

MASSIMO MATERASSI'S CURRICULUM VITÆ

February 18, 2015

Contents

1	Personal Information	2
2	Research interests	2
2.1	Fundamental Physics: irreversibility	2
2.2	Space Physics: complexity in near-Earth plasma	3
2.3	Mathematical ecology	3
3	Attributions and education	3
4	Academic and research references	4
5	Scientific collaborations	5
6	Operative projects	5
7	Publications	6
7.1	Refereed papers on journals	6
7.2	Books	9
7.3	Internal CNR reports	9
7.4	Proceedings	10
7.5	Oral and poster presentations	12
7.6	International school and university lectures	15
7.7	Preprints	15
8	Batchelor students	15
9	Work experience	16

1 Personal Information

Name: Massimo Materassi.

Nationality: Italian.

Date and place of birth: April 27, 1970, Florence (ITALY).

Languages:

Italian: native speaker. English: fluent. Latin: school knowledge. Elements of Polish, Spanish and Russian.

Affiliation:

Istituto dei Sistemi Complessi del Consiglio Nazionale delle Ricerche (Institute for Complex Systems of the National Research Council), ISC-CNR, webpage: www.isc.cnr.it. Personal webpage: www.massimomaterassi.it.

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2 Research interests

Due to my theoretical background, I always approach my work trying to unveil and exploit the underlying symmetries of the dynamics governing the system at hand.

2.1 Fundamental Physics: irreversibility

If the fundamental interactions of Nature may be cast into an Action Principle framework, i.e. if the fundamental forces are “conservative” ones, why should dissipation and irreversibility characterize every macroscopic physical system?

What are the “fundamental motivations” for entropy to enter the play?

Can the answers to such questions “explain” the phenomena of complexity, life and evolution in terms of the “traditional” tools of theoretical physicists?

Topics:

- *Metriplectic algebra.*
- *Stochasticity in the dynamics of continua.*
- *Information theory in dynamics.*

2.2 Space Physics: complexity in near-Earth plasma

The Sun-Earth interaction determines the dynamics of the near-Earth plasma as a complex system, organized in “spheres” communicating through “pauses”.

What are the causal relationships between the different phenomena taking place in this environment? To which extent can the ionospheric effects be predicted observing the Solar Wind or the near-Earth space?

How can the ionospheric turbulence be characterized and what can its effects on radio communication teach on its local dynamics?

Topics:

- *Space weather and the Sun-Earth connection.*
- *Multifractal formalism for turbulence. Statistical aspects of multi-scale dynamics in turbulence.*
- *Magnetic reconnection.*
- *Ionospheric turbulence and radio scintillation.*
- *Ionospheric remote sensing and tomography.*

2.3 Mathematical ecology

Ecology gives scientists the chance to observe systems formed by highly interacting sub-systems at an energy and size scale very far from those of fundamental Physics and Chemistry processes that apparently determine their evolution. It is of great interest to see to which extent the fundamental tools of Theoretical Physics (dynamical system formalism, analytical mechanics, conservation laws and issues of symmetry) may be of use in this field.

Topics:

- *Prey-predator dynamics with scavenging.*
- *Trophic web dynamics algebrization.*

3 Attributions and education

Referee of: “Annals of Geophysics”, “Advances in Space Research”, “Annales Geophysicæ”, “Journal of Atmospheric and Solar-Terrestrial Physics”, “Radio Science”, “Transactions on Geoscience and Remote Sensing”, “Modern Physics Letters B”, “Nonlinear Science and Numerical Simulation”, “Scientia Iranica”, “Space Weather”, “Journal of Physics A”, “Journal of Geophysical Research”.

December, 2014:

Italian National Delegate to Commission G in URSI (Union Radio-Scientifique Internationale).

November 10, 2014:

Delegate of the Institute for Complex Systems of the National Research Centre in the Outreach Working Group of the CNR Area of Florence.

October 2014:

Member of the Foundation Assembly of the “Space Weather Italian Community (SWICO)”.

October 2011 - November 2012:

Project Manager of the Project “Inter-Satellite & In Situ Plasmaspheric Monitoring and Modelling” (ISIS), ESA Contract 4000103331/11/NL/WE between ESA and ISC-CNR.

From December 28, 2001:

Researcher with permanent position at the Italian CNR Consiglio Nazionale delle Ricerche (National Research Council).

From March 12, 2001:

Qualified teacher of Physics at the Italian State High School (Ministero dell’Istruzione, dell’Università e della Ricerca) with a permanent position.

PhD:

PhD in Theoretical Physics at the University of Perugia (www.unipg.it), obtained on February 14, 2000.

Title of PhD thesis:

Quasi thermal emissions in string theory and Hawking effect.

PhD supervisor: Prof. Giorgio Immirzi, University of Perugia.

