SEMINÁRIO DE EQUAÇÕES DIFERENCIAIS

Lower bounds on blow up solutions of the three-dimensional Navier–Stokes equations in homogeneous Sobolev spaces

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Resumo: Suppose that $u(t)$ is a (weak) solution of the three-dimensional Navier–Stokes equations, either on the whole space or with periodic boundary conditions, that has a singularity at time T. We show that the norm of $u(T-t)$ in the homogeneous Sobolev space $\dot{H}^s$ must be bounded below by $c_s t^{-(2s-1)/4}$ for $1/2 < s < 5/2$ ($s \neq 3/2$), where c_s is an absolute constant depending only on s; and by $c_s \|u_0\|_{L^2}^{(5-2s)/5} t^{-2s/5}$ for $s > 5/2$. (The result for $1/2 < s < 3/2$ follows from well known lower bounds on blowup in L^p spaces.) We show in particular that the local existence time in $\dot{H}^s(\mathbb{R}^3)$ depends only on the $\dot{H}^s$-norm for $1/2 < s < 5/2$, $s \neq 3/2$. Work in collaboration with: James Cooper Robinson (University of Warwick) and Witold Sadowski (Warsaw University)