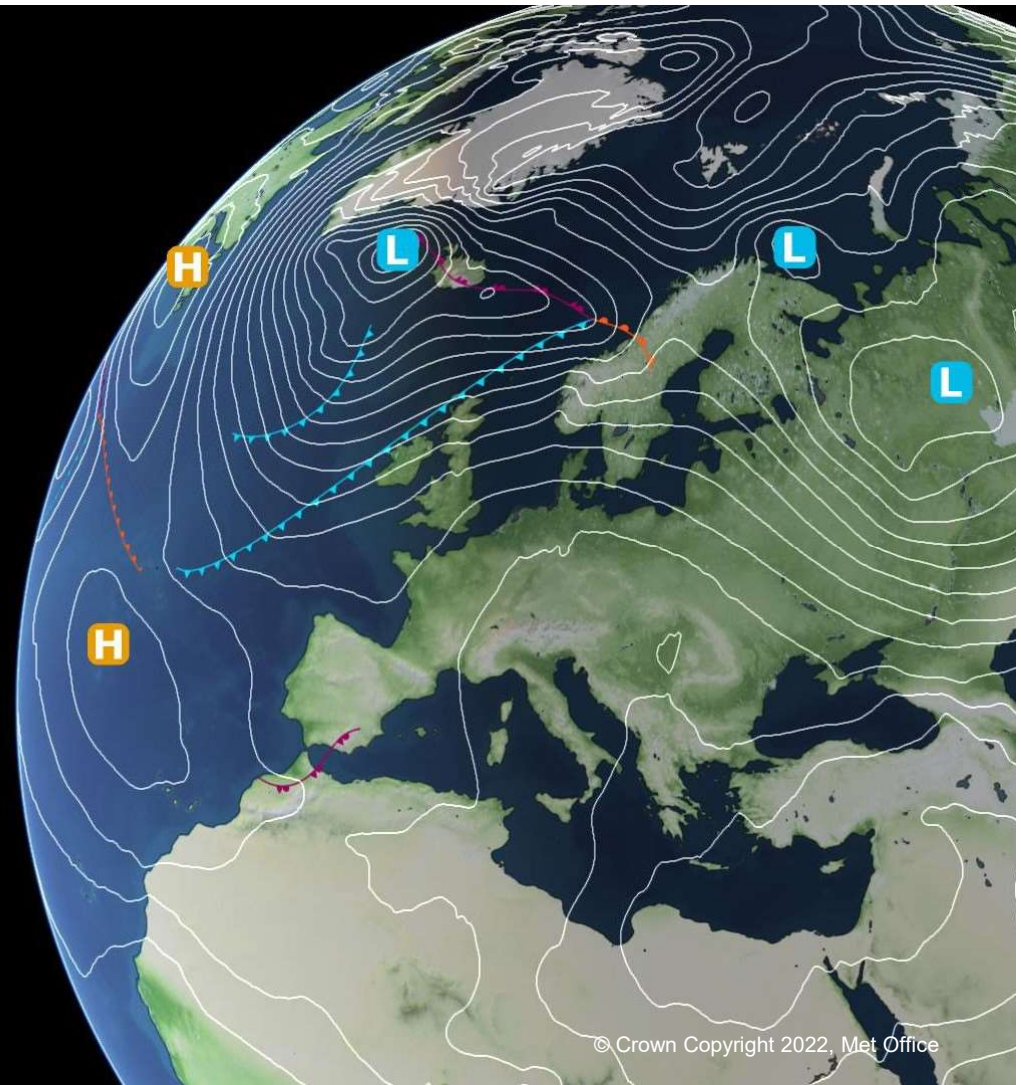


Met Office Consortia Presentation

44th EWGLAM and 29th SRNWP
meeting 26th September 2022

Stuart Webster

With thanks to Mike Bush, Gareth Dow
and Marco Milan

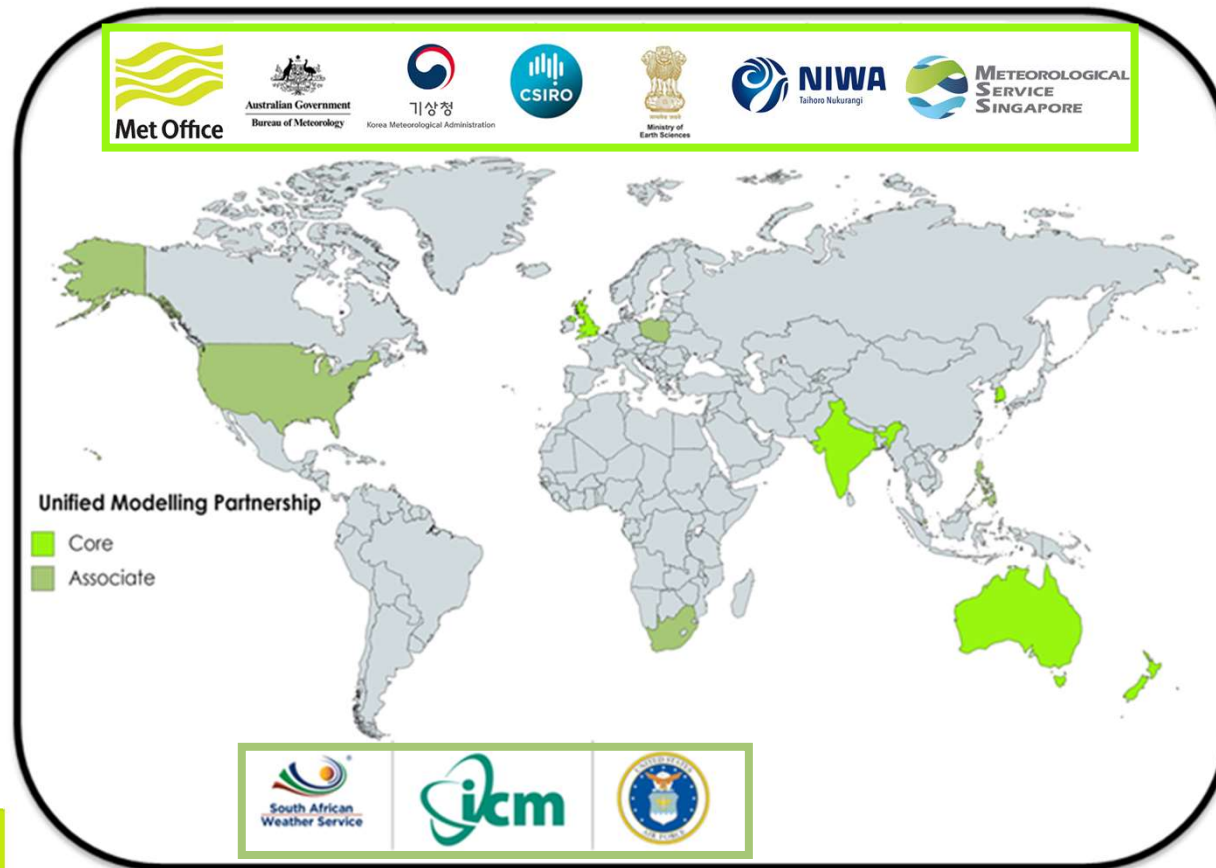


Outline

- UM partnership status
- Focus on progress with technical aspects of collaborative working
 - In part because I led the suite development work for several years!
 - Also there has been a big push over the last 2-3 years on the development of suites
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UM Partners 2022





Met Office Science Repository Service

- Has enabled a step change in collaborative working between UM partners.
- Service first hosted a code base (the UM) in November 2014.
- Regional model suites developed in rose/cylc since October 2015.
- RMED repository since March 2016
 - RMED = Regional Modelling Evaluation and Development
- RMED set up as a strategic area within the Met Office in April 2019.
