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title

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de
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rector magnificus prof.dr.ir. F.P.T. Baaijens, voor een
commissie aangewezen door het College voor
Promoties, in het openbaar te verdedigen

door

Carmela Filosa

geboren te Torre del greco, Italië

Dit proefschrift is goedgekeurd door de promotoren en de samenstelling van de promotiecommissie is als volgt:

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Het onderzoek of ontwerp dat in dit proefschrift wordt beschreven is uitgevoerd in overeenstemming met de TU/e Gedragscode Wetenschapsbeoefening.

“ ”

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Bibliography

GigliSavare08 [AGS08] L. Ambrosio, N. Gigli, and G. Savaré. *Gradient Flows in Metric Spaces and in the Space of Probability Measures.* Lectures in mathematics ETH Zürich. Birkhäuser, 2008.

areZambotti09 [ASZ09] L. Ambrosio, G. Savaré, and L. Zambotti. Existence and stability for Fokker–Planck equations with log-concave reference measure. *Probability theory and related fields*, 145(3):517–564, 2009.

rrilloSoler97 [BCS97] L. L. Bonilla, J. A. Carrillo, and J. Soler. Asymptotic behavior of an initial-boundary value problem for the Vlasov–Poisson–Fokker–Planck system. *SIAM Journal on Applied Mathematics*, 57(5):1343–1372, 1997.

puisFischer12 [BDF12] A. Budhiraja, P. Dupuis, and M. Fischer. Large deviation properties of weakly interacting processes via weak convergence methods. *The Annals of Probability*, 40(1):74–102, 2012.

Bakry2014 [BGL+14] D. Bakry, I. Gentil, M. Ledoux, et al. *Analysis and geometry of Markov diffusion operators.* Springer, 2014.

Cattiaux1994 [CL94] Patrick Cattiaux and Christian Léonard. Minimization of the Kullback information of diffusion processes. In *Annales de l'institut Henri Poincaré (B) Probabilités et Statistiques*, volume 30, pages 83–132. Gauthier-Villars, 1994.

ttiauxLeonard [CL95] P. Cattiaux and C. Léonard. Large deviations and nelson processes. 7(7):95–116, 1995.

DupuisEllis97 [DE97] Paul Dupuis and Richard S Ellis. *A Weak Convergence Approach to the Theory of Large Deviations*, volume 902. John Wiley & Sons, 1997.

DupuisEllis11 [DE11] Paul Dupuis and Richard S Ellis. *A weak convergence approach to the theory of large deviations*, volume 902. John Wiley & Sons, 2011.

wsonGartner87 [DG87] D. A. Dawson and J. Gartner. Large deviations from the McKean-Vlasov limit for weakly interacting diffusions. *Stochastics*, 20(4):247–308, 1987.

etierSharma15 [DLPS15] Manh Hong Duong, Agnes Lamacz, Mark A Peletier, and Upanshu Sharma. Variational approach to coarse-graining of generalized gradient flows. *arXiv preprint arXiv:1507.03207*, 2015.

immer13 [DPZ13] M. H. Duong, M. A. Peletier, and J. Zimmer. GENERIC formalism of a Vlasov-Fokker-Planck equation and connection to large-deviation principles. *Nonlinearity*, 26(2951-2971), 2013.

adhan75 [DV75] Monroe D Donsker and SR Srinivasa Varadhan. Asymptotic evaluation of certain markov process expectations for large time, i. *Communications on Pure and Applied Mathematics*, 28(1):1–47, 1975.

scher14 [Fis14] Markus Fischer. On the form of the large deviation rate function for the empirical measures of weakly interacting systems. *Bernoulli*, 20(4):1765–1801, 2014.

lin1994 [FW94] M. I. Freidlin and A. D. Wentzell. Random perturbations of Hamiltonian systems. *Mem. Amer. Math. Soc.*, 109 (523), 1994.

rtner77 [Gär77] Jürgen Gärtner. On large deviations from the invariant measure. *Theory of Probability & Its Applications*, 22(1):24–39, 1977.

nberg09 [GOVW09] N. Grunewald, F. Otto, C. Villani, and M. G. Westdickenberg. A two-scale approach to logarithmic Sobolev inequalities and the hydrodynamic limit. *Ann. Inst. H. Poincaré Probab. Statist*, 45(2):302–351, 2009.

ers1940 [Kra40] H.A. Kramers. Brownian motion in a field of force and the diffusion model of chemical reactions. *Physica*, 7(4):284 – 304, 1940.

cchia00 [KS00] D. Kinderlehrer and G. Stampacchia. *An Introduction to Variational Inequalities and Their Applications*. Classics in Applied Mathematics. SIAM, 2000.

lager84 [Oel84] Karl Oelschlager. A martingale approach to the law of large numbers for weakly interacting stochastic processes. *The Annals of Probability*, pages 458–479, 1984.