[**Oxford Workshop on Model Uncertainty**](https://oxfordmodeluncertainty.web.ox.ac.uk/)

Monday 23rd – Thursday 26th September 2024, Department of Physics, University of Oxford

Timetable v3.3 19/09/24

| **Mon 23rd Sep** |  |  |  |
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| 10:00 – 11:00 | Registration + coffee | 1hr |  |
| 11:00 – 11:20 | Introduction | 20min | H. Christensen (20) |
| 11:20 – 12:30 | **Constraining parametric uncertainty (1)**  *Beyond prediction: exploring parametric uncertainty in climate models in the AI era*  *Quantifying and Constraining Parametric Uncertainty in Land Carbon Uptake in the Community Land Model*  *Model uncertainty in sea ice melt pond parametrisations and their emulation using neural networks* | 1hr10 | **V. Balaji (30)**  L. Hawkins (20)  S. Driscoll (20) |
| 12:30 – 13:30 | Lunch | 1hr |  |
| 13:30 – 15:10 | **Constraining parametric uncertainty (2)**  *Identifying structural uncertainties in the UKESM1 aerosol scheme*  *Model calibration with discrepancy for high-dimensional output*  *Bayesian optimisation of ocean models*  *Surrogate-based model parameter optimization in simulations of the West African monsoon*  *Effect of resolution on teleconnections from a causal network of North Atlantic winter circulation* | 1h40 | L. Prévost (20)  J. Salter (20)  M. Mrozowska (20)  M. Fischer (20)  D. Sexton (20) |
| 15:10 – 15:40 | Coffee | 30min |  |
| 15:40 – 17:10 | **The role of climate model resolution**  *Kilometer-resolution climate models: prospects and challenges*  *Further evidence of the value of resolution, and its surrogates, in GCM simulations of Tropical Cyclones*  *Dynamical decomposition of precipitation uncertainty in climate models*  *Understanding the added value of high resolution climate modelling using explainable AI* | 1h30 | **C. Schär (30)**  P.L. Vidale (20)  J. Dorrington (20)  S. Michel (20) |
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| **Tue 24th Sep** |  |  |  |
| 09:00 – 10:30 | **Initialised forecasts and an operational perspective**  *Representing model uncertainty in seasonal and multi-annual forecasts*  *A critical look at the impact of perturbations on ensemble forecast performance*  *A Comparison of Forecast Uncertainty Growth Between Ensemble Prediction Systems*  *Quantification of interactions between multiple sources of uncertainty in convective-scale ensemble forecasts* | 1hr30 | **A. Weisheimer (30)**  W. Tennant (20)  D. Wood (20)  T. Matsunobu (20) |
| 10:30 – 11:00 | Coffee | 30min |  |
| 11:00 – 12:30 | **Understanding and representing uncertainty in parametrisation schemes (1)**  *Experiments with model error representations in the AROME-EPS kilometric-resolution ensemble*  *Can FLUXNET data be used to constrain land surface processes?*  *Generalising Probabilistic Surrogate Models of Quasi-Geostrophic Turbulence across Parameter Regimes*  *Recurrent neural networks for sub-grid parameterization* | 1hr30 | **F. Bouttier (30)**  H. Lambert (20)  I. Shokar (20)  P. Ukkonen (20) |
| 12:30 – 13:30 | Lunch | 1hr |  |
| 13:30 – 15:10 | **Understanding and representing uncertainty in parametrisation schemes (2)**  *Data-driven deterministic and stochastic subgrid-scale parameterization for atmosphere and ocean models: a pattern-based approach*  *Improving Atmospheric Processes in Earth System Models with Deep Learning Ensembles and Stochastic Parameterizations*  *A Machine Learning Approach to Stochastic Parameterisation*  *Some Markovian parameterisations are better than others*  *When does variability on unresolved scales matter?* | 1h40 | F. Kwasniok (20)  G. Behrens (20)  H. Reid (20)  M. Brolly (20)  G. Craig (20) |
| 15:10 – 15:40 | Coffee | 30min |  |
| 15:40 – 17:30 | Poster session 1 | 1h50 |  |
| 17:30 - | Break |  |  |
| 19:00 - | Drinks reception, followed by conference dinner |  | Reuben College |
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| **Wed 25th Sep** |  |  |  |
| 09:00 – 09:40 | **The big picture**  *Thoughts on representations of model uncertainty*  *Ensembles of Ensembles of Ensembles - On designing modelling experiments to support climate sensitive decisions* | 40min | T. Palmer (20)  D. Stainforth (20) |
| 09:40 – 10:40 | **Panel discussion**  *The future of climate modelling: model uncertainty and the great k-scale debate*  Global k-scale modelling, where models are run with atmospheric and oceanic resolutions of order one km, promises to transform climate modelling. In the atmosphere, for example, it aims to substantially reduce uncertainties associated with the parametrisation of convection, representing a step-change in the structure and behaviour of the model. However, key uncertain processes will still be parametrised, and the ultra-high resolution will reduce the number of simulations that can be produced. This would impact our ability to quantify structural uncertainties and uncertainty due to internal variability, among others. How can we balance these ideas, when looking to the future of climate modelling? | 1hr | V. Balaji  B. Booth  F. Bouttier  C. Schär  A. Weisheimer  M. Willson  Chair: H. Christensen |
| 10:40 – 11:10 | Coffee | 30min |  |
| 11:10 – 12:30 | Breakout groups | 1hr20 |  |
| 12:30 – 13:30 | Lunch | 1hr |  |
| 13:30 – 14:40 | **Machine Learning approaches, including applications to data assimilation**  *GenCast: Diffusion-based ensemble forecasting for medium-range weather*  *Combining dynamical and machine learning ensembles for data assimilation using the multi-model ensemble Kalman filter*  *Machine-learning, stochastic physics and model uncertainty activities in Met Office Parametrization Team* | 1h10 | **M. Willson (30)**  E. Bach (20)  C. Morcrette (20) |
| 14:40 – 15:10 | Coffee | 30min |  |
| 15:10 – 17:00 | Poster Session 2 | 1h50 |  |
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| **Thu 26th Sep** |  |  |  |
| 09:00 – 10:30 | **Uncertainty in climate models and their projections (1)**  *Bridging the current gaps between our understanding of the Earth System and climate adaptation.*  *Interpreting time series from ensembles of climate projections*  *Aerosol impacts on regional climate: chaotic or physical effect?*  *How Might We Improve Predictions of Regional Hydroclimate?* | 1h30 | **B. Booth (30)**  R. Chandler (20)  C. Zhao (20)  T. Aerenson (20) |
| 10:30 – 11:00 | Coffee | 30min |  |
| 11:00 – 12:00 | **Uncertainty in climate models and their projections (2)**  *Enhanced risk of hot extremes unveiled by observation-constrained scenario projections*  *The statistical challenges in tackling persistent climate model uncertainty through model-observation comparisons.*  ---  **Tools for analysing model uncertainty**  *AQUA: a novel quality assessment tool for km-scale simulations* | 1h | S. Corti (20)  J. Johnson (20)  ---  S. Caprioli (20) |
| 12:00 – 13:00 | Feedback from breakout groups | 1h |  |
| 13:00 | Lunch and Conference end |  |  |

