

ANTONELLO PASINI
Climate change scientist

CNR – Institute of Atmospheric Pollution Research, via Salaria km 29,300, 00015 Monterotondo
Stazione (Rome)

Date of birth: 28 January 1960

Nationality: Italian

Languages: Italian: mother tongue; English: fluent; Spanish: good knowledge.

Tel.: +3906 90672274; **Fax:** +3906 90672660

email: pasini@iia.cnr.it

website: www.iia.cnr.it/index.php?option=com_content&view=article&id=86&Itemid=92&lang=it

blog: <http://pasini-lescienze.blogautore.espresso.repubblica.it/>

EDUCATION

1985 **Italian Laurea in Physics** (emphasis: Theoretical Physics), Department of Physics, University of Bologna, Italy. Supervisor: S. Bergia (full Professor of Relativity). Grade: Summa cum Laude.

1986 **Specialization in Theoretical Physics**, Department of Physics, University of Bologna, Italy. Supervisor: S. Bergia.

1990 **Specialization in Physics of the Atmosphere and Meteorology**
Recognised by the World Meteorological Organisation, Italian Meteorological Service (IMS), Rome, Italy. Supervisors: M. Capaldo (Head of IMS) and C. De Simone (Director of the Centre for Aeronautical Meteorology and Climatology, IMS). Grade: Summa cum Laude.

EMPLOYMENT

1999-present **Researcher, Institute of Atmospheric Pollution Research (IIA), National Research Council – Rome, Italy**

At present **Leader** of the IIA Research Area “Atmospheric modelling at regional and global scales”

2000-present **Project leader** of several projects and research lines on the development and application of models to the study of the atmospheric boundary layer and climate change

2008-2009 **School Director** organized and taught two International Summer Schools on *Climate changes in the Mediterranean area, University of Enna, Italy*

2005-2009 **Participant** to many projects financed to the Institute of Atmospheric Pollution Research of CNR *on meteorological influences on pollution and air quality*

2001 **Course Director** organized and taught a course on *Environmental Meteorology, CNR, Rome 1988*

- 1988-1999 **Research Officer** *Research Officer, Italian Air Force Meteorological Service – Italy.* In all this period I have been invested with many responsibilities, especially as far as activities of research and development are concerned
- 1997-1999 **Focal Point** *Scientific Collaboration with the Galileo National Telescope, Canary Islands*
- 1996-1999 **Focal Point** *Scientific Collaboration with the National Research Council, Institute of Atmospheric Pollution*
- 1996-1998 **Vice-Head** 2nd Regional Meteorological Centre of Rome, Pratica di Mare
and
Division Head *Analysis, Forecasts and Research Service*

COMMITTEES, ROUNDTABLES AND WORKING GROUPS

- 2005-2010 **Artificial Intelligence Applications to Environmental Science**, Committee Member, American Meteorological Society (at the time the only non-American member)
- 2004-2005 **European Cooperation in the field of Scientific and Technical Research, Management Committee**, National Delegate, COST Action 728: *Enhancing Mesoscale Meteorological Modelling Capabilities for Air Pollution and Dispersion Applications*
- 2001-2007 **Several working groups of Ministero Ambiente on pollution and air quality**, Expert Member
- 2000 **Roundtable on Climate Change**, National Delegate, 2nd AOSIS Workshop on *Climate Change Negotiations, Management and Strategy*, Apia, Samoa
- 1998 **12th Session of the Commission for Atmospheric Sciences**, National Delegate, World Meteorological Organisation, Skopje, Macedonia
- 1996-1999 **Working Group on Statistical Methods and Decision Support Systems for Fog and Low Cloud Forecasting**, National Expert, European COST Action 78: *Improvement of Nowcasting Techniques*

ALTRE ESPERIENZE

Speaker, Invited Speaker, Chairman and Session Organiser at many international conferences and congresses

Seminar Lecturer, all around the world and with high frequency in the United States

Author of many scientific papers and three books on climate and climate modelling

Editor and Co-Author of two multi-author books

Leading Scientist and Coordinator for many scientific and editing activities

Collaborator with the Italian financial newspaper “Il Sole 24 ore” with a blog on climate change and its economic and social consequences in its web pages (2007-2012). At present the blog is published on the web pages of the Italian edition of Scientific American (Le Scienze).

