

**Agarwal, Pooja; Manna, Utpal; Mukherjee, Debopriya**

**Stochastic control of tidal dynamics equation with Lévy noise.** (English) Zbl 1420.35220  
Appl. Math. Optim. 79, No. 2, 327-396 (2019).

Summary: In this work we first present the existence, uniqueness and regularity of the strong solution of the tidal dynamics model perturbed by Lévy noise. Monotonicity arguments have been exploited in the proofs. We then formulate a martingale problem of *D. W. Stroock* and *S. R. S. Varadhan* [Multidimensional diffusion processes. Berlin, Heidelberg, New York: Springer (1979; [Zbl 0426.60069](#))] associated to an initial value control problem and establish existence of optimal controls.

**MSC:**

- [35Q35](#) PDEs in connection with fluid mechanics
- [60H15](#) Stochastic partial differential equations (aspects of stochastic analysis)
- [76D03](#) Existence, uniqueness, and regularity theory for incompressible viscous fluids
- [76D55](#) Flow control and optimization for incompressible viscous fluids
- [35D35](#) Strong solutions to PDEs
- [35A01](#) Existence problems for PDEs: global existence, local existence, non-existence
- [35A02](#) Uniqueness problems for PDEs: global uniqueness, local uniqueness, non-uniqueness
- [35B65](#) Smoothness and regularity of solutions to PDEs
- [93E20](#) Optimal stochastic control

Cited in 1 Document

**Keywords:**

[stochastic control](#); [initial value control](#); [tide equation](#); [Minty-Browder theory](#); [martingale solution](#)

**Full Text:** [DOI](#) [arXiv](#)

**References:**

- [1] Aldous, D., Stopping times and tightness, *Ann. Probab.*, 6, 335-340, (1978) · [Zbl 0391.60007](#)
- [2] Applebaum, D.: *Lévy Processes and Stochastic Calculus*, 2nd edn. Cambridge University Press, Cambridge (2009) · [Zbl 1200.60001](#)
- [3] Albeverio, S.; Brzeźniak, Z.; Wu, JL, Existence of global solutions and invariant measures for stochastic differential equations driven by Poisson type noise with non-Lipschitz coefficients, *J. Math. Anal. Appl.*, 371, 309-322, (2010) · [Zbl 1197.60050](#)
- [4] Barbu, V.: *Analysis and Control of Nonlinear Infinite Dimensional Systems*. Academic Press Inc., New York (1993) · [Zbl 0776.49005](#)
- [5] Billingsley, P.: *Convergence of Probability Measures*. Wiley, New York (1969) · [Zbl 0172.21201](#)
- [6] Brzeźniak, Z.; Hausenblas, E.; Zhu, J., 2D stochastic Navier-Stokes equations driven by jump noise, *Nonlinear Anal.*, 79, 122-139, (2013) · [Zbl 1261.60061](#)
- [7] Brzeźniak, Z.; Motyl, E., Existence of a martingale solution of the stochastic Navier-Stokes equations in unbounded 2D and 3D domains, *J. Differ. Equ.*, 254, 1627-1685, (2013) · [Zbl 1259.35230](#)
- [8] Brzeźniak, Z.; Serrano, R., Optimal relaxed control of dissipative stochastic partial differential equations in Banach spaces, *Siam J. Control Optim.*, 51, 2664-2703, (2013) · [Zbl 1283.60092](#)
- [9] Castaing, C., Raynaud de Fitte, P., Valadier, M.: *Young Measures on Topological Spaces: With Applications in Control Theory and Probability Theory*. Mathematics and Its Applications 571. Kluwer Academic Publishers, Dordrecht (2004) · [Zbl 1067.28001](#)
- [10] Chemin, J.-Y.: *Perfect Incompressible Fluids*. Oxford University Press, New York (1998) · [Zbl 0927.76002](#)
- [11] Chow, P.L.: *Stochastic Partial Differential Equations*. Chapman and Hall/CRC, New York (2007) · [Zbl 1134.60043](#)
- [12] Chow, PL; Khasminskii, RZ, Stationary solutions of nonlinear stochastic evolution equations, *Stoch. Anal. Appl.*, 15, 671-699, (1997) · [Zbl 0899.60056](#)
- [13] Da Prato, G., Zabczyk, J.: *Stochastic Equations in Infinite Dimensions*. Cambridge University Press, Cambridge (1992) · [Zbl](#)

