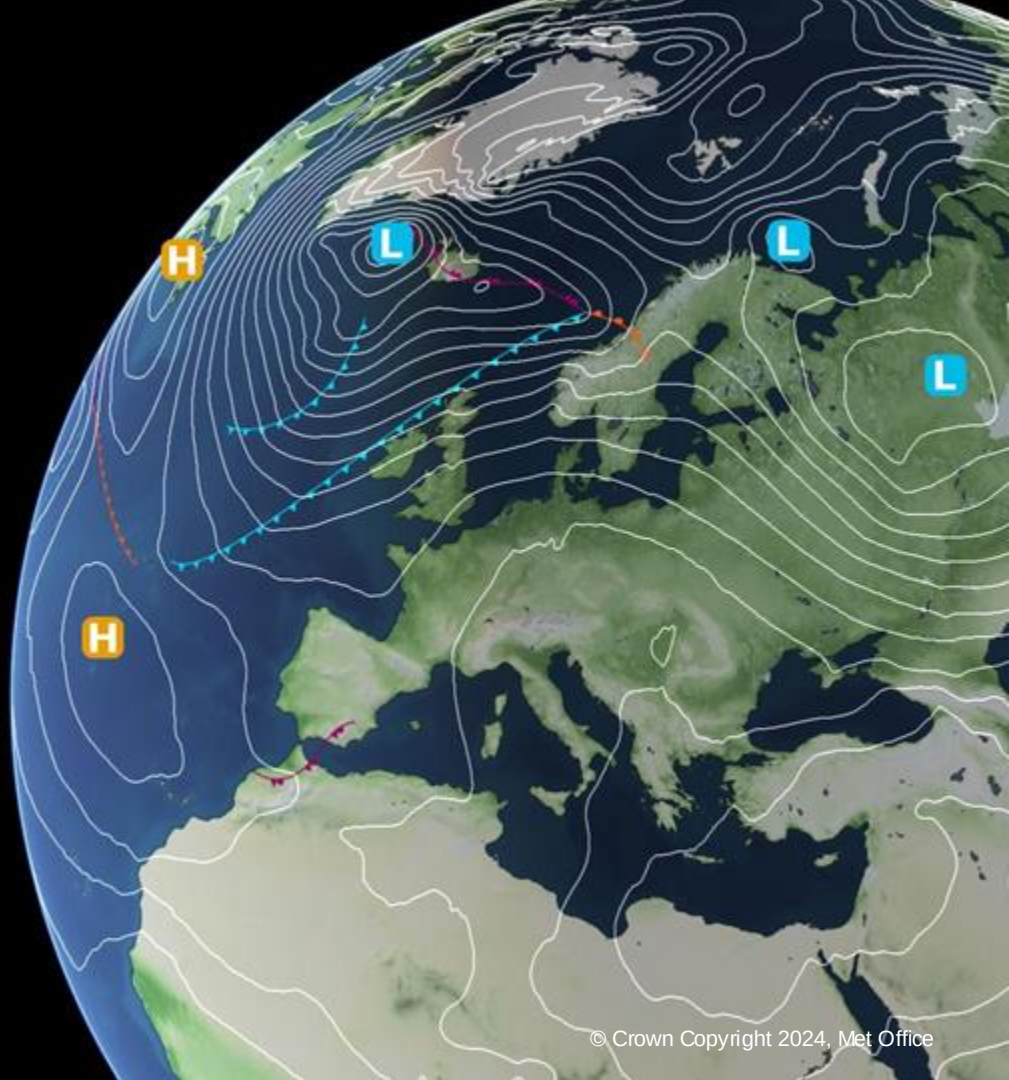
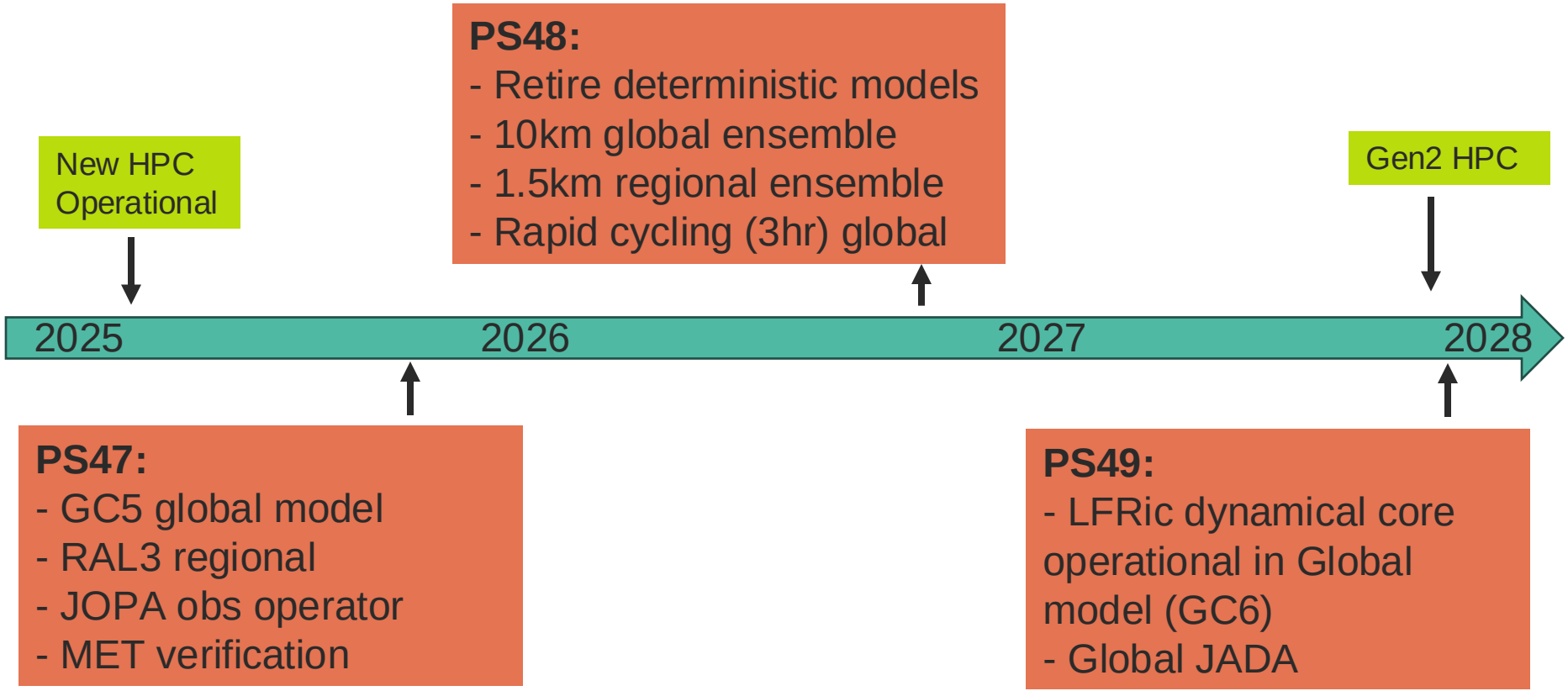
Met Office Update

