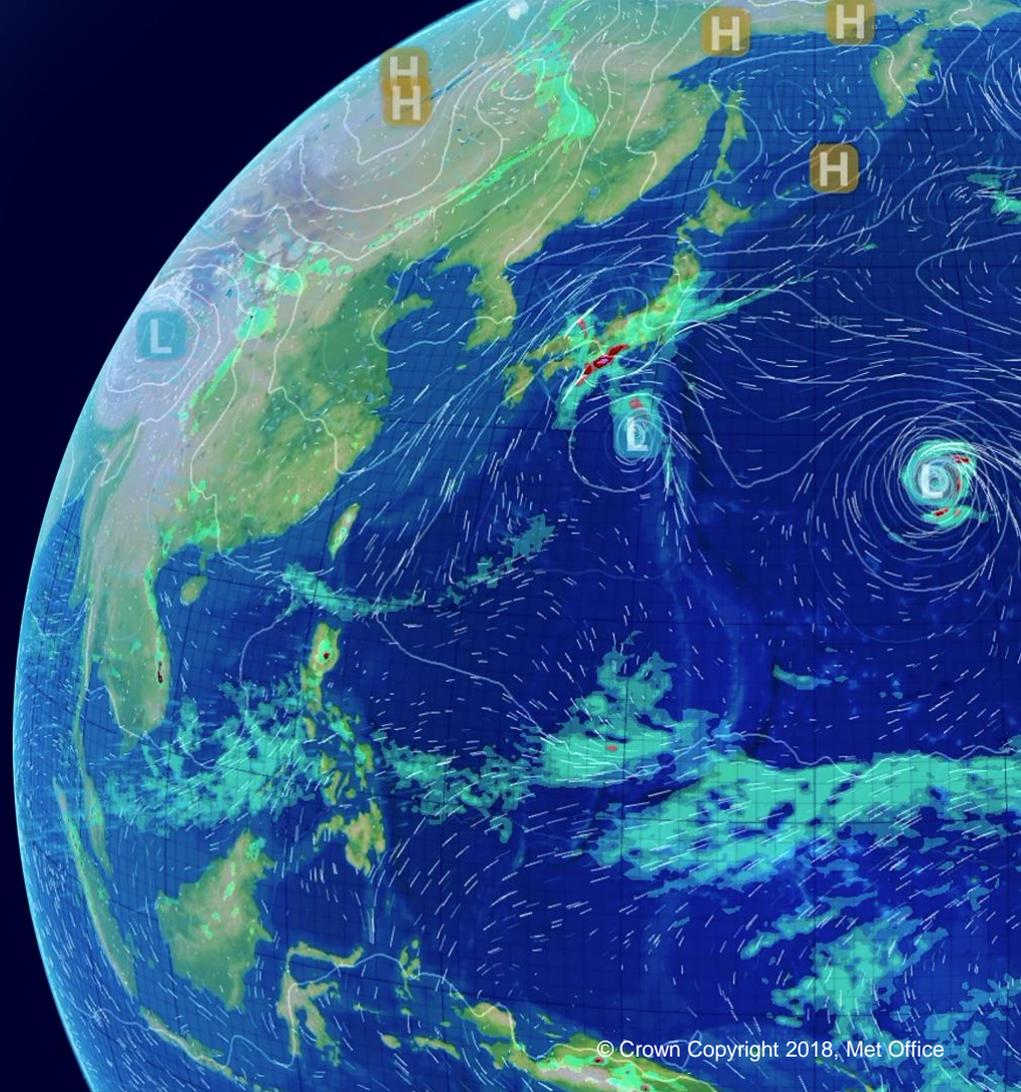


Outlook to the Future

Gordon Inverarity

10 January 2018, Leeds



Purpose: Working at the forefront of weather and climate science for protection, prosperity, and well-being

Aim: To be the global partner of choice for weather and climate services

Contents

Moist convection (Maths Foresees study group challenge)