0761.60052

- [14] Flandoli, F.; Gatarek, D., Martingale and stationary solutions for stochastic Navier-Stokes equations, *Probab. Theory Relat. Fields*, 102, 367-391, (1995) · [Zbl 0831.60072](#)
- [15] Gawarecki, L., Mandrekar, V.: *Stochastic Differential Equations in Infinite Dimensions with Applications to Stochastic Partial Differential Equations*. Springer, New York (2011) · [Zbl 1228.60002](#)
- [16] Ichikawa, A., Some inequalities for martingales and stochastic convolutions, *Stoch. Anal. Appl.*, 4, 329-339, (1986) · [Zbl 0622.60066](#)
- [17] Jacod, J.; Mémin, J., Sur un type de convergence intermédiaire entre la convergence en loi et la convergence en probabilité, *Séminaire de Probabilités XV*, 1979, 529-546, (1981) · [Zbl 0458.60016](#)
- [18] Ladyzhenskaya, O.A.: *The Mathematical Theory of Viscous Incompressible Flow*. Gordon and Breach, New York (1969) · [Zbl 0184.52603](#)
- [19] Mandrekar, V., Rüdiger, B.: *Lévy Noises and Stochastic Integrals on Banach Spaces*. *Stochastic Partial Differential Equations and Applications-VII. Lecture Notes in Pure and Applied Mathematics*, pp. 193-213. Chapman & Hall/CRC, Boca Raton (2006) · [Zbl 1096.60024](#)
- [20] Mandrekar, V., Rüdiger, B.: *Stochastic Integration in Banach Spaces: Theory and Applications*. Springer, Heidelberg (2015) · [Zbl 1314.60007](#)
- [21] Manna, U., Mohan, M.T., Sritharan, S.S.: Stochastic non-resistive magnetohydrodynamic system with Lévy noise. *Random Oper. Stoch. Equ.* \textbf{25}(3) (2017) · [Zbl 1372.76030](#)
- [22] Manna, U.; Menaldi, J.L.; Sritharan, S.S.; Sengupta, A. (ed.); Sundar, P. (ed.), *Infinite Dimensional Stochastic Analysis*, Special Volume in honor of Professor H.H. Kuo, (2008), Singapore
- [23] Marchuk, G.I., Kagan, B.A.: *Dynamics of Ocean Tides*. Kluwer Academic Publishers, Dordrecht (1989)
- [24] Marinelli, C.; Röckner, M., On the maximal inequalities of Burkholder, Davis and Gundy,, *Expositiones Mathematicae*, 34, 1-26, (2015) · [Zbl 1335.60064](#)
- [25] Métivier, M.: *Stochastic Partial Differential Equations in Infinite Dimensional Spaces*. Scuola Normale Superiore, Pisa (1988) · [Zbl 0664.60062](#)
- [26] Mikulevicius, R.; Rozovskii, B.L., Global  $L^2$ -solutions of stochastic Navier-Stokes equations, *Ann. Probab.*, 33, 137-176, (2005) · [Zbl 1098.60062](#)
- [27] Motyl, E., Stochastic hydrodynamic-type evolution equations driven by Lévy noise in 3D unbounded domains-Abstract framework and applications, *Stoch. Process. Appl.*, 124, 2052-2097, (2014) · [Zbl 1303.35075](#)
- [28] Motyl, E., Stochastic Navier-Stokes equations driven by Lévy noise in unbounded 3D domains, *Potential Anal.*, 38, 863-912, (2013) · [Zbl 1282.35282](#)
- [29] Motyl, E.: Martingale solutions to the 2D and 3D Stochastic Navier-Stokes equations driven by the compensated Poisson random measure. Preprint 13, Lodz University, Department of Mathematics and Computer Sciences (2011)
- [30] Ondreját, M., Uniqueness for stochastic evolution equations in Banach spaces, *Dissertationes Mathematicae*, 426, 1-63, (2004) · [Zbl 1053.60071](#)
- [31] Peszat, S., Zabczyk, J.: *Stochastic Partial Differential Equations with Lévy Noise*. *Encyclopedia of Mathematics and Its Applications 113*. Cambridge University Press, Cambridge (2007) · [Zbl 1205.60122](#)
- [32] Rüdiger, B.; Ziglio, G., Itô formula for stochastic integrals w.r.t. compensated poisson random measures on separable Banach spaces, *Stochastics*, 78, 377-410, (2006) · [Zbl 1117.60056](#)
- [33] Sakthivel, K.; Sritharan, S.S., Martingale solutions for stochastic Navier-Stokes equations driven by Lévy noise, *Evol. Equ. Control Theory*, 1, 355-392, (2012) · [Zbl 1260.35128](#)
- [34] Sritharan, S.S., Deterministic and stochastic control of Navier-Stokes equation with linear, monotone and hyperviscosities, *Appl. Math. Optim.*, 41, 255-308, (2000) · [Zbl 0951.76023](#)
- [35] Sritharan, S.S.: *Optimal control of viscous flow*. SIAM (1998) · [Zbl 0920.76004](#)
- [36] Stroock, D., Varadhan, S.R.S.: *Multidimensional Diffusion Processes*. Springer, New York (1979) · [Zbl 0426.60069](#)
- [37] Suvinthra, M.; Sritharan, S.S.; Balachandran, K., Large deviations for stochastic tidal dynamics equation, *Commun. Stoch. Anal.*, 9, 477-502, (2015)
- [38] Vakhania, N.N., Tarieladze, V.I., Chobanyan, S.A.: *Probability Distributions on Banach Spaces*. D. Reidel Publishing Company, Dordrecht (1987)
- [39] Viot, M.: *Solution faibles d'équations aux dérivées partielles stochastique nonlineaires*. These, Université Pierre et Marie Curie, Paris (1976)
- [40] Watanabe, S.; Yamada, T., On the uniqueness of solutions of stochastic differential equations. II, *J. Math. Kyoto Univ.*, 11, 155-167, (1971) · [Zbl 0236.60037](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.