WGNE 2024

Tim Graham



Forecast system updates

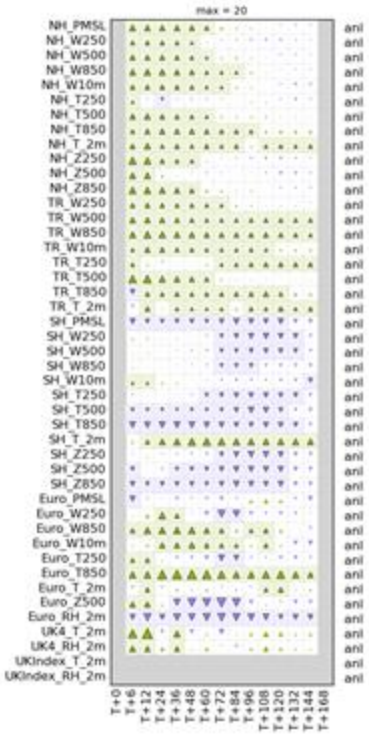


GC5 model

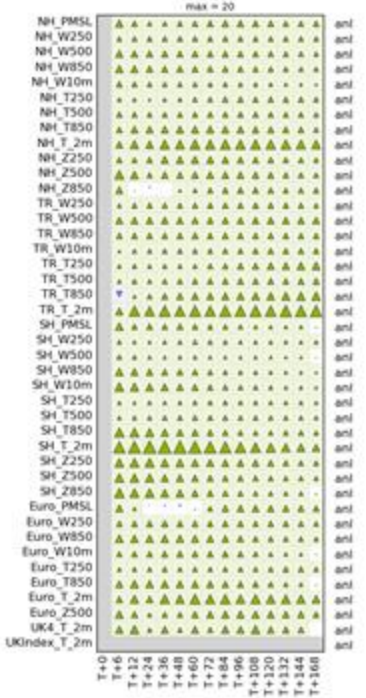
- NEMO 4.0.4 & SI3 (replacing CICE)
- Convection improvements
- Bi-modal cloud initialisation

