



THE LONDON SCHOOL
OF ECONOMICS AND
POLITICAL SCIENCE ■



CATS CENTRE FOR
THE ANALYSIS
OF TIME SERIES

Annual Report

2012-2013



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About CATS

The Centre for the Analysis of Time Series (CATS) is a well-established research centre, which brings together the expertise of internationally recognised statisticians and physical scientists who have a common interest in non-linear analysis.

CATS aims to promote awareness of the limitations of non-linear analysis and the dangers of confusing models with reality. Over the last few years CATS has focused on the role of uncertainty in complex models, with special intensity on issues of decision support. Of particular interest is the unexpectedly high quality of probabilistic climate forecasts from relatively simple models, when "quality" is judged relative to complex models (for instance those used in the IPCC reports).

CATS has a long track record of successful research grant funding from a variety of sponsors in the UK, EU and USA, as well as funding from industry, the latter usually for more discrete projects of specific interest to end users.

In addition, CATS has recently broadened its research footprint, with Professor Henry Wynn's involvement in the EU multi-partner Smart Cities project "CELSIUS" (Combined Efficient Large Scale Integrated Urban Systems) which looks at maximising the efficient use of energy by cities.

Current projects also include a UK EPSRC-funded project on managing flood risk, "Delivering and Evaluating Multiple Flood Risk Benefits", in which CATS plays a key role in the understanding and communication of issues of model uncertainty.

At LSE CATS works closely with a number of departments and centres: its "home department" Statistics, the Grantham Research Institute on Climate Change and the Environment, the ESRC Centre for Climate Change Economics and Policy, the Centre for Philosophy of Natural and Social Science, and, more recently, LSE Cities, among others.

CATS is led by director Professor Leonard Smith, co-directors Professors Pauline Barrieu and Roman Frigg, and Chair of the centre Professor Henry Wynn. The centre benefits from the expertise of a range of Visiting Professors and Fellows from a number of disciplines, sectors and regions of the world.



Message from the Chair

The academic year of this report, 2012-2013, was a healthy year for CATS, in the same kind of sense that a healthy life-style is for an individual.

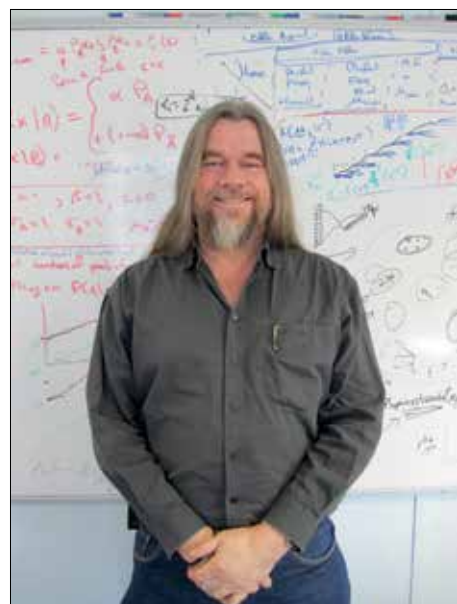
The year was financially healthy, always a help, but also shows a remarkably robust range of activities. The basic and successful interest in climate change is widening. Perhaps first on the list is an increased emphasis on the persistent and hugely important issues connected with prediction, decision making and risk related to weather. This goes to the heart of CATS' historical interest in time series and forecasting but we also find ourselves asking questions at the centre of fashionable areas such as uncertainty quantification (UQ). Another strand is that of energy policy and energy use, particularly as it is related to Cities. I would like

to think that it is the skill of our Director, Professor Leonard Smith and our outstanding staff and associates, that keeps CATS abreast and often one step ahead of public debates on climate, weather, energy policy and green issues. This robustness puts us in a strong position as a number of successful projects come to an end and others start up. We are in the eye of the storm of debate but have a well-stocked hold of intellectual provisions. Thanks to the captain and all the crew.

Professor Henry Wynn



Chair, Professor Henry Wynn



Director, Professor Leonard Smith

New and Ongoing Projects, 2012-13

Further information on all CATS research projects can be found at:
lse.ac.uk/CATS/ResearchGrants

Combined Efficient Large Scale Integrated Systems (CELSIUS)

This multi-partner EU project, led by the City of Gothenburg, involves a number of leading utilities organizations as well as academic partners. It aims to maximize carbon savings in cities by maximizing the unused energy saving potential through tackling ways to effectively and efficiently recover energy losses. The project began in April 2013, and will run for four years. The Principal Investigator at LSE is Professor Henry Wynn.

Delivering and Evaluating Multiple Flood Risk Benefits in "Blue Green Cities"

This EPSRC-funded project is led by the University of Nottingham, and will run from January 2013 to December 2015. New strategies for managing urban flood risk are required, necessitating radical changes in the ways cities are managed, planned and developed. Previous research has identified multiple options and measures for future urban flood risk management that align with more general targets for water centric, sustainable communities. However, it remains unclear how these options and measures can be: (1) delivered in practice, and; (2) comprehensively evaluated in terms of their benefits and costs. This project aims to

develop novel ways of driving new, resilient urban forms and fabrics through delivering measures to manage flood events sustainably while enhancing urban life; providing scope for radical solutions under new build; and, realising possibilities for improving existing performance through retrofit and urban renewal. At LSE the project is led by Professor Leonard Smith.

Forecast Evaluation

Funded by the Bermuda Institute of Ocean Sciences' Risk Prediction Initiative, this project aims to provide a platform for the open and fair comparison of a variety of different forecasts. CATS has provided for the insurance industry an evaluation of seasonal forecast skill. This has proven an interesting project and takes us towards our goal of being the honest broker for probabilistic forecast evaluation.

Communicating the Character of Climate Change Uncertainty

Dr David Stainforth was awarded HEIF5 funds for this project which aims to encourage a wider and more informed public discourse around the challenges of understanding and responding to the problems of climate change. The project began in January 2013 and will continue until June 2015. It builds on the exhibition materials produced for the Royal Society Summer Science Exhibition in 2011.

Evaluating the Economics of Climate Risks and Opportunities in the Insurance Sector

This project was funded by Munich Re as the 5th research programme of the Centre for Climate Change Economics and Policy (CCCEP). The programme focuses on informing the insurance sector on the impacts of alternative approaches to carbon finance and emission trading; aiding the design of trading schemes and suggesting new financial service products to be developed; informing decision-makers, at the company level and the country level, on how better to balance investment between mitigation and adaptation, survivability and sustainability. The project began in October 2008 and will run until December 2013.

