

# Curriculum vitae of Daniela Grasso

## **Education and scientific career**

I was born in 1967 and obtained my Degree in Physics in 1993 and my PhD in Physics in 1997 at the “Università degli Studi di Torino”.

Starting on September 2008 I am employed as a researcher with permanent position from of the National Council of Research in Italy. Before September I was employed on temporary contracts from the Politecnico di Torino and from the National Institute for the Physics of Matter.

During my career I have been visiting the following institutions:

- Centre de Physique Theorique, CNRS, Campus de Luminy, Marseille, France.
- Plasma and Fusion Center of Massachusetts Institute of Technology (Cambridge, MA, USA).
- Department de recherches sur la Fusion Controlée in Cadarache (France).
- FOM Institute for Plasma Physics, Rijnhuizen (The Netherlands).

I was chair of the last edition of the Easter Plasma Meeting, held in Turin in April 2009. I have been member of the scientific and organizing committee of the Easter Plasma Meeting, held in Turin in 1999, 2000, 2002, 2003 and in Cairo in 2008.

I am member of the scientific committee of the EFTC since 2007 and in 2011 I was appointed chair for the next two editions of the meeting.

My research activity developed in the plasma physics area. In particular, I devoted myself to the investigation of magnetic reconnection from a theoretical and numerical point of view. Magnetic reconnection is a fundamental process in high conductive fluids and in plasmas. Solar flares in the solar corona and sawtooth oscillations in Tokamak devices are typical phenomena related to a reconnection event. Carrying out research activity in this field requires knowledge of:

- magnetohydrodynamics
- plasma and fluids instabilities
- nonlinear dynamics
- Hamiltonian systems
- numerical techniques

## **Teaching activity**

Lecturer at the Research Doctorate Programs in Fluidynamics (Politecnico di Torino) since the a.y. 2008-2009 till now. Title of the course: “Introduction to magnetic reconnection”. Lecturer at the Politecnico di Torino during the a.y. 2001-2002, 2002-2003 and 2003-2004 (20 hours per year for the course “ Physics and Engineering of Plasmas”).

## **Publications**

I am author of 39 publications in the peer-reviewed international scientific literature and 25 proceedings of conferences. I am recognized as an expert in the field of magnetic reconnection by the scientific community and I was invited to participate in several restricted workshops. The detailed lists of the papers and invited talk follow.

