

New tools for detecting the epochs of irregularity of Leray-Hopf solutions to some 3D Navier-Stokes equations

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We study global Leray-Hopf solutions to Cauchy problems for the 3D Navier-Stokes equations in a cube under Navier boundary conditions. With a suitable reflection procedure, these solutions become space-periodic over the whole space R^3 . Since the pioneering work by Jean Leray, it is known that solutions exist for any initial data with finite energy but it is not known whether their enstrophy may blow up in finite time in the so-called epochs of irregularity. Our simplified geometric and functional-analytic framework enables us to determine explicit bounds both for the epochs of irregularity and for the enstrophy. This is a joint work with Gianni Arioli and Alessio Falocchi.