curriculum vitae et studiorum

Susanna Corti

Academic Degrees

- **1989** : Degree in Physics at the Faculty of Sciences, University of Bologna (final marks 110 out of 110). Final thesis (Tesi di Laurea) on greenhouse effect in the atmosphere and climate sensitivity.
- **1990** : Diploma of the Physics Specialization School at the University of Bologna
- **1994** : Ph.D. in Physics/Geophysics at the University of Bologna - Thesis on low and ultra-low frequency atmospheric variability in a 3-level T21 quasi-geostrophic model.

Research experience and future work

Apr 2013 onwards

- Senior Scientist at the Institute of Atmospheric Science and Climate (ISAC) of the National Research Council (CNR). Susanna Corti is the Coordinator of the Climate Dynamics and Variability Research Unit (DIVAC). DIVAC research activities include the characterization of Earth's climate and of its past, present and future variability (reconstructions and scenarios), the estimate of environmental risks induced by climate change, and the analysis of (some of) the fundamental processes of climate dynamics. Susanna Corti is involved in researches on: Sub-seasonal to decadal climate predictions, also in the framework of climate services; High resolution climate reconstructions and future scenarios; Climate predictability; Sources (and limitations) of climate predictability; Impact of stochastic physical parameterizations in model simulations of climate variability from sub-seasonal to centennial time-scales; reconstruction of climate variability over Europe.

Apr 2010 – Mar 2013

- Consultant at ECMWF (as part of the team of the European Union project THOR)

THOR stands for "Thermohaline Overturning – at Risk?" and is an EU-funded FP7 project that establishes an operational system to monitor and forecast the development of the North Atlantic Thermohaline Circulation (THC) on decadal time scales and to assess its stability and the risk of a breakdown in a changing climate. Within the EU-project THOR decadal climate hindcasts over the period 1960-2000 have been carried out with the ECMWF coupled system IFS/Nemo in which both atmosphere and ocean are initialised to bring the state of the coupled model close to the observed state. Two main objectives of the project were:

- Objective 1: To carry out Initial value decadal predictions from analysed ocean-atmosphere initial states and assess their reliability and skill.
- Objective 2: To isolate the impact of the initial conditions from the impacts of greenhouse gas

Nov 2001 – May 2010

- Staff Scientist at ISAC-CNR in the section of Dynamic Meteorology and Climate Dynamics.
    - Evaluation of the vertical structure of weather regimes, utilising reanalysis datasets. Evaluation of the significance of any discrepancies between observed regime behaviour and that simulated by the current generation of A-OGCMs
    - Study of the modulation of atmospheric intraseasonal variability due to boundary forcing on the interannual and decadal timescale.

- Quantification of the uncertainty in regime properties arising from the internal, chaotic dynamics of the atmosphere, and assessment of the predictability of such properties as a response to external variations in forcing terms.
- Investigation of the predictability and variability of the West African Monsoon (as part of the European Union project AMMA)

Jul 1998 – Oct 2001

- Staff at CINECA, Consortium of Universities in the Laboratory for numerical Analysis of Meteorological and Oceanographic data (the largest Italian Computing Centre).
  - Statistical analysis of the relationship between variability of surface air temperature and frequency of large-scale atmospheric regimes / teleconnection patterns on the interdecadal time-scale (as part of the European Union project MILLENNIA).
  - Evaluation of the extent to what anthropogenic climate change can be understood in terms of changes to the PDFs of these regimes.
  - Modulation of atmospheric intraseasonal variability by boundary forcing on the interannual and decadal timescale (as part of the European Union project SINTEX).
  - Identification of forcing errors in GCMs (as part of the European Union project POTENTIALS).

Apr 1996 – Jun 1998

- PostDoc at CINECA (as part of the team of the European Union project PROVOST).
  - Quantification of potential predictability of seasonal fluctuations in climate using ensembles of GCM simulations performed at ECMWF, initialised using reanalysis datasets and forced with observed sea surface temperature fields.

