

STEFANIA GATTI

Associate professor of Mathematical Analysis

Personal Data

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Education

(1992) Degree in Mathematics, Università di Modena
(1997) PhD in Mathematics, Politecnico di Milano

Academic Career

(1998-1999) (GNAFA) CNR grant
(1999-2002) Post-doc position in PDEs, Dipartimento di Matematica-Politecnico di Milano
(2002-2006) Assistant Professor of Mathematical Analysis MAT/05, Università di Ferrara.
(2006–October 2014) Assistant Professor of Mathematical Analysis MAT/05, Università di Modena e Reggio Emilia.
(November 2014–present) Associate Professor of Mathematical Analysis MAT/05, Università di Modena e Reggio Emilia.

Teaching:

Bachelor Degree: Courses of Calculus, Function Theory (2016-present)

Master Degree: Evolution Equation

PhD: (in Economics) Discrete Dynamical systems

GADeS 2017 Summer School: Stability and Bifurcation of Dynamical Systems: Theoretical Aspects and Applications. Lecture on "Global Study of the Asymptotic Behavior" (organized by Associazione Italiana di Meccanica Teorica ed Applicata".

Research Fields

Partial differential equations; asymptotic behavior of dynamical systems associated with evolution equations of hyperbolic and parabolic type; memory relaxation of evolution equations.

Scientific Publications

- (1) **S.Gatti**: *Stabilità e Unicità delle soluzioni onde-viaggianti in un modello di combustione*, Rendiconti dell'Istituto Lombardo, Sezione A: Scienze Matematiche e Applicazioni, **130** (1996), 273-294.

- (2) **S.Gatti**: *Continuous selections avoiding a multifunction with values in $\mathcal{P}(\mathbb{R}^n)$* , Atti del Seminario Matematico e Fisico dell'Università di Modena, **vol. XLV** (1997), 389-394.
- (3) **S.Gatti**: *A stability result for an inverse problem related to a quasilinear parabolic equation*, Journal of Inverse and Ill-posed problems, **5** (1997), 1-17.
- (4) **S.Gatti**: *An existence result for an inverse problem for a quasilinear parabolic equation*, Inverse Problems, **14** (1998), 53-56.
- (5) **S.Gatti**: *Una equazione parabolica in teoria della combustione: problemi diretti ed inversi*, La matematica nella società e nella cultura. Supplemento al Bollettino UMI, **8** (1998), 117-120.
- (6) **S.Gatti**: *Automatic control of the temperature in phase change problems with memory*, Z. Anal. Anwendungen **20** (2001), 883-914.
- (7) **S. Gatti**, M. Grasselli, V. Pata: *Exponential attractors for a conserved phase-field system with memory*, Phys. D **189** (2003), 31-48.
- (8) **S. Gatti**, D. Pierotti: *Solvability of a Plane Elliptic Problem for the Flow in a Channel with a Surface-Piercing Obstacle*, Z. Anal. Anwendungen **22** (2003), 357-381.
- (9) **S.Gatti**, E. Sartori: *Well-posedness results for phase field systems with memory effects in the order parameter dynamics*, Discrete Contin. Dyn. Syst. **9** (2003), 705-726.
- (10) **S.Gatti**, E. Sartori: *Phase-field systems with memory effects in the order parameter dynamics: convergence to the standard phase-field system*, Adv. Math. Sc. Appl. **13** (2003), 487-518.
- (11) **S. Gatti**, M. Grasselli, V. Pata: *Exponential attractors for a phase-field model with memory and quadratic nonlinearity*, Indiana Univ. Math. J. **53** (2004), 719-754.
- (12) **S. Gatti**, C. Giorgi, V. Pata: *Navier-Stokes limit of Jeffreys type flows*, Physica D, **203** (2005), 55-79.
- (13) **S. Gatti**, M. Grasselli, A. Miranville, V. Pata: *Hyperbolic relaxation of the viscous Cahn-Hilliard equation in 3-D*, Math. Mod. Meth. Appl. Sci. **15** (2005), 165-198.
- (14) **S. Gatti**, M. Grasselli, V. Pata: *Lyapunov functionals for reaction-diffusion equations with memory*, Math Meth. Appl. Sci. **28** (2005), 1725-1735.
- (15) **S. Gatti**, M. Grasselli, M. Squassina, V. Pata: *Robust exponential attractors for a family of nonconserved phase-field systems with memory*, Discrete Contin. Dyn. Syst. **12** (2005), 1019-1029.
- (16) **S. Gatti**, M. Grasselli, A. Miranville, V. Pata: *Memory relaxation of first order evolution equations*, Nonlinearity **18** (2005), 1859-1883.
- (17) V. Berti, **S. Gatti**: *Parabolic-Hyperbolic Time-dependent Ginzburg-Landau-Maxwell equations*, Q. Appl. Math., **64** (2006), 617-639.
- (18) V.V. Chepyzhov, **S. Gatti**, M. Grasselli, A. Miranville, V. Pata: *Trajectory and global attractors for evolution equations with memory*, Appl. Math. Lett. **19** (2006), 87-96.
- (19) **S. Gatti**, M. Grasselli, A. Miranville, V. Pata: *A construction of a Robust Family of Exponential Attractors*, Proc. Amer. Math. Soc. **134** (2006), 117-127.