- Blended orography smoothing makes model more stable allowing increase in amplitude of SPT and reduced weighting of additive inflation in ensemble.

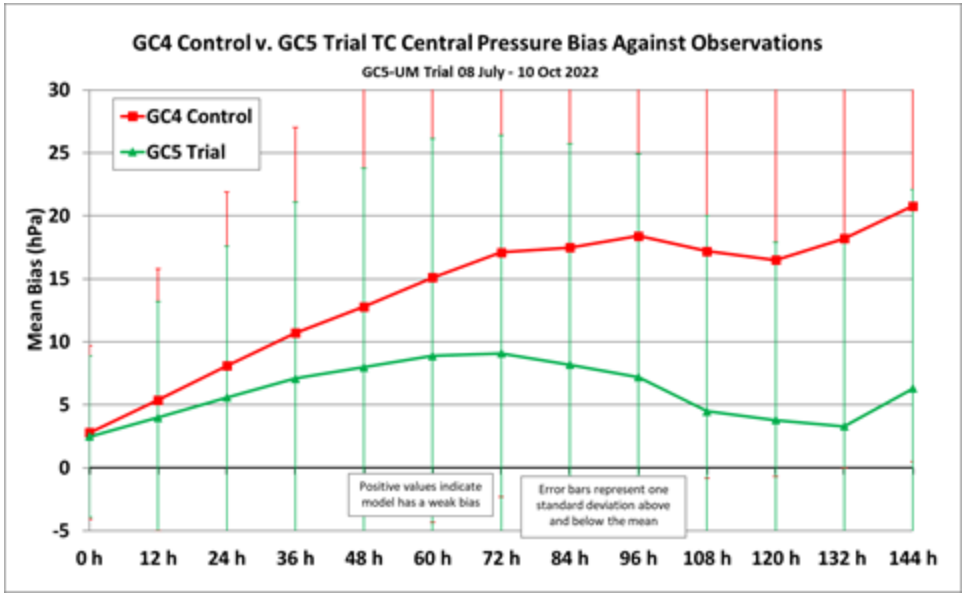
Deterministic +0.37%

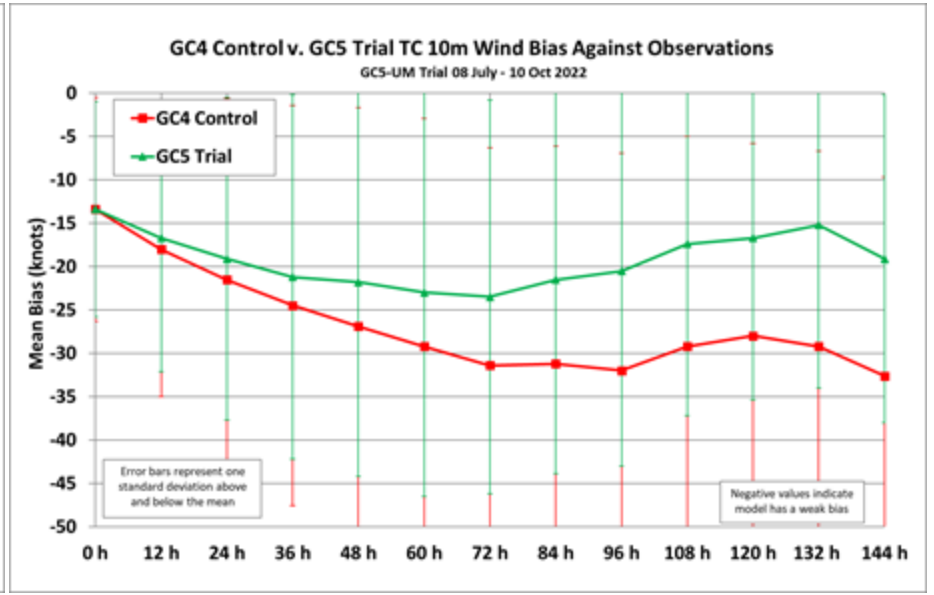


Ensemble CRPS +3.6%



GC5 Tropical Cyclones

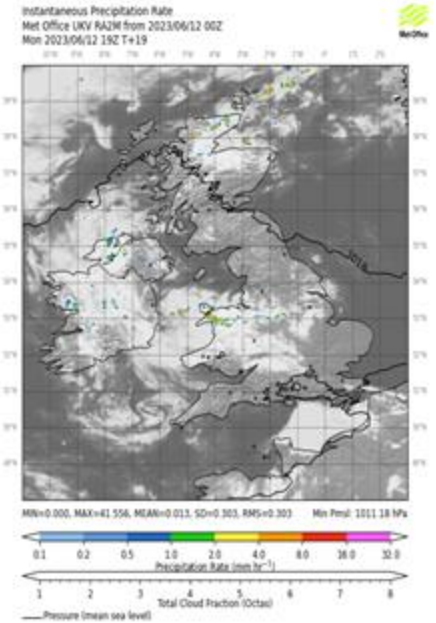




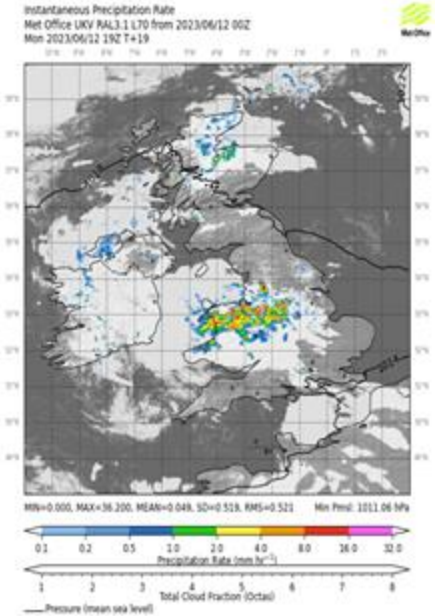
RAL3 model

- Bi-modal cloud scheme *(Kwinten van Weverberg)*
  Van Weverberg et al., 2021: https://doi.org/10.1175/MWR-D-20-0224.1 and https://doi.org/10.1175/MWR-D-20-0230.1
  - based on Smith cloud scheme previously used in mid-latitude RAL
  - replaces Smith scheme in RAL2-M and prognostic PC2 scheme in the tropical version RAL2-T