 - Improved resourcing and more systematic development of RMED Suites since then.



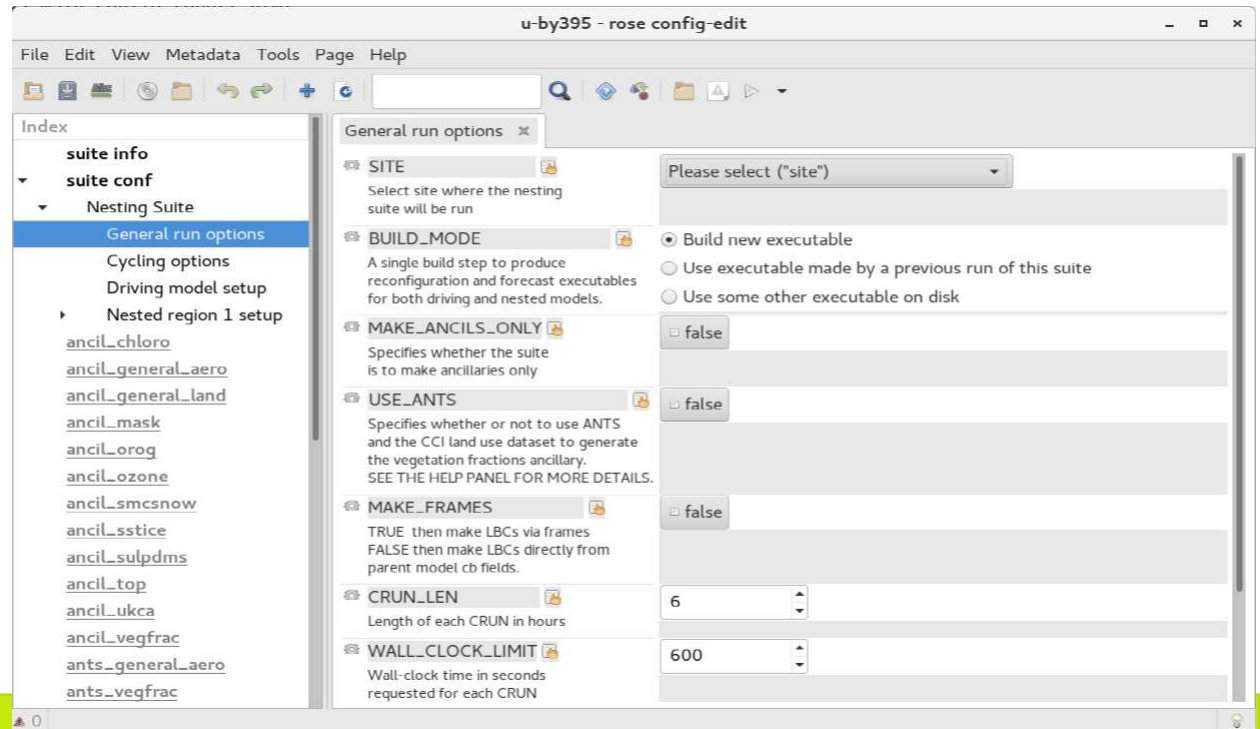


Regional Model Research Suites

- Aim is to make the suites relocatable, flexible, easy to use and portable between partner sites.
- Regional ancillary suite
 - Generates surface and 3D ancillaries for any user specified domain(s).
 - Fixed or variable resolution.
 - True lat/lon or rotated pole.
- Regional Nesting Suite
 - Deterministic suite.
 - Can run off the operational suite, rerun the global for past cases, or run from ECMWF analyses/forecasts
 - Multiple domains and/or multiply nested domains.
 - Downscaling only - no DA
- Ensemble Nesting Suite
 - Can run inside the operational MOGREPS-G, or rerun for past cases.
 - Multiple domains and/or multiply nested domains.
- Regional Coupled Suite
 - Coupling to regional ocean and wave models
 - Also includes ensemble and climate capabilities.

Regional Nesting suite example

Suite development aimed at hiding site-specific technical details from the user.

