3:20-3:55 Abhishek Chaudhary (Mathematisches Institut, Universität Tübingen, Germany)

A higher order discretization for the stochastic Navier–Stokes equations with additive noise

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We consider the numerical approximation of the two-dimensional stochastic Navier–Stokes equations driven by additive noise. Standard time-stepping schemes are limited by the low temporal regularity of the Wiener process and therefore typically yield only low-order convergence rates. In this talk, we present a higher-order time discretization which overcomes this difficulty by first reformulating the stochastic problem as a random partial differential equation for the transformed variable

$$y = u - \Phi W.$$

This transformation separates the rough stochastic contribution from the nonlinear fluid dynamics and allows the use of suitable higher-order quadrature rules in the discretization of the resulting random PDE.

The main result is a strong convergence rate of order $3/2$ in probability for the velocity approximation. In addition, the corresponding pressure approximation is shown to converge with the same order. We also discuss numerical experiments which support the theoretical convergence rate and illustrate the performance of the proposed higher-order scheme.

The talk is based on joint work with L'ubomír Baňas, Dominic Breit, and Andreas Prohl.