End-to-End Quantification of Uncertainty for Impacts Prediction (EQUIP)

Funded by NERC, the EQUIP project brings together the UK climate modelling, statistical modelling and impacts communities to work closely together for the first time on developing risk-based prediction for decision making in the face of climate variability and change. EQUIP



was a collaborative project involving eleven UK Universities and research institutions. In CATS our focus was to contrast information from statistical models of observational time series with the output of complicated dynamical models of the atmosphere/ocean system. Our aim was to quantify the spatial and temporal scales on which these different methods could provide quantitative input to policy decisions. Principal Investigators at LSE were Professor Leonard Smith and Dr David Stainforth. The project ran from January 2010 to December 2012.

Integrated Ocean Observing Systems.

Since 2007 CATS has received funding from the US National Oceanic and Atmospheric Administration (NOAA) to fund a professorial research fellow, Dr Ralph Rayner, as the industry liaison for the US Interagency Ocean Observation Committee (IOOC) and the US Integrated Ocean Observing System (IOOS) that it coordinates. Dr Rayner acts as the information point for a broad range of relevant industries; implements and manages a network for the exchange of information; and organises outreach workshops which promote the socioeconomic benefits of ocean observations. He also supports the interface between US IOOS and regional initiatives in other countries as well as the interface with the United Nations coordinated Global Ocean Observing System.

RAPID-RAPIT

This NERC funded collaborative project is led by the National Oceanography Centre and attempts to quantify the likelihood of a shut down in the Meridional Overturning Circulation (MOC) in the North Atlantic. At LSE the project is led by David Stainforth and funds a PhD student, Ed Wheatcroft, who is studying the relationship between models and reality in the context of climate change. The research will work towards the design of ensemble experiments which can evaluate the spatial and temporal scales on which complex climate models can potentially provide quantitative information about the future real world climate. The project runs until September 2013.

Defining the limits of climate modelling: when to downscale

The majority of policy decisions are based on information that comes from regional models, which do not feedback to the global model. This NERC Doctoral Training Grant project aims to build statistical methodology to support how far into the future it is reasonable to continue this one-way approach. It will examine existing, very complex climate models, compare outputs from regional and global ones, assess input variables, identify

which variable prevents accurate results and determinate when small and large models deviate too much. The outcome will be a method of determining what was potentially informative to policy makers, what was likely misleading. The research will also aim to improve correctness of global models, examining whether it can be aggregate of the regional models. The project funds a PhD student, Ewelina Sienkiewicz, working between CATS and NCAR (National Centre for Atmospheric Research), and is supervised by Professor Leonard Smith.

Managing Uncertainty in Complex Models (MUCM)

The second phase of this project ('MUCM2) drew to a close in the autumn of 2012. MUCM was a Research Councils UK funded project that started in 2006. It was held by a consortium of five universities led by the University of Sheffield. At LSE it was led by Professor Henry Wynn. MUCM was a multidisciplinary project concerned with quantifying and reducing uncertainty in the predictions of complex models across a wide range of application areas, including basic science, environmental science, engineering, technology, biosciences, and economics.



Events, Talks and Discussion Groups

Symposium

"Insurance in emerging markets: determinants of growth and the case of climate change?"

21 November 2012, LSE.

This academic symposium was held as part of the LSE "Munich Re programme" ("Evaluating the economics of climate risks and opportunities in the insurance sector"), and was led by Dr Swenja Surminski. The symposium brought together a small group of leading academics and practitioners to discuss the different determinants of insurance growth. The aim was to have an open exchange on latest findings, considering evidence from emerging markets and developed markets, as well as comparing tools and methods for evaluation. Further information and conference proceedings can be found at: <http://www.cccep.ac.uk/Events/Past/2012/November/insurance-markets-growth-climate-change-symposium.aspx>

Meetings

17-18 June 2013 – Leonard Smith, David Stainforth, Erica Thompson and Ewelina Sienkiewicz took part in a closed workshop at the Netherlands Environmental Assessment Agency led by Professor Arthur Petersen; they formed part of a panel of earth science experts who reflected on the way uncertainty is characterised in the "Final Government Distribution" of the Summary of Policymakers (SPM) for the Working Group I contribution to the IPCC assessment report.

26-27 February 2013 – Leonard Smith took part in discussions with congressmen as part of the ASA Advisory Committee on Climate Change Policy (ACCCP) 3rd annual Climate Science Day 2013 meeting, Capitol Hill, Washington DC. The purpose is to provide a non-partisan opportunity for scientists of many disciplines to build relationships and provide Members of Congress access to the best possible climate science information.

18-20 March 2013 – Swenja Surminski hosted and chaired two science-practitioner sessions (session with science-practitioner interactions): "uncertainty and decision making" and "Challenges to respond to loss and damage of climate change" at the European Adaptation to Climate Change (ECCA) Conference, Hamburg. Swenja also presented on "role of private sector in adaptation". Ana Lopez gave a talk entitled "Loss and damage: a physical science perspective", and David Stainforth and Nicola Ranger participated in a panel discussion entitled: "Addressing Uncertainties in National Adaptation Strategies." A Synthesis Report is available at: lse.ac.uk/CATS/Events/EventsDocs/ECCA-Synthesis-paper-Loss-and-Damage-final.pdf

Selected talks and presentations

8-12 July 2013 – Leonard Smith gave an invited talk at the Davos Atmosphere and Cryosphere Assembly, Switzerland. His talk was on "Dynamic probabilities, mature probabilities, and the links between data assimilation and ensemble forecasting in actual decision support".

1-3 July 2013 – Pauline Barrieu gave a plenary lecture at the 17th International Congress on Insurance: Mathematics and Economics, Copenhagen.

24-26 June 2013 – Pauline Barrieu gave a plenary lecture at AFIR-ERM Colloquium, Lyon.

17-21 June 2013 – Leonard Smith gave an invited talk at the workshop "Methods of Chaos Detection and Predictability: Theory and Applications (MCDPTA13)" at the Max Planck Institute for the Physics of Complex Systems, Dresden.