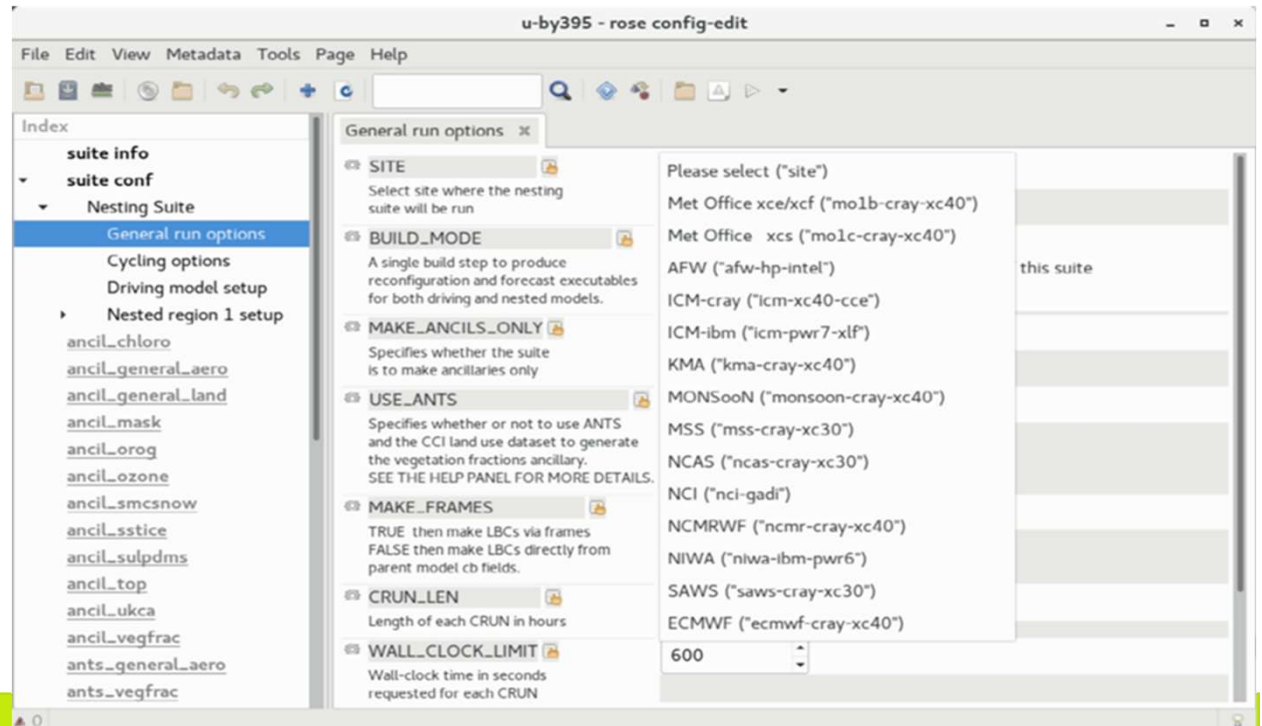




Regional Nesting suite example

Suite development aimed at hiding site-specific technical details from the user.

Ongoing work to propagate this site portability to the other suites.





Met Office Fifth convective-scale UM Partner Workshop On-line through June 2022

Fifth Convective-scale UM Partner Workshop



Menon, Arathy
Senior Scientist - UM Partnership

The UM partnership will be holding its **Fifth Convective-scale Workshop** as a special issue of nine different sessions in June 2022. Due to continued travel restrictions related to COVID-19, the workshop will be held virtually via TEAMS.

The workshop will provide an opportunity for the members of the Partnership to present their work related to the following themes:

- Convective-scale modelling: Future challenges and opportunities (7 June: 0700 - 0930 GMT)
- Near-surface processes: parameterization and evaluation (9 June: 0700 - 0930 GMT)
- Regional Atmosphere and Land modelling science - RAL3 evaluation (14 June: 0730 - 1030 GMT; *Part of UM User Workshop week*)
- *Demo Session:* Regional Model Research Suites - practical guide and discussion (16 June: 0730 - 0945 GMT; *During UMUW week*)
- Finding local solutions to forecasting over complex terrain (21 June: 0700 - 0930 GMT)
- Convection processes in regional weather and climate simulations (23 June: 0700 - 0930 GMT)
- Urban modelling: Progress, challenges and applications (28 June: 0700 - 0930 GMT)
- Progress on km-scale climate and coupled modelling across the partnership (30 June: 0700 - 1030 GMT; *Part 1: Climate; Part 2: Coupled*)



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Regional Model Research Suites

- On-line practical session as part of the convective-scale workshop.
- 80 attendees – lots of users interested in finding out the latest developments within the suites 😊
- Continuing to develop working practices that enable/encourage users to add their own capabilities to these suites.
 - Users being entrained to become developers!

Demonstration Session: Regional Model Research Suites - practical guide and discussion (16 June)		
Time (GMT)	Topic	Speaker
	Session Chair: Huw Lewis	
0730 - 0735	Introduction to the session and suite development working practices	Huw Lewis (Met Office)
0735 - 0800	Regional Ancillary Suite [RAS]: <i>what is it, and how do I run it?</i> • 10-min video how-to guide introduction • 15-min Q&A session • TEAMS chat running to capture user questions	Claudio Sanchez (Met Office)
0800 - 0830	Regional Nesting Suite [RNS]: <i>what is it, and how do I run it?</i> • 15-min video how-to guide introduction • 15-min Q&A session • TEAMS chat running to capture user questions	Stuart Webster (Met Office)
0845 - 0900	Ensemble Nesting Suite [ENS]: <i>what is it, and how do I run it?</i> • 15-min Q&A session • How-to guide introduction video provided for later viewing • TEAMS chat running to capture user questions	Anne McCabe (Met Office)
0900 - 0915	Regional Coupled Suite [RCS]: <i>what is it, and how do I run it?</i> • 15-min Q&A session • How-to guide introduction video provided for later viewing • TEAMS chat running to capture user questions	Juan Castillo (Met Office)
0915 - 0945	Discussion: • Future development priorities across UM Partnership • Portability challenges and solutions • Embedding common suite development across UM Partnership	

