Met Office

UM Consortium

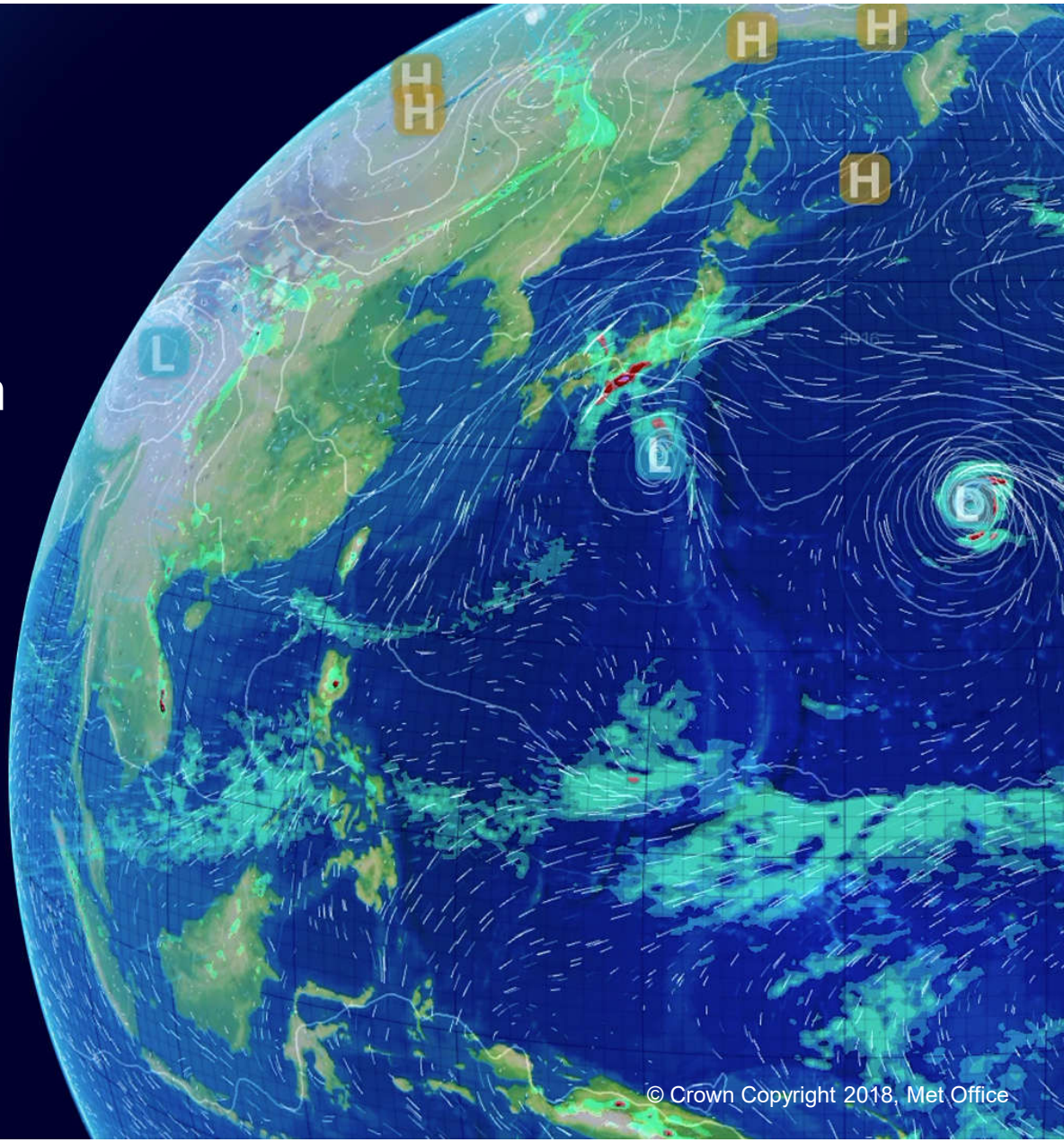
Regional atmospheric model/system development and implementation

David Walters, Head of Research to Operations

Content by many colleagues and collaborators

40th EWGLAM - 25th SRNWP Workshop

Salzburg, Austria, 1st – 4th October, 2018.



