Équations aux dérivées partielles stochastiques singulières

- Yvain Bruned (Université de Lorraine)

  Title: Decorated trees versus multi-indices for singular SPDEs

  Abstract: Multi-indices have been recently introduced in the context of singular SPDEs. They provide an alternative way of expanding locally solutions of these singular dynamics. We will discuss via different examples and applications what new insights they propose and how they compare with decorated trees.

- Lucas Broux (Max Planck Institute)

  Title: Construction d'un modèle indexé par des multi-indices pour l'équation Φ^4

  Abstract: Cet exposé portera sur quelques aspects de la renormalisation de l'équation aux dérivées partielles stochastiques non-linéaire Φ^4, dans le régime singulier (i.e. où la non-linéarité est mal définie) et sous-critique (i.e. où l'on peut tout de même espérer la renormaliser). Je tâcherai d'expliquer comment un objet appelé "modèle" peut être défini en partant de considérations heuristiques sur la "géométrie" de l'ensemble des solutions. Cet objet est indexé par des multi-indices, ce qui est en constraste avec la théorie "classique" des structures de régularité de Hairer qui fait intervenir une combinatoire d'arbres. La notion de modèle est centrale en structures de régularité, où l'une des tâches cruciales est d'en obtenir des estimées robustes: si le temps le permet je donnerai quelques idées de leur preuve. (Travail en collaboration avec Felix Otto et Markus Tempelmayr).

- Carlo Bellingeri (TU Berlin)

  Title: Stochastic reconstruction theorem and mixed hyperbolic SPDEs

  Abstract: Originally thought as key-lemma in regularity structures, the reconstruction theorem has proven to be a very flexible analytic tool to study both stochastic and deterministic integration in higher dimension. In this talk, we will discuss a particular extension of of the reconstruction theorem in a stochastic setting where the underlying family of distributions satisfies some natural conditions involving rectangular increments. This allows us to prove the well-posedness of a new class of mixed stochastic partial differential of hyperbolic type which combines standard Walsh stochastic integration and Young products. Joint work with Hannes Kern (TU Berlin)

- Rita Nader (Université de Rennes)

  Title: Metastability in slowly time-dependent non-singular or singular stochastic PDEs

  Abstract: We consider slowly time-dependent stochastic partial differential equations (SPDEs) driven by space-time white noise. These SPDEs are not always well-posed. On the one-dimensional torus, we show that this problem does not occur. We are interested in SPDEs subjected also to a time-periodic driving force which vanishes on three equilibrium branches, two of which come close to each other at particular times.

We show the effect of stochastic resonance on the system: the dynamic changes when the noise intensity crosses a critical value. The probability that solutions of the SPDE make transitions between stable equilibria is exponentially small below the threshold, while for a larger noise intensity transitions happen with high probability. On the other hand, on the two-dimensional torus, the SPDEs are ill-defined and a renormalisation in the Wick sense is needed because space-time white noise is more singular in dimension two than in dimension one. We show that sample paths stay near stable equilibrium branches with high probability. We discuss a case involving a pitchfork bifurcation characterized by a delay of the transition from the unstable to the stable state.