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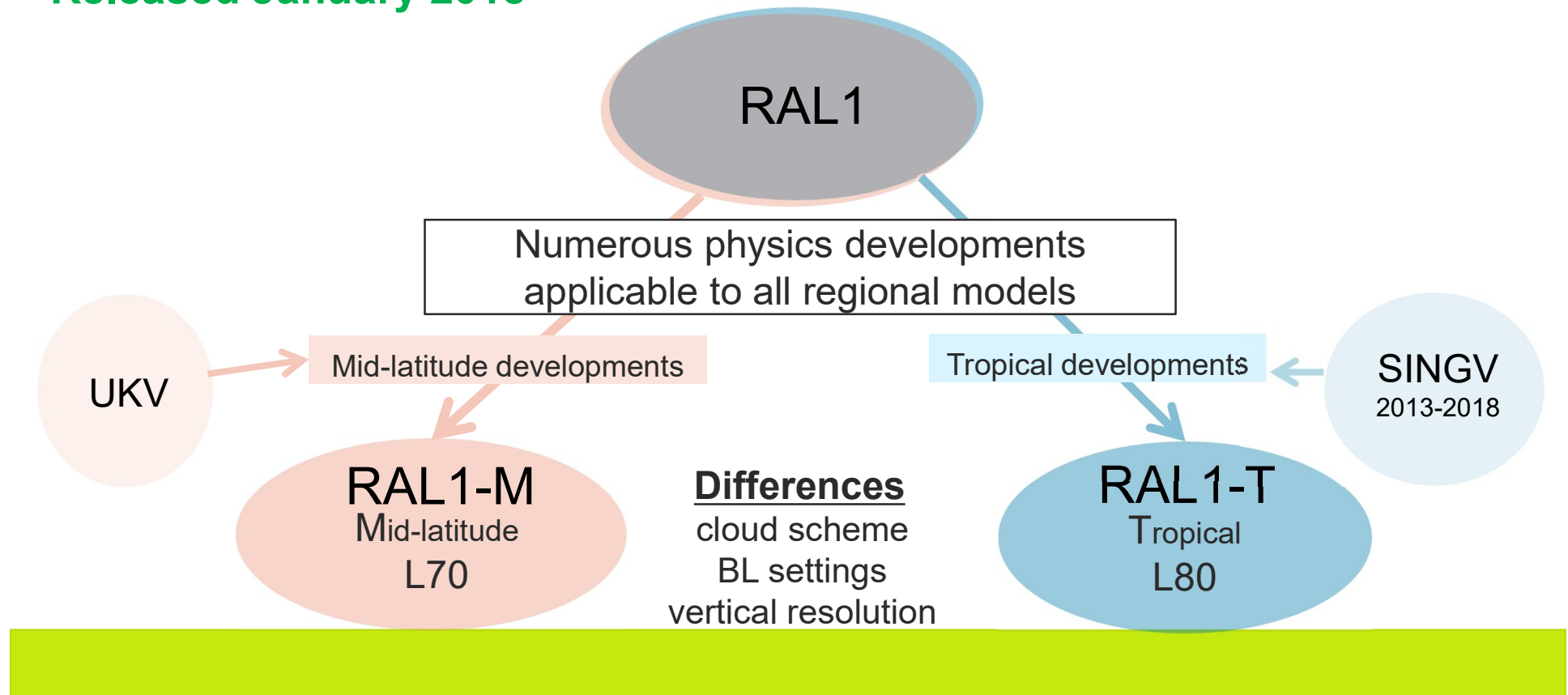
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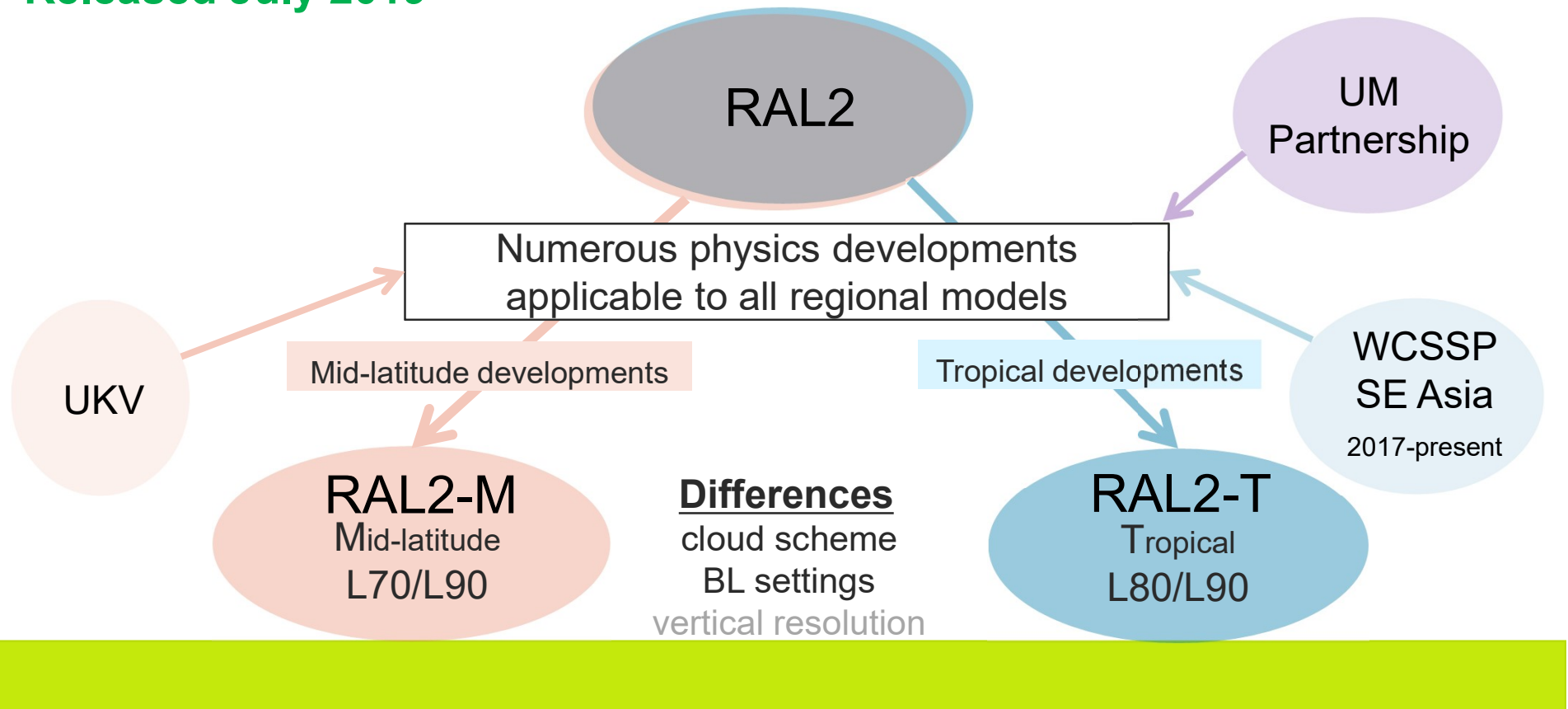
 Met Office RAL1 = 1st Regional Atmosphere and Land Configuration

