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A note on the blow-up criterion for the inviscid 2-D Boussinesq equations. (English)

Zbl 0991.35070

Salvi, Rodolfo (ed.), The Navier-Stokes equations: theory and numerical methods. Proceedings of the international conference, Varenna, Lecco, Italy, 2000. New York, NY: Marcel Dekker. Lect. Notes Pure Appl. Math. 223, 131-140 (2002).

Summary: We show that a smooth solution of the 2-D Boussinesq equations

$$\partial_t u + u \cdot \nabla u + \nabla p = \theta f, \quad \partial_t \theta + u \cdot \nabla \theta = 0, \quad \operatorname{div} u = 0,$$

in the whole plane \mathbb{R}^2 breaks down if and only if a certain norm of $\nabla \theta$ blows up at the same time. Here the norm is weaker than the L^∞ -norm and generates a Banach space including singularities of $\log \log 1/|x|$. Roughly speaking, when a smooth solution breaks down, $\nabla \theta$ has stronger singularities than $\log \log 1/|x|$ or has an infinite number of singularities.

For the entire collection see [Zbl 0972.00046].

MSC:

- 35Q35 PDEs in connection with fluid mechanics
- 35B40 Asymptotic behavior of solutions to PDEs
- 76B07 Free-surface potential flows for incompressible inviscid fluids

Cited in **22** Documents

Keywords:

incompressible inviscid flows; passive scalar; 2-D Boussinesq equations; singularities