# WELL-POSEDNESS AND LONG TIME ASYMPTOTICS OF SPDE WITH LOCALLY MONOTONE COEFFICIENTS

**Wei LIU** *Jiangsu Normal University, China*, E-mail: weiliu@math.uni-bielefeld.de

KEY WORDS: SPDE; well-posedness; long time asymptotics; random attractor; Navier-Stokes equation.

MATHEMATICAL SUBJECT CLASSIFICATION: 60H15, 37L30, 37L55, 34D45

**Abstract**: In this talk we will first present some recent results [1,2,3] on the well-posedness of SPDE with locally monotone coefficients, which substantially generalize the classical results by Pardoux [4], Krylov and Rozovskii [5] and also some recent works. This extension provides a unified framework to analyze a large class of SPDEs such as stochastic reaction-diffusion equations, stochastic Burgers type equations, stochastic 2D hydrodynamical systems, stochastic tamed 3D Navier-Stokes equations and stochastic equations of non-Newtonian fluids, which can not be included in the classical variational framework in [4,5,6].

The second part of this talk is to show the long time asymptotics of SPDE with locally monotone coefficients by proving the existence of random attractors [7]. The approach is based on a construction of strictly stationary nonlinear Ornstein-Uhlenbeck processes, which also allows spatially much rougher noise than in existing works. The main result is applicable to various types of SPDE, which improves many known results in the literature including recent works [8,9,10] on quasilinear SPDEs .

This talk is mainly based on some joint works with Michael Röckner (Universität Bielefeld) and Benjamin Gess (Technische Universität Berlin).

## References

[1] W. Liu & M. Röckner (2010). SPDE in Hilbert space with locally monotone coefficients, *J. Funct. Anal.*, **259**, 2902–2922.

[2] W. Liu & M. Röckner (2013). Local and global well-posedness of SPDE with generalized coercivity conditions, *J. Differential Equations*, **254**, 725–755.

[3] W. Liu (2013).Well-posedness of Stochastic Partial Differential Equations with Lyapunov Condition, *J. Differential Equations*, **255**, 572–592.

[4] E. Pardoux (1975). Equations aux dérivées partielles stochastiques non linéaires monotones, *Ph.D. thesis, Université Paris XI.*

[5] N.V. Krylov & B.L. Rozovskii (1979). Stochastic evolution equations, *Translated from Itogi Naukii Tekhniki, Seriya Sovremennye Problemy Matematiki*, **14**, 71–146.

[6] C. Prévôt & M. Röckner (2007). A concise course on stochastic partial differential equations, *Lecture Notes in Mathematics*, **vol. 1905**, Springer, 2007.

[7] B. Gess & W. Liu (2013). Random attractors for stochastic partial differential equations with locally monotone coefficients, *Preprint.*

[8] W.-J. Beyn, B. Gess, P. Lescot & M. Röckner (2011). The global random attractor for a class of stochastic porous media equations, *Commun. Partial Differ. Equ.*, **36**, 446–469.

[9] B. Gess, W. Liu & M. Röckner (2011), Random attractors for a class of stochastic partial differential equations driven by general additive noise, *J. Differential Equations*, **251**, 1225–1253.

[10] B. Gess, (2013). Random Attractors for Degenerate Stochastic Partial Differential Equations, *J. Dyn. Diff. Equat.*, **25**, 121–157.