- CASIM multi-moment cloud microphysics scheme *(Adrian Hill, Paul Field, Kalli Furtado)*
  Shipway and Hill, 2012 - https://doi.org/10.5194/acp-18-14253-2018 , Miltenberger et all, 2018 - https://doi.org/10.5194/acp-18-3119-2018
  - **C**loud **A**ero**S**ol **I**nteracting **M**icrophysics
  - permits the UM to have single or double moments microphysical capability
- stochastic boundary layer perturbations in mid-latitude configuration no longer needed *(Adrian Lock)*
- and many more…
- **No longer need different configurations for tropics and mid-latitudes!**

RAL2M



RAL3



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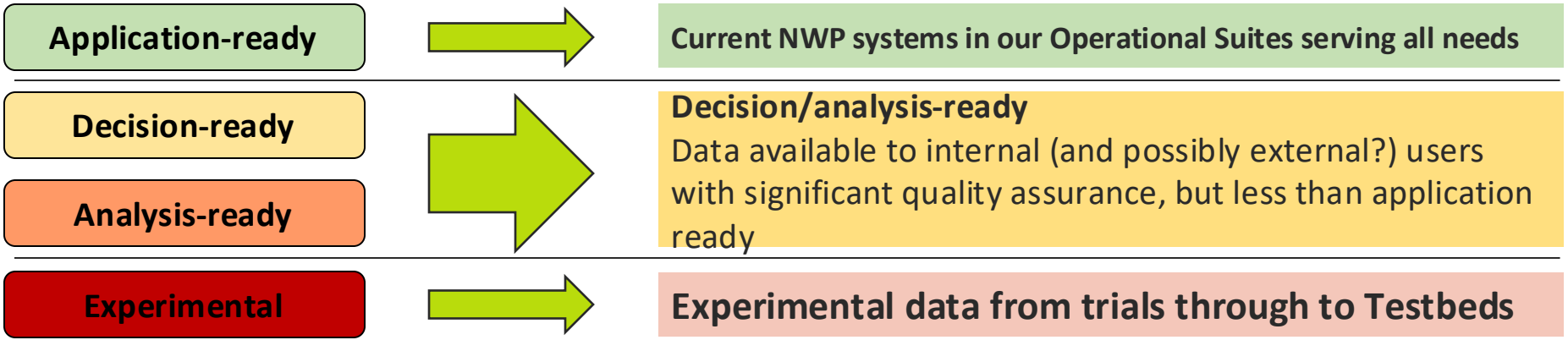
Trailblazers