## Peer reviewed papers

- 40) L. Comisso, D. Grasso, E. Tassi, F. Waelbroeck, **Numerical investigation of a compressible gyrofluid model for collisionless magnetic reconnection**, *Phys. Plasmas*, **19**, 042103 (2012).
- 39) F. Militello, D. Borgogno, D. Grasso, C. Marchetto, M. Ottaviani, **Asymmetric tearing mode in the presence of viscosity**, *Phys. Plasmas* **18**, 112108 (2011).
- 38) Borgogno, D. Grasso, F. Pegoraro, T.J. Schep **Barriers in the transition to global chaos in collisionless magnetic reconnection. II. Field line spectroscopy**, *Phys. Plasmas*, **18**, 102308 (2011).
- 37) Borgogno, D. Grasso, F. Pegoraro, T.J. Schep **Barriers in the transition to global chaos in collisionless magnetic reconnection. I. Ridges of the finite time Lyapunov exponent field**, *Phys. Plasmas*, **18**, 102307 (2011).
- 36) D. Grasso, D. Borgogno, E. Tassi, **Numerical investigation of a three-dimensional four field model for collisionless magnetic reconnection**, *Commun. Nonlinear Sci. Numer. Simulat.*, doi:10.1016/j.cnsns.2011.06.013 (2011).
- 35) E. Tassi, F. Waelbroeck, D. Grasso, **Gyrofluid simulations of collisionless reconnection in the presence of diamagnetic effects**, *J. Phys.: Conf. Ser.* **260** 012020 (2010).
- 34) A. Perona, D. Grasso, D. Borgogno, **Electron response in gyrofluid simulations of magnetic reconnection**, *J. Phys.: Conf. Ser.* **260** 012015 (2010).
- 33) D. Grasso, D. Borgogno, F. Pegoraro and T.J. Schep, **Barriers to field line transport in 3D magnetic configurations**, *J. Phys.: Conf. Ser.* **260** 012012 (2010).
- 32) D. Grasso, E. Tassi and F.L. Waelbroeck, **Nonlinear gyrofluid simulations of collisionless reconnection**, *Phys. Plasmas*, **17**, 082313 (2010).
- 31) A. Perona, L.- G. Eriksson and D. Grasso, **Electron response to collisionless magnetic reconnection**, *Phys. Plasmas*, 042104 (2010).
- 30) E. Tassi, P.J. Morrison, D. Grasso and F. Pegoraro, **Hamiltonian four-field model for magnetic reconnection: nonlinear dynamics and extension to three dimensions with externally applied fields**, *Nucl. Fusion*, **50**, 034007, (2010).
- 29) E. Tassi, D. Grasso, F. Pegoraro, **Nonlinear processes in Hamiltonian reconnection**, *Commun. Nonlinear Sci. Numer. Simulat.*, **15**, 2, (2010).
- 28) D. Grasso, D. Borgogno, F. Pegoraro and E. Tassi **Coupling between reconnection and Kelvin-Helmholtz instabilities in collisionless plasmas**, *Nonlin. Processes Geophys.* **16**, 241 (2009).
- 27) E. Tassi, D. Grasso, F. Pegoraro and P. Morrison **Stability and nonlinear dynamics aspects of a model for collisionless magnetic reconnection**, *Journal of Plasma and Fusion Research Series*, Vol. **8**, 159, 2009.
- 26) Borgogno, D. Grasso, F. Pegoraro, T.J. Schep **Stable and unstable invariant manifolds in a partially chaotic magnetic configuration generated by nonlinear reconnection**, *Phys. Plasmas*, **15**, 102308 (2008).
- 25) D. Grasso, R.J. Hastie, F. Porcelli and C. Tebaldi **Critical  $\Delta'$  for stability of visco-resistive tearing modes**, *Phys. Plasmas* **15** 072113 (2008).
- 24) E. Tassi, P.J. Morrison, F.L. Waelbroeck, D. Grasso **Hamiltonian formulation and analysis of a collisionless fluid reconnection model** *Plasma Phys. Control. Fusion* **50** 085014 (2008).
- 23) P. Helander, D. Grasso, R.J. Hastie, A. Perona, **Resistive stability of a plasma with runaway electrons**, *Phys. Plasmas*, **14**, 122102 (2007).
- 22) D. Grasso, D. Borgogno, F. Pegoraro, **Secondary instabilities in two and three dimensional magnetic reconnection in fusion relevant plasmas** *Phys. Plasmas*, **14**, 055703 (2007).