| **Poster Session 1** |  | **Posters displayed Monday - Tuesday** |
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| Yuqi | Bai | The Hi-Fi project: a new turbulent scheme for large eddy simulation for grey-zone parametrization |
| Jeff | Beck | Convection-allowing model simulations using scale-dependent initial conditions (ICs) and perturbations: Toward multi-scale IC blending in the RRFS |
| Max | Bouman | Machine learning based automatic tuning and parameter uncertainty quantification of land-atmosphere interactions |
| Yi-Hsuan | Chen | Addressing Marine Stratocumulus Biases in Taiwan Earth System Model Version 1 (TaiESM1) |
| Ting-Chen | Chen | Potential impact of ocean mesoscale on the persistence of the Southern Annular Mode |
| Eswyn | Chen | The effect of atmospheric resolution on North Atlantic Extratropical Storm Track Characteristics in HadGEM3 |
| Ian | Dragaud | Representation of marine low‐level clouds in global-coupled storm-resolving models |
| Yao | Ge | Sensitivity and uncertainty assessment with perturbed parameters in a UKCA box model |
| Patrick | Heimbach | Differentiable programming for Hessian-based uncertainty quantification and ocean observing system design in the North Atlantic. |
| Hideaki | Kawai | Importance of minor-looking treatments for ESM performances |
| Richard | Keane | Demonstrating scales of predictability at tropical and middle latitudes |
| Zhi-Jun | Liu | Statistical Modeling of Meter-Scale Permafrost Subsidence for Integration into Kilometer-Resolution Earth System Models |
| Danny | McCulloch | Impact of local and remote atmospheric heating interventions on subtropical low clouds |
| Greta | Miller | Probabilistic machine learning for stochastic parameterization of deep convection triggering |
| Kaustubh | Mittal | A comparison of forecast bust characteristics for different numerical weather prediction models over the european region |
| Aditi | Sheshadri | Calibration and uncertainty quantification for physics-based and machine learning-based subgrid scale parameterizations |
| Jeremy | Walton | Regional Impacts Poorly Constrained by Climate Sensitivity |
| Matthew | Wright | Multi-decadal variability in seasonal hindcasts: the role of aerosol forcing |
| Zhixiao | Zhang | Improving Organized Convection Parameterization in the Unified Model |
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| **Poster Session 2** |  | **Posters displayed Wednesday - Thursday** |
| Henry | Addison | Generative machine learning emulation of a km-scale regional climate model |
| Jonnie | Barnsley | Antarctica's contribution to sea level during the mid-Pliocene warm period |
| Edward | Groot | Linking CAPE and precipitation rate non-stationarity during spin-up across NWP physics packages |
| Natalia | Nazarova | Evaluating Tropical Precipitation Extremes Using NextGEMS and DestinE Climate Digital Twin Simulations |
| Tamzin | Palmer | Can a process-based model assessment constrain Central European precipitation projections? |
| Valentin | Portmann | Comparison of different observational constraint methods applied to the AMOC projections |
| Nigel | Roberts | A new synoptic-scale curvature diagnostic and application to ensembles |
| John | Rostron | A clearer view of systematic errors in model development: two practical approaches using perturbed parameter ensembles |
| Emanuele | Silvio Gentile | What are the benefits of km-scale global climate model simulations for predicting extratropical cyclones extreme winds? |
| Laurence | Smith | Driving business decision making through understanding and communicating climate uncertainty |
| Rhidian | Thomas | Hindcast-based estimates of recent climate trends |
| Martina | Tudor | Treating Uncertainties in an Operational ALARO Physics Limited Area Model Ensemble |
| Wahiba | Lfarh | What are the errors in the representation of deep convection in Arpège-Climat ? |
| Peter | Watson | Frameworks for estimating and characterising extreme weather risks given major uncertainties |
| Tim | Woollings | Blocking in a perturbed physics ensemble of HadGEM3 |
| Qingyuan | Yang | Insights and uncertainty in working with Parameter Perturbation Experiments from two climate models |
| Shuiqing | Yin | Can wet heatwaves be represented by CMIP6 models and bias-corrected NEX-GDPP-CMIP6? |
| Ming | Zhao | Crucial Role of Sea Surface Temperature Warming Patterns in Near-Term High-Impact Weather and Climate Projection |

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