Undergraduate:

Università degli Studi di Firenze, Florence (Italy), 1989/90 - 1995/96.

Laurea degree in Physics (roughly equivalent to M.Sc.).

First honour marks, 110/110 *cum laude*, University of Firenze, July 15, 1996.

Title of the M.Sc. thesis:

Variabili canoniche collettive e relative per un campo di Klein-Gordon classico (Canonical collective and relative variables for a classical Klein-Gordon field).

M.Sc. Supervisor: Prof. Giorgio Longhi, University of Florence.

4 Academic and research references

Dr Giuseppe Consolini, Istituto di Fisica dello Spazio Interplanetario, Istituto Nazionale di Astrofisica, via Fosso del Cavaliere 100, I-00133 Roma, Italy, e-mail: giuseppe.consolini@ifsi-roma.inaf.it.

Prof Andrzej W. Wernik, Polska Akademia Nauk, Centrum Badań Kosmicznych, Bartycka 18A, Warsaw (Poland), tel. 0048-22-8403766(379), e-mail: aww@cbk.waw.pl.

Dr Paolo Spalla, retired from Istituto di Fisica Applicata “Nello Carrara”, C.N.R. di Firenze, Sesto Fiorentino, Italy, tel. 0039-349-3516003, e-mail: paolo-horse@gmail.com.

Prof Cathryn C. N. Mitchell, Department of Electric and Electronic Engineering of the University of Bath, BA2 7AY, United Kingdom, tel. +44 (0)1225 386610, e-mail: C.N.Mitchell@bath.ac.uk.

Dr Emanuele Tassi, Centre de Physique Théorique, CNRS, Aix-Marseille Universités, Campus de Luminy, Marseille, France, tel. +33 (0)4-91269512, e-mail: tassi@cpt.univ-mrs.fr.

Prof Giorgio Longhi, Università degli studi di Firenze, via Sansone 1, 50019 Sesto Fiorentino, Italy tel. 0039-055-4572312, e-mail: longhi@fi.infn.it.

5 Scientific collaborations

IAPS-INAF (Dr G. Consolini): aspects of complexity in space plasma dynamics.

CBK-PAN, Poland (Prof A. Wernik, Dr M. Grzesiak): ionospheric scintillation and turbulence.

University of Bath, UK (Dr C. Mitchell, Dr N. Smith): ionospheric scintillation and tomography. Information theory in dynamical systems.

INGV in Roma (Dr G. De Franceschi, Dr P. De Michelis): ionospheric scintillation and space weather, plasma turbulence in the near-Earth space.

CPT-University of Marseille (Dr E. Tassi): dissipative regimes of plasmas and metriplectic framework.

ISC-CNR (Dr S. Focardi): phase space analysis of ecological systems.

6 Operative projects

- “Observing, Modelling And Testing Synergies And Trade-Offs For The Adaptive Management Of Multiple Impacts In Coastal Systems (TETRIS)”, PRIN 2010-2011 - “Research Programmes of National Interest”. Role: *researcher in the node of ISC-CNR Florence*.
- “Inter-Satellite & In Situ Plasmaspheric Monitoring and Modelling (ISIS)”. Cooperating bodies: ISC-CNR, INGV, TAS-I. Role: *Project Manager*.
- “Training Research and Application Network to Support the Mitigation of Ionospheric Threats (TRANSMIT)”. Consortium: University of Nottingham (UoN), UK (Prime); Politecnico di Torino (PoliTo), Italy; Space Research Centre (SRC), Poland; Technical University Berlin (TUB), Germany; University of Bath (UoB), UK; University of Nova Gorica (UNG), Slovenia; University of Zagreb (UoZ), Croatia; German Aerospace Center (DLR), Germany; IEEA, France; INGV, Italy. Role: *scientific advisor and teacher*.
- ITER consortium (International Thermonuclear Experimental Reactor), project involving ISC through the ENEA collaboration with EURATOM, see webpage: <http://www.iter.org/default.aspx>. Role: *researcher*.

- ROSA (Radio Occultation for Sounding the Atmosphere), project of the Italian Space Agency ASI, involving ISC-CNR and IFAC-CNR, webpage: <http://www.asi.it/Rosa/RosaEN/ROSA.htm>. Role: *researcher*.