- 21) F. L. Waelbroeck, R. Fitzpatrick and D. Grasso **Effect of sheared flow on magnetic islands**, *Physics of Plasmas* **14**, 022302, 2007.
- 20) D. Grasso, L Margheriti, C. Tebaldi, F. Porcelli, **Magnetic islands and spontaneous generation of zonal flows**, *Plasma Physics and Controlled Fusion*, **48**, L87 - L95, 2006.
- 19) D. Borgogno, D. Grasso, F. Califano, D. Farina, F. Pegoraro, F. Porcelli, **Aspects of three-dimensional magnetic reconnection**, *Physics of Plasmas*, **12**, 032309, 2005.
- 18) M. Ottaviani, F. Porcelli, and D. Grasso, **Multiple States of Nonlinear Drift-Tearing Islands**, *Physical Review Letters*, **93**, 075001, 2004.
- 17) D. Grasso, D. Borgogno, F. Califano, D. Farina, F. Pegoraro, F. Porcelli, **Numerical solution of a reduced model of collisionless magnetic reconnection in two and three dimensions**, *Computer Physics Communications*, **164**, pp. 23-28, 2004.
- 16) F. Pegoraro, D. Borgogno, F. Califano, D. del Sarto, E. Echkina, D. Grasso, T. Li-seikina, F. Porcelli, **Developments in the theory of collisionless reconnection in magnetic configurations with a strong guide field**, *Nonlinear Processes in Geophysics*, **11**, (5), pp.567-577, 2004.
- 15) M. Ottaviani, N. Arcis, D. F. Escande, D. Grasso, P. Maget, F. Militello, F. Porcelli and W. Zwingmann, **Progress in the theory of magnetic reconnection phenomena**, *Plasma Phys. Control. Fusion*, **46**, p.B201, 2004.
- 14) F Porcelli, D Borgogno, F Califano, D Grasso and F Pegoraro **Magnetic reconnection: collisionless regimes**, *Physica Scripta*, **T107**, pp. 153-158, 2004.
- 13) F. Porcelli, S. Annibaldi, D. Borgogno, R. Coelho, D. Grasso, J. Martinell, P. Buratti, E. Giovannozzi, F. Califano, F. Pegoraro, E. Lazzaro, M. Ottaviani, J. J. Ramos, R. Verastegui, E. Rossi, A. I. Smolyakov, **Predicting the Behavior of Magnetic Reconnection Processes in Fusion Burning Plasma Experiments**, *Nuclear Fusion*, **44**, (2), pp. 362-371, 2004.
- 12) F. Porcelli, D. Borgogno, F. Califano, D. Grasso, M. Ottaviani, F. Pegoraro, **Recent advances in collisionless magnetic reconnection**, *Plasma Physics and Controlled Fusion*, **44**, B389, 2002.
- 11) D. Grasso, F. Porcelli, M. Ottaviani, **Growth and stabilization of drift-tearing modes in weakly collisional plasmas**, *Nuclear Fusion*, **42**, 1067, 2002.
- 10) F. Califano, F. Pegoraro, S. Bulanov, D. Borgogno, D. Grasso, F. Porcelli, **Fast collisionless magnetic reconnection: fluid regime and kinetic effects**, *Physica Scripta*, **T98**, 72, 2002.
- 9) D. Grasso, F. Porcelli, M. Ottaviani, **Linear stability and mode structure of drift tearing modes** *Phys. of Plasmas.*, **8**, 4306, 2001.
- 8) D. Grasso, F. Califano, F. Pegoraro, F. Porcelli, **Phase mixing and saturation in Hamiltonian reconnection** *Phys. Rev. Lett.*, **86**, 5051, 2001.
- 7) F. Porcelli, A. Airoidi, C. Angioni, A. Bruschi, P. Buratti, F. Califano, S. Cirant, I. Furno, D. Grasso, E. Lazzaro, A. A. Martynov, M. Ottaviani, F. Pegoraro, G. Ramponi, E. Rossi, O. Sauter, C. Tebaldi, O. Tudisco, **Modeling of macroscopic magnetic islands in Tokamaks**, *Nuclear Fusion*, **41** (9), 1207, 2001.
- 6) D. Grasso, F. Califano, F. Pegoraro, F. Porcelli, **Ion Larmor radius effects in collisionless reconnection**, *Plasma Phys. Rep.* **21** (6), 548, 2000.
- 5) G. Valori, D. Grasso, H. de Blank **Collisionless reconnection in instabilities and due to external forcing**, *Phys. of Plasmas* **7** (1), 2000.
- 4) D. Grasso, F. Califano, F. Pegoraro, F. Porcelli, **Hamiltonian magnetic reconnection**, *Plasma Phys. Control. Fusion* **41**, 1497, 1999.
- 3) E. Cafaro, D. Grasso, F. Pegoraro, F. Porcelli, A. Saluzzi, **Invariants and geometric Structures in Nonlinear Hamiltonian Magnetic Reconnection**, *Phys. Rev. Lett.* **80**, 4430, 1998.

- 2) D. Grasso, F. Pegoraro, F. Porcelli, E. Cafaro, A. Saluzzi, **Hamiltonian reconnection**, *Electromagnetic Waves & Electronic Systems Publishing House of the Journal Radiotekhnika*, **3**, 51, 1998.
- 1) D. Grasso, E. Cafaro, F. Pegoraro, F. Porcelli, A. Saluzzi, **Hamiltonian model of magnetic reconnection**, *Physica Scripta* **T75**, 200, 1998.