AFFILIAZIONI

- European Geophysical Union (EGU)
- American Meteorological Society (AMS)
- Società Italiana per le Scienze del Clima (SISC)
- Società Italiana di Fisica (SIF)
- Società Italiana di REti Neuroniche (SIREN)
- Società Meteorologica Italiana (SMI)

RESEARCH ACTIVITIES AND RESULTS

As a Theoretical Physicist, since the late '80s I began dealing with meteo-climatic modelling, with a particular focus on overcoming the limits shown by dynamical models in local short-range forecasting and global/regional long-range projections.

An expert in the theory of complex systems and artificial intelligence techniques, in recent years my research activity has been focused on climate change. In doing so, I paid a particular attention to the development and application of modelling techniques which are able to complement investigations performed through the classical dynamical climate models (GCMs or RCMs): I focused on neural network modelling and regressive models of Granger causality. The main results obtained in this field are as follows:

- The development and application of a neural network model and a model of Granger causality to attribution studies at the global level permit to univocally determine the major forcings which have been causing the last-century global warming. These kinds of modelling overcomes the criticism that affects GCMs and other dynamical models, and, in a completely independent way, the results clearly show that anthropogenic forcings are the driving causes of recent climate change.
- At regional and local scales, the neural network technique can be applied and results show that it leads to recognising the major circulation patterns that affect climate at these scales. This is crucial for identifying the most important predictors which can permit a reliable downscaling of global/regional models.
- A pioneering study was performed for the analysis of predictability in scenarios of climate change using an extended Lorenz system and both dynamical and neural techniques. The results show an increase in predictability and in the capability of forecasting whether external forcings (such as CO₂ concentration) will increase in the future.
- I have also analysed the impacts of recent climate change on territories (landslides and hydrogeological instabilities) and ecosystems, for instance in a case study concerning Rodents in central Italy. These animals show great sensitivity to changes in meteo-climatic parameters and a neural network model is able to reconstruct their density starting from the values of meteo-climatic variables. Work is in progress to achieve a projection for Rodent density in future climatic scenarios.

In 2009 I edited a multi-author book for Springer, in which the state of the art of artificial intelligence research in environmental sciences is presented.

I was and I am leading scientist of several projects related to the topics previously described. In particular, at present I am leading scientist of a research project whose final goal is goal is to achieve reliable climate projections at the regional/local scale in the Basilicata Region, by means of an adaptive downscaling system.

Previously, I worked out new neural network models for forecasting physical variables in the atmospheric boundary layer, such as meteorological visibility (fog), Radon concentration at the surface and stable layer depth. The latter physical characterisation activity of the boundary layer from natural radioactivity data analysis led to a reliable forecasting technique for air quality estimations in urban sites, especially as far as peak events of pollution are concerned.

Furthermore, I obtained relevant results for a better modelling of atmospheric dynamics and predictability by means of both time-series analysis and the study of low-dimensional models from a differential-geometry point of view.

ACTIVITY OF SCIENCE DIFFUSION AND POPULARIZATION

In the last ten years, I added to my research investigations even an activity of science diffusion and popularization on the topic of climate and climate change. In doing so, I paid a particular attention to the analysis of the characteristic features of climate as a complex system and to the methods adopted by contemporary science for studying its properties and behaviour.

In this framework, in 2003 I published a book of popularization but also epistemologic analysis on meteo-climatic modelling. A revised version was published in 2005 in English.

In 2007 I opened the first Italian blog on climate («Il Kyoto fisso») on the web pages of Il Sole 24 ore, in the framework of the project "Nova 100". Since 2012 this blog has been present of the web pages of Le Scienze (Italian edition of Scientific American). In the meantime I began to collaborate with the printed journal Le Scienze with a section of news on climate.

In the meantime, in 2006 I edited a popular-science multi-author book on observed and projected climate changes and their impacts in the Mediterranean basin.

In 2010 my last popular-science book (written in collaboration with L. Fiorani) has been published. The topic of this book concerns the climate debate on media.

In this period I wrote many papers on magazines and newspapers. I was consultant for RAI (Italian public television), sector Educational, for several television programs of popularization. I was also interviewed by many radios, TVs, newspapers and magazines on the topics of my competence.

In the period 2008-2012 I was a climate columnist ("Climate observatory") on the magazines "Fotovoltaici" and "CasaEnergia".

Recently, together with a theatre company and a professor of anthropology, I staged a theatrical performance on climate and climate changes entitled «Il Kyoto fisso», which has been put on several theatres in Rome.