Dec 1993 – Mar 1996

- Consultant at ECMWF (as part of the team of the European Union project Short-term Climate Variability).
  - Analysis and interpretation of results from long integrations of a realistic quasi-geostrophic model on the basis of the behaviour of simple nonlinear systems. Investigation of the dynamical origin of interannual and interdecadal fluctuations in the statistical properties of low-frequency variability analysing the role of internal nonlinear dynamics and the effects of variations in atmospheric forcing arising from the lower boundary. Application of adjoint techniques to study the predictability of transitions between quasi-geostrophic model weather regimes. Identification of fairly distinct paths in phase space associated with predictable and unpredictable transitions. Analysis and comparison of “weather” and “climate” predictability properties in this model. (PI: Dr. T.N. Palmer)

Feb 1993 – Sep 1993

- Visiting scientist at ECMWF as PhD Student of the Atmospheric Dynamics Group of the University of Bologna.
  - Long term integrations with a quasi-geostrophic three level atmospheric model. EOF analysis and PDF estimation of output. Diagnosis of weather regimes behaviour. (Supervised by Dr. F. Molteni and Dr. T. N. Palmer)

Nov 1990 – Jan 1993

- PhD Student at the Physics Department of the University of Bologna.
  - Diagnostics of blocking events in the Northern Hemisphere during the winter. (Supervised by Prof. S. Tibaldi)

Teaching Experience (Including Lectures at International Schools)

- Lecturer of Atmospheric Dynamics at the University of Ferrara, Physics Department, for the years 2002/2003 and 2003/2004
- Lecturer of Introduction to the Physics of Atmosphere and Ocean at the University of Padua, Physics Department, for the year 2007/2008
- Lecturer of Global Changes at the University of Bologna, Environmental Sciences Department, for the year 2008/2009
- Lecturer at the ECMWF Training Course in Predictability Diagnostics and Seasonal Forecasting for years 2010-2013. Lecture on "Clustering techniques and their applications"
- Co-Director and Lecturer of the School and Workshop on *"Weather Regimes and Weather Types in the Tropics and Extra-tropics: Theory and Application to Prediction of Weather and Climate*" at the Abdus Salam International Centre for Theoretical Physics (ICTP) held in Miramare, Trieste, Italy in October 21-30 2013. http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a12220
- Lecturer at the Woods Hole Oceanographic Institution (WHOI) for the fifty-sixth year of the Geophysical Fluid Dynamics Program, which has as its central theme "GFD and Climate." The program was held from June 16 through August 22, 2014. I participated for eight days (July 5 through July 12). Lecture title: "On the reliability of multi-year Forecasts of Climate" http://www.whoi.edu/main/gfd/lectures

Editorial Activities

- Executive Editor of "Climate Dynamics" (Impact Factor 4.6) since July 2007 (Associate Editor since May 2005).

Review/Evaluation Experience

- Evaluator of research proposals and reviewer of funded projects for the programme "Environment and Sustainable Development" of the Commission of the European Communities within the V Framework Programme and for the programme "Global Change and Ecosystems" and RTD-NEST within the VI Framework Programme
- Reviewer for the NOAA's Office of Global Program on Climate Variability and Predictability
- Reviewer for the NOAA's Office of Climate Change Detection and Attribution Project
- Reviewer of the IPCC WG1 Fourth and Fifth Assessment Reports
- Reviewer for the European Research Council (ERC) Advanced Grant 6th Call - 2013 call for proposals.
- Member of the Panel of Experts (PoE) for the Belmont Forum evaluations of the "Climate Predictability and Inter-Regional Linkages" call (2015).
- Several peer reviews for the following scientific journals:
    - Climate Dynamics
    - Geophysical Research Letters
    - Journal of Climate
    - Journal of Geophysical Research
    - Journal of Atmospheric Sciences
    - Monthly Weather Review
    - Quarterly Journal of the Royal Meteorological Society

International Projects

Principal Investigator in the following projects funded by the European Commission:

- V Framework “Environment and Sustainable Development”:
  - PI for CINECA in PROMISE (PRedictability and variability Of Monsoons and the agricultural and hydrological Impacts of climate change) for the years 2000-2001
  - PI for CINECA in PRUDENCE (Prediction of Regional scenarios and Uncertainties for Defining European Climate change risks and Effects) for the years 2001-2002
- VI Framework “"Global Change and Ecosystems”:
  - PI for CNR-ISAC in ENSEMBLES (ENSEMBLE-based predictionS of climate changes and their impacts) for the years 2004-2000
- Horizon2020 “H2020-SC5-2014-two-stage “GROWING A LOW CARBON, RESOURCE EFFICIENT ECONOMY WITH A SUSTAINABLE SUPPLY OF RAW MATERIALS:
  - PI for CNR-ISAC in PRIMAVERA (PRocess-based climate sIMulation: AdVances in high resolution modelling and European climate Risk Assessment) for the years 2015-2019

International Collaborations.