## Proceedings

- 25) A. Perona, L.-G. Eriksson and D. Grasso, **Electron Response to Inertial Magnetic Reconnection**, pages 125-135 in: *IAGA-II Proceedings: Solar Wind Space Environment Interaction Cairo Egypt, December 4 - 8, 2009*, Luc Damè and Ahmed Hady editors Cairo University Press 2010.
- 24) D. Grasso, D. Borgogno, F. Pegoraro and E. Tassi, **Magnetic reconnection in inertial regimes**, pages 137-146 in: *IAGA-II Proceedings: Solar Wind Space Environment Interaction Cairo Egypt, December 4 - 8, 2009*, Luc Damè and Ahmed Hady editors Cairo University Press 2010.
- 23) C. Tebaldi, D. Grasso, R.J. Hastie, **Asymmetry Effects in Visco-resistive Magnetic Reconnection**, In: *WAVES AND STABILITY IN CONTINUOUS MEDIA*, World Scientific Publ., WAVES AND STABILITY IN CONTINUOUS MEDIA, Mondello (PA) June 28-July 1 2009, ISBN: 9789814317
- 22) D. Grasso, D. Borgogno, E. Tassi, F. Pegoraro, **Nonlinear collisionless magnetic reconnection**, *Frontiers in Modern Plasma Physics*, Proceedings of the ICTP International Workshop on Frontiers of Modern Plasma Physics, Trieste, 14-25 July 2008, AIP Conference Proceeding, Vol. 1061, pp. 208-216. Editors: Shukla, Padma K.; Eliasson, Bengt; Stenflo, Lennart. Melville, New York 2008.
- 21) D. Grasso, R.J. Hastie, P. Helander, **Effect of a runaway electron current on tearing modes** Europhysics Conference Abstracts Vol. 32D, P-2.116 (2008).
- 20) A. Perona, L.G. Eriksson, D. Grasso, **Generation of suprathermal electrons during magnetic reconnection**, Europhysics Conference Abstracts Vol. 32D, P-5.054 (2008).
- 19) E. Tassi, D. Grasso, F. Pegoraro, **Nonlinear dynamics of magnetic reconnection in collisionless plasmas** Europhysics Conference Abstracts Vol. 32D, P-2.179 (2008).
- 18) E. Tassi, D. Grasso, F. Pegoraro, **Nonlinear dynamics of a Hamiltonian four-field model for magnetic reconnection in collisionless plasmas**, in *Chaos, Complexity and Transport : theory and applications* Proceedings of the CCT '07 Marseille, 4-8 June 2007, Ed. World Scientific, Singapore, pag. 245-254 (2008).
- 17) C. Tebaldi, L. Margheriti, D. Grasso, **Bifurcation analysis of sequence of magnetic island equilibria and spontaneous generation of zonal flows**, nel proceeding della conferenza su *ASYMPTOTIC METHODS IN NONLINEAR WAVE PHENOMENA*, 5-7 June, Palermo 2006, edited by T. Ruggeri and M. Sammartino (World Scientific, Singapore, 2007) p.195.
- 16) E. Tassi, P.J. Morrison, D. Grasso, **Hamiltonian structure of a collisionless reconnection model valid for high and low beta plasmas**, in G. Bertin, R. Pozzoli, M. Romè and K. R. Sreenivasan editors, *Collective phenomena in macroscopic systems*, pages 197-206, World Scientific, 2007.
- 15) F. Porcelli, G. Bateman, L.-G. Eriksson, D. Grasso, J. Graves, T. Hellesten, G. Huysmans, T. Johnson, A. Kritz, H. Lutjines, M.-L. Mayoral, M.F. Nave, C.N. Nguyen. A. Pankin, A. Perona, S.D. Pinches, P. Sandquist, O. Sauter, S. Sharapov, I. Voitsekhovich, F. Zonca, contributors to JET-EFDA and to the European Task Force on Integrated Modelling Activity, **Integrated Modelling of Sawtooth Oscillations in Tokamak**