Finally, I held numerous conferences and seminars throughout Italy, both during popular-science events and in schools.

SCIENTIFIC PUBLICATIONS

- U. Triacca, A. Pasini, A. Attanasio, A. Giovannelli, M. Lippi (2014), Clarifying the roles of greenhouse gases and ENSO in recent global warming through their prediction performance, **Journal of Climate** (early online release), doi: 10.1175/JCLI-D-13-00784.1.
- L. Bertolaccini, A. Viti, L. Boschetto, A. Pasini, A. Attanasio, A. Terzi, C. Cassardo (2014), Analysis of spontaneous pneumothorax in the city of Cuneo: environmental correlations with meteorological and air pollutant variables, **Surgery Today** (published online), doi: 10.1007/s00595-014-1014-1.
- M. Piccarreta, M. Lazzari, A. Pasini (2014), Trends in daily temperature extremes over the Basilicata region (southern Italy) from 1951 to 2010 in a Mediterranean climatic context, **International Journal of Climatology** (published online), doi: 10.1002/joc.4101.
- A. Pasini, F. Mazzocchi (2014), Can a multi-approach investigation of the climate system lead to more robust results in attribution studies?, **Isonomia epistemologica** (in press).
- U. Triacca, A. Pasini, A. Attanasio (2014), Measuring persistence in time series of temperature anomalies, **Theoretical and Applied Climatology** (published online), doi: 10.1007/s00704-013-1076-9.
- A. Pasini, R. Salzano, A. Attanasio (2014), Modeling radon behavior for characterizing and forecasting geophysical variables at the atmosphere–soil interface, in **Recent trends in modelling of environmental contaminants** (D. Sengupta ed.), Springer, New Delhi, pp. 213-237.
- V. Pelino, F. Maimone, A. Pasini (2014), Energy cycle for the Lorenz attractor, **Chaos, Solitons & Fractals** 64, 67-77.
- M. Piccarreta, A. Pasini, D. Capolongo, M. Lazzari (2013), Changes in daily precipitation extremes in the Mediterranean from 1951 to 2010: the Basilicata region, southern Italy, **International Journal of Climatology** 33, 3229-3248.
- A. Pasini, G. Modugno (2013), Climatic attribution at the regional scale: a case study on the role of circulation patterns and external forcings, **Atmospheric Science Letters** 14, 301-305.
- A. Pasini, U. Triacca, A. Attanasio (2013), A data-driven causality analysis for the attribution of recent global warming, **Proceedings of the SISC First Annual Conference**, pp. 91-101.
- M. Piccarreta, A. Pasini, M. Lazzari (2013), Recent trends in daily temperature extremes over the Basilicata Region, Southern Italy (1951-2010), **Proceedings of the SISC First Annual Conference**, pp. 328-338.
- A. Attanasio, A. Pasini, U. Triacca (2013), Granger causality analyses for climatic attribution, **Atmospheric and Climate Sciences** 3, 515-522.
- U. Triacca, A. Attanasio, A. Pasini (2013), Anthropogenic global warming hypothesis: testing its robustness by Granger causality analysis, **Environmetrics** 24, 260-268.
- A. Pasini, U. Triacca, A. Attanasio (2012), Evidence of recent causal decoupling between solar radiation and global temperature, **Environmental Research Letters** 7, 034020.
- V. Pelino, F. Maimone, A. Pasini (2012), Oscillating forcings and new regimes in the Lorenz system: a four-lobe attractor, **Nonlinear Processes in Geophysics** 19, 315-322.

A. Pasini, R. Langone (2012), Influence of circulation patterns on temperature behavior at the regional scale: A case study investigated via neural network modeling, **Journal of Climate** 25, 2123-2128.

A. Attanasio, A. Pasini, U. Triacca (2012), A contribution to attribution of recent global warming by out-of-sample Granger causality analysis, **Atmospheric Science Letters** 13, 67-72.

A. Pasini, R. Langone, F. Maimone, V. Pelino (2010), Energy-based predictions in Lorenz system by a unified formalism and neural network modelling, **Nonlinear Processes in Geophysics** 17, 809-815.

A. Pasini, R. Langone (2010), Attribution of precipitation changes on a regional scale by neural network modeling: A case study, **Water** 2, 321-332.

A. Cecinato, C. Balducci, V. Budetta, A. Pasini (2010), Illicit psychotropic substance content in the air of Italy, **Atmospheric Environment** 44, 2358-2363.