7 Publications

7.1 Refereed papers on journals

1. Longhi, G., Materassi, M., “A canonical realization of the BMS algebra”, (1999) *Journal of Mathematical Physics*, 40 (1), pp. 480-500. Cited 13 times. (*IF* = 1.085 (2008)).
2. Longhi, G., Materassi, M., “Collective and relative variables for a classical Klein-Gordon field”, (1999) *International Journal of Modern Physics A*, 14 (21), pp. 3387-3420. Cited 4 times. (*IF* = 0.982, 2008).
3. Lusanna, L., Materassi, M., “A canonical decomposition in collective and relative variables of a Klein-Gordon field in the rest-frame Wigner-covariant instant form”, (2000) *International Journal of Modern Physics A*, 15 (18), pp. 2821-2916. Cited 12 times. (*IF* = 0.982, 2008).
4. Materassi, M., “Conformal nature of the Hawking radiation”, (2000) *Journal of High Energy Physics*, 4 (4), pp. XLI-13. (*IF* = 5.375, 2008).
5. De Franceschi, G., Alfonsi, L., Perrone, L., Materassi, M., “Report on the long term trend of the critical frequency of the F2 layer at high latitudes”, (2002) *Acta Geodaetica et Geophysica Hungarica*, 37 (2-3), pp. 297-302.
6. Alfonsi, L., De Franceschi, G., Perrone, L., Materassi, M., “Long-term trends of the critical frequency of the F2 layer at northern and southern high latitude regions”, (2002) *Physics and Chemistry of the Earth*, 27 (6-8), pp. 607-612. Cited 7 times. (*IF* = 1.138, 2008).
7. Materassi, M., Mitchell, C.N., Spencer, P.S.J., “Ionospheric Imaging of the Northern Crest of the Equatorial Anomaly”, (2003) *Journal of Atmospheric and Solar-Terrestrial Physics*, 65 (16-18), pp. 1393-1400. Cited 4 times. (*IF* = 1.667, 2008).
8. Wernik, A.W., Alfonsi, L., Materassi, M., “Ionospheric irregularities, scintillation and its effect on systems”, (2004) *Acta Geophysica Polonica*, 52 (2), pp. 237-249. Cited 2 times [source: Scopus.com, on September 15, 2009]. (*IF* = 0.308, 2008).
9. Materassi, M., Mitchell, C.N., “Imaging of the Equatorial Ionosphere”, (2005) *Annals of Geophysics*, 48 (3), pp. 477-482. Cited 2 times. (*IF* = 0.418, 2008).

10. Materassi, M., Mitchell, C.N., "A Simulation Study into Constructing of the Sample Space for Ionospheric Imaging", (2005) *Journal of Atmospheric and Solar-Terrestrial Physics*, 67 (12 SPEC. ISS.), pp. 1085-1091. Cited 6 times. (*IF* = 1.667, 2008).
11. Yordanova, E., Bergman, J., Consolini, G., Kretzschmar, M., Materassi, M., Popielawska, B., Roca-Sogorb, M., Stasiewicz, K., Wernik, A.W., "Anisotropic scaling features and complexity in magnetospheric-cusp: a case study", (2005) *Nonlinear Processes in Geophysics*, 12 (6), pp. 817-825. Cited 6 times [source: Scopus.com, on September 15, 2009]. (*IF* = 1.022, 2008).
12. Materassi, M., Wernik, A.W., Yordanova, E., "Statistics in the p-model", (2006) *Chaos, Solitons and Fractals*, 30 (3), pp. 642-655. (*IF* = 2.980, 2008).
13. Zapfe, B.D., Materassi, M., Mitchell, C.N., Spalla, P., "Imaging of the Equatorial Anomaly over South America - A simulation study of total electron content", (2006) *Journal of Atmospheric and Solar-Terrestrial Physics*, 68 (16), pp. 1819-1833. Cited 3 times. (*IF* = 1.667, 2008).
14. Materassi, M., Mitchell, C.N., "Wavelet analysis of GPS amplitude scintillation: a case study" (2007) *Radio Sci.*, 42 (1). [Received 27 October 2005; accepted 27 September 2006; published 17 February 2007] Cited 2 times. (*IF* = 0.972, 2010).
15. Materassi, M., Wernik, A., Yordanova, E., "Determining the verse of magnetic turbulent cascades in the Earth's magnetospheric cusp via transfer entropy analysis: Preliminary results", (2007) *Nonlin Processes Geophys*, 14, p. 153. Cited 2 times. (*IF* = 1.314, 2010).
16. Wernik, A.W., Alfonsi, L., Materassi, M., "Scintillation modeling using in situ data", (2007) *Radio Sci.*, 42. Cited 6 times. (*IF* = 0.972, 2010).
17. Materassi, M., Consolini, G., "Magnetic reconnection rate in space plasmas: a fractal approach", (2007) *Physical Review Letters*, 99 (17), art. no. 175002. Cited 1 time. (*IF* = 6.944, 2008).
18. Materassi, M., Consolini, G., "Turning the resistive MHD into a stochastic field theory", (2008) *Nonlinear Processes in Geophysics*, 15 (4), pp. 701-709. (*IF* = 1.022, 2008).
19. Materassi, M., Alfonsi, L., De Franceschi, G., Romano, V., Mitchell, C., Spalla, P., "Detrend effect on the scalograms of GPS power scintillation", (2009) *Advances in Space Research*, 43 (11), pp. 1740-1748. (*IF* = 1.079, 2010).
20. Y. Beniguel, V. Romano, L. Alfonsi, M. Aquino, A. Bourdillon, P. Cannon, G. De Franceschi, S. Dubey, B. Forte, V. Gherm, N. Jakowski, M.