- (20) **S. Gatti**, M. Grasselli, A. Miranville, V. Pata: *On the hyperbolic relaxation of the one-dimensional Cahn-Hilliard equation*, J. Math. Anal. Appl. **312/1** (2006), 230-247.
- (21) **S. Gatti**, M. Grasselli, V. Pata: *Memory relaxation of the one-dimensional Cahn-Hilliard equation Dissipative phase transitions edited by P. Colli and N. Kenmochi, J. Sprekels*, Series on Advances in Mathematics for Applied Sciences World Sci. Publishing, **71** (2006), 101–114.
- (22) **S. Gatti**, E. Vuk: *Singular limit of equations for linear viscoelastic fluids with periodic boundary conditions*, Int. J. Nonlinear Mech. **41** (2006), 518–526.
- (23) **S. Gatti**, V. Pata: *A One-Dimensional Wave Equation with Nonlinear Damping*, Glasgow Math. J. **48** (2006), 419–430.
- (24) M. Conti, **S. Gatti**, V. Pata: *Decay rates of Volterra equations on \mathbb{R}^N* Cent. Eur. J. Math. **5** (2007), 720–732.
- (25) M. Conti, **S. Gatti**, V. Pata: *Uniform decay properties of linear Volterra integro-differential equations* Math. Mod. Meth. Appl. Sci. **18** (2008), 21–45.
- (26) L. Cherfils, **S. Gatti**, A. Miranville: *Existence of global solutions for Caginalp models with dynamic boundary conditions* J. Math. Anal. Appl. **343** (2008), 557–566.
- (27) L. Cherfils, **S. Gatti**, A. Miranville: *Corrigendum to "Existence of global solutions for Caginalp models with dynamic boundary conditions"* J. Math. Anal. Appl. **348** (2008), 1029–1030.
- (28) **S. Gatti**, A. Miranville, V. Pata, S. Zelik: *Attractors for semilinear equations of viscoelasticity with very low dissipation*, Rocky Mountain J. Math. **38** (2008), 1117–1138.
- (29) **S. Gatti**, V. Pata, S. Zelik: *A Gronwall-type lemma with parameter and dissipative estimates for PDEs* Nonlinear Anal. **70** (2009), 2337–2343.
- (30) M. Conti, **S. Gatti**, M. Grasselli, V. Pata: *Two-dimensional reaction-diffusion equations with memory* Q. Appl. Math. **68** (2010), 607-643.
- (31) **S. Gatti**, A. Miranville, V. Pata, S. Zelik: *Continuous families of exponential attractors for singularly perturbed equations with memory* Proc. Roy. Soc. Edinburgh Sect. A **140A** (2010), 329-366.
- (32) L. Cherfils, **S. Gatti**, A. Miranville: *A doubly nonlinear parabolic equation with a singular potential* Discrete Contin. Dyn. Syst. Series S (1) **4** (2011), 51-66.
- (33) M. Conti **S. Gatti**, A. Miranville: *Asymptotic behavior of the Caginalp phase-field system with coupled dynamic boundary conditions* Discrete Contin. Dyn. Syst. Series S (4) **5** (2012), 485-506.
- (34) L. Cherfils, **S. Gatti**, A. Miranville: *Long time behavior of the Caginalp system with singular potentials and dynamic boundary conditions* Commun. Pure Appl. Anal. (6) **11** (2012), 2261-2290.
- (35) M. Conti, **S. Gatti**, A. Miranville: *Attractors for a Caginalp model with a logarithmic potential and coupled dynamic boundary conditions* Analysis and Applications **11** (2013), 1350024.