17-20 June 2013 – Emma Suckling and Hailiang Du presented at the 2013 SIAM Conference on Mathematical and Computational Issues in the Geosciences, Padova, Italy. Du's talk was entitled "Pseudo-Orbit Data Assimilation for Atmospheric GCMs". Emma's talk was entitled "Pseudo-Orbit Gradient Descent for Lagrangian Data Assimilation".

7-12 April 2013 – EGU General Assembly 2013, Vienna. Leonard Smith presented a short course: "Predictability in Theory and Predictability in Practice". Ewelina Sienkiewicz presented a poster by A. S. Jarman and L.A. Smith entitled "Forecasting the Probability of Tropical Cyclone Formation: the reliability of NHC forecasts from the 2012 hurricane season". Also at EGU, Nick Watkins gave four presentations: "The scaling of wild events in stochastic models: The Fisher limit, the Mandelbrot limit, and FARIMA as a model of the intermediate cases", "Bayesian Analysis of Non-Gaussian Long-Range Dependent Processes", "Compound Extremes and Bunched Black (or Grouped Grey) Swans", and "A spatio-temporal analysis of US station temperature trends over the last century". Nick Watkins and David Stainforth co-authored two presentations given by Sandra Chapman, "Mapping the changing pattern of local climate as an observed distribution" and "An observationally centred method to quantify local climate change as a distribution".

3 April 2013 – Ana Lopez was invited to a seminar on "Developing Adaptation Strategies under uncertainty", in the Department of Atmospheric and Ocean Sciences, University of Buenos Aires.

21-22 March 2013 – Leonard Smith gave an invited talk on "Unpopular Essays of Juergen Kurths: Practicalities and Predictability" at the conference Nonlinear Data Analysis and Modeling: Advances, Applications, Perspectives, Potsdam, Germany.

13-14 March 2013 – David Stainforth gave a presentation at the EQUIP workshop: “Strengthening resilience through improved treatment of uncertainty in weather, climate and impacts” at the Royal Society. The title of the presentation was “Equipping Users While Maintaining the Credibility of Science” Slides.

25-27 February 2013 – Ana Lopez presented a statement entitled “Are loss and damages climate stressors attributable to global warming?”, at the UNU-EHS “Perspectives on Loss & Damage: Society, Climate Change, and Decision Making” Conference, Bonn, Germany.

14-18 February 2013 – Leonard Smith gave an invited talk on “Two-way communication with decision makers on uncertainties of climate science” at the AAAS Annual Meeting 2013, Boston.

3-7 December 2012 – Leonard Smith spoke at the AGU Fall Meeting 2012, San Francisco. His invited talk was on “Queuing the wrong U?”, and Emma Suckling also gave a talk, entitled “Increasing the relevance of GCM simulations for Climate Services”.

12-16 November 2012 – Leonard Smith gave a talk on “Guidance, Information or Probability Forecast: Where Do Ensembles Aim?”, and Emma Suckling gave a talk entitled “The Pseudo-orbit Gradient Descent Ensemble Data Assimilation Method” at the International Conference on Ensemble Methods in Geophysical Sciences, Toulouse, France.

8-12 October 2012 – Leonard Smith gave a keynote speech entitled “Predictability and Understanding of Our Climate Risk: Approximations, Bugs and Insight” at the 8th IEEE International Conference on eScience, Chicago.

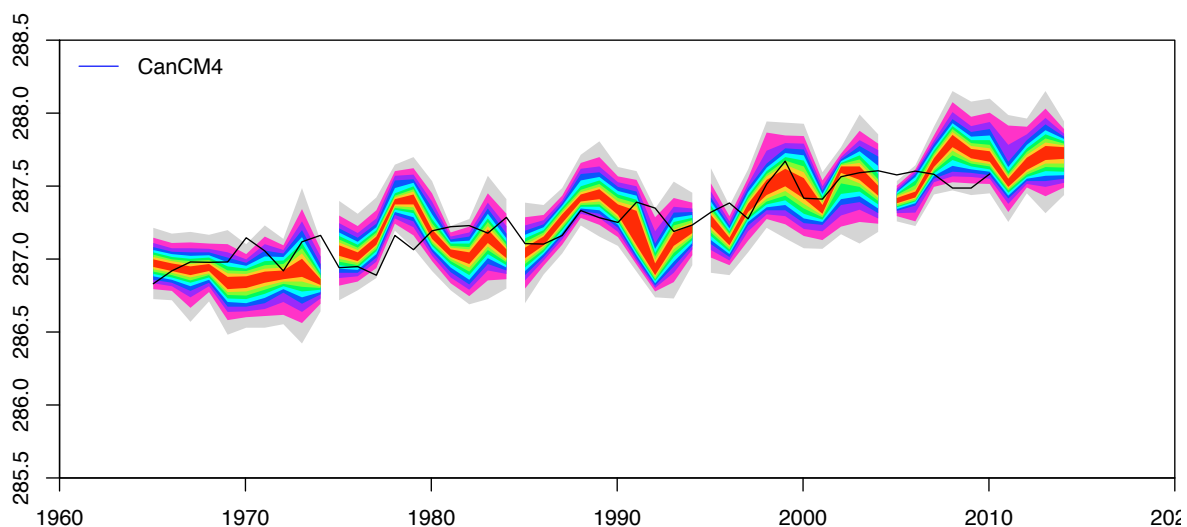
4-5 October 2012 – Leonard Smith gave an invited talk at the Royal Society Theo Murphy International Scientific Meeting on “Handling uncertainty in weather and climate prediction, with application to health, agronomy, hydrology, energy and economics”. The talk was entitled “Probabilistic prediction without probabilities”.

Climate Change Decision Theory Group (CCDTG)

The Climate Change Decision Theory Group, led by Dr David Stainforth, addresses questions of how we evaluate the information content of statements about future climate change. It meets on a monthly basis and brings together multi-disciplinary expertise, with members from across LSE including CATS, Statistics, Philosophy, Economics and Operations Research. There is considerable discussion of the role and interpretation of models - unsurprising given the extrapolatory nature of the climate change problem - but there is also much discussion of alternative information sources and alternative approaches to decision making in the context of climate change. Communication of research outputs, confidence and uncertainty are also key themes.

