

MUMIP

Model Uncertainty – Model Intercomparison Project

WGNE Update

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WGNE36, 1-4 November 2021, online

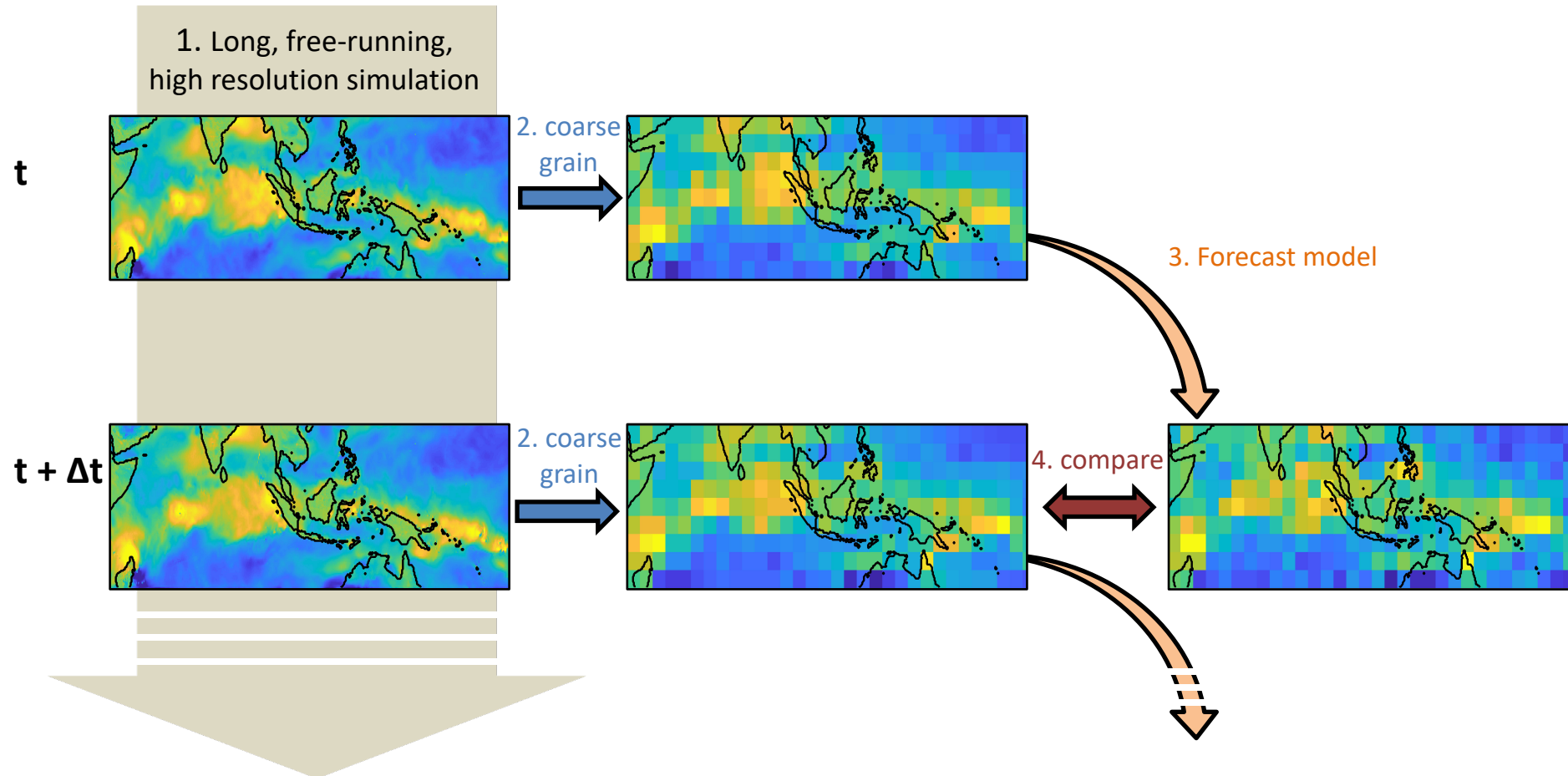
Background

- Joint initiative of WGNE and Predictability, Dynamics and Ensemble Forecasting (PDEF) working group
- At the joint WGNE/PDEF meeting in Tokyo, October 2018, a coordinated activity was proposed to evaluate model error across a number of forecast models
- Some key questions:
 - Stochastic parametrisation**
 - How should we best represent model uncertainty (random error)?
 - Should stochastic parametrisations be model dependent?
 - Are current approaches justified? How can they be improved?