- (36) L. Cherfils, **S. Gatti**, A. Miranville: *A variational approach to a Cahn-Hilliard model in a domain with non-permeable walls* J. Math. Sci. (N.Y.) (4) **189** (2013), 604-636.
- (37) M. Conti, **S. Gatti**, A. Miranville: *A generalization of the Caginalp phase-field system with Neumann boundary conditions* Nonlinear Analysis **87** (2013), 11-21.
- (38) S. Bosia, **S. Gatti**: *Pullback exponential attractor for a Cahn-Hilliard-Navier-Stokes system in 2D* Dynamics of PDE **11** (2014), 1-38.
- (39) M. Conti, **S. Gatti**, A. Miranville: *Multi-component Cahn-Hilliard systems with dynamic boundary conditions* Nonlinear Analysis, RWA **25** (2015), 137-166.
- (40) L. Cherfils, **S. Gatti**: *Robust family of exponential attractors for isotropic crystal models* Math.Meth. Appl. Sci **39** (2016), 1705-1729.
- (41) M. Conti, **S. Gatti**, A. Miranville: *A phase-field system with two temperatures and memory* Diff. Int. Eqns. **30** (2017), 53-80.
- (42) M. Conti, **S. Gatti**, A. Miranville, R. Quintanilla: *On a Caginalp Phase-Field System with Two Temperatures and Memory* Milan J. Math. **85** (2017), 1-27.
- (43) M. Conti, **S. Gatti**, A. Miranville: *A singular Cahn-Hilliard-Oono phase-field system with hereditary memory* Discrete Contin. Dyn. Syst. Series A **38** (2018), 3033-3054.
- (44) L. Cherfils, **S. Gatti**, A. Miranville: *Asymptotic behavior of higher-order Navier-Stokes-Cahn-Hilliard systems* Math. Meth. App. Sci. **41** (2018), 4776-4794.
- (45) M. Eleuteri, **S. Gatti**, G. Schimperna: *Regularity and long-time behavior for a thermodynamically consistent model for complex uids in two space dimensions* Indiana Univ. Math. J. **68** (2019), 1465-1518.
- (46) M. Conti, **S. Gatti**, A. Miranville: *Mathematical analysis of a model for proliferative-to-invasive transition of hypoxic glioma cells* Nonlinear Anal. **189** (2019), 111572, 17 pp.
- (47) L. Cherfils, **S. Gatti**, A. Miranville, R. Guillevin: *Analysis of a model for tumor growth and lactate exchanges in a glioma* Discrete Contin. Dyn. Syst. Series S **14** (2021), 2729-2749.
- (48) M. Conti, **S. Gatti**, A. Miranville: *Mathematical analysis of a phase-field model of brain cancers with chemotherapy and antiangiogenic therapy effects* AIMS Math. **7** (2022), 1536-1561.
- (49) **S. Gatti**: *An Oxygen driven proliferative-to-invasive transition of glioma cells: an analytical study* Discrete Contin. Dyn. Syst. Series S **15(8)** (2022), 2233-2248.
- (50) L. Cherfils, **S. Gatti**, C. Guillevin, A. Miranville and R. Guillevin: *On a tumor growth model with brain lactate kinetics* Math. Med. Biol. **39** (4) (2022), 382-409.
- (51) M. Conti, **S. Gatti**, A. Miranville: *A perturbation of the Cahn-Hilliard equation with logarithmic nonlinearity* Journal of Differential Equations **382** (2024), 50-76.
- (52) L. Cherfils, **S. Gatti**, A. Miranville, H. Raad and R. Guillevin: *Optimal control of therapies on a tumor growth model with brain lactate kinetics* Discrete Contin. Dyn. Syst. Series S (to appear)