CATS “roasts”

CATS holds a regular seminar series with a difference: rather than giving a presentation, the invited “speaker” (whether a member of CATS, other LSE departments, or from another institution) is asked to highlight a current aspect of their research. They are then “grilled” on this (in friendly fashion!) by the other members/attendees. The aim is to have an informal but serious discussion.



Assessing the accuracy of decadal ensemble predictions made by climate models.

Dr E Thompson

Research Students, 2012-13

Ongoing doctoral research

Sarah Higgins (PT): thesis is on the link between weather and global cereal prices.

Alex Jarman: thesis 'On the Provision, Reliability, and Use of Hurricane Forecasts on all Timescales', sponsored by reinsurance company, Munich Re.

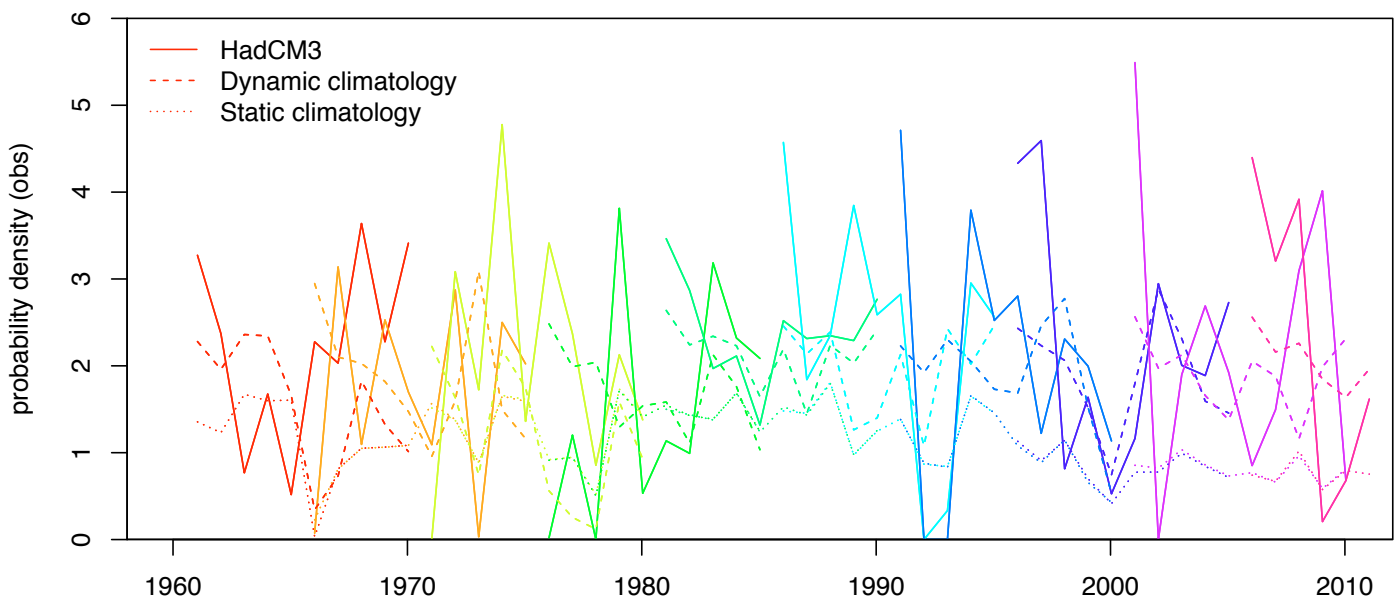
Trevor Maynard: thesis on robustness of general insurers to trends and cycles including climate change.

Ewelina Sienkiewicz: thesis on "Defining the limits of climate modelling: When to downscale", funded by a NERC Doctoral Training Grant.

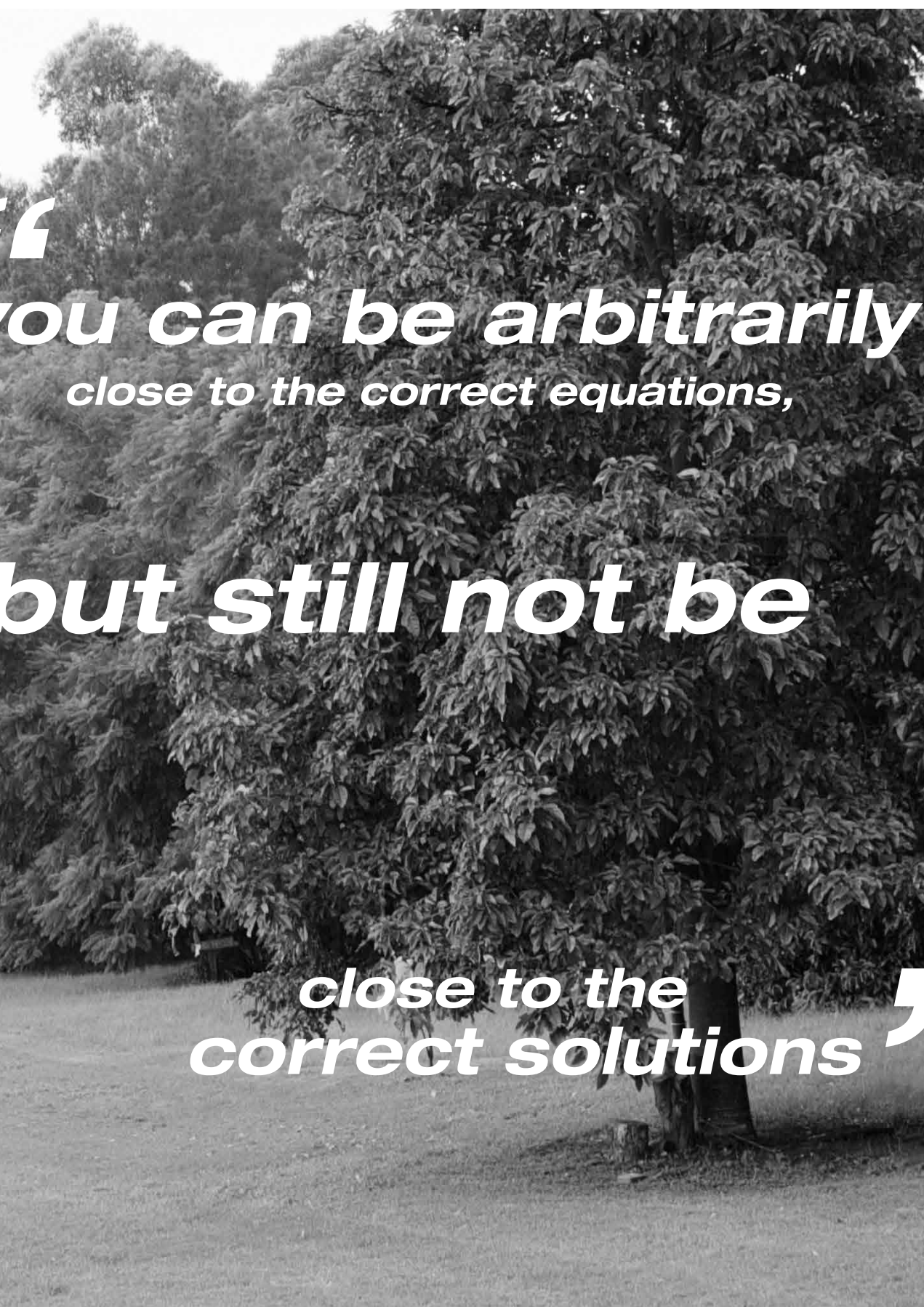
Edward Wheatcroft: thesis on the relationship between models and reality in the context of climate change, funded by NERC as part of the RAPID-RAPIT project (see above).