Released January 2018



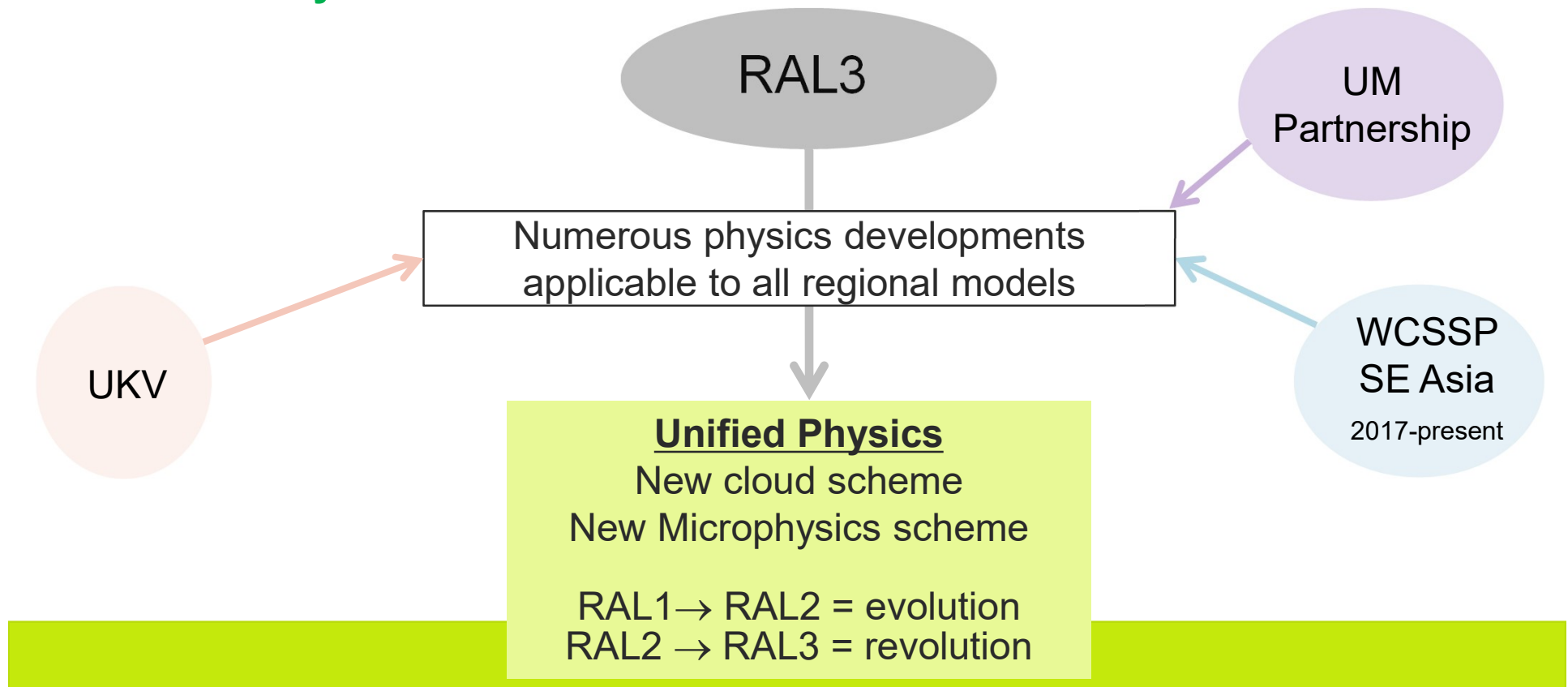
Met Office **RAL2 = 2nd Regional Atmosphere and Land Configuration**

