Scientific Report: Short Visit to Haifa - 2012 - Thomas Rippl

Host: Leonid Mytnik, Technion, Haifa.

Visitor: Thomas Rippl, University of Göttingen, Göttingen.

Date: 29/04/2012 - 13/05/2012

Topic: Uniqueness, Non-uniqueness of stochastic heat equations; convergence of particle models; compact support property.

The *purpose of the visit* was to understand deeper the connection between the density of branching particle systems driven by spatially correlated noise and its expected limit, a stochastic heat equation (SHE). The goal was to obtain a result about convergence of renormalized densities. Related to that question is the question of uniqueness/non-uniqueness of the SHE with multiplicative noise. We wanted to obtain a non-uniqueness result in the colored noise case. We also planned to think about the question of dropping finite variance assumptions, i.e. allowing jump-type SPDE.

The *work carried out during the visit* can be grouped among the three questions mentioned before. We addressed the question of convergence, especially the question of finding an appropriate particle model, s.t. in the large population limit density dependent branching with white noise or colored noise can be observed.
Secondly, in the colored noise case the question of non-uniqueness is not solved and we worked on extending a result by Mueller, Mytnik and Perkins to that case. There we identified the questions of growth of the support and the mass growth of an emerging cluster as crucial for the argument. However, the first question, though natural to ask independently of the problem, seems not to have been discussed in the literature for the colored noise case. A key tool for both questions is a lower bound on the quadratic variation which we worked on intensively. As a consequence we tried to extend the result to a modulus of continuity for the boundary of the support. Nevertheless, the non-uniqueness proof could not yet be carried over to the colored noise case. We quickly thought about the question of compact support property for jump-type SPDE .

The *main results* lie in a good formulation of the compact support property and some control of its growth behavior. Additionally we can construct particle models for the white noise case with density dependent branching, but the spatially correlated model is not yet attainable. We developed ideas how to tackle the question of non-uniqueness, more precisely adapting Lemma 4.1 in Mueller, Mytnik Perkins (2012) for the colored noise case. The formulation of a particle system which has densitites converging to density dependent SHE is possible for the white noise case.

As the visit was very inspiring we plan to continue our colloboration. The visitor plans to visit the host again in the end of 2012 or early 2013.

The result about compact support property and the growth of the support could be published, but we might embed them in the non-uniqueness proof. The support of the ESF grant will be greatly acknowledged.