Theses submitted

Roman Binter "Applied Probabilistic Forecasting". Thesis submitted December 2012. Supervisor Prof Leonard Smith



Comparing the performance of complex physics-based models with simpler statistical models.
Dr E. Thompson



“
you can be arbitrarily
close to the correct equations,

but still not be

close to the
correct solutions **”**

Erica Thompson,
“Modelling North Atlantic Storms in a Changing Climate”,
PhD thesis, 2012

Publications, 2012-13

For a full list of CATS publications and links to papers etc. please go to:
lse.ac.uk/CATS/Publications

Stainforth, D A, Chapman, S.C. and Watkins, N W (2013) **Mapping climate change in European temperature distributions**, *Environmental Research Letters*, 8 (034031).

Daron, J D and Stainforth, D A (2013) **On predicting climate under climate change**. *Environmental Research Letters*, 8 (034021).

Chapman, S C, Stainforth, D A and Watkins, N W (2013) **On Estimating Local Long Term Climate Trends**, *Phil. Trans. R. Soc. A*, 371 (1991).

Baker, D J (15 February 2013) **Climate Change as an Inter-generational Problem**, *Proceedings of the U.S. National Academy of Sciences*, www.pnas.org/cgi/doi/10.1073/pnas.1302536110

Millner, A, Calel, R, Stainforth, D A and MacKerron, G (2013) **Do probabilistic expert elicitations capture scientists' uncertainty about climate change?** *Climatic Change*, 116 (2): 427-436.

Watkins, N W (2013) **Bunched black (and grouped grey) swans: Dissipative and Non-Dissipative Models of Correlated Extreme Fluctuations in Complex Geosystems**, *Geophysical Research Letters*, 40 (2): 402-410.

Frigg, R, Smith, L A and Stainforth, D A (2013) **The Myopia of Imperfect Climate Models: The Case of UKCP09**, *Philosophy of Science*, 80 (5), pp.886-897.

Glendinning, P and Smith, L A (2013) **Lacunarity and Period-doubling**, *Dynamical Systems*, 28 (1), 111-121

Machete, R L (2013) **Model Imperfection and Predicting Predictability**, *International Journal of Bifurcation and Chaos*, 23 (8): 1330027.

Machete, R L (2013) **Contrasting Probabilistic Scoring Rules**, *Journal of Statistical Planning and Inference*, 143 (10): 1781-1790.

Barrieu, P and Giammarino, F (2013) **Indifference pricing with uncertainty averse preferences**, *Journal of Mathematical Economics*, 49, 22-27.



- Barrieu, P and El Karoui, N (2013) **Monotone stability of quadratic semimartingales with applications to general unbounded quadratic BSDEs**, *The Annals of Probability*, 41, 1831-1853.
- Barrieu, P and Loubergé, H (2013) **Reinsurance and securitisation in life risk: the impact of regulatory constraints**, *Insurance: Mathematics and Economics*, 52, 135-144.
- Ranger, N and Niehoerster, F (2012) **Deep uncertainty in long-term hurricane risk: Scenario generation and implications for future climate experiments**, *Global Environmental Change*, 22:3.
- Baker, D J (14 December 2012) **Cloudy Forecast for Weather Satellite Data**, a letter in *Science*, 338, 1419.
- Smith, L A and Stainforth, D A (13 September 2013) **Clarify the limits of climate models**, in *Nature*, Correspondence, Vol. 489.
- Frigg, R, Bradley, S, Machete, R L and Smith, L A (2013) **"Probabilistic Forecasting: Why Model Imperfection Is a Poison Pill"**, in Andersen, H, Dieks, D, Wheeler, G, Gonzalez, W, and Uebel, T (ed.) *New Challenges to Philosophy of Science*. Berlin and New York: Springer, Vol. 4, 479-491.
- Du, H and Smith, L A (2012) **Parameter estimation using ignorance**, *Physical Review E*, 86: 016213.
- Beven, K, Buytaert, W and Smith, L A (2012) **On virtual observatories and modelled realities (or why discharge must be treated as a virtual variable)**, *Hydrol. Process.*, 26: 1905-1908.
- Giovagnoli, A and Wynn, H P (2012) **(U,V) ordering and a duality theorem for risk aversion and Lorenz type orderings**, in *LSE Philosophy Papers*.
- Lopez, A (2012) **Regional Implications**, in Booth, C, Hammond, F, Lamond, J and Proverbs, D (ed.) *Solutions to Climate Change Challenges in the Built Environment* London: Wiley-Blackwell London: Wiley-Blackwell.
- Lopez, A, (2012) **Understanding Flood Hazard**, Chapter 1 in Jha, A, Bloch, R and Lamond, J (ed.) *Cities and Flooding: A Guide to Integrated Urban Flood Risk Management for the 21st Century* A World Bank Report, Washington DC
- Suminski, S, Lopez, A, Birkmann, J and Welle, T (2012) **"Current knowledge on relevant methodologies and data requirements as well as lessons learned and gaps identified at different levels, in assessing the risk of loss and damage associated with the adverse effects of climate change"** UNFCCC Technical Report.
- Maynard, T and Ranger, N (2012) **What role for "Long-term Insurance" in Adaptation? An analysis of the prospects for and pricing of multi-year insurance contracts**, in *The Geneva Papers on Risk and Insurance - Issues and Practice*.
- Surminski, S (2012) **"The role of insurance risk transfer in encouraging climate investment in developing countries"**, in Vinales (ed.) *Harnessing Foreign Investments for Environmental Protection*, Cambridge: Cambridge University Press.
- Rowlands, D J, Frame, D J, Ackerley, D, Aina, T, Booth, B B B, Christensen, C, Collins, M, Faull, N, Forest, C E, Grandey, B S, Gryspeerdt, E, Highwood, E J, Ingram, W J, Knight, S, Lopez, A, Massey, N, McNamara, F, Meinshausen, N, Piani, C, Rosier, S M, Sanderson, B M, Smith, L A, Stone, D A, Thurston, M, Yamazaki, K, Yamazaki, Y H and Allen, M R (2012) **Broad range of 2050 warming from an observationally constrained large climate model ensemble**, *Nature Geoscience*, 5, 256-260.
- Petersen, A (2012) **Simulating Nature: A Philosophical Study of Computer-Simulation Uncertainties and Their Role in Climate Science and Policy Advice** CRC Press (2nd edition).
- Ellepola, J, Thijssena, N, Grievink, J, Avhijeet, A, and van Schijndel, J (2012) **Development of a synthesis tool for Gas-To-Liquid complexes** *Computers and Chemical Engineering*. 42:2-14
- Barrieu, P and Sinclair-Desgagné, B (2012) **Economic Policy When Models Disagree**, CIRANO – Scientific Publication No. 2009s-03.

