

Renato Vitolo

Curriculum vitae et studiorum

Personal data

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Marital status: Married, one daughter (30/9/2003).
Birth: Perugia (IT), 27th July 1971.
Age: 35.
Citizenship: Italian.

Current position

Research contract with the Department of Mathematics and Informatics of the University of Camerino. Research director: Antonio Speranza.

Previous positions

October 2004–September 2006 Post-doctoral fellowship at the Department of Mathematics and Informatics of the University of Camerino. Research title: “Extreme value statistics in dynamical systems of intermediate dimensionality for the simulation of atmospheric circulation”. Research director: Antonio Speranza.

March 2004–September 2004: Research contract with the department of Mathematics and Informatics of the University of Camerino, under the direction of Prof. Luciano Misici and Riccardo Piergallini, concerning the simulation of fluid dynamical systems based on Lattice Boltzmann methods.

September 1998–September 2003: “Assistent in Opleiding” (PhD student) at the department of Mathematics of the Rijksuniversiteit Groningen.

January 1998–September 1998: Fellowship of the INdAM (Istituto Nazionale di Alta Matematica Francesco Severi – Roma, IT).

Education

20/10/2003: PhD in Mathematics, Rijksuniversiteit Groningen.

Research directors: Prof.dr. H.W. Broer (Univ. Groningen), Prof.dr. F. Takens (Univ. Groningen), Prof.dr. C. Simó (Univ. Barcelona UB, Spain). Title of the thesis:

Bifurcations of attractors in 3D diffeomorphisms
A study in experimental Mathematics

11/12/1997: Degree in Mathematics, Università degli studi di Camerino, graduation with honours.

1990: Secondary school, Liceo scientifico G. Antinori, Camerino, graduation with honours.

Research

Dynamical systems depending on parameters, in particular ordinary differential equations and iterated mappings. Bifurcations and strange attractors from both theoretical and applied/numerical viewpoint.

Applications of dynamical systems theory to climatological models of low and intermediate dimensionality. Variability at low frequencies.

Statistical inference of extreme value models (GEV, GPD, point process) on time series of atmospheric models and observed records.

Numerical simulation of physical systems on PC clusters of Beowulf type, under the Linux operating system using MPI libraries in C, Fortran77 and Python.

Computing and programming skills

Excellent knowledge of C and Fortran77. Good knowledge of Python, C++, Pascal, R and Matlab.

Part of my research work consists of numerical simulations on (clusters of) PC programmed in C, Fortran77, Python, and MPI libraries for parallel algorithms.

Excellent knowledge of the Linux operating systems (Debian, Gentoo). I have installed and take care of the maintenance of a 4 PC and an 8 PC cluster at the department of Mathematics and Informatics of the University of Camerino.

I am webmaster of the PASEF site: www.unicam.it/matinf/pasef/.

Languages

English (fluent), Dutch (fluent), Spanish (fluent), French (basic), Catalan (basic), Italian (native).

Publications

See <https://unicam.it/~renato.vitolo/publications.html>.

Journal articles

1. M. Felici, V. Lucarini, A. Speranza, R. Vitolo: Extreme Value Statistics of the Total Energy in an Intermediate Complexity Model of the Mid-latitude Atmospheric Jet. Part II: trend detection and assessment, to appear in *J. Atmos. Sci.* (2007).
Preprint mp_arc # 06-357.
2. M. Felici, V. Lucarini, A. Speranza, R. Vitolo: Extreme Value Statistics of the Total Energy in an Intermediate Complexity Model of the Mid-latitude Atmospheric Jet. Part I: Stationary case, to appear in *J. Atmos. Sci.* (2007). Preprint mp_arc # 06-9, and ArXiv, DOI:physics/0601081,
3. H.W. Broer, C. Simó, R. Vitolo: Bifurcations and strange attractors in the Lorenz-84 climate model with seasonal forcing, *Nonlinearity* **15** no. 4 (2002), 1205–1267.

Book chapters

4. V. Lucarini, A. Speranza, R. Vitolo, Self-Scaling of the Statistical Properties of a Minimal Model of the Atmospheric Circulation, in *20 Years of Nonlinear Dynamics in Geosciences*, Eds. J. Elsner, A. Tsonis, Springer (New York, USA) (2006).

Conference Proceedings (with review)

5. H.W. Broer, C. Simó, R. Vitolo: Quasi-periodic Hénon-like attractors in 3D diffeomorphisms, *Proceedings ENOC 2005*.
6. L. Misici, S. Palpacelli, R. Piergallini, R. Vitolo: Lattice Boltzmann model for coffee percolation, *Proceedings IMACS 2005*.
7. H.W. Broer, C. Simó, R. Vitolo: Quasi-periodic Hénon-like attractors in the Lorenz-84 climate model with seasonal forcing, *Proceedings Equadiff 2003*.

