Long-term behavior for superprocesses over a stochastic flow

Jie Xiong, *University of Tennessee*

Abstract

We study the limit of a superprocess controlled by a stochastic flow as $t\to\infty$. It is proved that when $d \le 2$, this process suffers long-time local extinction; when $d\ge 3$, it has a limit which is persistent. The stochastic log-Laplace equation conjectured by Skoulakis and Adler (2001) and studied by this author (2004) plays a key role in the proofs like the one played by the log-Laplace equation in deriving long-term behavior for usual super-Brownian motion.

Full text: PDF | PostScript

Pages: 36-52

Published on: April 7, 2004

Bibliography

1. Dawson, D. A.; Fleischmann, K.; Foley, R. D.; Peletier, L. A. A critical measure-valued branching process with infinite mean. *Stochastic Anal. Appl.* 4 (1986), no. 2, 117--129. Math. Review 87e:60085
2. Dawson, Donald A.; Li, Zenghu; Wang, Hao. Superprocesses with dependent spatial motion and general branching densities. *Electron. J. Probab.* 6 (2001), no. 25, 33 pp. (electronic). Math. Review 2002k:60202
3. Ethier, Stewart N.; Kurtz, Thomas G. *Markov processes. Characterization and convergence.* Wiley Series in Probability and Mathematical Statistics: Probability and Mathematical Statistics. John Wiley & Sons, Inc., New York, 1986. Math. Review 88a:60130
4. Friedman, Avner. *Stochastic differential equations and applications.* Vol. 1. Probability and Mathematical Statistics, Vol. 28. Academic Press [Harcourt Brace Jovanovich, Publishers], New York-London, 1975. Math. Review 58 #13350a
5. Ikeda, Nobuyuki; Watanabe, Shinzo. *Stochastic differential equations and diffusion processes.* Second edition. North-Holland Mathematical Library, 24. North-Holland Publishing Co., Amsterdam; Kodansha, Ltd., Tokyo, 1989. Math. Review 90m:60069
6. Kallianpur, Gopinath; Xiong, Jie. *Stochastic differential equations in infinite-dimensional spaces.* Institute of Mathematical Statistics Lecture Notes---Monograph Series, 26. Institute of Mathematical Statistics, Hayward, CA, 1995. Math. Review 98h:60001
7. Skoulakis, Georgios; Adler, Robert J. Superprocesses over a stochastic flow. *Ann. Appl. Probab.* 11 (2001), no. 2, 488--543. Math. Review 2002e:60081
8. Varadhan, S. R. S. *Lectures on diffusion problems and partial differential equations. With notes by Pl. Muthuramalingam and Tara R. Nanda.* Tata Institute of Fundamental Research Lectures on Mathematics and Physics, 64. Tata Institute of Fundamental Research, Bombay, 1980. Math. Review 83j:60087
9. Wang, H. A class of measure-valued branching diffusions in a random medium. *Stochastic Anal. Appl.* 16 (1998), no. 4, 753--786. Math. Review 99e:60194
10. Wang, Yong-Jin. A proof of the persistence criterion for a class of superprocesses. *J. Appl. Probab.* 34 (1997), no. 2, 559--563. Math. Review 98g:60155
11. Wong, Eugene; Zakai, Moshe. On the relation between ordinary and stochastic differential equations. *Internat. J. Engrg. Sci.* 3 1965 213--229. Math. Review 32 #505
12. Xiong, Jie. A stochastic log-Laplace equation. *To appear in Ann. Probab.* (2004).

13. Xiong, Jie. The sigma-finite invariant measures for diffusion processes.
     (Chinese) *Beijing Daxue Xuebao* 24 (1988), no. 3, 287--290. Math. Review
     90d:60062

13. Xiong, Jie. The sigma-finite invariant measures for diffusion processes.
     (Chinese) *Beijing Daxue Xuebao* 24 (1988), no. 3, 287--290. Math. Review
     90d:60062