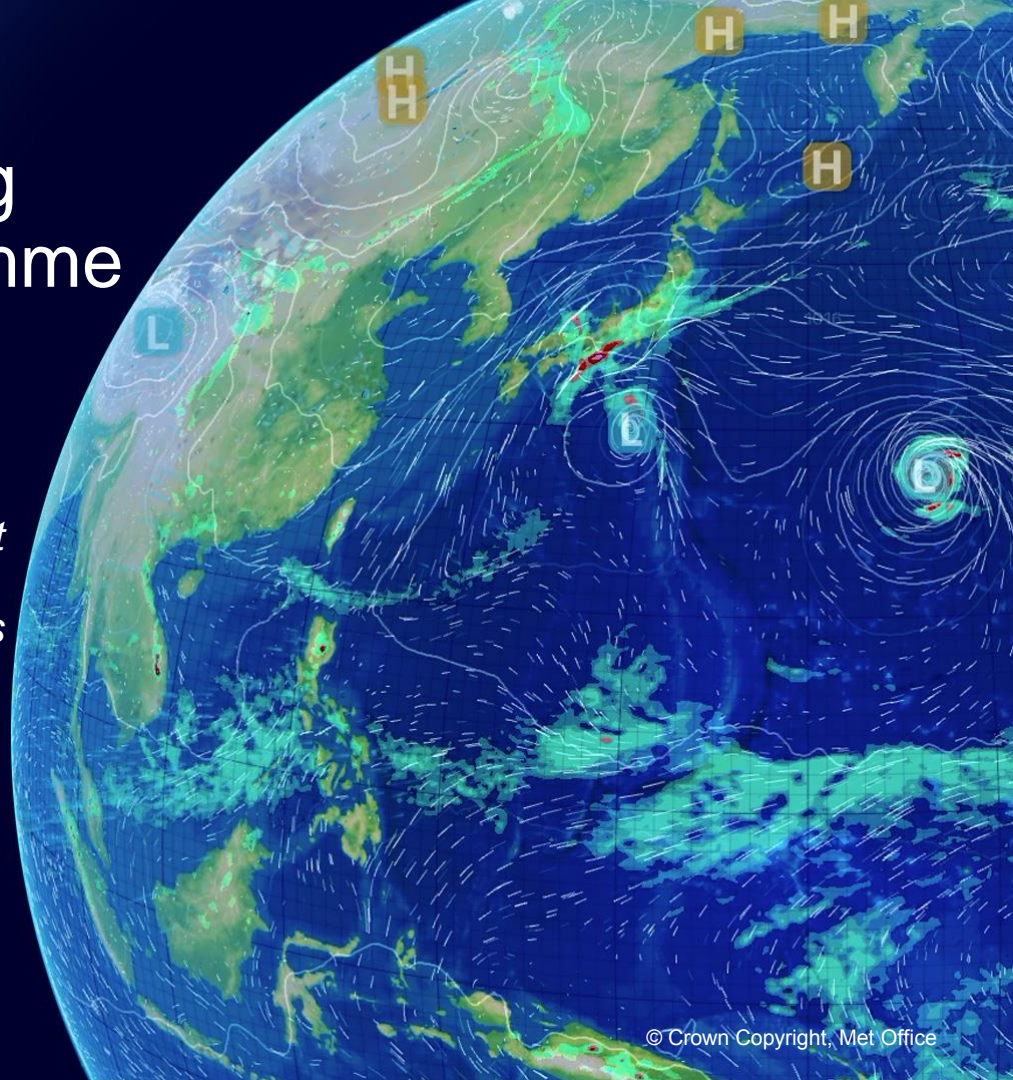


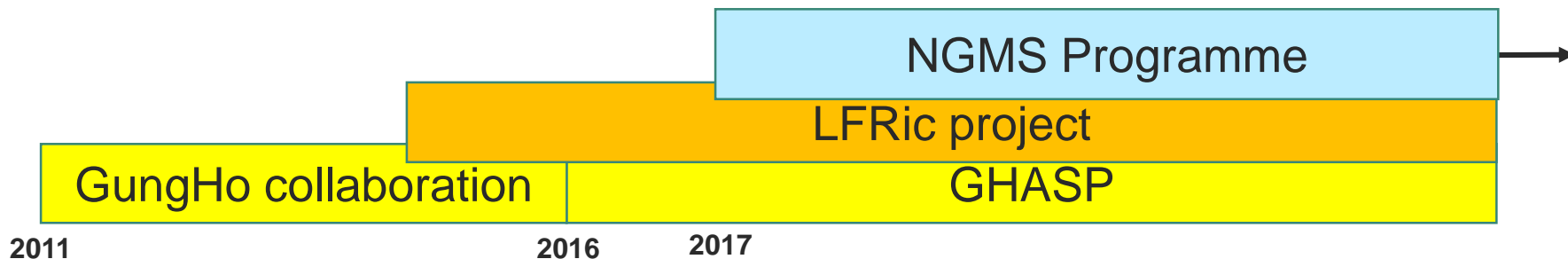
Next Generation Modelling Systems (NGMS) Programme

“To reformulate and redesign our complete weather and climate research and operational/production systems, including oceans and the environment, to allow the Met Office and its partners to fully exploit future generations of supercomputer for the benefits of society.”