- Materassi, T. Noack, M. Pozoga, N. Rogers, P. Spalla, H. J. Strangeways, E. M. Warrington, A. Wernik, V. Wilken, N. Zernov, “Ionospheric scintillation monitoring and modelling”, *Annals of Geophysics*, **52**, 391 (2009). (*IF* = 0.540, 2010).
21. Barucci, A., L. Noferini, A. Facchini, D. Fanelli, M. Materassi, “Turbulent fluctuations in coherent radar measurements”, *EPL*, **89** (2010) 20006. Doi: 10.1209/0295-5075/89/20006. (*IF* = 2.203, 2008).
 22. Forte B., Materassi M., Alfonsi L., Romano V., De Franceschi G. and Spalla P. (2010), “Optimum parameter for estimating phase fluctuations on transionospheric signals at high latitudes”, *Advances in Space Research*, doi: 10.1016/j.asr.2010.04.033.
 23. Materassi, M., “Stochastic Lagrangian for the 2D Visco-Resistive Magneto-Hydrodynamics”, *Plasma Phys. Control. Fusion* **52** (2010) 075004. (*IF* = 2.299, 2008)
 24. De Michelis, P., G. Consolini, M. Materassi, R. Tozzi, “An information theory approach to storm-substorm relationship”, *Journal of Geophysical Research*, vol. 116, A08225, doi:10.1029/2011JA016535, 2011.
 25. Materassi, M., L. Ciralo, G. Consolini, N. Smith, “Predictive Space Weather: an information theory approach”, *Advances in Space Research* **47** (2011), pp. 877-885, doi:10.1016/j.asr.2010.10.026. (*IF* = 1.079, 2010).
 26. Forte, B., M. Materassi, L. Alfonsi, V. Romano, G. De Franceschi, P. Spalla, “Optimum parameter for estimating phase fluctuations on transionospheric signals at high latitudes”, *Advances in Space Research* **47** (2011) 2188–2193.
 27. Z. T. Katamzi, N. D. Smith, C. N. Mitchell, P. Spalla, M. Materassi, “Statistical analysis of traveling ionospheric disturbances using TEC observations over more than one solar cycle”, *Journal of Atmospheric and Solar-Terrestrial Physics* vol. 74 January, 2012. p. 64-80.
 28. Materassi, M. & Tassi, E. (2012), “Metriplectic Framework for Dissipative Magneto-Hydrodynamics”, *Physica D*, <http://www.sciencedirect.com/science/article/pii/S0167278911003708>, also available as arXiv:1110.4404v1 at xxx.lanl.gov. Published version: *Physica D*, Volume 241, Issue 6, 15 March 2012, Pages 729–734. (*IF* = 1.555, 2010. 5 Years *IF*: 1.857).
 29. Materassi, M. & Tassi, E. (2012), “Algebrizing friction: a brief look at the Metriplectic Formalism”, *Intellectual Archive Journal*, Issue of July 2012, Toronto: Shiny World.
 30. Jeffrey Baumgardner, Joei Wroten, Michael Mendillo, Carlos Martinis, Cesare Barbieri, Gabriele Umbriaco, Cathryn Mitchell, Joe Kinrade, Massimo Materassi, Luigi Ciralo and Marc Hairston, “Imaging space weather

over Europe”, SPACE WEATHER, VOL. 11, 1–10, doi:10.1002/swe.20027, 2013.

31. Materassi M., G. Consolini, N. Smith and R. De Marco, “Information Theory Analysis of Cascading Process in a Synthetic Model of Fluid Turbulence”. Entropy 2014, **16**, 1272-1286. (*IF* = 1.322, 5 Years, 2012).
32. Consolini, G., M. Materassi, M. F. Marcucci, G. Pallochia, “Statistics of Velocity Gradient Tensor in Space Plasma Turbulent Flows”, submitted to Astro Physical Journal.
33. Materassi M., “Metriplectic Algebra for Dissipative Fluids in Lagrangian Formulation”, submitted to Entropy, manuscript code *entropy-71359*.