Data Readiness Categories

- Would like to use these to be more agile on delivering new NWP capabilities.
- Need to agree rules about agreeing, recording and marking these in our data.



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Proposed NWP “trailblazers”

- 300m “London model” ensemble: **Aim for:** **Decision-ready?**
  - Still need to determine benefits of sub-km modelling.
- 5km global trailblazer: **Aim for:** **Analysis-ready?**
  - Move towards km-scale global models in MOGREPS-G.
  - Need to learn more about sub-10km global model first.
- AI-based NWP system: **Aim for:** **Analysis-ready?**
  - Currently only a research project.
  - Very early days, but things are moving quickly.

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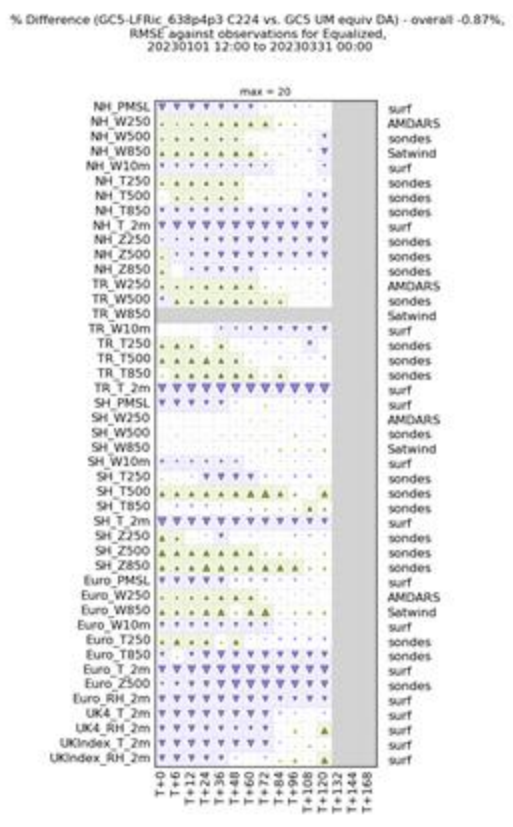
GC5-LFRic update

