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Scaling and saturation in infinite-dimensional control problems with applications to SPDEs

We discuss scaling methods which can be used to solve low mode control problems for nonlinear partial differential equations. These methods lead naturally to a infinite-dimensional generalization of the notion of saturation, originally due to Jurdjevic and Kupka in the finite-dimensional setting of ODEs. The methods will be highlighted by applying them to specific equations, including reaction-diffusion equations, the 2d/3d Euler/Navier-Stokes equations and the 2d Boussinesq equations. Applications to support properties of the laws solving randomly-forced versions of each of these equations will be noted.