Outline

- Met Office science structure
- Regional UM development
- Latest operational upgrades
- Future plans/upgrades

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Met Office science structure

Personnel changes

Chief Scientist

Stephen Belcher

Director Met. Science

Simon Vosper

Climate Science

Albert Klein-Tank

Simon Vosper

Dale Barker

lied Science

Doug Johnson

Prof. Albert Klein Tank
joins Met Office from KNMI as
Associate Director of Climate Science and
Director of Met Office Hadley Centre

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Regional UM development

UM partnership 2018

Joint science	Joint model development	Joint technical development

Core partners setting the direction of the partnership

Associate partners part of the community of UM users and developers

Working with our in-country academic partners

George Pankiewicz

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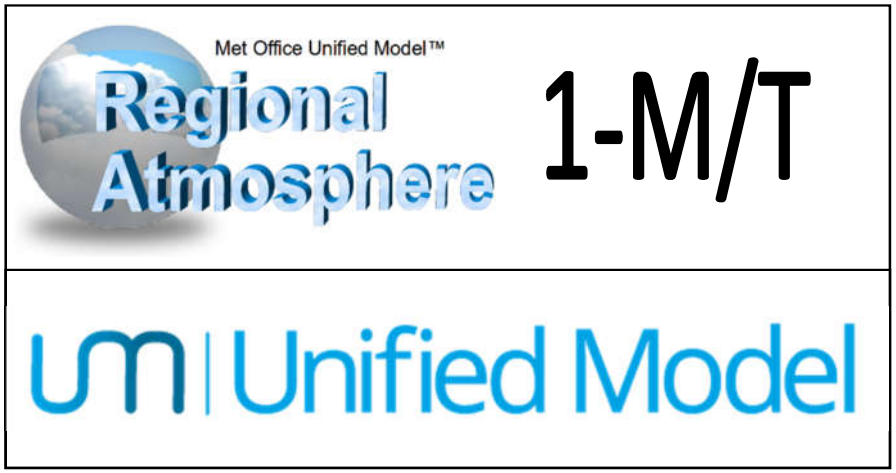
Regional Atmosphere 1-M/1-T

UM Regional Atmosphere Configuration



~1km ⟶ 4.5km

What is Regional Atmosphere/RA1?

- Science config. of Unified Model
- Defined set of physics/dynamics settings
- ***Convection permitting*** resolutions
  - Regional 1.5km → Regional 4.5km
- Timescales from day 1 to 100s years
- Currently 2 “flavours” of RA1:
  - RA1-M: mid-latitudes
  - RA1-T: tropics
- Developed with community of UM partners and academic collaborators

Mike Bush, Stu Webster et al.

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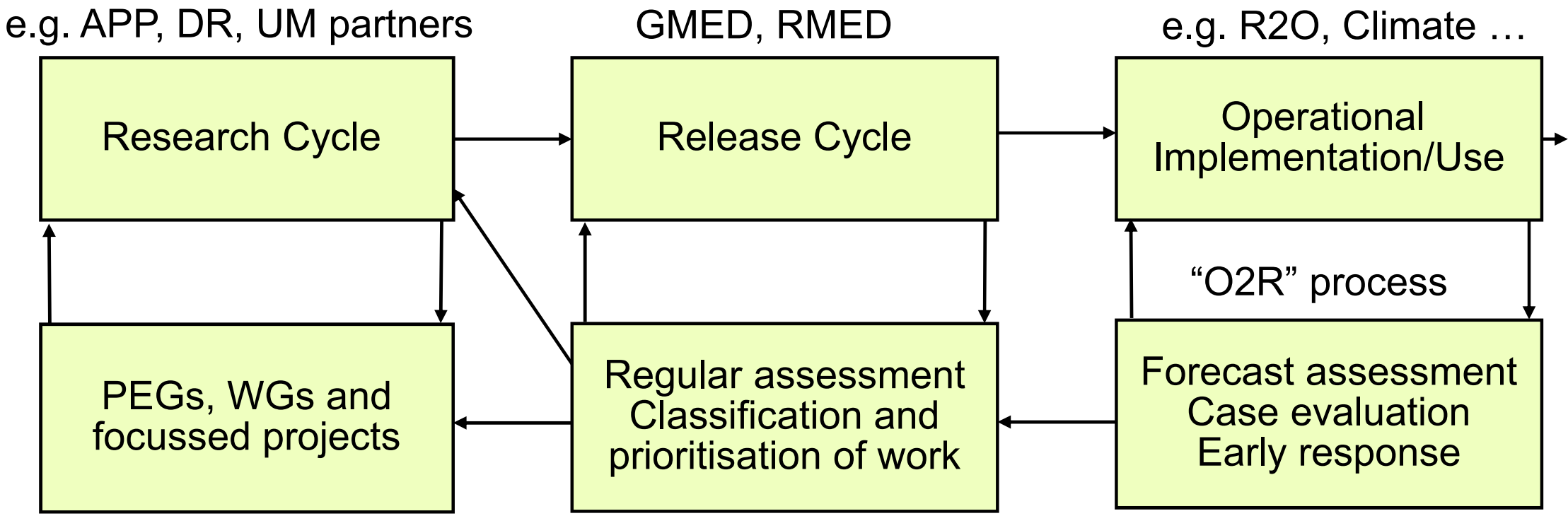
RA development process