Released July 2019



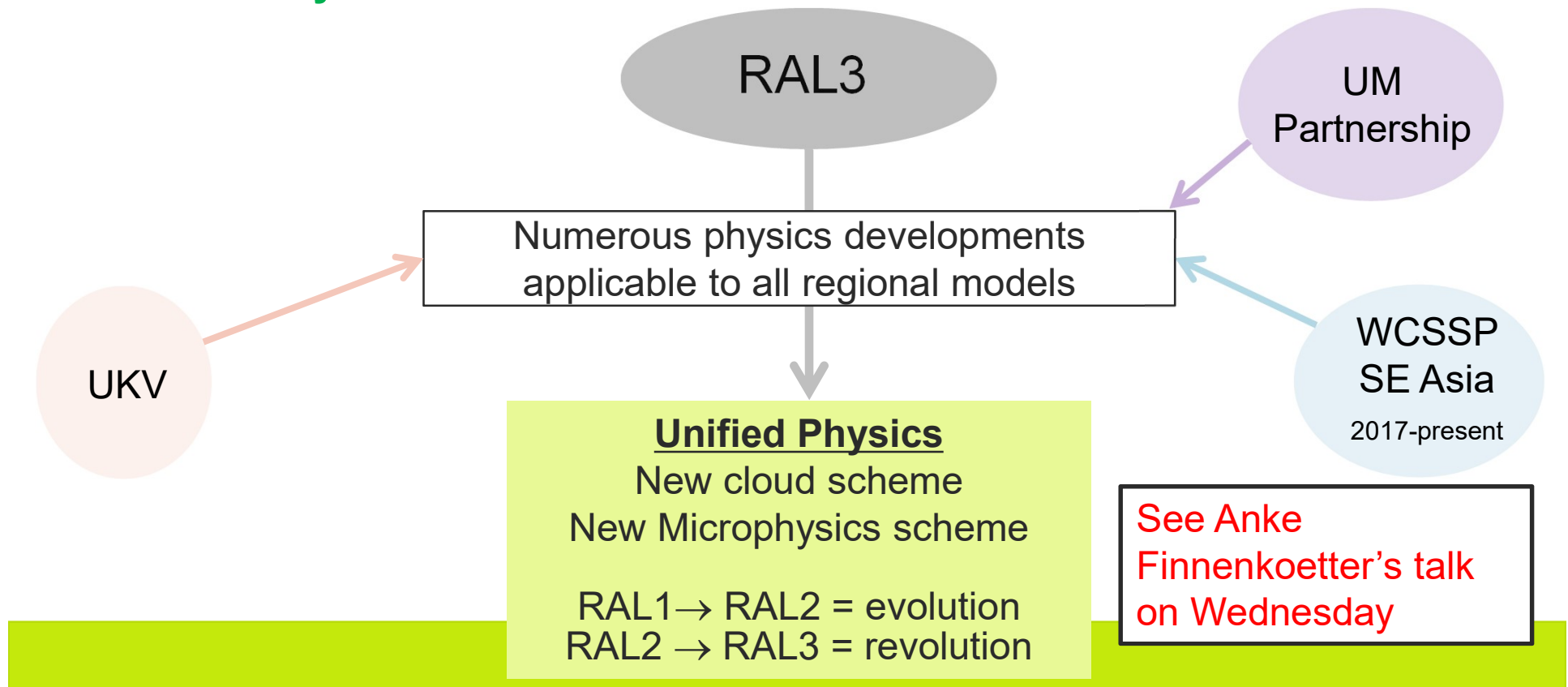
 **Met Office RAL3 = 3rd Regional Atmosphere and Land Configuration**

Released July 2022



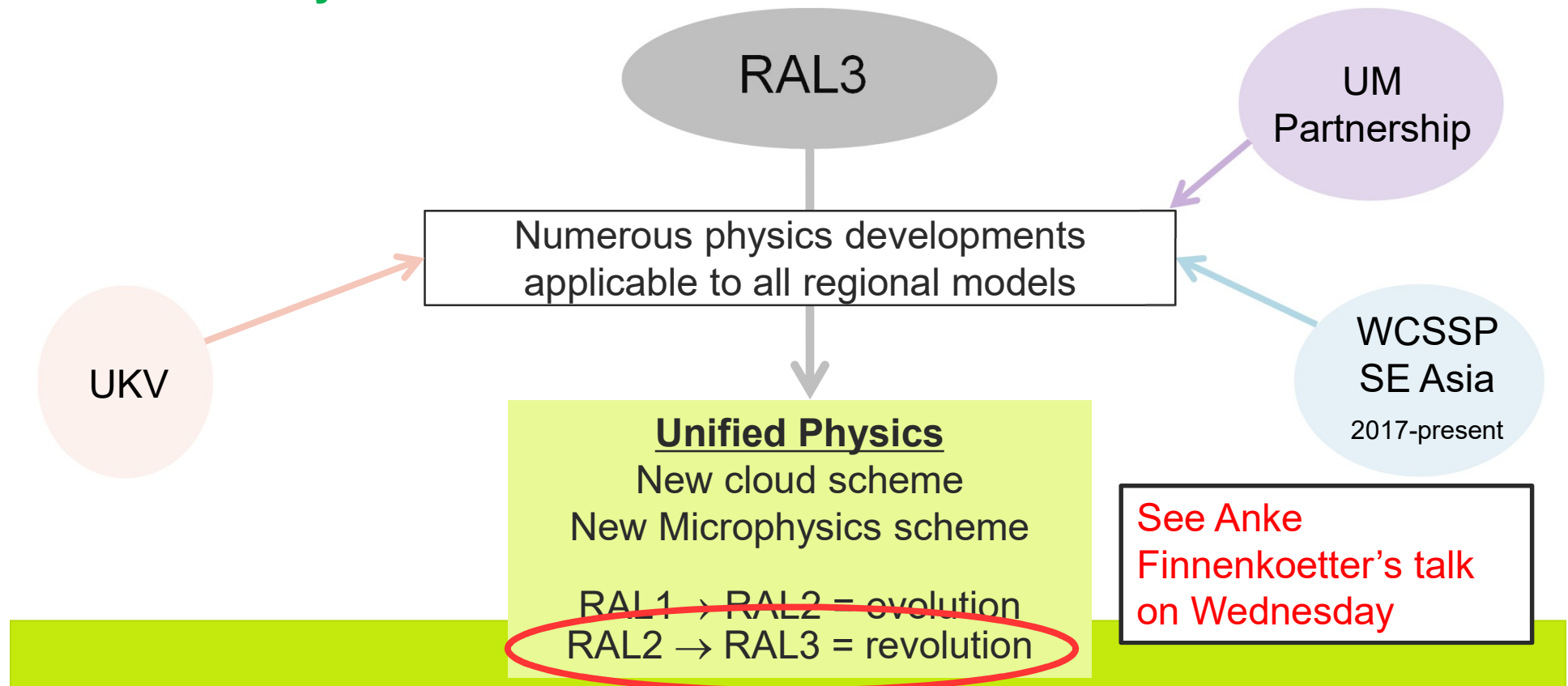
Met Office **RAL3 = 3rd Regional Atmosphere and Land Configuration**

Released July 2022



Met Office **RAL3 = 3rd Regional Atmosphere and Land Configuration**

Released July 2022





Operational CSDA

RAL2 -> RAL3

- Met Office primary focus is the UKV.
 - Also ODA funded WCSSP SE Asia project provides tropical research testbed
 - Big domain and in the deep tropics
- UM partners keen to test RAL3 in their own CSDA systems/domains at the same time as the Met Office.
 - Opportunity to do this has been enabled by MOSRS, coordinated suite development etc.
 - MSS and BoM in a position to do this now.
 - Up until now partners have only begun testing changes once the Met Office have implemented them operationally.
 - Partners moving from being users to co-developing and testing the latest scientific developments.