Preprints

8. H.W. Broer, R. Vitolo: Dynamical systems modeling of low-frequency variability in low-order atmospheric models, submitted (2006).
9. V. Lucarini, A. Speranza, R. Vitolo: Physical and Mathematical Properties of a Quasi-Geostrophic Model of Intermediate Complexity of the Mid-Latitudes Atmospheric Circulation, submitted (2006).
Preprint mp_arc # 05-401 and ArXiv, DOI:physics/0511208.
10. H.W. Broer, C. Simó, R. Vitolo: The Hopf-Saddle-Node bifurcation for fixed points of 3D-diffeomorphisms: a dynamical inventory, preprint (2006).

11. H.W. Broer, C. Simó, R. Vitolo: Chaos and quasi-periodicity in diffeomorphisms of the solid torus, preprint `mp_arc # 05-107` (2005).
12. H.W. Broer, C. Simó, R. Vitolo: The Hopf-Saddle-Node bifurcation for fixed points of 3D-diffeomorphisms: analysis of a resonance ‘bubble’, preprint (2004).

In preparation

13. A. dell’Aquila, M. Felici, P.M. Ruti, A. Speranza, R. Vitolo: Extreme value statistics of atmospheric large-scale properties in present-day and perturbed climate (2006).
14. A. Gonzalez, J. Puig, R. Vitolo: A criterion to decide positiveness of Lyapunov exponents for skew-products (2006).

Technical reports

15. R. Vitolo: Characterization of the “state of the coast” by extreme value analysis of sea level and wave height time series. Report for CADSEALAND Interreg IIIB project (www.cadsealand.net), work package 1.7.

PhD thesis

R. Vitolo: Bifurcations of attractors in 3D diffeomorphisms – A study in experimental Mathematics, Univ. of Groningen (2003).

Conferences and seminars

1. “Parametric smoothness and scaling of the statistical properties of a minimal model of the atmospheric baroclinic jet”, workshop Mathematics in Earth Sciences, November 28- December 1, 2006, Univ. of Groningen (NL).
2. “Smooth dependence on external parameters of the statistical properties of climate models”, 7th International Conference Probability in contemporary mathematical physics, September 7-13, 2006, Lake Sevan, Armenia.
3. “Hopf-saddle-node bifurcation for fixed points of 3D-diffeomorphisms: a computer assisted dynamical inventory”, Carles Simó Fest, international conference for the 60th birthday of Carles Simó, 29/5-5/6/2006, S’Agaró, Spain.
4. “Extreme Value Statistics of the Total Energy in an Intermediate Complexity Model of the Mid-latitude Atmospheric Jet. Part I: Stationary case.”, Universitat de Barcelona, Spain, April 2006.
5. “Smooth Parametric Dependence in a Quasi-Geostrophic Model of Intermediate Complexity of the Mid-Latitudes Atmospheric Circulation”, European Science Foundation Workshop Fluctuations and Dissipation: The new synthesis far from equilibrium, STOCHDYN Programme, 19-21 March 2006, Camerino, Italy.

6. “Bifurcations and strange attractors in the Lorenz-84 climate model with seasonal forcing”, *ENOC 2005*, Eindhoven (NL), August 2005.
7. “Meteorologie, wiskunde en chaos”, in the series *Studium Generale*, Univ. Groningen, January 2004.
8. “Quasi-periodic Hénon-like attractors in the Lorenz-84 climate model with seasonal forcing”, *Equadiff 2003*, Hasselt (BE) 22–26th July 2003.
9. “Bifurcations and strange attractors in the Lorenz-84 climate model with seasonal forcing”, univ. Austin (Texas), November 2002.
10. “Hénon-like strange attractors in a family of maps of the cylinder” univ. Austin (Texas), November 2002.
11. “The Lorenz-84 climate model with seasonal forcing”, univ. Utrecht (NL).
12. “Bifurcations and strange attractors in the Lorenz-84 climate model with seasonal forcing”, at the “School and Workshop on Dynamical Systems”, Abdus Salam centre for theoretical physics, Trieste, 30th July – 17th August 2001.
13. “The Lorenz-84 climate model with seasonal forcing”, poster presented at the “Workshop on Global Analysis of Dynamical Systems”, Lorenz Center, Leiden (NL), 24–29th June 2001.

Scientific visits

1. September–December 1999: Prof.dr. Carles Simó, Univ. Barcelona UB.
2. 2000-2006: several short visits at Univ. Barcelona (UB).
3. 2003-2006: several short visits at Univ. Groningen (RUG).
4. November 2002: Prof. Rafael de la Llave, Univ. Texas at Austin (USA).

Fellowships

1993/1994: ERASMUS fellowship at the University of Groningen.

1998: C.N.R. scholarship.

1997/98: INdAM scholarship (Istituto Nazionale di Alta Matematica Francesco Severi).

Courses and schools

1. **MSMM:** Mediterranean school on mesoscale meteorology, 2nd edition - Mediterranean Cyclones: phenomenological and theoretical aspects, 5-9 June 2006, Alghero, Italy.
2. **MRI Summerschool** Applied Analysis, KAM theory & Mathematical Optics, Univ. Twente, Enschede (NL), 10–14th June 2002.

