

The incompressible Navier–Stokes–Fourier system with thermal noise

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We establish a solution theory (global weak existence, local strong existence and weak-strong uniqueness) for the incompressible Navier–Stokes–Fourier system with thermal noise, posed on the three-dimensional torus. While in the incompressible deterministic setting the equation for the velocity can be solved independently of the temperature, the inclusion of the effects of thermal fluctuations by means of the GENERIC framework leads to a nonlinear gradient noise term, which couples the dynamics of both variables. Therefore, the analysis of the stochastic system poses new challenges, which are absent in deterministic Navier–Stokes–Fourier equations. This talk is based on the joint work <https://arxiv.org/abs/2603.26307> with Benjamin Gess and Zhengyan Wu.