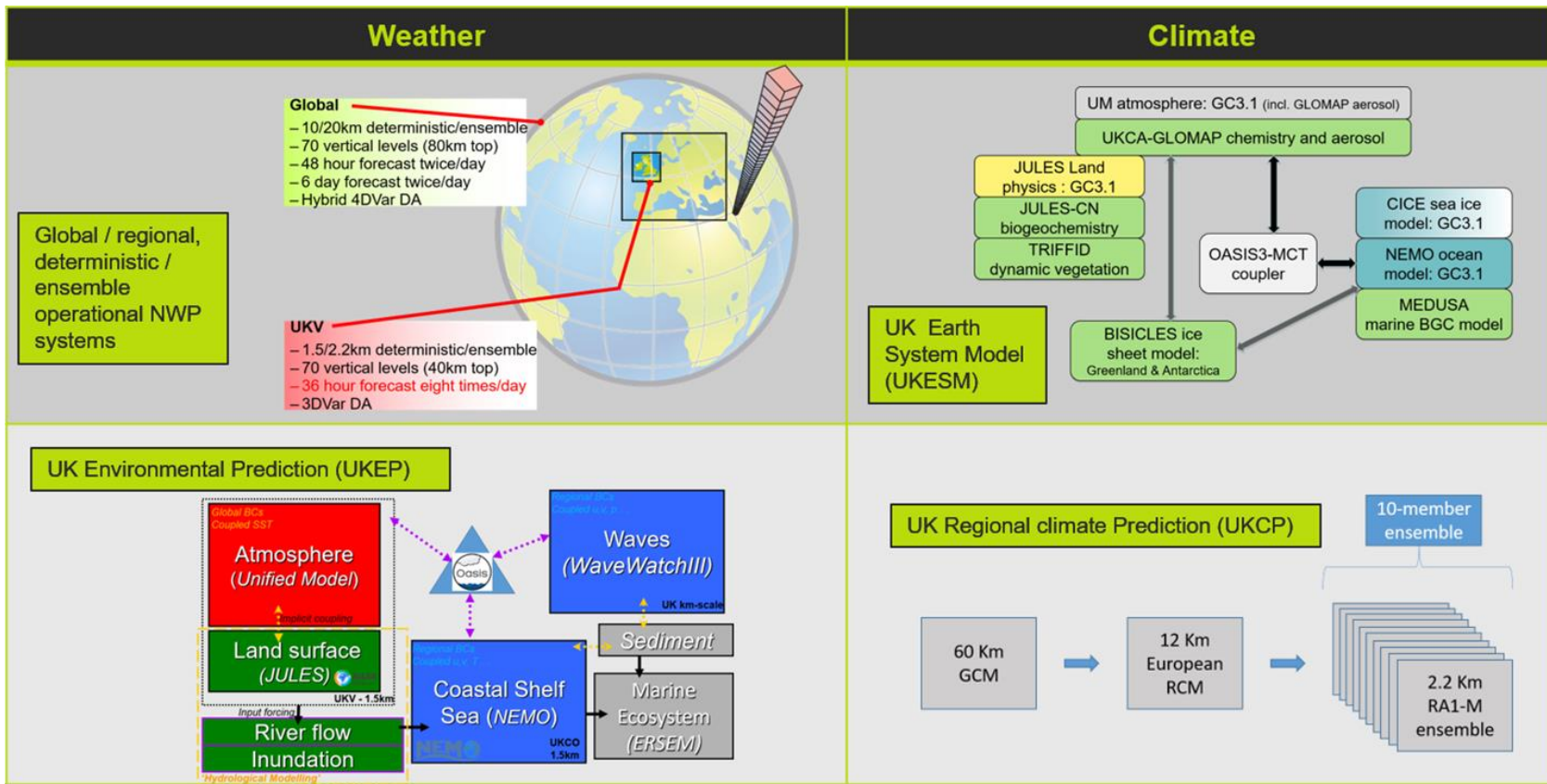
Tim Graham, Keir Bovis, Nigel Wood



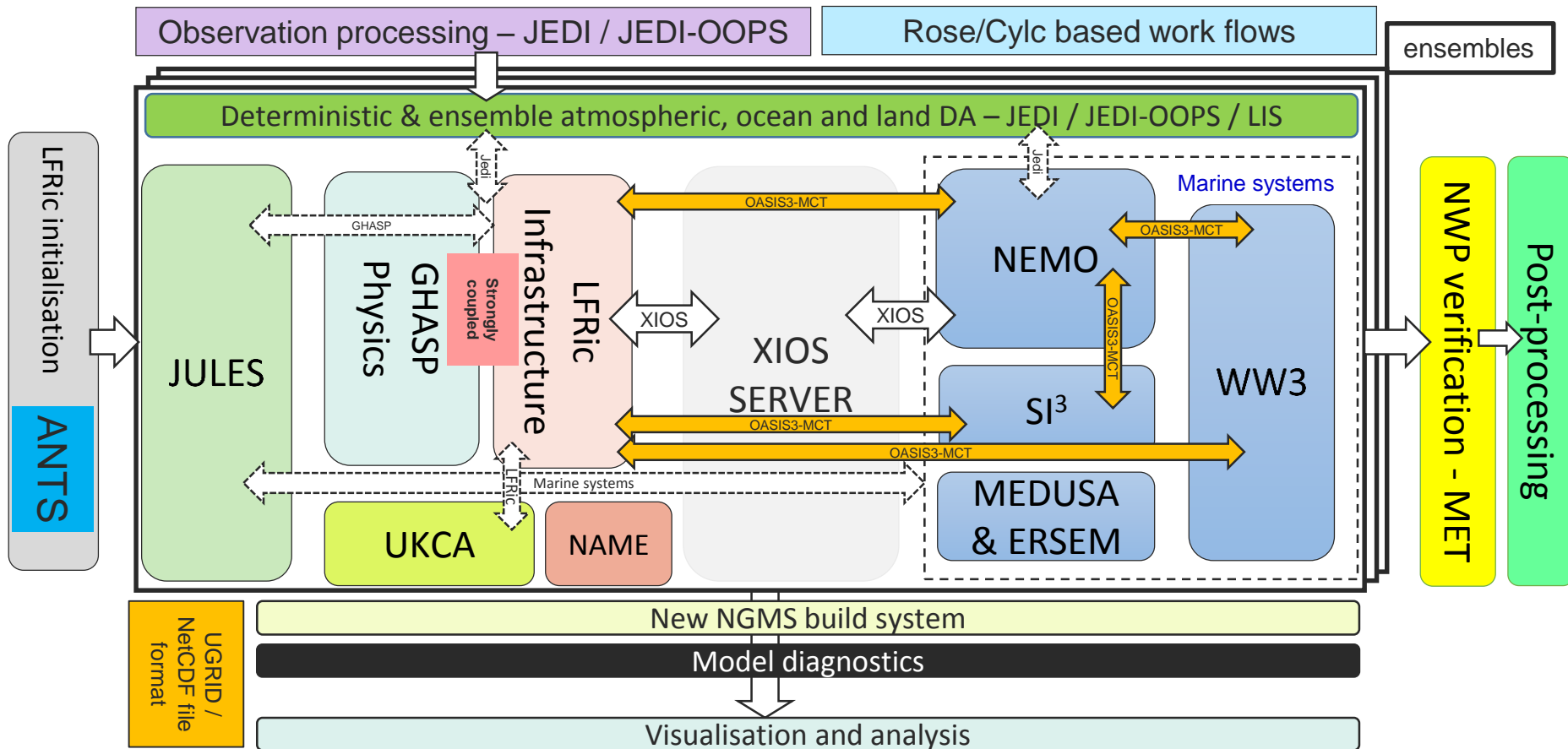
- **GungHo** = Met O/academia collaboration to research & design new, scalable atmosphere fluid dynamical core for weather and climate models (→ GHASP)
- **LFRic** = project that emerged from GungHo to build infrastructure to implement GungHo model (from which **PSyclone** DSL approach emerged)
- **Next Generation Modelling Systems** programme = recognition that it's not all about the dynamical core; formally initiated in October 2017 to coordinate all aspects required to deliver exascale-ready system
 - = Corporate Strategic Action and Research & Innovation Strategy theme in 2019