3. **MRI Summerschool** Hamiltonian Dynamics & Homoclinic Bifurcations, Univ. Twente, Enschede (NL), 11–15th June 2001.
4. **School on Dynamical Systems**, Porto (Portugal), 2–5th May 2000.
5. **International Springschool** on Fundamental Issues of Nonlinear Laser Dynamics, Texel (NL), 16–19th April 2000.
6. **Summer school** Theory and Applications of Hamiltonian Dynamics, C.I.M.E. (Centro Internazionale Matematico Estivo), Cetraro (Cosenza), 1–10th July 1999.
7. **Summer school** on Dynamical Systems, Stochastic, Chaotic and Spatial, Univ. Twente, Enschede (NL), 7–11th June 1999.
8. **Courses followed at the University of Groningen during PhD:**
 - MPI** Minicourse, Dr. A. Meijster, 2001.
 - Architecture and programming of parallel and high performance systems**, Prof.Dr.sc.techn. N. Petkov, 2001.
 - Numerical Analysis 1** , Dr.ir. F. Wubs, 1998/99.
 - Numerical Analysis 2** , Dr.ir. F. Wubs, 1998/99.
 - Dynamical Systems** , Prof.dr. F. Takens, 1998/99.
 - Geometry for Physicists** , Prof.dr. F. Takens, 1998/99.
9. **Courses at INdAM**, Istituto Nazionale di Alta Matematica Francesco Severi, 1997/98:
 - (a) Algebra, Prof. Giandomenico Boffi
 - (b) Complex Analysis, Prof. Marco Abate
 - (c) Real Analysis, Prof. Vittorio Coti Zelati
 - (d) Mathematical Physics, Prof. Mario Pulvirenti
 - (e) Partial Differential Equations, Prof. Alberto Tesei
10. **Summer school** of Mathematics, Scuola Matematica Interuniversitaria, Perugia (IT), August 1997:
 - (a) Complex Analysis, Prof. Kerzman, University of North Carolina;
 - (b) Game theory, Prof. Zamir, Hebrew University of Jerusalem;
11. **Summer school** of Mathematics, Scuola Matematica Interuniversitaria, Perugia (IT), August 1996:
 - (a) Probability, Prof. Billingsley, University of Chicago.
 - (b) Differential Equations of Mathematical Physics Prof. Donato, Università di Messina (IT).
12. **ERASMUS** courses at the University of Groningen, 1993/94:
 - (a) Distribution theory, Prof. Dijkma;
 - (b) Fourier Analysis, Prof. Braaksma;
 - (c) Advanced differential equations and dynamical systems, Prof. Takens and Broer;
 - (d) Linear Analysis, Prof. Thomas.

Other educational activities

1. **Course** “Presenteren in hoor- en werkcolleges” (Presentations in lectures and exercise sessions), COWOG, Univ. of Groningen, November 2000.
2. **Course** “Geven van werkcolleges” (Exercise sessions), COWOG, Univ. Groningen, March 2001.
3. **Course** Persoonlijke effectiviteit (Personal effectiveness) Afd. Mobiliteit en Opleiding, Univ. Groningen, March 2002.

Teaching experience

- 2005-2006:**
- “Programming techniques I and II” (40+40 hours), University of Camerino, detachment of Recanati.
 - “Didactics of Statistics” (30 hours), University of Camerino, SSIS course.
 - “Didactics of data Elaboration” (20 hours), University of Camerino, SSIS course.
- 2004-2005:**
- “Programming techniques I and II” (80 hours), University of Camerino, detachment of Recanati.
 - “Geometric Modelling” (45 hours), Master “Racing Car Engineer”, University of Camerino.
 - Dynamical Systems seminar (organizer), Univ. Camerino.
- 2003-2004:** “Computational Geometry” (computer exercises) course taught by Prof. Riccardo Piergallini.
- 2001:** Co-director of Master thesis “Bifurcations from regular to chaotic behaviour in the Lorenz-84 climate model”, Hanneke Molenaar, Univ. Groningen.
- 1998-2003:** Several exercise courses taught in Dutch at Univ. Groningen.
- Geometry for Physicists, 2002/2003.
 - Statistics, 2002/2003.
 - Dynamical Systems 1, 2002/2003.
 - Introduction to Dynamical Systems, 2001/2002.
 - Perturbation theory, 2001/2002.
 - Geometry for Physicists, 2001/2002.
 - Introduction to Dynamical Systems, 2000/2001.
 - Geometry for Physicists, 2000/2001.
 - Hamiltonian Mechanics, 2000/2001.
 - Function theory 1, 1999/2000.
 - Curves and Surfaces 2, 1999/2000.
 - Numerical Analysis 1, 1999/2000.

- Perturbation theory, 1999/2000.
- Mathematics 1 for Physics and Astronomy, 1998/1999.
- Function theory 1, 1998/1999.

Other interests

Mountain hiking.
Languages.

Camerino, December 11th, 2006

Renato Vitolo

Referees

Prof. Antonio Speranza
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For didactic activities at the University of Camerino:

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