diffusion equations with superlinear drifts driven by space-time white noise

报告人：王鹏宇

Consider the following stochastic reaction-diffusion equation with a logarithmically superlinear coefficient b , driven by space-time white noise W :

$$\partial_t u(t, x) = \frac{1}{2} \partial_{xx} u(t, x) + b(u(t, x)) + \sigma(u(t, x)) W(dt, dx), \quad t > 0, x \in [0, 1],$$

$$u(0, x) = u_0(x), \quad x \in [0, 1].$$

where the initial condition $u_0 \in L^2([0, 1])$. In this paper, we establish the existence and uniqueness of probabilistically strong solutions in $C(\mathbb{R}^+, L^2([0, 1]))$ for this equation. Our result not only resolves a recent open problem posed in [*Annals of Probability* **47** (2019), no. 1, 519-559], but also provides an alternative proof of the non-blowup of $L^2([0, 1])$ -solutions obtained therein. Our approach relies crucially on several new Gronwall-type inequalities that we derive. Moreover, due to the nature of the nonlinearity, we are forced to work with the first-order moment of the solutions, which in turn requires precise first-order moment estimates for the stochastic convolution.

北京大学燕园校区地图

Map of Peking University Main Campus



- A School of Mathematical Sciences
(Zhi-Hua Building)
- ◆ Ding Shusun Lecture Hall
- B Beijing International Center for
Mathematical Research
- C Zhongguanyuan Global Village Hotel
- ★ Southeast Gate

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| 1 | 燕园中心 | Yuan Garden Center |
| 2 | 图书馆 | Library |
| 3 | 学生活动中心 | Student Activity Center |
| 4 | 学生服务中心 | Student Service Center |
| 5 | 就业指导中心 | Employment Guidance Center |
| 6 | 国际交流中心 | International Exchange Center |
| 7 | 学生公寓 | Student Dormitory |
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