L^2-asymptotic stability of mild solutions to Navier-Stokes system

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We consider the following initial value problem for the Navier-Stokes system for an incompressible fluid in the whole three dimensional space

$$\begin{gathered} u_t - \Delta u + \nabla \cdot (u \otimes u) + \nabla p = F, \quad (x,t) \in \mathbf{R}^3 \times (0,\infty), \\ \operatorname{div} u = 0, \\ u(x,0) = u_0(x). \end{gathered}$$

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.

This is a joint work with *Grzegorz Karch* and *Maria Elena Schonbek*.

References

[1] *G. Karch, D. Pilarczyk*: Asymptotic stability of Landau solutions to Navier-Stokes system. Arch. Ration. Mech. Anal. *202* (2011), 115–131.

[2] *G. Karch, D. Pilarczyk, M. E. Schonbek*: L^2-asymptotic stability of mild solutions to Navier-Stokes system. Work in preparation.