- (53) M. Conti, P. Galimberti, **S. Gatti**, A. Giorgini *New results for the Cahn-Hilliard equation with non-degenerate mobility: well-posedness and longtime behavior* Calc. Var. Partial Differential Equation **64(3)** (2025), 1-32.

PROCEEDINGS

- [Proc1] **S. Gatti**, M. Grasselli: *Convergence to stationary states of solutions to the semilinear equation of viscoelasticity* *Differential Equations: Inverse and Direct Problems* Lecture notes in Pure and Applied Mathematics *Taylor and Francis*, 131-147, 2006.(refereed)
- [Proc2] **S. Gatti**, A. Miranville: *Global and Exponential Attractors for a phase-field system with dynamic boundary conditions* *Differential Equations: Inverse and Direct Problems* Lecture notes in Pure and Applied Mathematics, *Taylor and Francis*, 149-170, 2006.(refereed)
- [Proc3] L. Cherfilis **S. Gatti**, A. Miranville: *Finite dimensional attractors for the Caginalp system with singular potentials and dynamic boundary conditions* *Bulletin of the Transilvania University of Braşov* Proc. 9^{ème} Colloque franco-roumain de math. appl., 28 août - 2 septembre 2008, Braşov, Romania, 2009, .(refereed)

Visiting

09/05/2004-14/05/2004 Invited visiting at Laboratoire de Mathématiques et Applications, Université de Poitiers, France.

28/04/2008-02/05/2008 Invited visiting at Laboratoire de Mathématiques et Applications, Université de Poitiers, France.

09/11/2011 Invited visiting at the Department of Mathematics, Indiana University.

04/12/2011 – 11/12/2011 Invited visiting at the Institute of Mathematics of the Academy of Sciences of the Czech Republic, Praha.

01/07/2013 – 09/07/2013 Invited visiting at Laboratoire MIA, Mathématiques, Image et Applications, Université de La Rochelle-France.

04/12/2018 – 07/12/2018 Invited visiting at Laboratoire de Mathématiques et Applications, Université de Poitiers, France.

16/05/2023 – 31/05/2023 Laboratoire de Mathématiques et Applications, Université de Poitiers, (Francia)

Research Projects

2003- Member of the research project "Studio di modelli matematici governati da equazioni differenziali: aspetti teorici, buona positura, proprietà qualitative delle soluzioni, risultati numerici". Co-financed by M.I.U.R. - Coordinated by G. Talenti

2004-2006: Member of the research project "Dinamica a lungo termine e problemi di regolarità per modelli di cambiamento di fase". Co-financed by M.I.U.R. - Coordinated by A. Visintin

2006 -2008: Member of project "Analisi asintotica e metodi geometrici per problemi di cambiamento di fase". Co-financed by M.I.U.R. - Coordinated by A. Visintin

2007-2008: Member of the Galileo project "Modelli matematici in scienza dei materiali"- Coordinated by G. Schimperna-A. Miranville.

2008-2010: Member of the project "Transizioni di fase, isteresi e scale multiple". Co-financed by M.I.U.R. - Coordinated by A. Visintin

2013: Member of the GNAMPA project "Analisi di modelli di tipo Navier-Stokes" (Analysis of Navier-Stokes type models).