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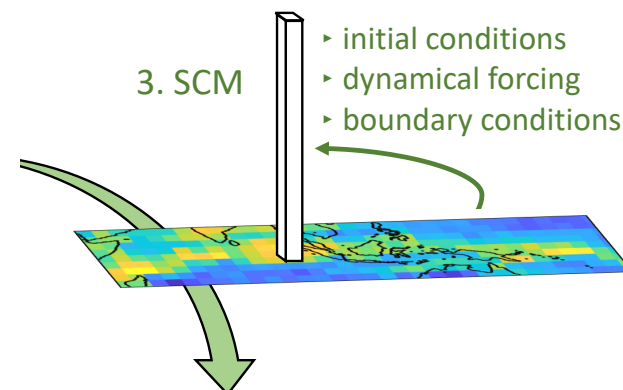
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- Some key questions:
 - Stochastic parametrisation**
 - How should we best represent model uncertainty (random error)?
 - Should stochastic parametrisations be model dependent?
 - Are current approaches justified? How can they be improved?
 - Systematic errors**
 - How structurally diverse are deterministic parametrisations?
 - How different are systematic errors on short timescales?
 - High resolution simulations**
 - Can we use coarse-graining as a validation tool for high-resolution models?

Summary of protocol: use high-resolution dataset as 'truth'



Use SCM as forecast model

- Use coarse-grained high resolution simulation to prescribe
 - Initial conditions
 - Forcing: advective tendencies, geostrophic winds, vertical velocity
 - Boundary conditions: Surface sensible and latent heat fluxes, Skin temperature



Why use the SCM?

- Supply dynamical tendencies → target uncertainty in the parametrization schemes
- The SCM is more portable than the full model, and is cheap to run. Potential to run SCM on computer where high-res data is stored
- (Spectral models cannot be run over a limited domain, but we can tile many independent SCM to cover the limited domain.)

What information do we have?

- ✓ **Total change in (T, q, U, V) in high-resolution dataset** as a function of **model level**, location and start date/time
- ✓ **Change in (T, q, U, V) in SCM, decomposed into dynamics and individual parametrised tendencies**, as a function of **model level**, location and start date/time

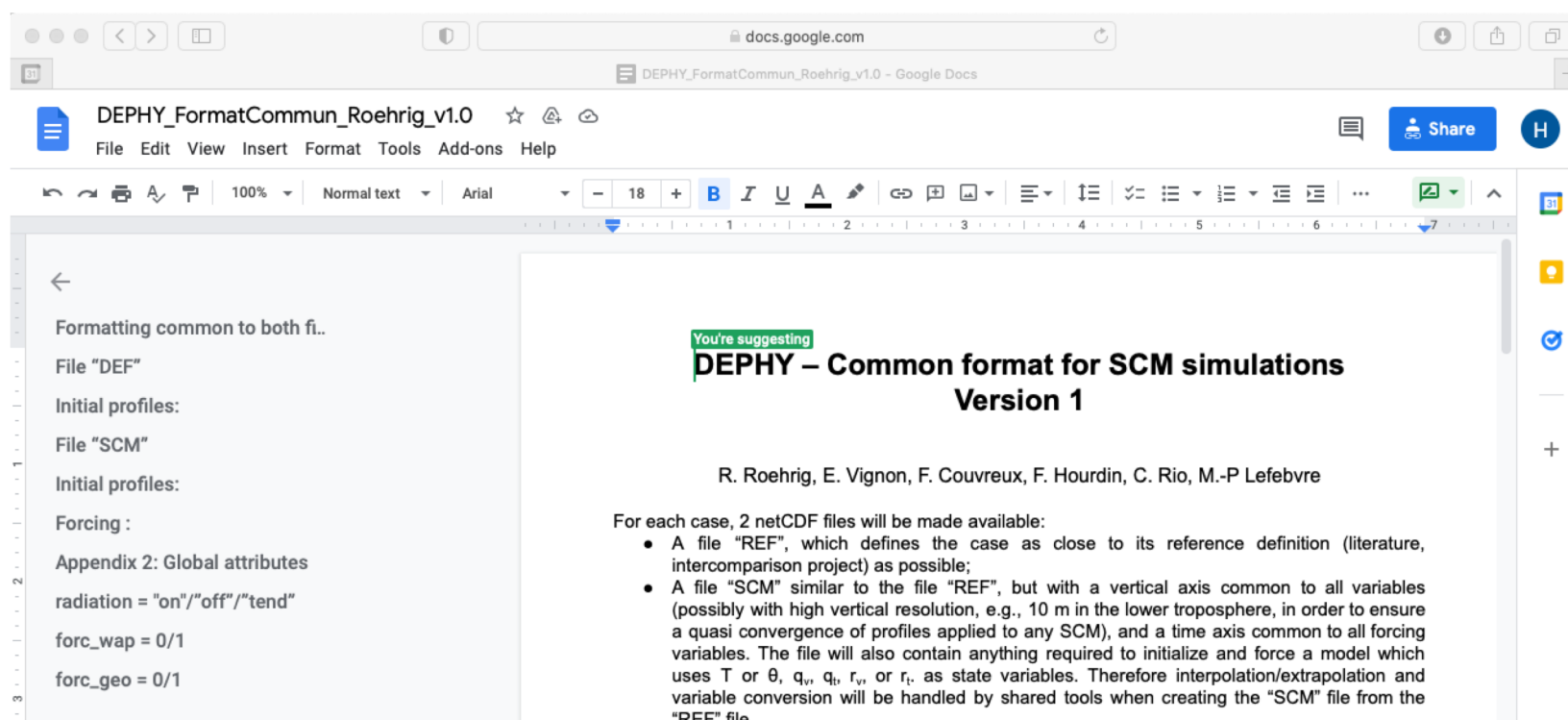
→ Model error statistics as a function of space and time