Met Office Programme scope – what we have to consider



Met Office Programme scope – *what we want to do*



Met Office NGMS project status – October 2021

green=active; yellow=spinning up; white=waiting; blue=ExCALIBUR

NG-Train

- **TBC [George Pankiewicz]**
- Develop and inaugural delivery of NGMS training material transitioning to BaU. This project will include aspects of usability

GungHo Atmosphere Science Project

- **Ben Shipway [Nigel Wood]**
- Develop atmospheric science aspects & deliver model scientifically as good as UM

LFRic Infrastructure Development

- **Steve Mullerworth [Adrian Hines]**
- Deliver infrastructure to replace the UM scalable for future platforms

LFRic Inputs

- **Rich Gilham [Glenn Greed]**
- Tools to ingest fixed & time-varying fields.
- Include initial conditions, ancillary fields and LBCs

ExCALIBUR data workflow

- **Stuart Whitehouse [Glenn Greed]**
- Development of research diagnostics and research workflow capabilities

NG-Marine Systems

- **Mike Bell [Andy Saulter]**
- Deliver scalable marine systems including ocean, sea-ice & wave models

NG-Coupling

- **JC Rioual [Adrian Hines]**
- OASIS3-MCT coupled components

NG-DA

- **Stefano Migliorini [Chiara Piccolo]**
- NGMS-ready coupled atmos/ocean DA
- JEDI as a DA framework

NG-OPS

- **David Simonin [Chiara Piccolo]**
- Processing of NWP observational data for NG-DA

NG-VAT (Visualisation Analysis Tools)

- **Kevin Wheeler [Glenn Greed]**
- Support for visualisation and evaluation tools used by scientists

FAB Build System

- **Rich Gilham [Glenn Greed]**
- Development of new build systems for NGMS components

NG-R2O

- **Mike Thurlow [David Walters]**
- Support transition of NGMS capability from research to NWP operations

