Differential
Equations
& Applications
Volume 8, Number 4 (2016), 471–499 doi:10.7153/dea-08-27

CONTINUOUS DEPENDENCE FOR SOLUTIONS TO 2–D BOUSSINESQ SYSTEM CHANNEL FLOW

YUANFEI LI AND CHANGHAO LIN

Abstract. This paper considers the 2-D Boussinesq system in a semi-infinite channel. By making use of the earlier work of [19] and some Soblev inequalities, the continuous dependence on the coefficient of the system is obtained. The authors also show how to bound the total energy.

Mathematics subject classification (2010): 35K05,35K20,35K55.
Keywords and phrases: Boussinesq equations, Continuous dependence, Channel flow.

REFERENCES

[1] H. ABIDI AND T. HMIDI, *On the global well-posedness for Boussinesq system,* J. Differ. Equ., **233**, (2007), 199–220.
[2] D. ADHIKARI, C. CAO AND J. WU, *The 2-D Boussinesq equations with vertical viscosity and vertical diffusivity,* J. Differ. Equ., **249**, (2010), 1078–1088.
[3] D. ADHIKARI, C. CAO AND J. WU, *Global regularity results for the2DBoussinesq equations with vertical dissipation,* J. Differ. Equ., **251**, (2011), 1637–1655.
[4] B.A. BOLEY, *Some observations on Saint-Venant's principle, in: Proc. 3rd US Nat,* Congr. Appl. Mech., ASME, New York, (1958), 259-264.
[5] J.R. CANNON AND D. ZACHMANN, *Parameter determination in parabolic partial differential equations from overspecified boundary data,* Internat.J.Engrg.Sci., **20**, (1982), 779–788.
[6] CH. CAO AND J. WU, *Global Regularity for the Two-Dimensional Anisotropic Boussinesq Equations with Vertical Dissipation,* Arch. Rational Mech. Anal., **208**,(2013), 985–1004.
[7] D. CHAE, *Global regularity for the 2-D Boussinesq equations with partial viscosity terms,* Adv.Math., **203**, (2006), 497–513.
[8] D. CHAE, S. K. KIM AND H.S. NAM,*Local existence and blow-up criterion of Hölder continuous solutions of the Boussinesq equations,* Nagoya Math. J., **155**, (1999), 55–80.
[9] J. CHENG AND S. LI, *Global weak solutions and regularity for two-dimensional Boussinesq equations with partial disspation and thermal diffusivity,* J. Math. Anal.Appl., **428**, (2015), 794–803.
[10] C.H. HARDY, J.E. LITTLEWOOD AND G. POLYA, *Inequalities, Cambridge Univ,* Press, 1953.
[11] C.O. HORGAN, *Plane steady flows and energy astimates for the Niver-stokes equations,* Arch.Rat.Mech.Anal.,**68**(1978),359-381.
[12] T.Y. HOU AND C. LI, *Global well-posedness of the viscous Boussinesq equations,* Discrete Contin.Dyn.Syst., **12**, (2005), 1–12.
[13] J. LEE AND J.C. SONG, *Spatial decay bounds in a linearized magnetohydrodynamics channesl flow*, Communications on Pure and Applied analysis, **12**, (2013), 1349–1361.
[14] C. LIN, *Spatial decay estimates and energy bounds for the Stokes flow equations,* Stability Appl. Anal. Contin. Media., **2**, (1992), 249–264.
[15] C. LIN AND L. E. PAYNE,*Spatial decay bounds in the channel flow of an incompressible viscous fluid,* Math. Model. Meth., **6**, (2004), 795–818.
[16] C. LIN AND L. E. PAYNE,*Phragmen-Lindeöf type results for second order quasilinear parabolic equations in* $\mathbb{R}^2$, A angew Math Phys., **45**, (1994), 294–311.
[17] C. LIN AND L. E. PAYNE,*Spatial decay estimates and energy bounds for the Stokes flow equation,* SAACM.2, (1992), 249–264.

© ELEMENT, Zagreb
Paper DEA-08-27

[18] Y.LIU AND C. LIN,*Spatial decay bounds in time dependent pipe flow of an incompressible viscous fluid,* SIAM J. Appl. Math., **65**, (2005), 458–475.
[19] Y. LIU, YF. LI, YW. LIN AND ZH. YAO, *Spatial decay bounds for the channel flow of the Boussinesq equations,* J.Math.Anal.Appl., **381**, (2011), 87–109.
[20] A.J. MAJDA AND A.L. BERTOZZI, *Vorticity and Incompressible Flow,* Cambridge University Press, Cambridge., 2001.
[21] A.J. MAJDA, *Introduction to PDEs andWaves for the Atmosphere and Ocean,* Courant Lecture Notes in Mathematics.,**9**.AMS/CIMS,(2003).
[22] D.S. MITRONOVIC, *Analytical Inequalities,* Springer-Verlag., 1970.
[23] L.E. PAYNEN,*Uniqueness criteria for steady state solutions of the Navier-Stokes equation, in: Simpos. Internaz,* Appl. Anal. Fis. Mat., Cagliari-Sassari, 1964, Edizioni Cremonse, Rome, (1965), 130–153.
[24] L.E. PAYNE, *Uniqueness and continuous dependence criteria for the Navier-Stokes equations,* Rocky Mountain J. Math. **2**, (1971), 641–660.
[25] L.E. PAYNE AND G.A. PHILIPPIN, *Pointwise bounds and spatial decay estimates in heat conduction problems,* Math. Models Methods Appl. Sci., **5**, (1995), 755–775.
[26] L.E. PAYNE, P.W. SCHAEFER AND J.C. SONG, *Growth and decay results in heat conduction problems with nonlinear boundary conditions,* Nonlinear Anal., **33**, (1999), 269–286.
[27] J.PEDLOSKY, *Geophysical Fluid Dyanmics,* Springer, New York., 1987.
[28] J. C. SONG, *Improved decay estimates in time-dependent Stokes flow,* J. Math. Anal. Appl., **288**, (2003), 505–517.
[29] J. C. SONG, *Improved spatial decay bounds in the plane Stokes flow,* Appl. Math. Mech., **30**, (2009), 833–838.