"RA2 development": Anke Finnenkoetter, This afternoon

"Links between NWP and climate": M. Bush Thursday AM



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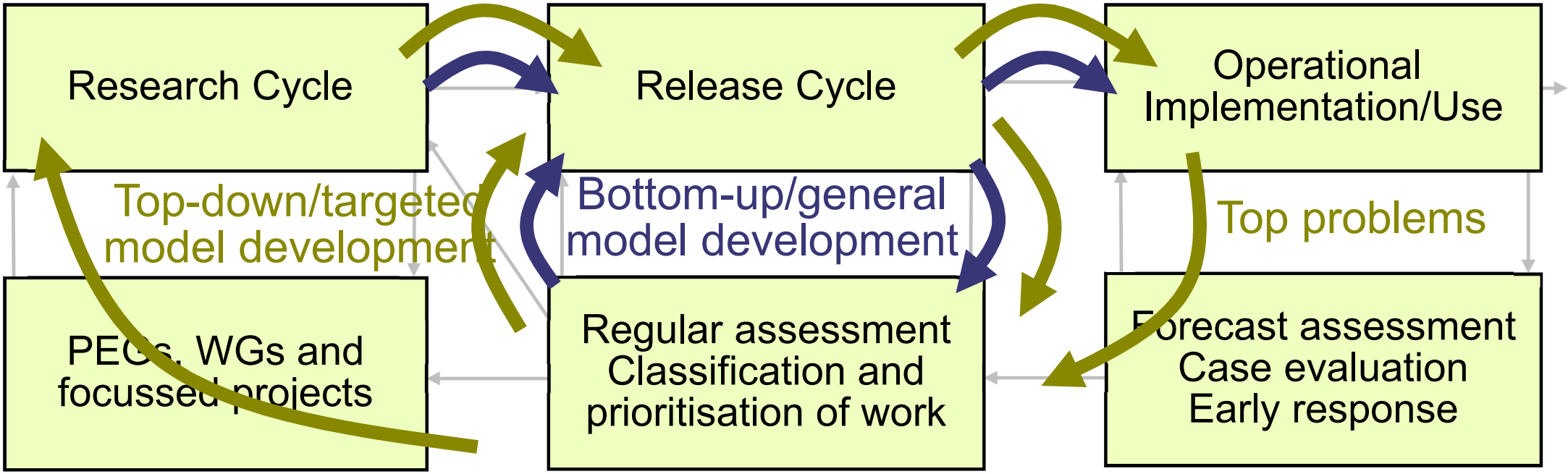
GA/RA development process



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Priorities for “top-down” development

Insufficient spread in MOGREPS-UK
Low vis/fog errors
Occasional excessive boundary layer cloud
Organised mid-level convection diagnosis missed
Excessive snow accumulations
Excessive showers in capped situations
Unrealistic frontal/organised features
Excessive sea fog

“Hourly time-lagged EPS”: Nigel Roberts, Wednesday morning

“Precip. assimilation”: Lee Hawkness-Smith, Later this morning

Adrian Semple, Steve Willington

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Latest operational upgrades

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Parallel Suite 41: Global model upgrade