Partnerships

Met Office Academic Partnership

Science strategy

Exascale computing

Collaboration principles

Convection – Mike Cullen

Moist convection in a single column – problem posed at an Environmental Modelling in Industry Study Group, September 2015 sponsored by Maths Foresees and the NERC PURE (Probability, Uncertainty and Risk in the Environment) Network

Instant vertical rearrangement of moist air parcels to achieve static stability, including condensation and latent heat release

Used to validate global model convection parametrization

Convection – Mike Cullen

[A model for moist convection in an ascending atmospheric column](#) by Cheng, B., Cullen, M. J. P., Esler, J. G., Norbury, J., Turner, M. R., Vanneste, J. and Cheng, J. (2018)

[A rigorous treatment of moist convection in a single column](#) by Cheng, B., Cheng, J., Cullen, M., Norbury, J. and Turner, M. (2018)

Partnerships (not exhaustive list)

[Unified Model Partnership](#)

[Met Office Academic Partnership](#)

[Joint Weather and Climate Research Programme](#) (NERC, MONSooN)

[Environmental Science to Services Partnership](#) (DataSpring API)

[Climate Science Research Partnership](#) (DFID, Africa)

[Newton Fund Weather and Climate Science for Service Partnership](#) (UK government)

[Natural Hazards Partnership](#)



Met Office Academic Partnership

<https://www.metoffice.gov.uk/research/collaboration/partnership>

Jointly funds chairs at partner universities

Sponsors CASE studentships and supports DTP/CDT studentships
(currently 60 students)

Enables research visits to/from universities

Exeter

Mathematical formulation of numerical weather prediction models

Statistical modelling of weather and climate processes

Earth system modelling and processes

Climate impacts

Leeds

Observations and processes

Atmospheric composition

Climate impacts

Weather, climate and social science

Reading

Data assimilation research for next-generation operational data assimilation

Space research for improved space-weather forecasting

High-resolution modelling of urban areas

Assessing weather and climate risks at the regional scale

Land-surface research for improved flood, drought and weather forecasting

Computational science for next-generation models and informatics

Earth's energy imbalance

High-resolution model evaluation through novel observations

Oxford

Coupled-climate dynamics and probabilistic forecasting

Remote sensing of atmospheric composition for weather and climate

Oceans and climate

Climate risks, decisions and services

Science strategy (not exhaustive list)

Exploit probabilistic information at all time-scales within a risk-based framework

Exploit increasing model resolutions

Improve convective-scale forecasts up to 12 hours (including impact of global lateral boundary conditions)

Improve skill on monthly, seasonal and decadal timescales (resolution and ensemble size)

Improve climate projections to better anticipate impacts

Science strategy

Enhanced Earth system modelling

Improved UK environmental prediction (atmosphere, land surface, ocean, waves, sediments/biogeochemistry)

Exploit observations better

Develop coupled ocean-atmosphere data assimilation

Enhance ensemble prediction systems

Develop improved verification metrics

Exascale computing

Future supercomputer architectures expected to require new code design

Increasing importance of scientific software engineering

LFRic UM redesign already in progress based on separation of concerns: kernel, algorithm and parallel systems layers (target 2023)

Data assimilation software redesign starting (Joint Effort for Data assimilation Integration – [Joint Center for Satellite Data Assimilation](#))

Implement En-4DEnVar with 100 ensemble members in 2018 and investigate alternatives to using an explicit linearised forecast model and adjoint

Collaboration principles

Make contact at an early stage – letters of support require Met Office involvement in developing a proposal. A clear route for pull-through into our models is recommended.

Industrial CASE Ph.D. proposals need Strategic Head approval by the end of April for the internal Met Office selection process ahead of the following autumn's research council selection process. Proposals aligned with Met Office strategic priorities have more chance of success in the internal selection process.

Proposals are not restricted to MOAP universities

Each proposal is considered on its merits

Questions?

For more information please contact



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