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Strong solutions of the Navier-Stokes equations with arbitrary large initial conditions

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Abstract

This contribution is motivated by the result of Scarpellini ([3]), in which he proved the following result. If we choose an arbitrary large number $R > 0$, an arbitrary small $\delta > 0$ and an arbitrary open set $U \subset \mathcal{D}(A^\gamma)$ (where $\frac{3}{4} < \gamma < 1$) then there exists a strong solution u of the Navier-Stokes initial boundary value problem with the nonslip boundary condition such that $\|A^{1/2}u(0)\| > R$ and $u(\xi) \in U$ for some $\xi \in (0, \delta)$. This result was improved by Kučera and Neustupa in [1], where such solutions were constructed with an arbitrary initial conditions in the norms of $\|A^\alpha\|$, $\frac{1}{4} < \alpha \leq \frac{1}{2}$. Kučera, Neustupa and Penel proved in [2] a similar result where the nonslip boundary conditions are substituted by the impermeability boundary conditions. In this contributions we give some other improvements of these results.

Keywords: Navier-Stokes equations, initial conditions, fractional power of the Stokes operator.

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