2016: Member of the GNAMPA project "Regolarità e comportamento asintotico di soluzioni di equazioni paraboliche" (Regularity and asymptotic behavior of solutions to parabolic equations).

2017: Member of the GNAMPA project "Comportamento asintotico di sistemi dissipativi non locali" (Asymptotic behavior of nonlocal dissipative systems).

2017: Coordinator of the project UNIMORE FAR2017 "Equazioni differenziali: problemi evolutivi, variazionali e applicazioni"

2020: FAR Impulso 2020 Grant

2020: Member of the Project PRIN2020 Mathematics for industry 4.0 (Math4I4)

Selected talks

13-05-2004 *On the robustness of exponential attractors*, Laboratoire d'Applications des Mathématiques - SP2MI, University of Poitiers-France.

2004 *Hyperbolic relaxation of the viscous Cahn-Hilliard equation in 3-D*, "Free boundary problems in Biomathematics, Multiscaling, Infinite-Dimensional Dynamical Systems" (Montecatini, June 10-12).

2004 *Hyperbolic relaxation of the Allen-Cahn equation*, "IperPisa 2004", Incontro Nazionale sulle Equazioni Iperboliche (Pisa, October 20-22).

2006 *Navier-Stokes limit of Jeffreys type flows*, "AIMS Conference" (Poitiers, June 24-29).

2008 *Uniform decay properties of linear Volterra integro-differential equations*, "Convegno SIMAI 2008" (Roma, Università La Sapienza, Facoltà di Ingegneria, September 16)

2010 *Continuous Families of Exponential Attractors for Singularly Perturbed Equations with Memory*, 2010 AIMS Meeting, special session "Qualitative Behavior of Dissipative Dynamical Systems" (Dresden, May 25-28)

2010 *Continuous Families of Exponential Attractors for Singularly Perturbed Equations with Memory*, ICMS Workshop "Dissipative PDEs in Bounded and Unbounded Domains and Related Attractors" (Edinburgh, September 20-24)

19-05-2011 *Decadimento uniforme per Equazioni integro-differenziali e lineari di Volterra* Seminario di Analisi "Pini", Dipartimento di Matematica dell'Università di Bologna

20-06-2011 *Long time behavior of the Caginalp system with singular potentials and dynamic boundary conditions* INDI2011, Interfaces and discontinuities in Solids, Liquids and Crystals, Gargnano June 20-23, 2011

09-11-2011 *Long time behavior of the Caginalp system with singular potentials and dynamic boundary conditions* Department of Mathematics, Indiana University (USA)

16-11-2011 *Long time behavior of the Caginalp system with singular potentials and dynamic boundary conditions* SIAM conference on Analysis of Partial Differential Equations, (San Diego, CA, November 14-17)

06-12-2011 *Well-posedness and asymptotic behavior of a Caginalp model with singular potential and dynamic boundary conditions*, Institute of Mathematics of the Academy of Sciences of the Czech Republic, Praha, Czech Republic

09-07-2014 *Pullback exponential attractor for 2D CHNS system* AIMS Conference, (Madrid, July 7–11)

14-00-2016 *Multi-component Cahn-Hilliard systems with dynamic boundary conditions* SIMAI conference 2016, (Milano, September 13–16)

06-12-2018 *Well-posedness and long-time behavior of a 2D thermodynamically consistent model for two-phase fluids* Laboratoire d'Applications des Mathématiques - SP2MI, University of Poitiers-France

25-06-2019 *Mathematical analysis of a model for proliferative-to-invasive transition of hypoxic glioma cells*, 39ème Colloque de la Société Francophone de Biologie Théorique, Poitiers (France), June 24-27, 2019

17-03-2022 *Some recent results in Nutrient Dynamics and Brain Cancer*, 6th Workshop on Recent Developments in PDEs and Applications (Online), King Fahd University of Petroleum & Minerals, Department of Mathematics, Dhahran/Saudi Arabia, March 16-17, 2022 (su invito)