7.2 Books

1. Vespe F., Perona G., De Cosmo V., Petitta M., Materassi M., Tartaglione N., Zin A., Notarpietro R., Benedetto C., Casotto S., Speranza A., Sutera A., “ROSA - The Italian Radio Occultation Mission Onboard the Indian OCEANSAT-2 Satellite” in “New Horizons in Occultation Research: Studies in Atmosphere and Climate”, editors: Steiner A., Pirscher B., Foelsche U., pp. 263-274, Springer, Berlin (2009), ISBN: 9783642003202.
2. Massimo Materassi, Giuseppe Consolini and Emanuele Tassi (2012). “Sub-Fluid Models in Dissipative Magneto-Hydrodynamics”, “Topics in Magneto-hydrodynamics”, Dr. Linjin Zheng (Ed.), ISBN: 978-953-51-0211-3, InTech, DOI: 10.5772/36022.
Available at:
<http://www.intechopen.com/books/topics-in-magneto-hydrodynamics/sub-fluid-models-in-dissipative-magneto-hydrodynamics>
3. Materassi, M., “Lagrangian Hydrodynamics, Entropy and Dissipation”, accepted for publication in “Hydrodynamics”, editor Harry Edmar Schulz, ISBN: 978-953-51-4126-6, InTech Publications, Reijka (2014).
4. Materassi, M., “The Fluid and the Hairy: Origin, Structure and Morphology of the Earth’s Ionosphere”, going to be published in “Fluid Dynamics”, editor Chaoqun Liu, ISBN: 978-953-51-4126-6, InTech Publications, Reijka (2014).

7.3 Internal CNR reports

1. Materassi M., “Notes on ionospheric ray tomography”, rapporto di ricerca IROE RR/ATM/10.00, Agosto 2000.
2. Materassi M., “A note on diffractive problems affecting occultation reconstructions and a possible fix”, rapporto tecnico IROE TR/ATM/03.01, February 2001.

3. Materassi M., "Study of the Northern Crest of the Equatorial Anomaly via a Multi Instrumental Data Analysis System", rapporto di ricerca IROE RR/ATM/02.01, February 2001.
4. Chiostri R., Materassi M., "Open Lab", rapporto di ricerca IFAC RR/OST/05.02, February 2002.
5. Materassi M., "Matter dynamics' equations in ionospheric physics", internal report IFAC RR/OST/06.02, September 2002.

7.4 Proceedings

1. Materassi M., Mitchell C.N., Spencer P.S.J., "The Application of a Multi-instrument Inversion Technique to Imaging the Northern Crest of the Equatorial Anomaly", EGS 2001, European Geophysical Society General Assembly, Nice 25-30 Marzo 2001.
2. Materassi M., Ciralo L., Spalla P., Mitchell C.N., Spencer P.S.J., "The Effect of the Northern Crest of the Equatorial Anomaly on the Propagation Delay at GPS Frequencies", GNSS 2001, Sevilla 8-11 May 2001.
3. Spencer P.S.J., Mitchell C.N., Meggs R., Ciralo L., Spalla P., Materassi M., "Reducing the ionospheric error for single frequency GNSS users", GNSS2001, Sevilla 8-11 May 2001.
4. Spalla, P., Ciralo L., Materassi M., Mitchell C.N., Spencer P.S.J., "Imaging of ionospheric features over Southern Europe", COST 271, Sopron September 2001.
5. Materassi, M., Mitchell C.N., "Comparing ionospheric vertical profiles from MIDAS inversion and CHAMP inversion", EGS 2002, Nice (France).
6. Materassi, M., Chong C., Mitchell C.N., Spalla P., Spencer P.S.J., "Contributions to ionospheric reconstructions from LEO-GPS measurements", XXVII URSI General Assembly, Maastricht, August 2002.
7. Alfonsi L., Materassi M., Wernik A.W., "Spatial distribution of the irregularity parameters. Preliminary results", COST271 Third workshop "Significant results in COST271 Action: a review" Spetses Island, Greece, Spetses Conference Center, 23-27 September 2003.
8. Alfonsi L., Materassi M., Wernik A.W., "Distribution of scintillation parameters calculated from in-situ data: preliminary results", invited paper at the Atmospheric Remote Sensing using Satellite Navigation Systems, Special Symposium of the URSI Joint Working Group FG 13-15 October 2003 ASI Centro di Geodesia Spaziale "Giuseppe Colombo" Matera, Italy.
9. Materassi M., "Ionospheric tomography, 3D and 4D imaging and data assimilation", invited paper at the Atmospheric Remote Sensing using Satellite Navigation Systems, Special Symposium of the URSI Joint Working

Group FG 13-15 October 2003 ASI Centro di Geodesia Spaziale “Giuseppe Colombo”, Matera, Italy.