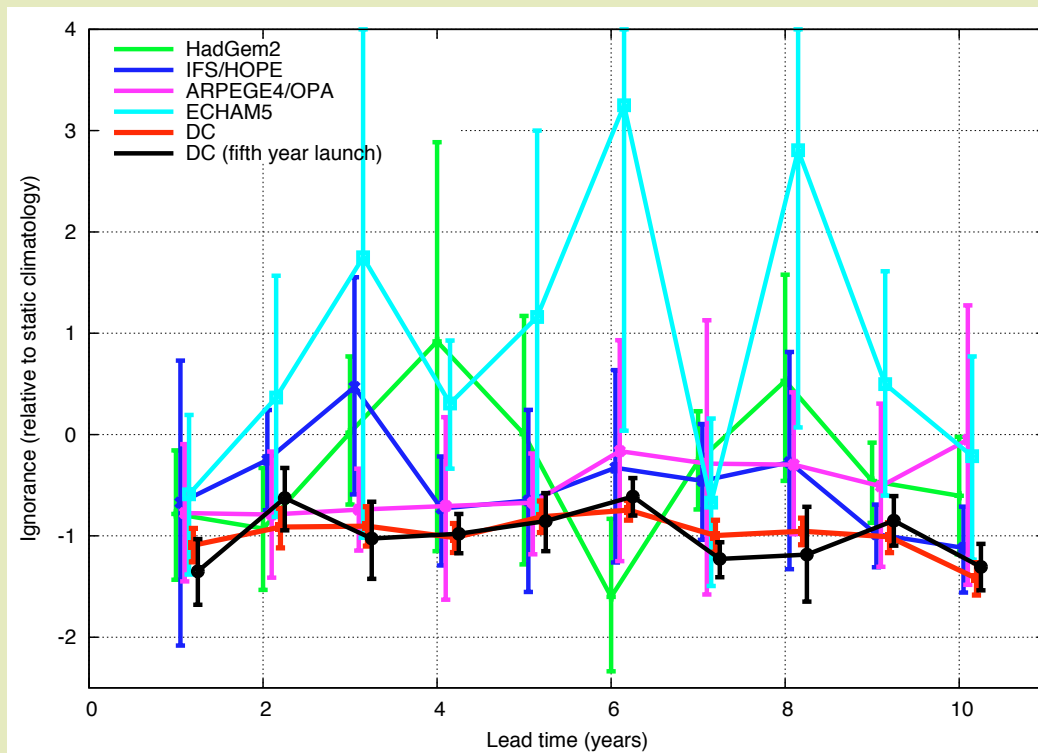
Financial Summary, 2012-13

Funding Received 2012-13

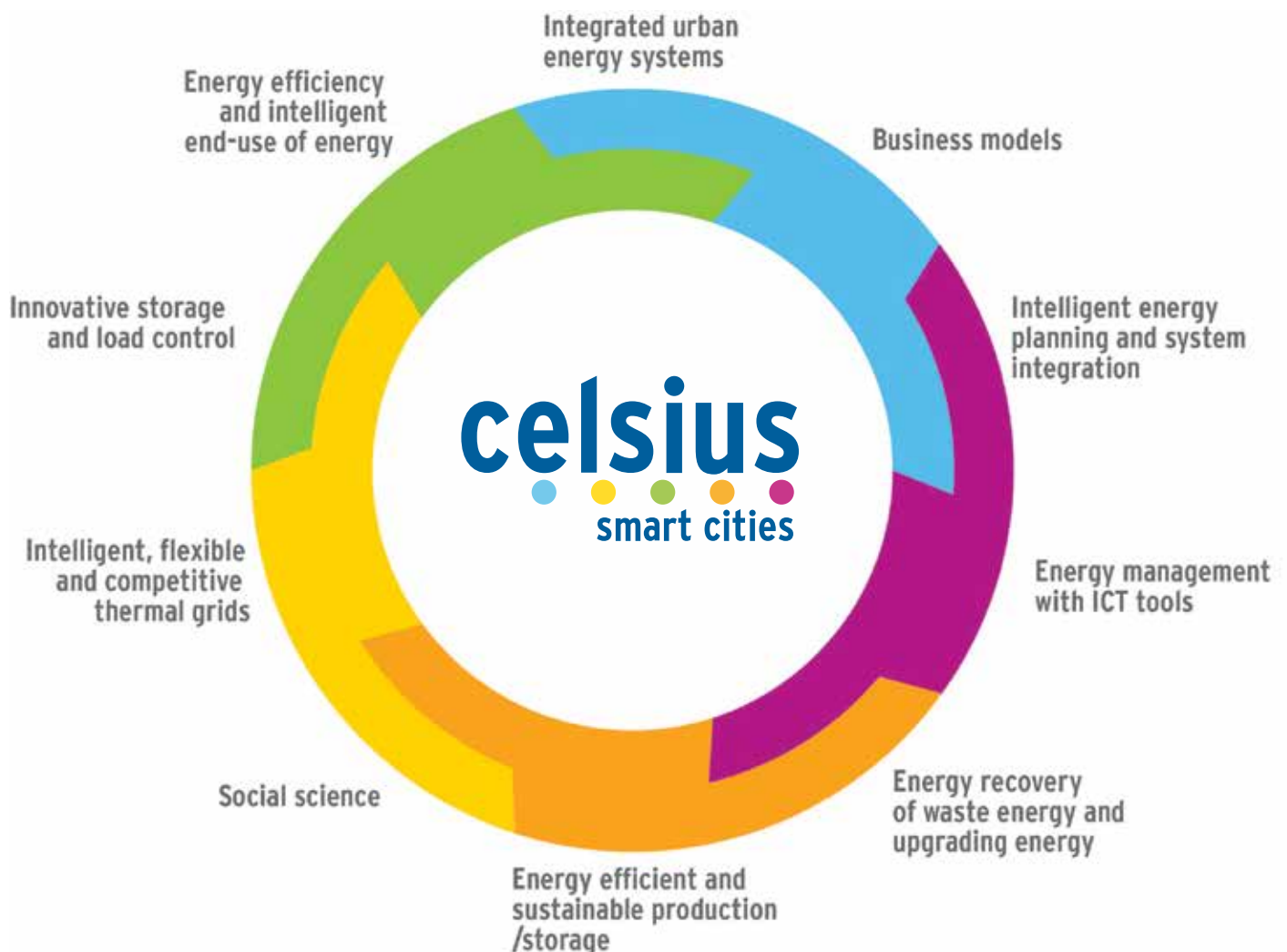
	No.	Awarded £
Research Councils	1	£97,193.00
European Commission	1	£349,000
Overseas Funders (non EU)	2	£99,676
HIEF	1	£56,924.00
Total funding received:		£602,793.00

Income and Expenditure Statement 2012-13

	Amount £
Research Councils	£84,678.32
UK Industry & Commerce	£4,122.43
European Commission	£2,937.29
Overseas Funders (non EU)	£45,263.17
EU (other)	£500,784.27
LSE Funding	£58,651.87
HIEF	£1,680.56
Total Income	£698,117.91



The figure illustrates the skill of decadal probability forecasts of annual global-mean temperature from climate simulation models from the EU ENSEMBLES project and an empirical model (DC), relative to reference forecasts based on the climatological distribution.



Groundbreaking synergy

There is enough waste heat produced in the EU to heat the EU's entire building stock; what is missing is the heating distribution network to transport the heat to where it is needed. Celsius will combine physical demonstration with systems modelling to explore alternative system configurations and management strategies to optimise system efficiencies and performance. This will develop new business models that value resource conservation and utilisation and encourage cities to develop more self-sufficient energy systems, ones that minimise energy flows into and out of the city, creating a more circular energy economy within the city.

Staff and Associates, 2012-13

Directors and management

Professor Leonard Smith – Director of CATS
Professor of Statistics, LSE; Senior Research
Fellow of Pembroke College, Oxford

Professor Pauline Barrieu – Co-director of CATS
Professor in Statistics

Dr Roman Frigg – Co-director of CATS
Reader in Philosophy

Professor Henry Wynn – Chair of CATS
Professor of Statistics

Lyn Grove – Centre Manager

Administrative Support

Rosie Tilson-Thomas

Jill Ramsay

Research Staff

Dr Hailiang Du – Research Officer

Dr Ana Lopez – Research Officer

Dr Nicola Ranger – Research Fellow

Dr Ralph Rayner – Professorial Research Fellow

Dr David Stainforth – Senior Research Fellow