A. Pasini, F. Cipolletti (2009), Cambiamenti climatici e impatti sulla qualità dell'aria: un caso di studio, in **Atti del Convegno su Clima urbano: diagnosi e previsione** (L. Fiumi e T. Georgiadis eds.), CNR, ISBN 978-88-6224-002-4, pp. 67-77.

A. Pasini, G. Szpunar, G. Amori, R. Langone, M. Cristaldi (2009), Assessing climatic influences on rodent densities: a neural network modelling approach and a case study in Central Italy, **Asia-Pacific Journal of Atmospheric Sciences** 45, 319-330.

A. Pasini, R. Langone (2009), Major influences of circulation patterns on temperatures in the Italian side of the Greater Alpine Region: an investigation via neural network modeling, in **Proceedings of the 89th Annual Meeting of the American Meteorological Society** (21st Conference on Climate Variability and Change – 7th Conference on Artificial Intelligence Applications to the Environmental Science), paper J2.3.

S.E. Haupt, A. Pasini, C. Marzban (eds.) (2009), **Artificial intelligence methods in the environmental sciences**, Springer, New York. <http://www.springer.com/environment/book/978-1-4020-9117-9>

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S.E. Haupt, V. Lakshmanan, A. Pasini, J.K. Williams, C. Marzban (2009), Environmental science models and artificial intelligence, in **Artificial intelligence methods in the environmental sciences** (S.E. Haupt, A. Pasini, C. Marzban eds.), Springer, New York, pp. 3-13.

A. Pasini (2009), Neural network modeling in climate change studies, in **Artificial intelligence methods in the environmental sciences** (S.E. Haupt, A. Pasini, C. Marzban eds.), Springer, New York, pp. 235-254.

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A. Pasini (2008), External forcings and predictability in Lorenz model: An analysis *via* neural network modelling, **Il Nuovo Cimento** 31C, 357-370.

A. Pasini, F. Cipolletti (2007), Evidence of changes in diffusive properties over Italy during the period November 2006-April 2007: A case study, **Il Nuovo Cimento** 30C, 431-434.

A. Pasini, G. Szpunar, G. Amori, R. Langone, M. Cristaldi (2007), Meteo-climatic influences on Rodent density in Central Italy: a nonlinear modelling approach, in **Proceedings of the European Conference on Ecological Modelling (ECEM07)**, Trieste, pp. 400-401.

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A. Pasini (2007), Predictability in past and future climate conditions: a preliminary analysis by neural networks using unforced and forced Lorenz systems as toy models, in **Proceedings of the 87th Annual Meeting of the American Meteorological Society** (Fifth Conference on Artificial Intelligence Applications to the Environmental Science), CD-ROM.

A. Pasini, M. Lorè, F. Ameli (2006), Neural network modelling for the analysis of forcings/temperatures relationships at different scales in the climate system, *Ecological Modelling* **191**, 58-67.

A. Pasini, V. Pelino (2005), Can we estimate atmospheric predictability by performance of neural network forecasting? The toy case studies of unforced and forced Lorenz models, in **Proceedings of the CIMSA 2005 IEEE International Conference on Computational Intelligence for Measurement Systems and Applications**, IEEE, pp.69-74.

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A. Pasini, F. Ameli (2005), Neural network modeling as a tool for climatic analyses of forcings/temperatures relationships at global and regional scales, in **Proceedings of the 85th Annual Meeting of the American Meteorological Society** (Fourth Conference on Artificial Intelligence Applications to the Environmental Science), CD-ROM.

A. Pasini, M. Lorè, F. Ameli (2004), Neural network modelling for the analysis of forcings/temperatures relationships at different scales in the climate system, in **Proceedings of the 4th International Workshop on Environmental Applications of Machine Learning (EAML 2004)**, (S. Dzeroski, B. Zenko and M. Debeljak eds.), J. Stefan Institute, Slovenia, pp.49-50.

A. Pasini, F. Ameli, M. Lorè (2004), Radon forecasting in the low atmosphere by neural network modelling and estimation of the stable layer depth, in **Proceedings of the 4th International Workshop on Environmental Applications of Machine Learning (EAML 2004)**, (S. Dzeroski, B. Zenko and M. Debeljak eds.), J. Stefan Institute, Slovenia, pp.51-52.