10. Materassi M., L. Alfonsi, G. De Franceschi, C. N. Mitchell, V. Romano, P. Spalla, A. W. Wernik, E. Yordanova, “Intermittency and ionospheric scintillations in GPS data”, proceedings of the International Workshop on Applications of Wavelets to Real World Problems (IWW2005), 17-18 July 2005, Istanbul (Turkey), editors: A. H. Siddiqi, S. Alsan, M. Rasulov, O. Oğun, Z. Aslan, Istanbul Commerce University Publications.
11. Materassi M., “Determining the direction of energy transfer in the dynamics of a turbulent plasma medium via Transfer Entropy Analysis”, invited paper at the workshop 08ESSE “Earth-Sun System Exploration: Energy Coupling Within and Between Plasma Regimes”, 14-18 January 2008, Kona, Hawaii, USA.
12. Petitta, M., F. Vespe, G. Perona, V. De Cosmo, R. Guzzi, S. Casotto, R. Notarpietro, M. Materassi, P. Spalla, A. Speranza, A. Sutera, N. Tartaglione and P. Zoccarato, “ROSA on board the Indian OCEANSAT-2 satellite mission: an Italian opportunity”, 2008 IEEE GOLD Remote Sensing Conference proceedings CD, 22,23 May 2008 ESA-ESRIN Frascati, Rome, Italy.
13. Materassi, M., G. Consolini, L. Ciraolo, D. Pokhotelov, “Doing Space Weather of small scale ionospheric structures via tools from complex system theory”, XXIX General Assembly of the International Union of Radio Science (Union Radio Scientifique Internationale-URSI), Chicago, August 7-16, 2008.
14. Materassi, M., L. Ciraolo, G. Consolini, “Predictive Space Weather through Information Theory”, 2nd International Colloquium – Scientific and Fundamental Aspects of the Galileo Programme, 14-16 October 2009, University of Padova, Padua, Italy.
15. Wernik, A. W., M. Grzesiak, M. Materassi, “Scintillation measurements as a means for diagnosis of ionospheric plasma turbulence”, in “Proceedings of the URSI 2nr International Symposium in Radio Systems and Space Plasma”, Sofia, Bulgaria, 25-27 August, 2010.
16. Materassi, M., E. Banfi, L. Ciraolo, P. De Michelis, R. Muscinelli, C. Scacchetti, P. Spalla, R. Tozzi, A. Zin, M. Zoppi, “ISIS (Inter-Satellite & In Situ plasmaspheric monitoring and modelling): a unique opportunity of studying the Earth’s plasmasphere via the European GNSS satellite system”, Proceedings of the 3rd International Colloquium on Scientific and Fundamental Aspects of the Galileo Program, August 31 - September 2, 2011, Copenhagen (Denmark).

7.5 Oral and poster presentations

1. Materassi, M., “Transfer entropy analysis of the magnetic turbulence in the Cusp: preliminary results”, invited talk given at Istituto di Fisica dello Spazio Interplanetario, Rome, on July 13, 2006.
2. Materassi, M., “Irregolarità nel plasma elio-geospaziale e modello frattale di riconnessione magnetica”, ISC-CNR weekly seminar, Sesto Fiorentino, March 27th, 2007.
3. Materassi, M., L. Alfonsi, G. De Franceschi, V. Romano, “Strutture ionosferiche, irregolarità e scintillazione: nuove campagne di misura e nuove tecniche di analisi”, Convegno Nazionale di Fisica della Terra Fluida e Problematiche Affini, 11-15 Giugno 2007, Ischia.
4. Materassi, M., G. Consolini, “Turning the resistive MHD into a stochastic field theory”, oral presentation at the Alfvén 2007 Workshop, Warsaw, September 17-21, 2007.
5. Materassi, M., L. Alfonsi, G. De Franceschi, C. N. Mitchell, V. Romano, P. Spalla, “Detrend effect on the scalograms of GPS amplitude scintillations”, EGU 2007 - Wien, April 18th, 2007.
6. Alfonsi, L., M. Materassi, M. Pożoga, V. Romano, A.W. Wernik, “High-latitude ionospheric scintillation modelling based on satellite in situ data”, IUGG 2007, Perugia.
7. Materassi, M., G. Consolini, “A fractional calculus approach to Magnetic Reconnection process in space plasmas”, poster presented at the XXIII IUPAP International Conference on Statistical Physics.
8. Materassi M., “Determining the direction of energy transfer in the dynamics of a turbulent plasma medium via Transfer Entropy Analysis”, invited paper at the workshop 08ESSE “Earth-Sun System Exploration: Energy Coupling Within and Between Plasma Regimes”, 14-18 January 2008, Kona, Hawaii, USA.
9. Materassi, M., A. W. Wernik, L. Alfonsi, “The WAM scintillation model: overview and applications to ionospheric studies”, Ionospheric scintillations: scientific aspects, space weather application and services, 20-22 February, 2008 (Nottingham, UK).
10. Materassi, M., “Use of ROSA data in Space Weather”, invited talk at the XXIX General Assembly of the International Union of Radio Science (Union Radio Scientifique Internationale-URSI), Chicago, August 7-16, 2008.
11. Materassi, M., G. Consolini, L. Ciruolo, D. Pokhotelov, “Doing Space Weather of small scale ionospheric structures via tools from complex system theory”, XXIX General Assembly of the International Union of Radio

Science (Union Radio Scientifique Internationale-URSI), Chicago, August 7-16, 2008.