Operational CSDA

RAL2 -> RAL3

- Met Office primary focus is the UKV.
- “Levelling the playing field”
 - by generating Covstats specific to each science configuration and vertical resolution.
 - using the Regional Nesting Suite to generate the lagged NMC training data
 - T+12 minus T+6 downscaled from successive global model analyses.
- Development of a faster trialling suite.
 - 1.5 km -> 2.2 km forecasts
 - 4.5 km -> 8 km VAR grid



Met Office Faster trialling tests

Hinton plots for Surface Obs

35 days
15/6/2021 to 22/7/2021

BETTER
WORSE

OS45 v OS44

- Large-scale blending
- big update to the global model (GA8)
- UKV science unchanged = RA2M

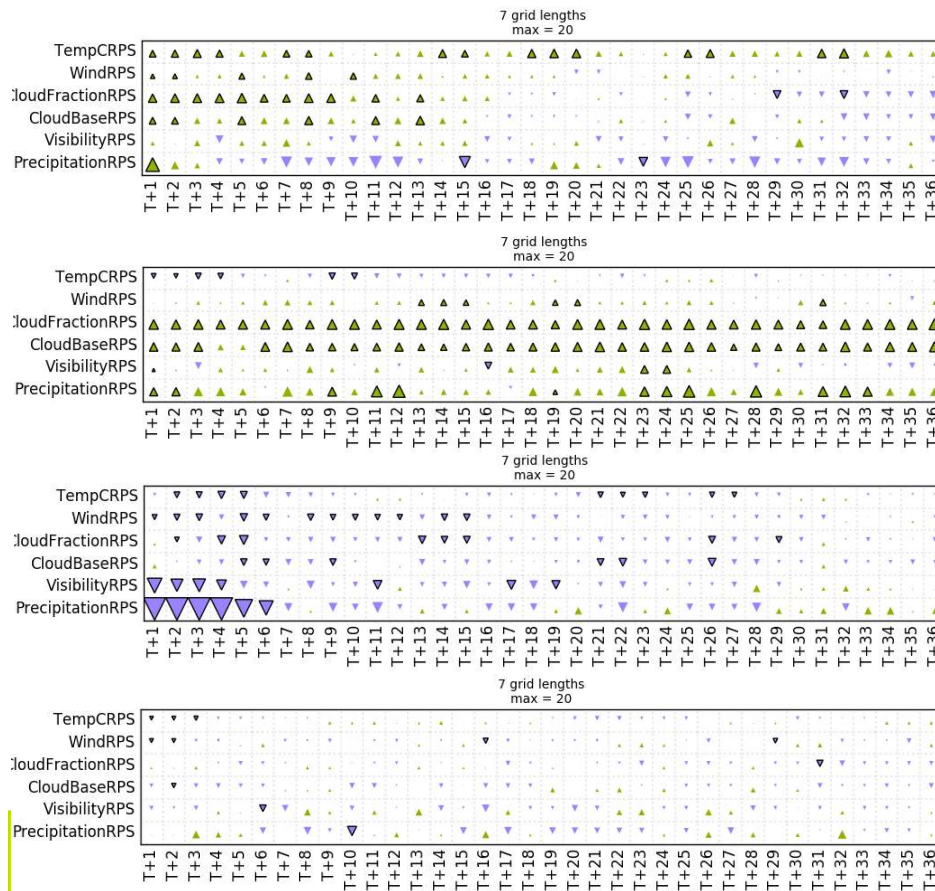
2.2 km v 1.5 km

2.2 km

3D Var versus 4D Var

2.2 km 4D Var

4.5km versus 8km VAR grid



Met Office Faster trialling tests

Hinton plots for hourly rainfall FSS

35 days
15/6/2021 to 22/7/2021

BETTER
WORSE

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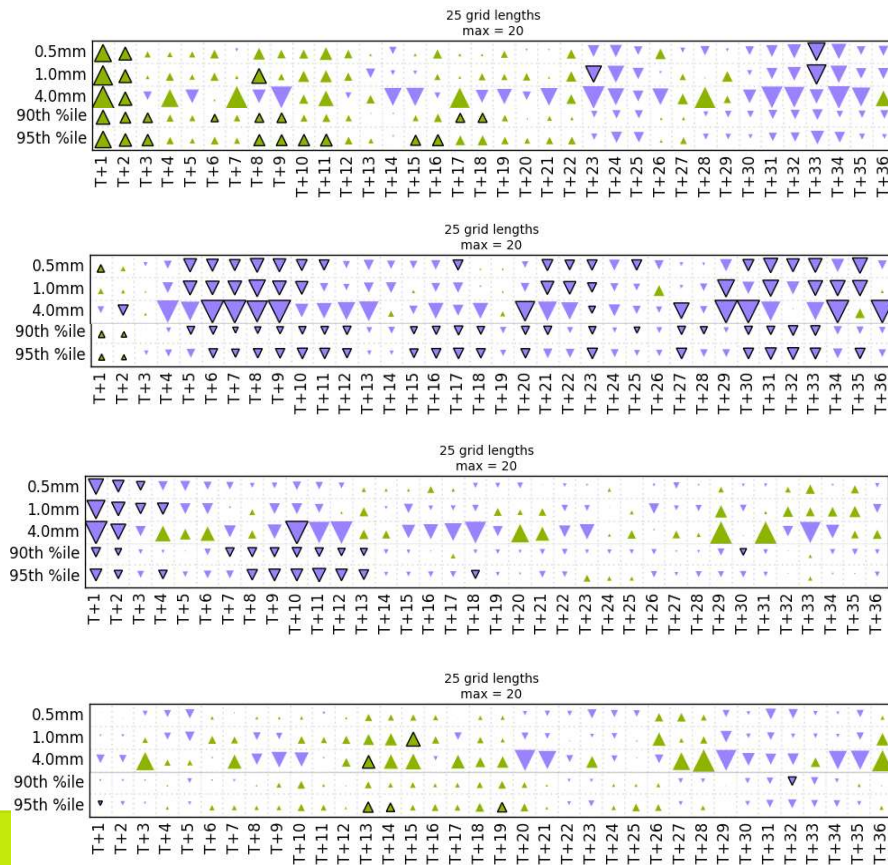
2.2 km v 1.5 km