- Land surface/surface exchange physics to GL8.1
  - JULES multi-layer snow scheme
  - Improved surface roughness over open sea and sea ice
  - Improved albedo parametrisations over land and sea
  - Improved vegetation maps and properties
- MOGREPS uses GA7 stochastic physics package (Improved SKEB + SPT)
- Increase temporal sampling of (o-b) from 3-hourly to hourly)
- Package of satellite updates (inc. NOAA-20 CrIS and ATMS)

Warren Tennant, Martin Willett

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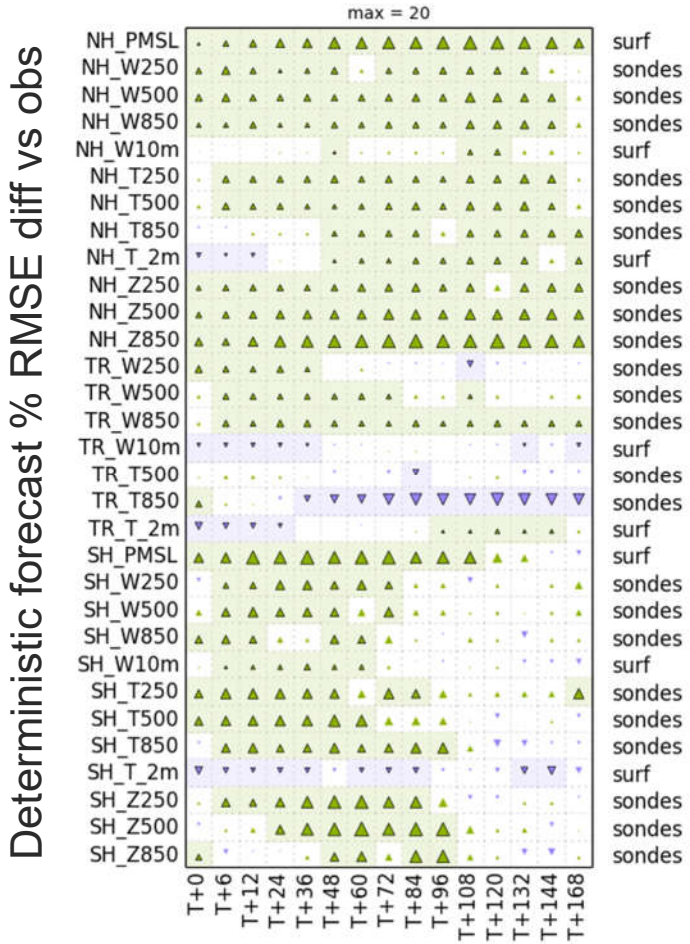
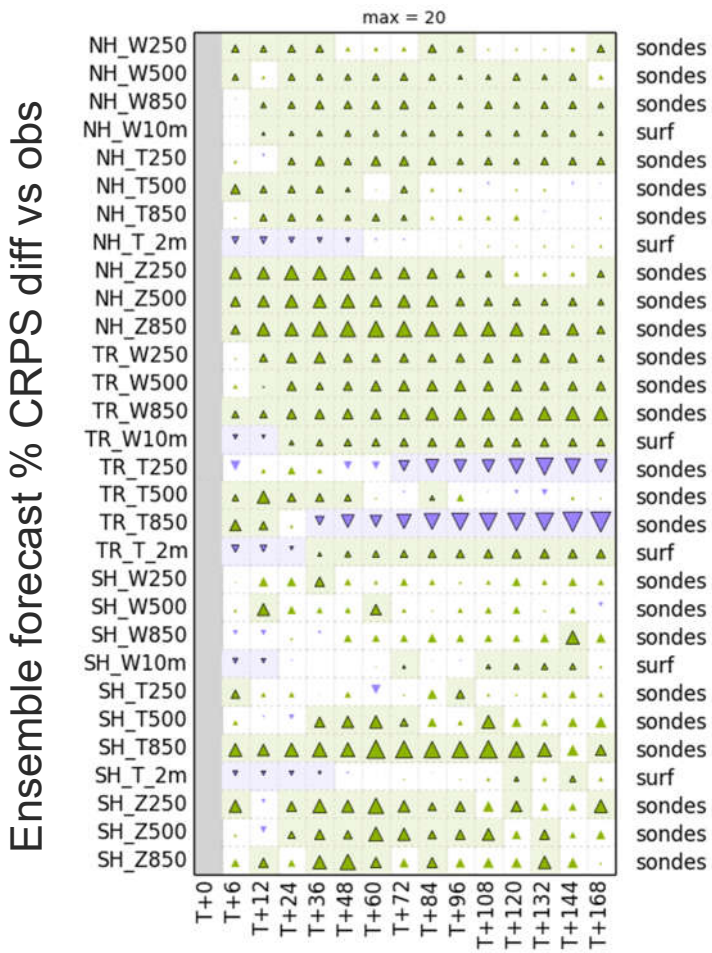
Parallel Suite 41: Global model upgrade