NG-Composition

- **Fiona O'Connor [Matt Hort]**
- Coordination of aerosol & chemistry development within NGMS

NG-Ver

- **Phil Gill [Ken Mylne]**
- Development of NWP verification capability for NGMS

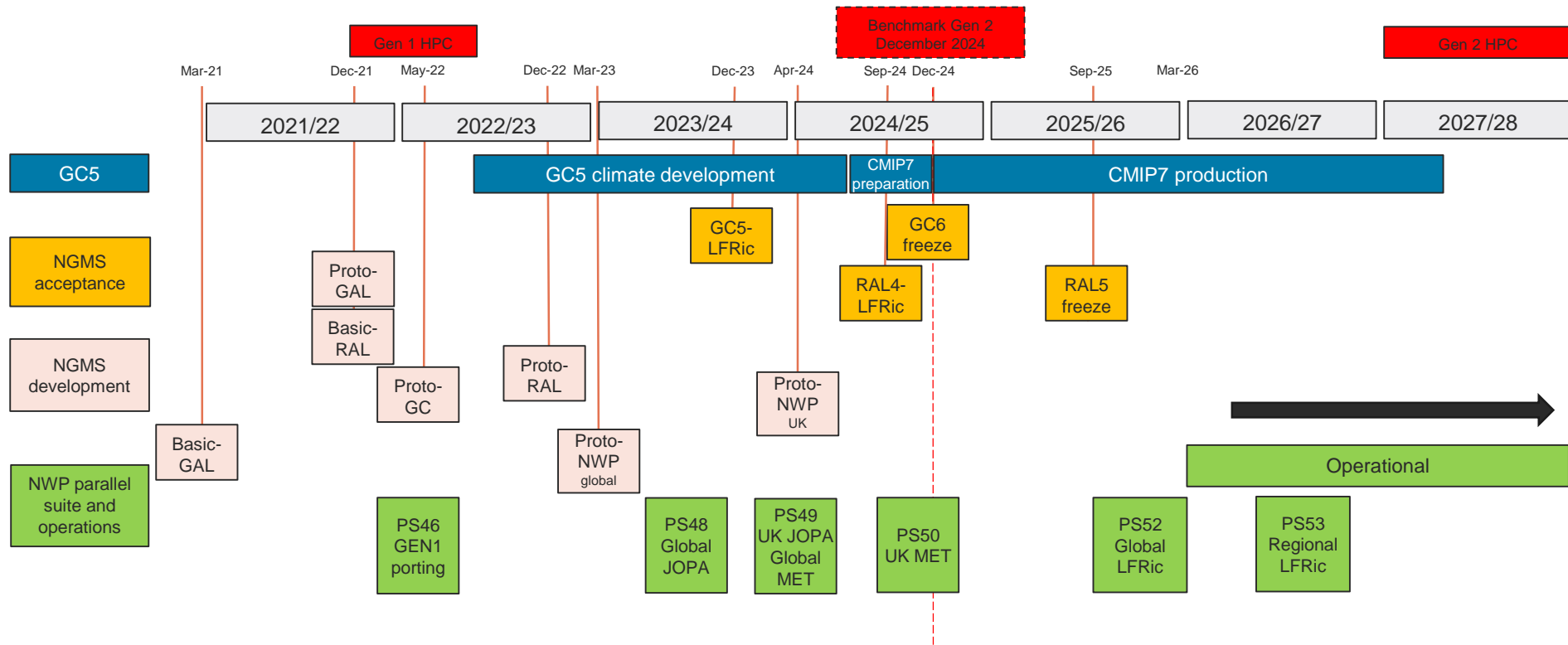
NG-R2C

- **TBC [Richard Wood]**
- Support transition of capability from research to climate production

NG-ADAQ

- **Ben Devenish [Matt Hort]**
- Development of dispersion models (e.g. NAME) for next generation computing

