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Asymptotic stability of mild solutions to the Navier-Stokes equations

Abstract We consider the initial value problem for the Navier-Stokes equations modeling an incompressible fluid in three dimensions:

$$\begin{aligned} u_t + u \cdot \nabla u + \nabla p = \Delta u + F, \quad (x,t) \in \mathbb{R}^3 \times (0,\infty), \\ \text{div } u = 0, \\ u(x,0) = u_0(x). \end{aligned}$$

It is well-known that this problem has a unique global-in-time mild solution for a sufficiently small initial condition u_0 and for a small external force F in suitable scaling invariant spaces. We show that these global-in-time mild solutions are asymptotically stable under every (arbitrary large) L^2-perturbation of their initial conditions.
The work is joint with Grsegorz Karch and Dominika Pilarczyk .