- Predictability of Weather and Climate Group at University of Oxford, Physics Department (Prof. TimPalmer, Dr. Antje Weisheimer)
- European Centre for Medium-range weather Forecasts (ECMWF) – Research and Forecast Departments (Dr. Franco Molteni, Dr. Tim Stockdale, Dr. Frederic Vitart, Dr. Antje Weisheimer, Dr. Laura Ferranti, Dr. Magdalena Balmaseda, Dr. Linus Magnusson)
- IC3 Institut Català de Ciències del Clima – Climate Forecasting Unit – (Dr. Francisco Doblas-Reyes, Dr. Virginie Guemas)
- Center for Ocean-Land-Atmosphere Studies (COLA) & George Mason University (Prof. David Straus)

Selected Publications

a) International Journals

- T.N. Palmer, R. Buizza, F. Molteni, Y.Q. Chen, S. Corti, 1994: "*Singular vectors and the predictability of weather and climate*" Phil. Trans. Roy. Soc. Lond. A(1994) **348**, 459-475
- S. Corti and T.N. Palmer, 1997 *“Sensitivity analysis of atmospheric low-frequency variability”* Q. J. R. Meteorol. Soc. **123**, 2425-2447
- S. Corti, A. Giannini, S. Tibaldi and F. Molteni, 1997: *“Patterns of low-frequency variability in a three level quasi-geostrophic model”.* Climate Dynamics **13**, 883-904
- F. Molteni and S. Corti, 1998 *“Long term fluctuations in the statistical properties of low-frequency variability: dynamical origin and predictability”* Q. J. R. Meteorol. Soc. **124**, 495-526
- P. Bongioannini Cerlini, S. Corti and S. Tibaldi, 1999 *“An intercomparison between low-frequency variability indices”.* Tellus **51A**, 773-789
- S. Corti, F. Molteni and T. N. Palmer, 1999 *“Signature of recent climate change in frequencies of natural atmospheric circulation regimes”.* Nature **398**, 799-802
- S. Corti, F. Molteni and C. Brankovic, 2000 *“Predictability of snow-depth anomalies over Eurasia and associated circulation patterns”*. Q. J. R. Meteorol. Soc. **126**, 241-262
- F. Molteni, M. G. Angelucci, S. Corti and V. Pavan, 2001: *Development of simplified parametrization schemes for a 5-level primitive equation model of the atmospheric circulation*. Arch. Oceanogr. Limnol. **22**, 1-8