Dr Emma Suckling – Research Officer

Dr Swenja Surminski – Senior Research Fellow

Dr Erica Thompson – Research Officer

Research Students

Sarah Higgins

Alex Jarman

Trevor Maynard

Ewelina Sienkiewicz

Ed Wheatcroft

Associate members from across LSE

Dr Simon Dietz – Co-Director of the
Grantham Research Institute on Climate
Change and the Environment; Deputy Director
of the Centre for Climate Change Economics
and Policy; Senior Lecturer in the Department
of Geography and Environment.

Dr Sam Fankhauser – Co-Director, Grantham
Research Institute on Climate Change and the
Environment

Professor Conor Gearty – Director, Centre
for the Study of Human Rights; Professor of
human rights law

Professor Mary Morgan – Professor of
the History of Economics, Department of
Economic History

Professor Nicholas Stern – Chair of the
Grantham Research Institute on Climate
Change and the Environment; Chair of the
Centre for Climate Change Economics and
Policy; IG Patel Professor of Economics and
Government at the Suntory and Toyota
International Centres for Economics and
Related Disciplines (STICERD); Chair of the
Asia Research Centre; and Director of the India
Observatory at LSE

Visiting Professors and Fellows

Dr D James Baker – Senior Visiting Fellow
Director, Global Carbon Measurement
Program, William J Clinton Foundation

Professor Mark Berliner – Visiting Professor
Professor of Statistics, Ohio State University

Professor Keith Beven – Visiting Professor
Professor of Hydrology and Fluid Dynamics at
Lancaster Environment Centre

Dr Jochen Bröcker – Visiting Fellow
Scientist at the Max Planck Institute for Physics
of Complex Systems in Dresden

Dr Milena Cuellar – Visiting Fellow
Adjunct Assistant Professor of City University of
New York (CUNY) at Bronx Community College

Dr Jerome Ellepola – Visiting Fellow
Shell Projects and Technology Organisation in
the Netherlands

Dr Joshua Elliot – Senior Visiting Fellow
Research Scientist and Fellow at the
Computation Institute, University of Chicago
and Argonne National Lab

Dr David Frame – Senior Visiting Fellow
Deputy Director of the Smith School of
Enterprise and Environment, and a Hugh Price
Fellow at Jesus College, University of Oxford