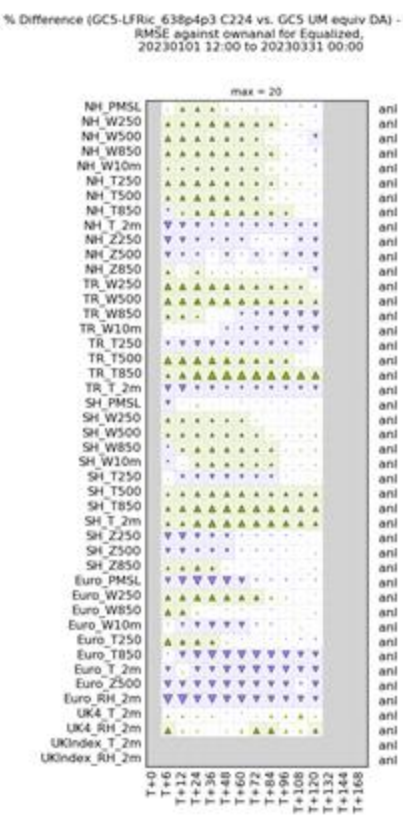
Future modelling capability

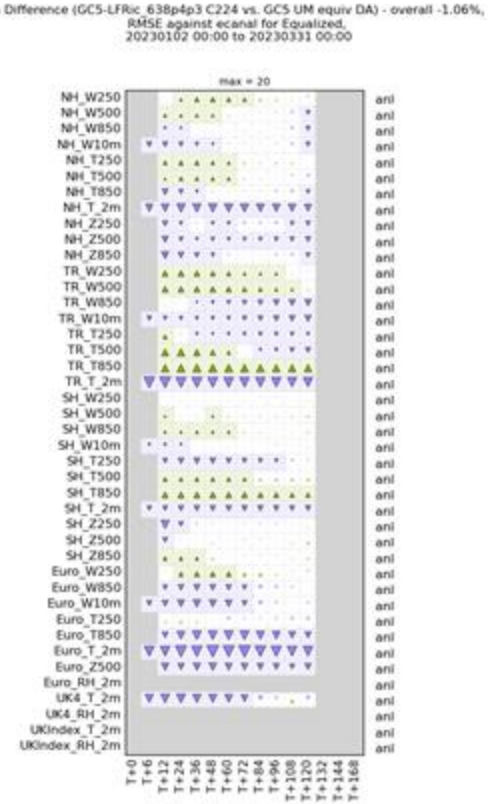
What are we doing?

- New dynamical core on cubed sphere grid
- Physics mostly unchanged (except mixing ratios and tuning)
- Target to be within 2% of UM NWP scores by end of this year
- Also no significant remaining issues that we don't fully understand

Latest Scorecards

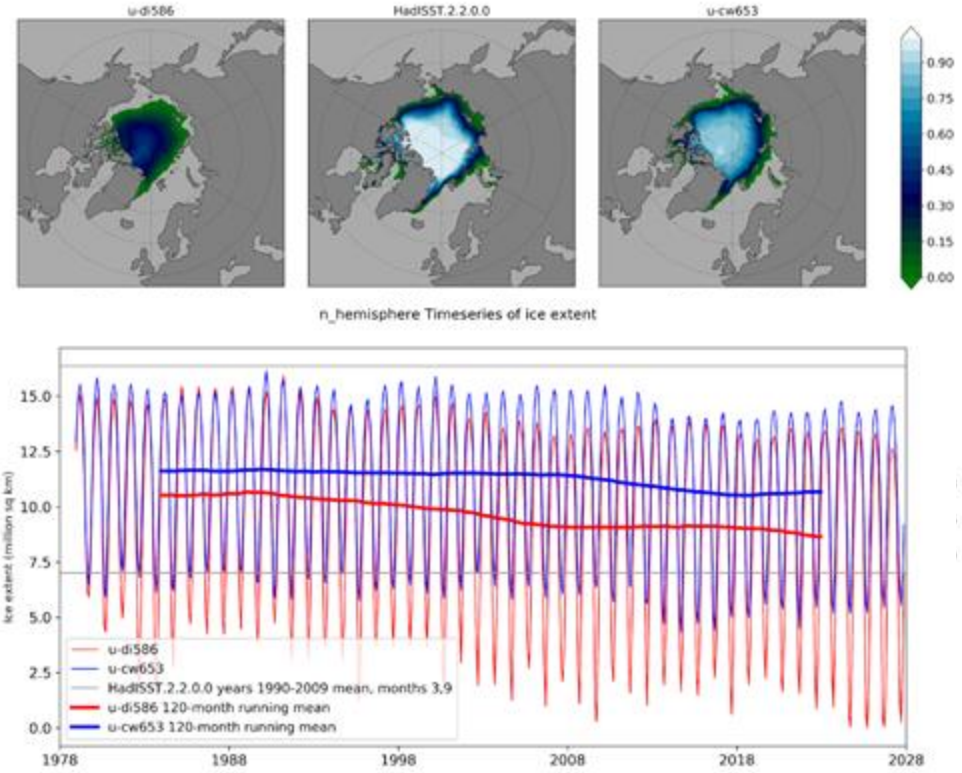






Climate model challenges

- Where's the sea-ice gone?
- Seems to be linked to radiation changes
- A lot of ongoing work to understand the differences in radiative fluxes leading to this change.



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Summary

- Access to new HPC is imminent allowing us to start upgrading forecast systems again.
- Plans to implement:
  - PS47: GC5 and RAL3
  - PS48: Retire deterministic model and implement 10km global ensemble
  - PS49: LFRic dynamical core into operational use.
- Trailblazers configurations to allow meteorologists to view output from new science more quickly
- LFRic development: Good progress on NWP scores but still issues with 2m temperatures and sea-ice loss.