12. Materassi, M., G. Consolini, “Modello frattale di riconnessione magnetica”, informal talk given to the Burning Plasma Research Group, Torino, November 24, 2008.
13. De Michelis, P., G. Consolini, M. Materassi, R. Tozzi, “An information theory approach to storm-substorm relationship”, poster for the 2008 AGU Fall Meeting.
14. Consolini, G., M. Materassi, “On velocity gradient tensor in space plasma turbulent flows: a case study”, poster for the 2008 AGU Fall Meeting.
15. Materassi M., G. Consolini, “An Information Theory Approach to Cross-Scale Coupling in Turbulent Plasmas”, poster for the Workshop on Cross-Scale Coupling in Plasmas, Università della Calabria, Rende (Cosenza) - Italy, March 9-11, 2009.
16. M. Materassi, L. Ciraolo, G. Consolini, P. De Michelis, R. Tozzi, “On the use of tools from Complexity Science for Space Weather”, talk presented at the first workshop of the COST Action ES0803, Frascati April 1-3, 2009.
17. Forte, B., M. Materassi, L. Alfonsi, V. Romano, P. Spalla, G. De Franceschi, “Analysis of GPS measurements of ionospheric scintillation during the International Heliophysical Year”, contribution submitted to the EGU2008 General Assembly, Vienna, Austria, 13 – 18 April 2008, website: <http://meetings.copernicus.org/egu2008/>.
18. Biagio F., M. Materassi, L. Alfonsi, V. Romano, P. Spalla, and G. De Franceschi, “Analysis of GPS measurements of ionospheric scintillation at high latitudes”, EGU 2009 - Wien, April 19th-24th, 2009.
19. Materassi, M., “Something new on scintillation: the multi-scale et al.”, invited talk presented at the MEETING OF THE SCAR ACTION GROUP “GPS FOR WEATHER AND SPACE WEATHER FORECAST”, Istituto Nazionale di Geofisica e Vulcanologia, Rome, 10-11 September 2009.
20. Materassi, M., “Aspects of Complexity in the Geospace Plasmas”, invited talk presented at the Centre du Physique Theorique of CNRS in Marseille (France) on September 30, 2009.
21. Materassi, M., L. Ciraolo, G. Consolini, “Predictive Space Weather through Information Theory”, poster presentation at the 2nd International Colloquium – Scientific and Fundamental Aspects of the Galileo Programme, 14-16 October 2009, University of Padova, Padua, Italy.
22. Materassi, M., “Aspects of Complexity in the Geospace Plasmas”, invited talk presented at the Centre du Physique Theorique of CNRS in Marseille (France), C.P.T., September 30, 2009.

23. Materassi, M., “Dealing with Plasma Irregularities in the Fluid Approach”, invited talk presented at the International Workshop ”Approches Hamiltoniennes de la physique d’ITER”, CIRM, Marseille (France), November 2-6, 2009.
24. Materassi, M., “The Smooth and the Irregular: New Routes in Ionospheric Modelling”, splinter session of the meeting “Sixth European Space Weather Week”, 16-20 November, 2009 - Brugge, Belgium.
25. Materassi, M., “Aspects of Complexity in the Geospace Plasmas”, invited talk presented at the first Meeting of the ISSI Group ”Dispersive cascade and dissipation in collisionless space plasma turbulence – observations and simulations”, ISSI Bern, April 20, 2010.
26. Materassi, M., “Stochastic Lagrangian for the 2D Visco-Resistive Magneto-Hydrodynamics”, poster presented at the 2010 European Geosciences Union General Assembly 2010, Vienna, Austria, 02 – 07 May 2010.
27. Barucci, A., L. Noferini, A. Facchini, D. Fanelli, M. Materassi, “Turbulent fluctuations in coherent radar measurements”, poster presented at the 2010 European Geosciences Union General Assembly 2010, Vienna, Austria, 02 – 07 May 2010.
28. De Michelis, P., G. Consolini, M. Materassi and R. Tozzi, “On the Storm-Substorm Relationship: an Information Theory Approach”, poster presented at the 2010 European Geosciences Union General Assembly 2010, Vienna, Austria, 02 – 07 May 2010.
29. Materassi, M., G. Consolini, N. Smith, “Mutual Information and Dynamics”, talk presented at the conference “Chaos 2010”, June 1-4, 2010 - Chania (Greece).
30. Consolini, G., P. De Michelis and M. Materassi, “Nonlinearity, Coupling and Non-stationarity in Magnetospheric Fast Processes”, invited talk at the Earth-Sun System Exploration, variability in space plasma phenomena, January 16-21, 2011, Kona, Hawaii, USA.
31. Materassi, M., E. Banfi, L. Ciruolo, P. De Michelis, R. Muscinelli, C. Scacchetti, P. Spalla, R. Tozzi, A. Zin, M. Zoppi, “ISIS (Inter-Satellite & In Situ plasmaspheric monitoring and modelling): a unique opportunity of studying the Earth’s plasmasphere via the European GNSS satellite system”, invited presentation at the 3rd International Colloquium on Scientific and Fundamental Aspects of the Galileo Program, Copenhagen, August 31, 2011.
32. Materassi, M., “Information Theory and Space Weather”, invited lecture at the “First European School on fundamental processes in space weather: a challenge in numerical modeling”, Spineto (Siena, Italy), June 5-9, 2012.