- S. Corti, S. Gualdi and A. Navarra, 2003 *"Analysis of the midlatitude weather regimes in the 200-year control integration of the SINTEX model".* Annals of Geophysics, **46**, 27-37
- F. Molteni, S. Corti, L. Ferranti and J. M. Slingo, 2003: "*Predictability experiments for the Asian summer monsoon: impact of SST anomalies on interannual and intraseasonal variability."* Journal of Climate, **16**, 4001-4021
- DM Straus, S. Corti and F. Molteni, 2007: *Circulation Regimes: Chaotic Variability vs. SST-Forced Predictability*. Journal of Climate, **20**, 2251-2272
- Corti, S., A. Weisheimer, T. N. Palmer, F. J. Doblas-Reyes, and L. Magnusson 2012, Reliability of decadal predictions, Geophys. Res. Lett., 39, L21712, doi:10.1029/2012GL053354.
- Dawson, A., T. N. Palmer, and S. Corti 2012, Simulating regime structures in weather and climate prediction models, Geophys. Res. Lett., 39, L21805, doi:10.1029/2012GL053284
- Guemas, V., S. Corti, J. García-Serrano, F. Doblas-Reyes, M. Balmaseda, and L. Magnusson, 2013: The Indian Ocean: the region of highest skill worldwide in decadal climate prediction. J. Climate. 26, 726-739 doi:10.1175/JCLI-D-12-00049.1
- Magnusson L, M Alonso-Balmaseda, S Corti, F Molteni and T Stockdale, 2013 Evaluation of forecast strategies for seasonal and decadal forecasts in presence of systematic model errors. Clim Dyn 41, 2393-2409 DOI 10.1007/s00382-012-1599-2
- W. Hazeleger, B. Wouters, G.J. van Oldenborgh, S. Corti, T. Palmer, D. Smith, N. Dunstone, J. Kröger, H. Pohlmann, J.-S. von Storch 2013 Predicting multi-year North Atlantic Ocean variability. J. Geophys. Res. Ocean – DOI:10.1002/jgrc.20117
- Hazeleger, W., V. Guemas, B. Wouters, S.Corti, I. Andreu-Burillo F.J. Doblas-Reyes, K. Wyser, and M. Caian, 2013: Multiyear climate predictions using two initialisation strategies. Geoph. Res. Lett.. DOI: 10.1002/grl.50355
- Gerald A. Meehl, Lisa Goddard, George Boer, Robert Burgman, Grant Branstator, Christophe Cassou, Susanna Corti, Gokhan Danabasoglu, Francisco Doblas-Reyes, Ed Hawkins, Alicia Karspeck, Masahide Kimoto, Arun Kumar, Daniela Matei, Juliette Mignot, Rym Msadek, Holger Pohlmann, Michele Rienecker, Tony Rosati, Edwin Schneider, Doug Smith, Rowan Sutton, Haiyan Teng, Geert Jan van Oldenborgh, Gabriel Vecchi, and Stephen Yeager, 2014: Decadal Climate Prediction: An Update from the Trenches. Bull. Am. Met. Soc DOI:http://dx.doi.org/10.1175/BAMS-D-12-00241.1
- Weisheimer, A., S. Corti, T.N. Palmer and F. Vitart, 2014 Addressing model error through atmospheric stochastic physical parameterisations: Impact on the coupled ECMWF seasonal forecasting system *Philos. T. Roy. Soc. A* doi: 10.1098/rsta.2013.0290
- Ferranti, L., Corti, S. and Janousek, M. 2014, Flow-dependent verification of the ECMWF ensemble over the Euro-Atlantic sector. Q.J.R. Meteorol. Soc.. doi: 10.1002/qj.2411
- Corti S., Tim Palmer, Magdalena Balmaseda, Antje Weisheimer, Sybren Drijfhout, Nick Dunstone, Wilco Hazeleger, Jürgen Kröger, Holger Pohlmann, Doug Smith, Jin-Song von Storch, and Bert Wouters, 2015: Impact of Initial Conditions versus External Forcing in Decadal Climate Predictions: A Sensitivity Experiment. J. Climate, 28, 4454–4470.doi: http://dx.doi.org/10.1175/JCLI-D-14-00671.1
- Davini P., J. von Hardenber and S. Corti, 2015: Tropical origin for the impacts of the Atlantic Multidecadal Variability on the Euro-Atlantic climate. Env. Res. Let. doi:10.1088/1748-9326/10/9/094010

b) Special Volumes

- Palmer, T.N., R. Buizza, F. Molteni, Y-Q Chen and S. Corti, 1995: Singular vectors and the predictability of weather and climate. In "*Chaos and Forecasting"* (Proceedings of the Royal Society discussion meeting), H. Tong ed., World Scientific, London.
- S. Tibaldi, S. Corti and A. Giannini, 1995: Blocking and teleconnections in a three-level quasi-geostrophic global model in "*Modern Dynamical Meteorology*" (Proceedings of the Symposium in honor of Professor Askel Wiin Nielsen, Copenhagen 4-7 April 1995) Peter Dislevsen Ed., Copenhagen

- F. Molteni, F. Kucharski and S. Corti, 2006: On the predictability of flow-regime properties on interannual to interdecadal timescales. In: "*Predictability of Weather and Climate*", T. Palmer and R. Hagedorn, Eds., Cambridge University Press, Cambridge. DOI: 10.2277/0521848822

- S. Corti, 2008: *Predictability of Climate Change.* In: "*Global climate change and the ecology of the next decade*" (Proceedings of the workshops "Global Change a 9 anni dagli accordi di Kyoto" Domus Galileiana – CISSC May 2006, May 2007 Pisa) G. Santangelo and L. Fronzoni Eds., ETS

- S. Corti, 2013 Contributing author to: IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change – Chapter 11: Near-term Climate Change: Projections and Predictability. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp

c) International Newsletters

- Manzini E., Corti S., Erying V., Girogetta M. A. and T.G. Shepherd 2009 A SPARC perspective on the World `modelling Summit. *SPARC Newsletter* 32 25-26

- Ferranti L, Corti S. 2011 New clustering products. *ECMWF Newsletter.* 127, 6–11

- Ferranti L, Corti S, and Janousek, M. 2014, Flow-dependent verification of the ECMWF ensemble over the Euro-Atlantic sector. *ECMWF Newsletter*. 139, 34-39