*For examples of analysis that can be carried out with this data,
please see Christensen, 2020, QJRMetS*

Case study using UKMO limited area high-res simulation and OpenIFS SCM

DEPHY common SCM format

- New standardised SCM protocol has been proposed by a group of French researchers involved in the High Tune and DEPHY communities.
 - standardises the format of input/output files needed to run an SCM.
- Many SCM groups participated at an interactive workshop in June 2020, and follow up meeting in January 2021
- Ideally, all SCM participating in this intercomparison will use DEPHY format



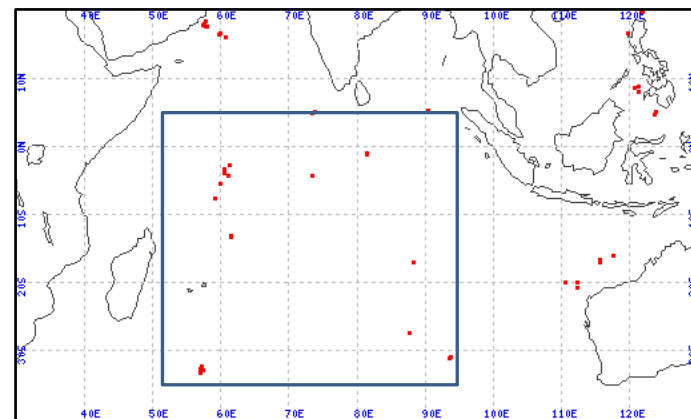
Partners



- **Representatives of WGNE and PDEF**
 - Nils Wedi, Romain Roehrig
 - Judith Berner, John Methven, Mark Rodwell
- **Modeling groups/ SCMs**
 - NCAR/NOAA DTC CCPP
 - IFS (U Oxf)
 - UM (UKMO/U Exeter)
 - Meteo France
 - DWD?
- **Benchmark simulations**
 - MPI (ESIWACE)
- **Analysis**
 - All
- **Knowledge transfer (RTO)**
 - ECMWF
 - NOAA
 - Met Office

Progress

- Two meetings since WGNE-35
 - One general, one technical
- Prototype coarse-grained input fields available (**HC**)
 - Initial resolution of 0.2 degrees (~22 km)
 - Domain in Indian Ocean: (51-95E, 5N-35S)
- Modeling groups working on DEPHY-isation of SCMs
 - UKMO (in progress), IFS (in progress), Meteo France (complete), CCPP (complete)
- NCAR/NOAA DTC proposal for funding submitted and accepted – just started
 - Mike Ek and Ligia Bernardet
- UK Leverhulme Trust funding application submitted, Oct '21 (outline stage)
 - **HC** (Oxford) lead, Co-Is: Romain Roehrig (MF), Hugo Lambert (Exeter), Judith Berner (NCAR)
 - Would fund PDRA time for IFS, UKMO, and Meteo France SCM runs





Model Uncertainty - MIP

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An initiative of the WCRP Working Group for Numerical Experimentation and the WWRP Predictability, Dynamics and Ensemble Forecasting Working Group

Introduction

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Contact

The MU-MIP team consists of scientists from 10+ institutes spanning three continents. Please get in touch by emailing hannah.christensen 'at' physics.ox.ac.uk if you would like to get involved!

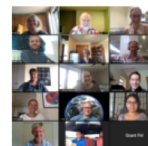
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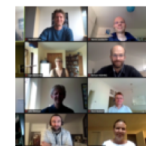
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News



Technical discussion meeting
26 August 2021



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23 June 2021



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20 May 2021



Developmental Testbed Center funding for MUMIP work
24 March 2021



MUMIP Launch Meeting
24 September 2020



Hello world
22 September 2020



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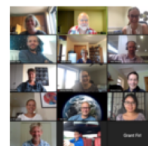
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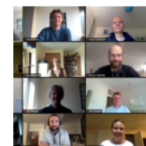
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Looking ahead

Next steps:

- Finish DEPHY-isation of SCM
 - Nb. DEPHY format v1.0 now finalized (Romain Roehrig and Etienne Vignon)
 - Separate timeline from DEPHY groups – testing proposed by end of the year
- Testing with prototype input files
- Funding timeline
 - Full proposal to be submitted in March 2022 if invited.
 - If successful, PDRAs in place for next WGNE.
- Continue to recruit new participants

Thanks for listening



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