zbMATH Open
THE FIRST RESOURCE FOR MATHEMATICS

Beck, Margaret; Cooper, Eric; Spiliopoulos, Konstantinos

Selection of quasi-stationary states in the Navier-Stokes equation on the torus. (English)

Zbl 1406.35219
Nonlinearity 32, No. 1, 209-237 (2019).

MSC:

35Q30 Navier-Stokes equations
37L25 Inertial manifolds and other invariant attracting sets of infinite-dimensional dissipative dynamical systems
76D05 Navier-Stokes equations for incompressible viscous fluids

Keywords:

Navier-Stokes; fluid dynamics; dipole; bar states; dynamical systems

Full Text: DOI

References:

[1] Armbuster, D.; Nicolaenko, B.; Smaoui, N.; Chossat, P., Symmetries and dynamics for 2D Navier–Stokes flow, Phys. D: Nonlinear Phenom., 95, 81-83, (1996) · Zbl 0899.76113 · doi:10.1016/0167-2789(96)00006-1

[2] Beck, M.; Wayne, C. E., Metastability and rapid convergence to quasi-stationary bar states for the two-dimensional Navier–Stokes equations, Proc. R. Soc. Edinburgh Sect. A, 143, 905-927, (2013) · Zbl 1296.35114 · doi:10.1017/S0308210511001478

[3] Bouchet, F.; Simonnet, E., Random changes of flow topology in two-dimensional and geophysical turbulence, Phys. Rev. Lett., 102, (2009)· doi:10.1103/PhysRevLett.102.094504

[4] Chicone, C., Ordinary Differential Equations with Applications, (2006), New York: Springer, New York · Zbl 1120.34001

[5] Weinan, E.; Mattingly, J. C., Ergodicity for the Navier–Stokes equation with degenerate random forcing: finite-dimensional approximation, Commun. Pure Appl. Math., 54, 1386-1402, (2001) · Zbl 1024.76012 · doi:10.1002/cpa.10007

[6] Fenichel, N., Geometric singular perturbation theory for ordinary differential equations, J. Differ. Equ., 31, 53-98, (1979) · Zbl 0476.34034 · doi:10.1016/0022-0396(79)90152-9

[7] Foias, C.; Hoang, L.; Saut, J. C., Asymptotic integration of Navier–Stokes equations with potential forces. II. An explicit Poincarè–dulac normal form, J. Funct. Anal., 260, 3007-3035, (2011) · Zbl 1232.35115 · doi:10.1016/j.jfa.2011.02.005

[8] Foias, C.; Saut, J. C., Asymptotic behavior, as $t→⊠$, of solutions of Navier–Stokes equations and nonlinear spectral manifolds, Indiana Univ. Math. J., 33, 459-477, (1984) · Zbl 0565.35087 · doi:10.1512/iumj.1984.33.33025

[9] Foias, C.; Saut, J. C., Asymptotic integration of Navier–Stokes equations with potential forces. I, Indiana Univ. Math. J., 40, 305-320, (1991) · Zbl 0739.35066 · doi:10.1512/iumj.1991.40.40015

[10] Gallet, B.; Young, R. W., A two-dimensional vortex condensate at high reynolds number, J. Fluid Mech., 715, 359-388, (2013) · Zbl 1284.76108 · doi:10.1017/jfm.2012.524

[11] Henry, D., Geometric Theory of Semilinear Parabolic Equations, (1981), Berlin: Springer, Berlin · Zbl 0456.35001

[12] Ibrahim, S.; Maekawa, Y.; Masmoudi, N., On pseudospectral bound for non-selfadjoint operators and its application to stability of kolmogorov flows, (2017)

[13] Kim, S. C.; Oka, H., Unimodal patterns appearing in the kolmogorov flows at large reynolds numbers, Nonlinearity, 28, 3219, (2015) · Zbl 1446.76093 · doi:10.1088/0951-7715/28/9/3219

[14] Mattingly, J. C.; Pardoux, E., Invariant measure selection by noise: an example, Discrete Continuous Dyn. Syst., 34, 4223-4257, (2014) · Zbl 1302.37048 · doi:10.3934/dcds.2014.34.4223

[15] Meshalkin, L. D.; Sinaĭ, J. G., Investigation of the stability of a stationary solution of a system of equations for the plane movement of an incompressible viscous liquid, J. Appl. Math. Mech., 25, 1700-1705, (1961) · Zbl 0108.39501 · doi:10.1016/0021-8928(62)90149-1

[16] Yin, Z.; Montgomery, D.; Clercx, H., Alternative statistical-mechanical descriptions of decaying two-dimensional turbulence in terms of 'patches' and 'points', Phys. Fluids, 15, 1937-1953, (2003) · Zbl 1186.76590 · doi:10.1063/1.1578078

[17] Zelik, S., Inertial manifolds and finite-dimensional reduction for dissipative pdes, Proc. R. Soc. Edinburgh A, 144, 1245-1327, (2014) · Zbl 1343.35039 · doi:10.1017/S0308210513000073