- Plasmas**, Proceedings (8 pag) of the *21st IAEA Fusion Energy Conference* (16-21 October, 2006), Chengdu, China (published in May 2007).
- 14) F. Pegoraro, D. Borgogno, F. Califano, D. del Sarto, E. Echkina, D. Grasso, T. Liseikina, F. Porcelli, **Developments in the theory of collisionless reconnection in magnetic configurations with a strong guide field**, *Alfvén 2004 Workshop on Space Environment Turbulence*, invited talk (10 pag.), April 19-23, Beaulieu-sur-Mer, 2004.
- 13) D. Borgogno, F. Califano, D. Farina, D. Grasso, F. Pegoraro, F. Porcelli, **3D effects on collisionless magnetic reconnection**, *30th EPS Conference on Controlled Fusion and Plasma Physics*, St. Petersburg, 7-11 July 2003, ECA Vol. 27A, P-2.7.
- 12) D. Grasso, M. Ottaviani, F. Porcelli **Stabilization of drift tearing modes**, *Joint Varenna-Lausanne International Workshop on Theory of Fusion Plasmas*. SIF Conference Proceedings ISPP-18, pagg. 45-58, Bologna, 2002.
- 11) D. Grasso, F. Califano, F. Pegoraro, F. Porcelli, **Phase mixing and magnetic reconnection**, in *28th EPS Conference on Controlled Fusion and Plasma Physics*, Funchal, 18-22 June 2001, ECA Vol. 25A, P4.102.
- 10) D. Grasso, M. Ottaviani, F. Porcelli, **Linear and nonlinear behavior of drift-tearing modes**, in *28th EPS Conference on Controlled Fusion and Plasma Physics*, Funchal, 18-22 June 2001, ECA Vol. 25A, P5.031.
- 9) D. Grasso, M. Ottaviani, F. Porcelli, **Nonlinear diamagnetic effects on the evolution and the saturation of drift tearing modes**, *Joint Varenna-Lausanne International Workshop on Theory of Fusion Plasmas*, oral talk, **paper P6** (6 pag.) Varenna, Italy, August 28 - September 1, 2000.
- 8) F. Porcelli, A. Airoidi, C. Angioni, A. Bruschi, P. Buratti, F. Califano, S. Cirant, I. Furno, D. Grasso, E. Lazzaro, A. A. Martynov, M. Ottaviani, F. Pegoraro, G. Ramponi, E. Rossi, O. Sauter, C. Tebaldi, O. Tudisco, **Macroscopic coherent magnetic islands**, **paper th3<sub>1</sub>** oral invited presentation (8 pag.), *18th IAEA Fusion Energy Conference* Sorrento, Italy, October 4-10, 2000.
- 7) F. Pegoraro, D. Grasso, F. Califano, F. Porcelli, **Nonlinear collisionless magnetic field line reconnection in plasmas**, *20th Summer School and International Symposium on the Physics of Ionized Gases (SPIG)*, invited talk (18 pag.) Zlatibor, Yugoslavia, September, 2000.
- 6) D. Grasso, F. Califano, F. Pegoraro, F. Porcelli, **Long term evolution of magnetic reconnection processes**, *27th EPS Conference on Controlled Fusion and Plasma Physics*, **paper P1.015** (4 pag.) Budapest, 12-16 June 2000 ECA Vol. 24B P1.015.
- 5) D. Grasso, F. Califano, F. Pegoraro, F. Porcelli **Collisionless magnetic reconnection**, *26th EPS Conference on Controlled Fusion and Plasma Physics*, Maastricht, 14-18 June 1999, ECA Vol. 23J P3.061.
- 4) F. Porcelli, F. Califano, D. Grasso, M. Ottaviani and F. Pegoraro Saluzzi, **Collisionless magnetic reconnection**, *Joint Varenna-Lausanne International Workshop on Theory of Fusion Plasmas*. SIF Conference Proceedings ISPP-18, pagg. 269-282, Bologna, 1998.
- 3) D. Grasso, F. Califano, F. Pegoraro, F. Porcelli, **Nonlinear regimes in collisionless magnetic reconnection** in *25th EPS Conference on Controlled Fusion and Plasma Physics*, Praha, June 29 - July 3, 1998, ECA Vol 22C H021.
- 2) E. Cafaro, D. Grasso, F. Pegoraro, F. Porcelli, A. Saluzzi, **Finite temperature effects on collisionless magnetic reconnection**, in *24th EPS Conference on Controlled Fusion and Plasma Physics*, Berchtesgaden, June 9-13 1997 ECA Vol. 21A Part III, p. 1353-1357.
- 1) E. Cafaro, D. Grasso, F. Pegoraro, F. Porcelli, A. Saluzzi, **Finite larmor radius effects on nonlinear collisionless magnetic reconnection**, *Joint Varenna-Lausanne International Workshop on Theory of Fusion Plasmas*. SIF Conference Proceedings ISPP-17, pagg. 453-458 Bologna, 1996.