A. Pasini, M. Lorè, F. Ameli (2004), Influence of forcings and circulation patterns on mean temperatures at different scales: an analysis by neural network modeling, in **Proceedings of the CIMSA 2004 IEEE International Conference on Computational Intelligence for Measurement Systems and Applications**, IEEE, pp.51-56.

A. Pasini, C. Perrino, A. Febo (2004), Diagnostic and prognostic estimations of the mean diffusive properties in an urban boundary layer by radon data and modelling, in **Proceedings of the RTO-MP-AVT-120 NATO Workshop on urban dispersion modelling** (J.-M. Buchlin ed.), von Karman Institute for fluid dynamics, Belgium, CD-ROM, pp.8.1-11.

A. Pasini, C. Perrino, A. Žujić (2003), Non-linear atmospheric stability indices by neural network modelling, *Il Nuovo Cimento* **26C**, 633-638.

A. Pasini, F. Ameli, M. Lorè, V. Pelino, A. Žujić (2003), Application of a neural network model to the analysis of climatic observations at global, regional and local scales, in **Proceedings of the first Italian IGBP Conference** (F. Miglietta e R. Valentini eds.), Paestum, pp.185-187.

A. Pasini, F. Ameli, M. Lorè (2003) - Short range forecast of atmospheric radon concentration and stable layer depth by neural network modelling, in **Proceedings of the CIMSA 2003 IEEE International Symposium on Computational Intelligence for Measurement Systems and Applications**, IEEE, pp.85-90.

A. Pasini, F. Ameli (2003) - Radon short range forecasting through time series preprocessing and neural network modeling, *Geophysical Research Letters* **30 (7)**, 1386, doi:10.1029/2002GL016726.

A. Pasini, F. Ameli, M. Lorè (2003) - Mixing height short range forecasting through neural network modeling applied to radon and meteorological data, in **Proceedings of the 83rd Annual Meeting of the American Meteorological Society** (Third Conference on Artificial Intelligence Applications to the Environmental Science), CD-ROM.

G. Bertoni, C. Ciuchini, A. Pasini, R. Tappa (2002) - Monitoring of ambient BTX at Monterotondo (Rome) and indoor-outdoor evaluation in school and domestic sites, *Journal of Environmental Monitoring* **4**, 903-909.

A. Pasini, F. Ameli, A. Febo (2002) - Estimation and short-range forecast of the mixing height by means of box and neural-network models using radon data, in **Proceedings of the Conference "Physical Chemistry 2002"** (S. Anić ed.), Society of Physical Chemistry of Serbia, pp.607-614.

A. Pasini, C. Perrino, A. Žujić (2002) - Atmospheric stability indices by non-linear correlations and neural-network modelling applied to radon and benzene data, in **Proceedings of the Conference "Physical Chemistry 2002"** (S. Anić ed.), Society of Physical Chemistry of Serbia, pp.627-629.

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A. Pasini, V. Pelino, S. Potestà (2001) - A neural network model for visibility nowcasting from surface observations: Results and sensitivity to physical input variables, *Journal of Geophysical Research* **106 (D14)**, 14951-14959.

A. Pasini, F. Ameli, V. Pelino (2001) - A Neural-Network Approach to Radon Short-Range Forecasting from Concentration Time Series, *Il Nuovo Cimento* **24C**, 331-337.

A. Pasini, V. Pelino (2000) - A unified view of Kolmogorov and Lorenz systems, *Physics Letters* **A275**, 435-446.

A. Pasini, V. Pelino, S. Potestà (1999) - Un modello reticolare di neuroni artificiali per la previsione della visibilità meteorologica. Parte seconda: la sperimentazione operativa, *Rivista di Meteorologia Aeronautica* **59 (1-4)**, 13-25.

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A. Pasini, V. Pelino, S. Potestà (1998) - On the Cognitive Behaviour of a Multi-Layer Perceptron in Forecasting Meteorological Visibility, in **Neural Nets - WIRN Vietri '97** (M. Marinaro and R. Tagliaferri eds.), Springer-Verlag, pp.245-251.

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POPULAR-SCIENCE PUBLICATIONS

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Please, consider also more than 200 posts of my first blog on climate on the web pages of Il Sole 24 ore: <http://antonellopasini.nova100.ilsole24ore.com/>

And my new blog on the web pages of Le Scienze:
<http://pasini-lescienze.blogautore.espresso.repubblica.it/>

Furthermore, during the last 5 years I held the column «Osservatorio sul clima» on the magazines «Fotovoltaici» and «CasaEnergia».