33. Materassi, M., “Local topology, multi-scale interactions and stochasticity in space plasma physics”, poster presented at the American Geophysical Union Fall Meeting AGU2014, December 15-19 2014, San Francisco, USA.

7.6 International school and university lectures

1. Materassi, M., “Origin, Structure and Morphology of the Ionosphere”, invited lecture at the Summer School “Underlying causes of ionospheric effects on radio wave propagation”, 19th - 22nd September 2011, Warsaw (Poland).
2. Materassi, M., “Information Theory and Space Weather”, invited lecture given on June 9, 2012, at the “First European School on: fundamental processes in space weather: a challenge in numerical modeling”, 4-9 June 2012 Spineto, Tuscany, Italy, organized by SWIFF Co-organizer: CINECA, COST Action ES0803 Supported by: Spineto Studi, INAF, Dip. Fisica Pisa, webpage:
http://www.df.unipi.it/~califano/SWIFF_School/EU_School_on_Space_Weather.html.

7.7 Preprints

1. Materassi M., M. Ulivi, “Progetto per la costituzione del centro di divulgazione della cultura scientifica a Sesto Fiorentino”, arXiv:physics/9905023.
2. Materassi M., “Polyakov’s string classical mechanics”, arXiv:hep-th/9905028.
3. Materassi M., “Conformal nature of the Hawking radiation”, arXiv:hep-th/0002258.
4. Barucci A., G. Macaluso, D. Mecatti, L. Noferini, D. Fanelli, A. Facchini, M. Materassi, M. Pieraccini, C. Atzeni, “Universal fluctuations in tropospheric radar measurements”, arXiv:1002.3276.
5. Materassi M., E. Tassi, “Metriplectic Framework for Dissipative Magneto-Hydrodynamics”, arXiv:1110.4404.
6. Materassi M., “Metriplectic Algebra for Dissipative Fluids in Lagrangian Formulation”, arXiv:1409.6542 [physics.flu-dyn].

8 Batchelor students

1. Giulio Mariani (2013, Università di Firenze), “Fluidodinamica dei sistemi frattali” (Fluid Dynamics of Fractal Systems).
2. Lorenzo Maffi (2014, Università di Firenze), “Sistemi trofici e biforcazioni” (Trophic Systems and Bifurcations).

9 Work experience

From September 2007

Lecturer of General Physics at the University of Florence, in the Faculty of Engineering.

From June 2004

Affiliated to the "Istituto dei Sistemi Complessi" of the National Council of Researches (ISC-CNR).

From June 2004 to December 2004

Post-doc scholarship in the European Research Training Network "Turbulent Boundary Layers in Geospace Plasmas" at the Space Research Center of the Polish Academy of Sciences (CBK-PAN), Bartycka 18A, Warsaw (Poland).

From December 28, 2001

Researcher at the Istituto di Fisica Ricerca Onde Elettromagnetiche "Nello Carrara" in Florence (<http://www.ifac.cnr.it>), C.N.R. (National Research Council).

2001

Teacher of Physics at the Italian State High School (permanent position winner).

2000

Office worker at the Town Administration of Sesto Fiorentino, at the Town-planning Office (Ufficio Assetto del Territorio).

Post-doc scholarship in "Variability of Ionosphere" at the former Istituto Ricerca Onde Elettromagnetiche "Nello Carrara" in Florence (now Istituto di Fisica Applicata "Carrara").

1998

Co-author of the project: CDCS "Centro per la Divulgazione della Cultura Scientifica" (Center for the Scientific Culture Divulcation) in Sesto Fiorentino.

Member of the XX State Examining Board at the High School "Enriques", Castelfiorentino (Firenze).

1997

Teacher of Physics at the Florence private school C.E.P.U., via San Gallo 103, 50100 Firenze (Italy), tel. 39-055-474960.

Organization assistant at the "VII Settimana della Cultura Scientifica" (Seventh Scientific Culture Week) of the University of Florence.