

WORKSHOP ON

“STOCHASTIC PARTIAL DIFFERENTIAL EQUATIONS AND RELATED TOPICS”

Date: 26 July (Thursday) - 27 July (Friday), 2018

Venue: Room No. 401, Building A, Faculty of Science, Shinshu University
(信州大学 理学部 数理・自然情報合同研究室 (401 号室))

PROGRAM

26 July, 2018

14:00 ~ 14:50 Tadahisa Funaki (舟木 直久, 早稲田大学)

Derivation of coupled KPZ equation from multi-color zero-range process

15:00 ~ 15:50 Naoyuki Ichihara (市原 直幸, 青山学院大学)

Ergodic problems for viscous Hamilton-Jacobi equations with inward drift

Coffee Break

16:10 ~ 17:00 Mamoru Okamoto (岡本 葵, 信州大学)

On the energy critical nonlinear Schrödinger equations with randomized initial data

17:10 ~ 18:00 Takamori Kato (加藤 孝盛, 佐賀大学)

Almost sure global well-posedness for fourth order Schrödinger type equations on the torus

27 July, 2018

10:00 ~ 10:50 Zhao Dong (董 昭, Chinese Academy of Sciences)

Limiting Behavior of Stochastic Evolution Systems

11:00 ~ 11:50 Masato Hoshino (星野 壮登, 九州大学)

Global solutions of some singular SPDEs

Lunch

13:30 ~ 14:20 Jin Feng (馮 進, The University of Kansas)

A Hamilton-Jacobi theory for the hydrodynamic limit large deviation from nonlinear heat equation given by stochastic Carleman particles

14:30 ~ 15:20 Makoto Nakashima (中島 誠, 名古屋大学)

Free energy of directed polymers in random environment in $1 + 1$ dimension

Coffee Break

- 15:40 ~ 16:30 Patrick van Meurs (金沢大学)
Evolutionary convergence of positive and negative dislocations in 2D
- 16:40 ~ 17:30 Kazuki Okamura (岡村 和樹, 信州大学)
Long time behavior of the volume of the Wiener sausage on
Dirichlet spaces

Abstract

Zhao Dong (董 昭, Chinese Academy of Sciences)

Limiting Behavior of Stochastic Evolution Systems

In this talk, we present the variations of the support for the invariant probability measures of stochastic dynamic systems with the disappearance of the noise.

Jin Feng (馮 進, The University of Kansas)

A Hamilton-Jacobi theory for the hydrodynamic limit large deviation from nonlinear heat equation given by stochastic Carleman particles

The deterministic Carleman equation can be considered as an one dimensional two speed fictitious gas model. Its associated hydrodynamic limit gives a nonlinear heat equation. The first rigorous derivation of such limit was given by Kurtz in 1973. In this talk, starting from a more refined stochastic model giving the Carleman equation as the mean field, we derive a macroscopic fluctuation structure associated with the hydrodynamic limit.

The large deviation result is established through an abstract Hamilton-Jacobi method applied to this specific setting. The principal idea is to identify a two scale averaging structure in the context of Hamiltonian convergence in the space of probability measures. This is achieved through a change of coordinate to the density-flux description of the problem. We also extend a method in the weak KAM theory to the infinite particle context for explicitly identifying the effective Hamiltonian. In the end, we conclude by establishing a comparison principle for a set of Hamilton-Jacobi equation in the space of measures.

At the present time, there is still a gap before completing the whole theory. I will present some subtle issues involved and put the method in perspective regarding challenges we face when applying the method to other hydrodynamic limit issues.

This is a joint work with Toshio Mikami and Johannes Zimmer.

Tadahisa Funaki (舟木 直久, 早稲田大学)

Derivation of coupled KPZ equation from multi-color zero-range process

We consider a weakly asymmetric zero-range process with multi-colored particles as a microscopic system. We discuss its hydrodynamic limit, linear fluctuation and nonlinear fluctuation leading to the coupled KPZ equation. The model was originally proposed by Sunder Sethuraman. The talk is based on ongoing project with him and Cedric Bernardin.

Masato Hoshino (星野 壮登, 九州大学)

Global solutions of some singular SPDEs

By using the theory of paracontrolled calculus, we can obtain the local well-posedness for some singular SPDEs. In this talk, I explain how to obtain the global well-posedness for two examples: (a) coupled KPZ equation and (b) 3-dim stochastic CGL equation. A probabilistic approach is used in (a) and an analytic approach is used in (b).

Naoyuki Ichihara (市原 直幸, 青山学院大学)

Ergodic problems for viscous Hamilton-Jacobi equations with inward drift

In this talk we present some recent results on the ergodic problem for viscous Hamilton-Jacobi equations with superlinear Hamiltonian and inward drift. We study the asymptotic behavior of the generalized principal eigenvalue of the ergodic problem with respect to a perturbation of the potential function.

This is a joint work with Emmanuel Chasseigne (University of Tours).

Takamori Kato (加藤 孝盛, 佐賀大学)

Almost sure global well-posedness for fourth order Schrödinger type equations on the torus

In this talk, we consider the well-posedness of the Cauchy problem for the fourth order Schrödinger equation (4NLS) on the torus. For the first, in the deterministic setting, we prove the local well-posedness in a wide function space in which the Wiener measure is well-defined. This proof is based on dispersive PDEs approach. Secondly, we deal with 4NLS with randomized initial data. Then we extend the local solutions to global ones almost surely and construct an invariant Gibbs measure under the flow of 4NLS.

Makoto Nakashima (中島 誠, 名古屋大学)

Free energy of directed polymers in random environment in 1 + 1 dimension

In this talk, we discuss the asymptotics of the free energy $F(\beta)$ of directed polymers in random environment (DPRE) in 1 + 1 dimension at high temperature. It is conjectured that for $d = 1$ case, the asymptotics of $F(\beta)$

$$\frac{F(\beta)}{\beta^4} \rightarrow -\frac{1}{24}.$$

We will talk about the relation between DPRE and KPZ equation and give the answer to the above conjecture.

Mamoru Okamoto (岡本 葵, 信州大学)

On the energy critical nonlinear Schrödinger equations with randomized initial data

We consider the Cauchy problem for the energy-critical nonlinear Schrödinger equations. Cazenave and Weissler proved that the Cauchy problem is well-posed in the Sobolev space H^1 . Moreover, Christ, Colliander, and Tao showed ill-posedness in H^s with $s < 1$. In this talk, we consider existence of solutions to the Cauchy problem in H^s with randomized initial data for $s < 1$. This is a joint work with Tadahiro Oh (The Univ. Edinburgh) and Oana Pocovnicu (Heriot-Watt Univ.).

Kazuki Okamura (岡村 和樹, 信州大学)

Long time behavior of the volume of the Wiener sausage on Dirichlet spaces

We focus on the volume of the Wiener sausage for diffusion processes on metric measure spaces other than the Euclid space equipped with the Lebesgue measure. We show the growth rate of the expectations and almost sure behaviors of the volumes of the Wiener sausages on metric measure Dirichlet spaces satisfying Ahlfors regularity and sub-Gaussian heat kernel estimates.

Patrick van Meurs (金沢大学)

Evolutionary convergence of positive and negative dislocations in 2D

The starting point is the gradient flow of non-locally interacting particles, whose interacting force blows up as the distance between the particles goes to 0. Our main result is the rigorous limit passage as the number of particles goes to infinity. The limiting model is a non-local and nonlinear PDE. The proof relies on the theory of Wasserstein gradient flows and embedding results of Orlicz spaces. In this talk, the particle system is deterministic. However, in ongoing work, we are studying the extension to non-zero white noise.