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Giovanni P Galdi* (galdi@engr.pitt.edu), 630 Benedum Engineering Hall, Department of Mechanical Engineering, University of Pittsburgh, Pittsburgh, PA 15621. *Local Dynamics of Navier-Stokes Equations in Exterior Domains.*

Consider the Navier-Stokes initial-boundary-value problem in $\Omega\times(0,\infty)$, $\Omega\subset R^3$, with zero initial data and with a smooth right-hand side $f=f(x,t)$, $|f(x,t)|\leq M$, M independent of x and t. If Ω is bounded, it is known that, for M small enough, the problem has a unique, global, regular solution. Moreover, if f is time independent, periodic or quasi-periodic in time, this solution tends to the (unique) steady, periodic or quasi-periodic solution corresponding to f. This result relies on: (i) Validity of Poincarè's inequality, and (ii) Boundedness of the kinetic energy. If Ω is an exterior domain, both properties fail. In this talk we prove that, if f decays sufficiently fast in space and satisfies mild local regularity properties in time, a unique, regular solution exists such that $|v(x,t)|\leq C\,(1+|x|)^{-1}$, $|\nabla v(x,t)|\leq C\,(1+|x|)^{-2}$, with $C=C(\Omega)$. Moreover, if f is time independent or time periodic this solution will tend to the corresponding steady or time-periodic solution in appropriate norms. (Received September 07, 2004)