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Logarithmically improved blow-up criteria for the 3D nonhomogeneous incompressible Navier-Stokes equations with vacuum. (English) [Zbl 1344.35080](#)

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Summary: This article is devoted to the study of the nonhomogeneous incompressible Navier-Stokes equations in space dimension three. By making use of the “weakly nonlinear” energy estimate approach introduced by *Z. Lei* and *Y. Zhou* [*Discrete Contin. Dyn. Syst.* 25, No. 2, 575–583 (2009; [Zbl 1171.35452](#))], we establish two logarithmically improved blow-up criteria of the strong or smooth solutions subject to vacuum for the 3D nonhomogeneous incompressible Navier-Stokes equations in the whole space \mathbb{R}^3 . This results extend recent regularity criterion obtained by *H. Kim* [*SIAM J. Math. Anal.* 37, No. 5, 1417–1434 (2006; [Zbl 1141.35432](#))].

MSC:

- [35Q30](#) Navier-Stokes equations
- [35B40](#) Asymptotic behavior of solutions to PDEs
- [76D03](#) Existence, uniqueness, and regularity theory for incompressible viscous fluids
- [76D05](#) Navier-Stokes equations for incompressible viscous fluids
- [35B44](#) Blow-up in context of PDEs
- [35D35](#) Strong solutions to PDEs

Keywords:

nonhomogeneous Navier-Stokes equations; blow-up criterion; strong solution; vacuum

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