Optimal prediction and the rate of decay of incompressible flow

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Abstract

I will first present general numerical methods for estimating the solutions of time-dependent nonlinear differential equations when full resolution cannot be achieved, based on the Mori-Zwanzig formalism of irreversible statistical mechanics. This formalism provides in principle an optimal estimate, in a sense that will be specified, but it is of course too complicated to evaluate in full. I will present a particular approximation procedure that is suitable for applications to fluid mechanics (the "t-model") as well as its uses for the Burgers equation and for the estimation of the rate of decay of solutions of the Euler equations in two and three space dimensions. (joint work with O. Hald, R. Kupferman, P. Stinis).