2.2 km

3D Var versus 4D Var

2.2 km 4D Var

4.5km versus 8km VAR grid

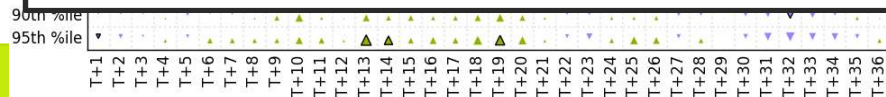




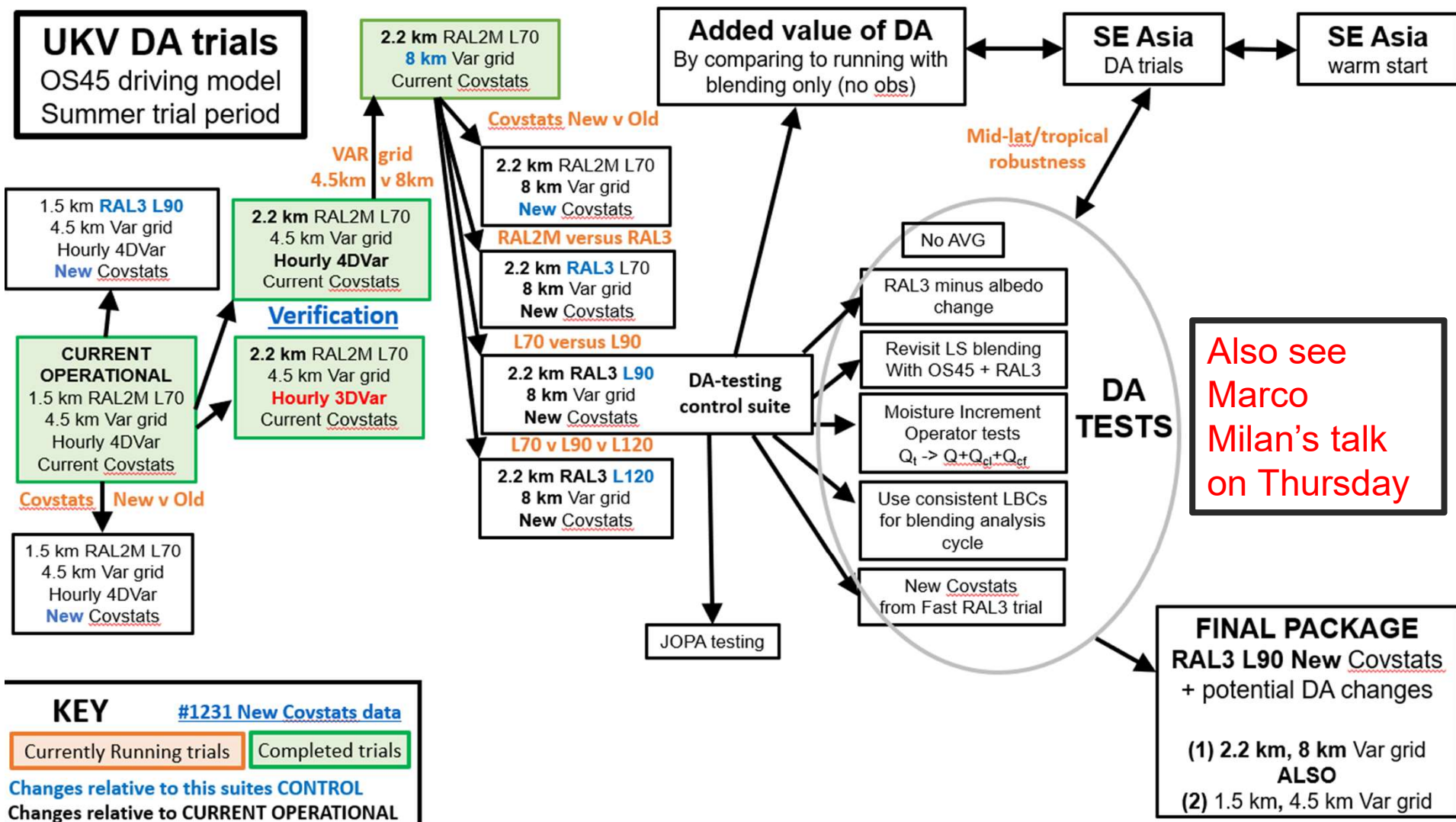
Met Office Faster trialling tests

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- Impact of 2.2 km broadly neutral overall
 - Positive for verification against surface obs
 - Negative for (quantitative) verification against radar rainfall amounts
 - Same sensitivity for RAL3?
- Impact of hourly 3D Var = clearly negative, especially over the first few hours
 - i.e. this is not a viable cost saving as it adversely affects performance
- Impact of 8 km Var grid is very small.
 - Thus far using the same Covstats as on the 4.5 km Var grid.
- **2.2 km 4DVar with 8 km Var grid = 2-3 times quicker than full resolution UKV CSDA suite.**
 - Enables longer trials = more robust impacts
 - Next HPC delivery delayed to next year – so cheaper trialling on existing HPCs is good!



4.5km versus 8km VAR grid



Questions?