Dr Neil Gordon – Senior Visiting Fellow
General Manager, Science Research and
Development, at Meteorological Service of
New Zealand Limited

Dr James A. Hansen – Senior Visiting Fellow
Lead Scientist in the Probabilistic-prediction
Research Office at the US Naval Research
Laboratory, Monterey

Professor Nigel Harvey – Visiting Professor
Professor of Judgement and Decision Research, UCL

Dr Ed Hawkins – Visiting Fellow
NCAS-Climate, Department of Meteorology,
University of Reading

Dr Kevin Judd – Senior Visiting Fellow
Associate Professor at the School of
Mathematics and Statistics, University of
Western Australia

Dr Reason L Machete – Visiting Fellow
Research Fellow, Department of Mathematics,
University of Reading

Dr Simon Mason – Senior Visiting Fellow
Research Scientist, Climate, Disasters,
International Outreach at the International
Research Institute for Climate and Society, The
Earth Institute, Columbia University

Trevor Maynard – Senior Visiting Fellow
Deputy Head of exposure management, Lloyd's
of London

Dr Patrick E McSharry – Visiting Fellow
Head of the Catastrophe Risk Financing Centre
the Smith School of Enterprise and Environment

Dr Falk Niehörster – Visiting Fellow
RPI (Risk Prediction Initiative) Science Program
Manager at the Bermuda Institute of Ocean
Science (BIOS)

Dave Parker – Senior Visiting Fellow
Head of Forecasting, EDF Energy

Professor Arthur Petersen – Munich Re
Programme Visiting Professor
Director of the Methodology and Modelling
Programme, Netherlands Environmental
Assessment Agency (PBL)

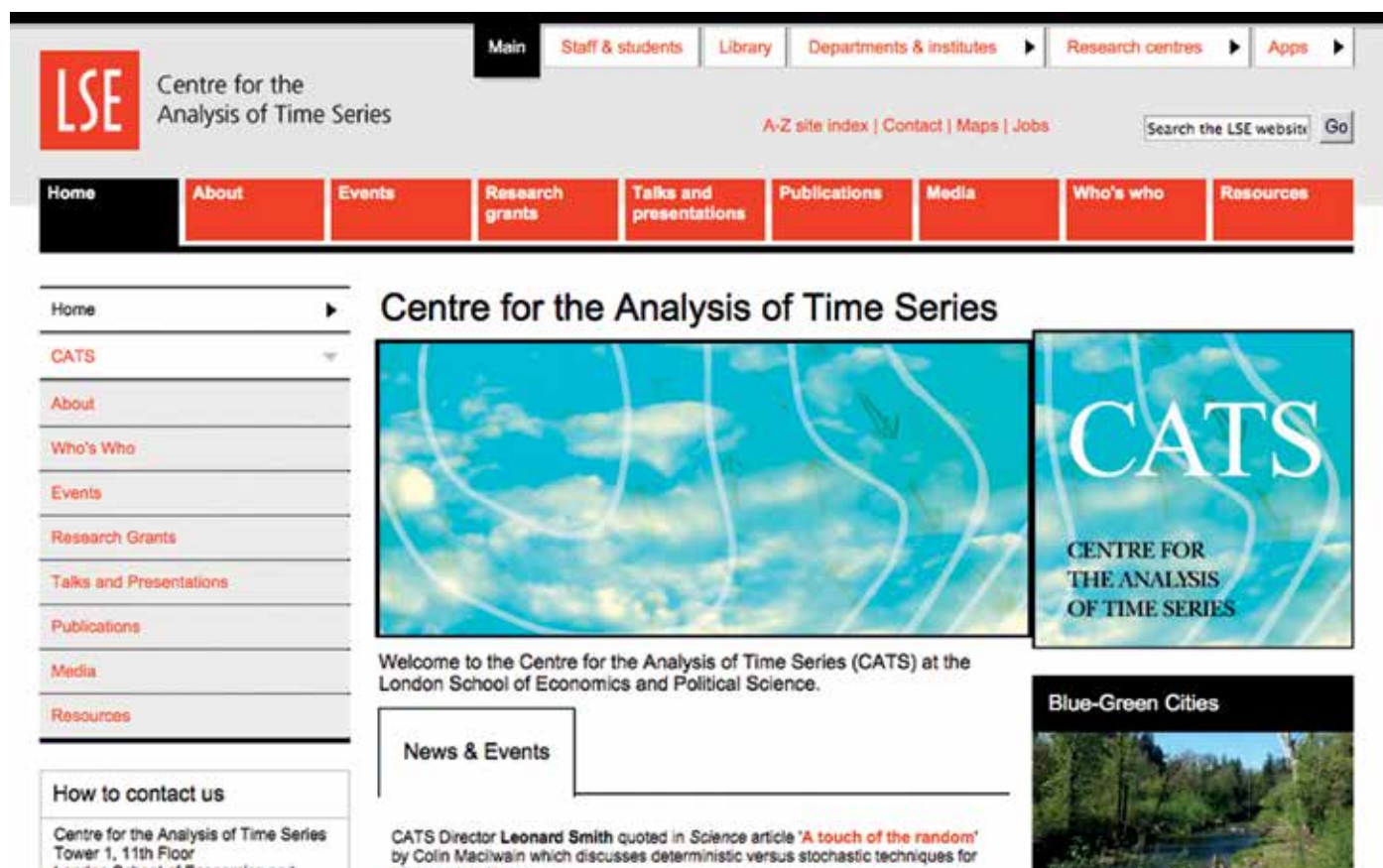
Dr Mark Roulston – Senior Visiting Fellow
Previously a Probability Forecast Applications
Specialist at the UK Met Office

Dr Dan Rowlands – Visiting Fellow
Weather Analyst, Cumulus Asset Management/
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Dr Nicholas Watkins – Visiting Fellow
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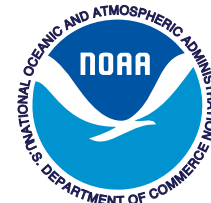
Dr Antje Weisheimer – Visiting Fellow
The European Centre for Medium Range
Weather Forecasts (ECMWF)

Roland Young – Visiting Fellow
Postdoctoral researcher, Atmospheric Oceanic
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