Objective verification scorecards from parallel suite period (17th May – 17th Sep)





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Parallel Suite 41: UK model upgrade

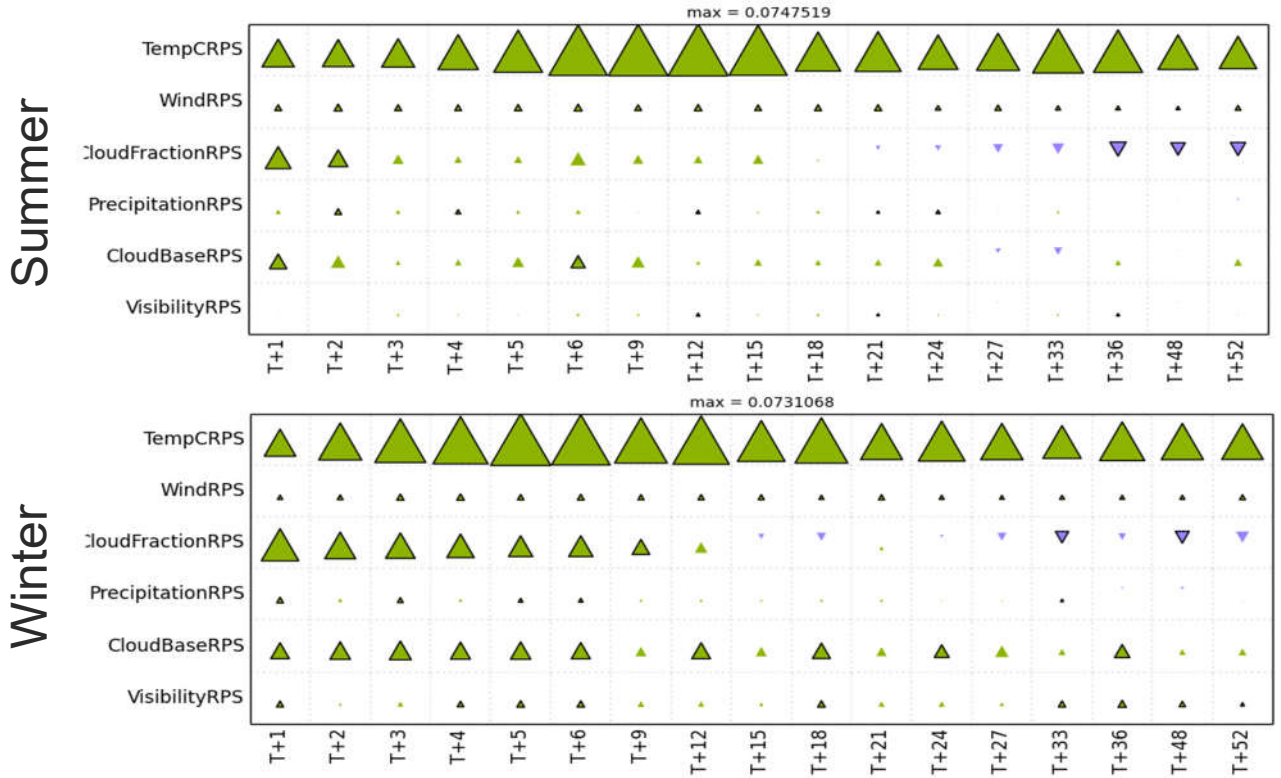
- Upgrade physics to RA1-M
  - Improved vegetation maps and properties
  - Improved near-surface profile of cloud droplet activation
  - Improved turbulent mixing across boundary layer top
  - Improved radiative gaseous absorption
  - Reduced vertical resolution sensitivity in boundary layer
- Updated aerosol emissions inventory
- DA upgrades, including reduced obs error for 2m RH
- Minor improvements to ensemble initialisation

