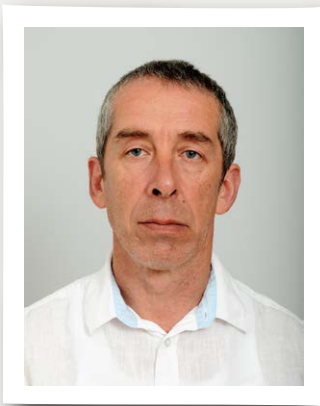# Fluctuation-dissipation relations for reversible diffusions in a random environment

November 10 - December 1, 2017
127 Conference Room, Faculty of Science Bldg. #3, Kyoto University

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Fluctuation-dissipation relations (FDR) were introduced in statistical physics to describe off-equilibrium dynamics; they express the linear response of a perturbed system as correlations for the un-perturbed system.

When applied to reversible diffusions in a random environment, they yield the so-called Einstein relation: the derivative of the effective drift of a diffusion in a random environment subject to a small external force equals the effective variance of the un-perturbed dynamics in the direction of the perturbation.

The aim of the course will be to explain the proof of FDR for reversible diffusions in a random environment with finite range of correlation. The proof also provides a full description of all the scaling limits of such processes.

Lectures 1 and 2 are introductory. Lectures 3 to 5 will concern the proof of FDR for diffusions.

Fri, Nov 10   13:00-15:00
Lecture 1 "Central limit theorems"

We shall first survey the martingale approach to establish the convergence towards Brownian motion of a reversible diffusion in a random environment.

Fri, Nov 17   14:30-16:30
Lecture 2 "Fluctuation-dissipation relations"

The lecture will be devoted to a soft introduction to FDR for additive functionals of Markov processes.

Fri, Nov 24   14:30-16:30
Lecture 3 "A priori estimates on diffusions"

We gather some PDE estimates for diffusions with a local drift.

Wed, Nov 29   13:00-15:00
Lecture 4 "Regeneration times and steady states"

We construct a steady state for perturbed diffusions in a random environment with finite range of correlation and study its continuity.

Fri, Dec 1   13:00-15:00
Lecture 5 "FDR and scaling limits"

End of the proof of FDR and the Einstein relation.

❖ 本講義は「スーパーグローバルコース数学特別講義６」として、大学院の学生には１単位認定されます。