## Invited and contributed talks at international conferences

- 15) Daniela Grasso, **Magnetic reconnection in inertial regimes**, invited talk at the *IAGA2 - 2009 conference on "Solar Wind-Space Environment Interaction"*, Cairo, Egypt, 4-9 December, 2009.
- 14) Daniela Grasso, **Magnetic reconnection in collisionless regimes**, guest lecturer at the *International Workshop on the Frontiers of Modern Plasma Physics*, ICTP, Trieste, Italy, 14-25 July, 2008
- 13) Daniela Grasso, **Nonlinear aspects of magnetic reconnection in collisionless regimes** invited talk at the *7th International Workshop on Nonlinear Waves and Turbulence in Space Plasmas*, Beaulieu sur mer, France, April 21-25, 2008.
- 12) Daniela Grasso, **Collisionless magnetic reconnection** invited talk at the *1st Niles International Workshop on Lasers and Plasmas* joined with the **10th Easter Plasma Meeting** Cairo, Egypt, March 16-18, 2008.
- 11) Daniela Grasso, **Single versus multiple helicity reconnection in fusion relevant plasmas** invited talk at the *48th Annual Meeting of the APS Division of Plasma Physics*, Philadelphia, Pennsylvania, October 30-November 3, 2006.
- 10) Daniela Grasso, **Magnetic reconnection**, invited talk at the *First Australian-Italian Workshop on Statistical Physics*, Gold Coast, AUS, February 12-15, 2006.
- 9) Daniela Grasso, **3D magnetic reconnection**, invited talk at the *8th International Workshop on the Interrelationship between Plasma Experiments in Laboratory and Space*, Tromsø, Norway, July 4-8, 2005 ).
- 8) Daniela Grasso, **Collisionless magnetic reconnection**, contributed talk at the *18th International Conference on Numerical Simulation of Plasmas*, Cape Cod, MA, USA, September 7-9, 2003.
- 7) D. Grasso, M. Ottaviani, F. Porcelli **Stabilization of drift tearing modes**, contributed talk at the *Joint Varenna-Lausanne International Workshop on Theory of Fusion Plasmas*. Varenna, Italy, 27-30 August, 2002.
- 6) Daniela Grasso, **Women: the other half of the atom**, invited talk at the round table on "Condizione delle donne nella Scienza" during the *Congresso Nazionale per la Fisica della Materia*, Bari, Italy, 24-28 June, 2002.
- 5) D. Grasso, M. Ottaviani, F. Porcelli, **Linear stability and nonlinear behavior of drift-tearing modes** invited talk at the *9th Fusion Theory Conference*, Elsinore, Denmark, 17-19 October, 2001.
- 4) D. Grasso, F. Califano, F. Pegoraro, F. Porcelli, **Magnetic reconnection and phase mixing**, invited talk at the *Congresso Nazionale per la Fisica della Materia*, Roma, Italy, 18-22 June, 2001.
- 3) Daniela Grasso, contributed talk on the research activity of the plasma physics group of the Politecnico di Torino at the *Congresso Nazionale sulla Fisica del Plasma in Italia*, Cetraro, Italy, September 20-23, 2000.
- 2) Daniela Grasso, **Collisionless reconnection** , invited talk at the *1999 Turin Easter Meeting on Nonlinear Phenomena in Fluids and Plasmas*, Torino, Italy, April 7-9, 1999.
- 1) D. Grasso, F. Pegoraro, F. Porcelli, E. Cafaro, A. Saluzzi, **Hamiltonian model of magnetic reconnection**, invited talk at the *Russian Italian Workshop on: Nonlinear Processes in Astrophysical and Laboratory Plasma*, Zvenigorod, Russia, 24-27 Febbraio, 1998.