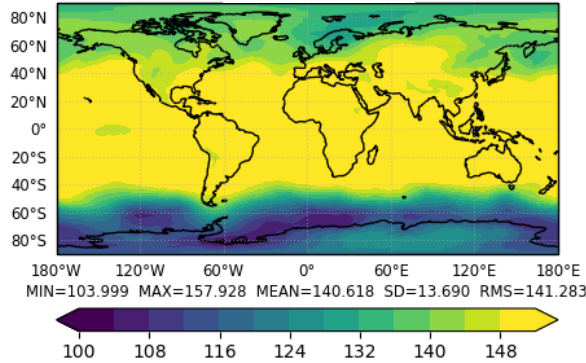
Met Office Programme timeline



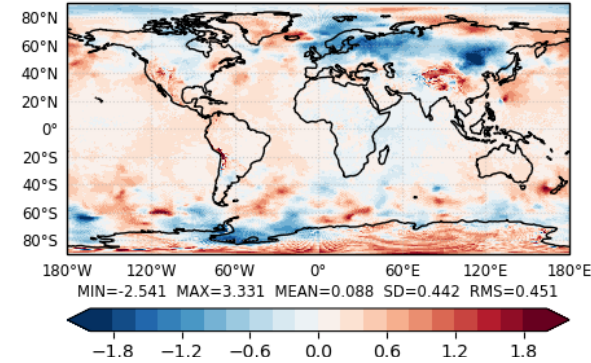
Results from prototype atmosphere model

850hPa Geopotential Height
T+72

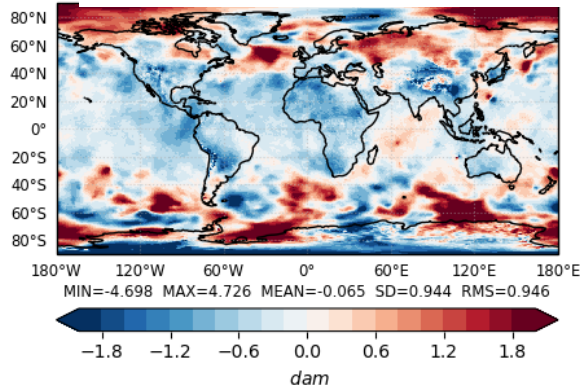
LFRic



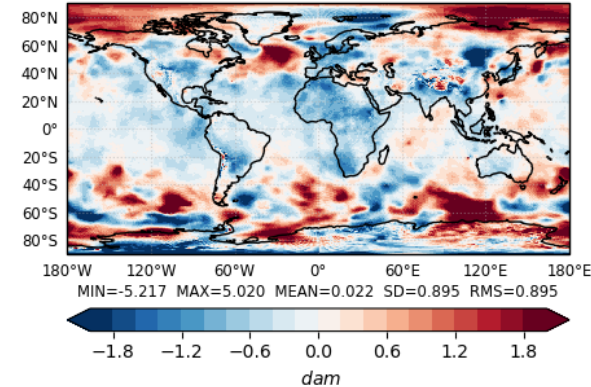
LFRic minus UM



UM minus analysis



LFRic minus analysis



Thank you! Any questions?

Observations

- JOPA obs processing (JEDI)
- JADA data assimilation (JEDI)
- NEMOVar
- LIS (land surface)

Atmosphere components

- GungHo dynamical core
- UM Physics
- UKCA chemistry

Infrastructure

- LFRic
- Rose
- Cylc
- XIOS
- ANTS
- PScyclone
- YAXT

Marine systems

- NEMO Ocean
- NEMO Sea Ice SI3
- MEDUSA& ERSEM biogeochemistry
- WaveWatch III wave model

Coupler

- OASIS
- ESMF

Verification

- MET
- TRUI
- ESMValTools

Land systems

- HydroJULES land model
- BISICLES land ice

Visualisation

- IRIS (extended)