Adrian Semple, Steve Willington

Verification during pre-operational trials

- Ensemble “HiRA” scorecard from pre-operational trials (~ 6 weeks)
- Backed up by subjective verification

“Robust verification for model upgrades”: poster by Clive Wilson



Verification during parallel suite period

Photos courtesy of BBC website

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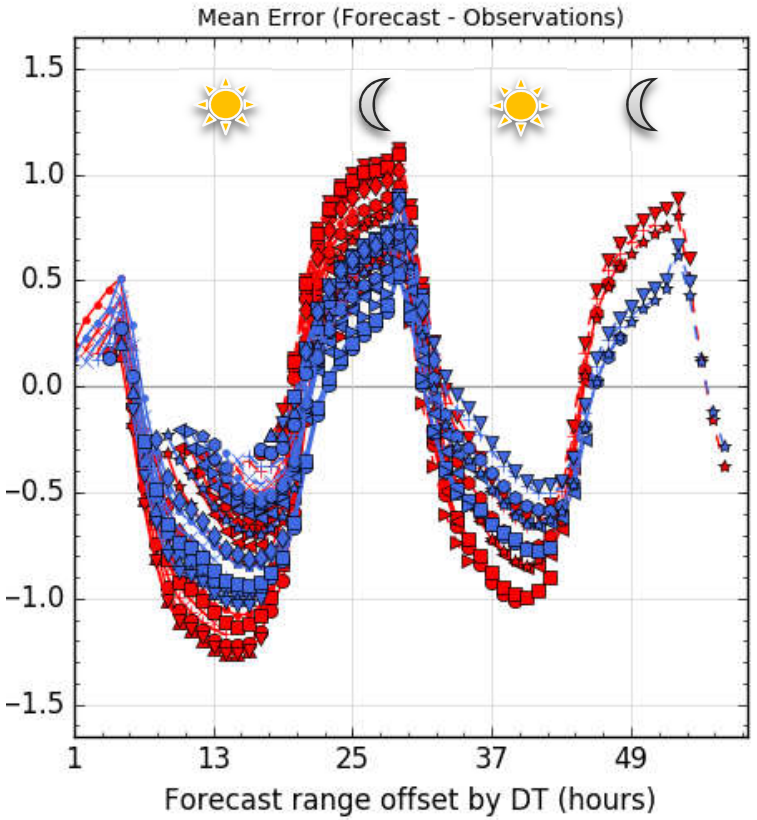
Verification during parallel suite period

Mean diurnal $T_{1.5m}$ bias: WMO block 03 stations, 29th May – 6th August

Subjective visibility evaluation over the coming winter.

Operational Suite

Parallel Suite (inc. RA1)



Adrian Lock

Future plans/upgrades

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Parallel Suite 42

November 2018 – February 2019

- UK DA devel. inc. moisture incrementing operator
- Assimilation of Mode-S aircraft winds
- Major upgrade to UK ensemble:
  - Hourly time-lagged EPS centred on hourly UKV an.
  - 12 members per 6-hours → 18 members per 6-hours
  - Forecast range extended from T+54 to T+120

"Developments of hourly 4D-Var system": Bruce Macpherson, Tuesday afternoon.

"Hourly time-lagged EPS": Nigel Roberts, Wednesday morning

Joanne Carr, Gareth Dow, Marco Milan, Aurore Porson

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RA2 development

- First stages of consolidating RA-M and RA-T configurations by consolidating on new 90L vertical level set
- Improvements to evolution/impact of thin snow layers
- A number of bug-fixes and minor improvements to boundary layer and microphysics schemes

"RA2 development":
Anke Finnenkoetter,
This afternoon

Mike Bush, Stu Webster et al.

Summary

- RA dev. now led by “RMED” team in Foundation Science
  - Strong links with Weather Science R2O
  - Developing links with Climate Science regional modellers
- Recent UK NWP developments focus on T/***v*** and fog
- Further development of UK NWP and RA science

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Questions