28-06-2022 *Some recent results on a tumor growth model with brain lactate kinetics*, 40ème Colloque de la Société Francophone de Biologie Théorique, Poitiers (France), June 27-30, 2022 (invited)

20-05-2024 *Some recent results on non-isothermal tumor growth*, International Conference on Elliptic and Parabolic Problems: GAETA 2024, Gaeta (Italy), May 20-24, 2024 (invited)

03-09-2025 *Recent results on the 2D Cahn-Hilliard equation with non-degenerate mobility*, XIII Brazilian-Italian Workshop in Nonlinear Differential Equations Modena, September 1-5, 2025 (invited)

Organization

Organizer with Michela Eleuteri of the Summer School "*Dissipative Dynamical Systems and Applications*", September 3-7, 2018, Modena, for which she obtained a grant from GNAMPA-INDAM.

Faculty Duty

Member of the Department Research Commission.

Advisory

2012-2019 Member of the Board of the PhD in Mathematics of the Universities of Modena and Reggio Emilia, Ferrara, Parma

2018 Advisor with Michela Eleuteri of the master degree thesis in Mathematics *Existence and Uniqueness for non-isothermal Cahn-Hilliard equation* by Andrea Zafferri.

2019 Advisor of the bachelor degree thesis in Mathematics *Applicazione del teorema di Lax Milgram ad un problema ai limiti ellittico* by Francesco Fiorani.

2020 Advisor of the bachelor degree theses (Dipartimento FIM, Università di Modena e Reggio Emilia)

- *Applicazione al ciclo glutammato glutammina dei teoremi di esistenza e unicità in grande per equazioni differenziali ordinarie* by Caterina Camellini

- *Analisi di un modello matematico per la dinamica cerebrale del lattato* by Giulia Monopoli

2022 Advisor of the bachelor degree thesis (Dipartimento FIM, Università di Modena e Reggio Emilia) *Modello matematico per la crescita di una popolazione di batteri in un chemostato* by Desiré Cilenti

2023 Advisor of the master degree thesis (Dipartimento FIM, Università di Modena e Reggio Emilia) *A generalized Allen-Cahn equation and its Cahn-Hilliard limit* by Matteo Storchi

2023 Supervisor of the Post-Doc Erica Ipocoana (Assegno di ricerca junior) on PRIN2020 "Mathematics for industry 4.0 (Math4I4) 2020F3NCPX" (CUP E93C20007850001) February 2023-January 2024;

2023-present Supervisor of the PhD student Pietro Galimberti (co-Supervisor Andrea Giorgini, Politecnico di Milano) XXXIX cycle of the PhD Programme in Mathematics Università di Modena e Reggio Emilia, Ferrara and Parma, since november 2023

2025 Advisor with Andrea Giorgini (Politecnico di Milano) of the master degree thesis (Dipartimento FIM, Università di Modena e Reggio Emilia) *Weak solutions for a Cahn-Hilliard equation with a non-local incompressibility constraint* by Greta Ricchi

2025 Advisor of the master degree thesis (Dipartimento FIM, Università di Modena e Reggio Emilia) *Long term behaviour of a perturbed Cahn-Hilliard equation* by Daniele Nassisi

Editorial Boards

AIMS Mathematics

Frontiers in Applied Mathematics and Statistics, Review Editor 2022-2024 and Associate Editor since May 2024

Other Professional Activities

14-10-2016 Member of the PhD Commission and rapporteur for the PhD Thesis "Etude de modèles en séparation de phase tenant compte d'effets d'anisotropie" by Ahmad Makki (supervisor Alain Miranville), Doctorat Mathématiques et leurs interactions, Université de Poitiers, France

07-12-2018 Member of the PhD Commission and rapporteur for the PhD Thesis "Analyse mathématique et numérique de plusieurs problèmes non linéaires" (supervisors Laurence Cherfils and Alain Miranville), École Doctorale Sciences et Ingénierie des Systèmes, Mathématiques, Informatique, Université de Poitiers, Specialite: Mathématiques, France