

# PREPARING THE MET OFFICE FOR THE NEXT GENERATION OF SUPERCOMPUTERS



*Abram*

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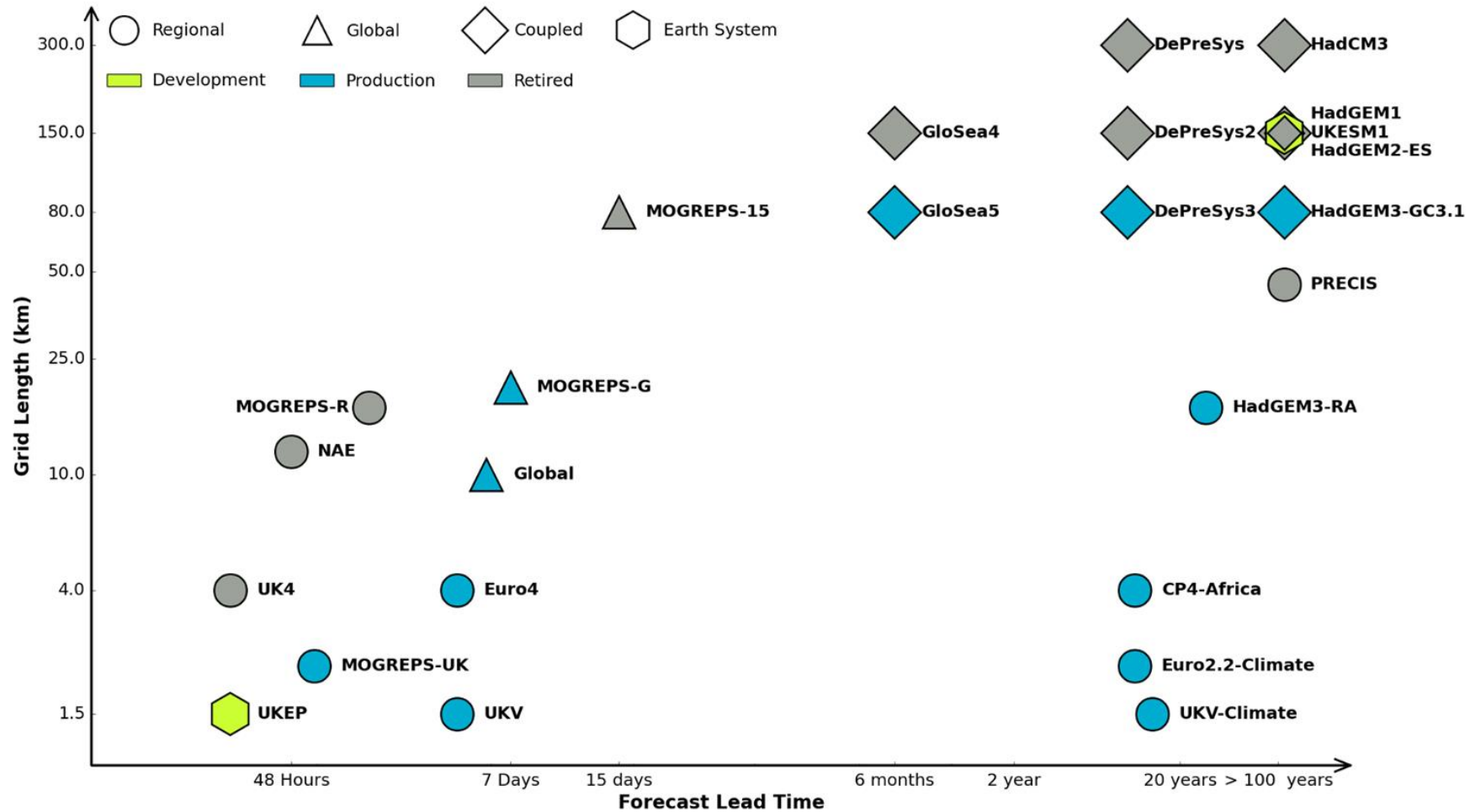
# Weather & Climate Modelling



Image: NASA

# Weather and Climate Modelling

## Current Unified Model Configurations





## June 2022 Top500

75 Cray XC40, Xeon E5-2695v4 18C 2.1GHz,  
Aries interconnect , HPE  
United Kingdom Meteorological Office  
United Kingdom

207 Cray XC40, Xeon E5-2695v4 18C 2.1GHz,  
Aries interconnect , HPE  
United Kingdom Meteorological Office  
United Kingdom

208 Cray XC40, Xeon E5-2695v4 18C 2.1GHz,  
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# PREPARING THE MET OFFICE FOR THE *NEXT* NEXT GENERATION OF SUPERCOMPUTERS

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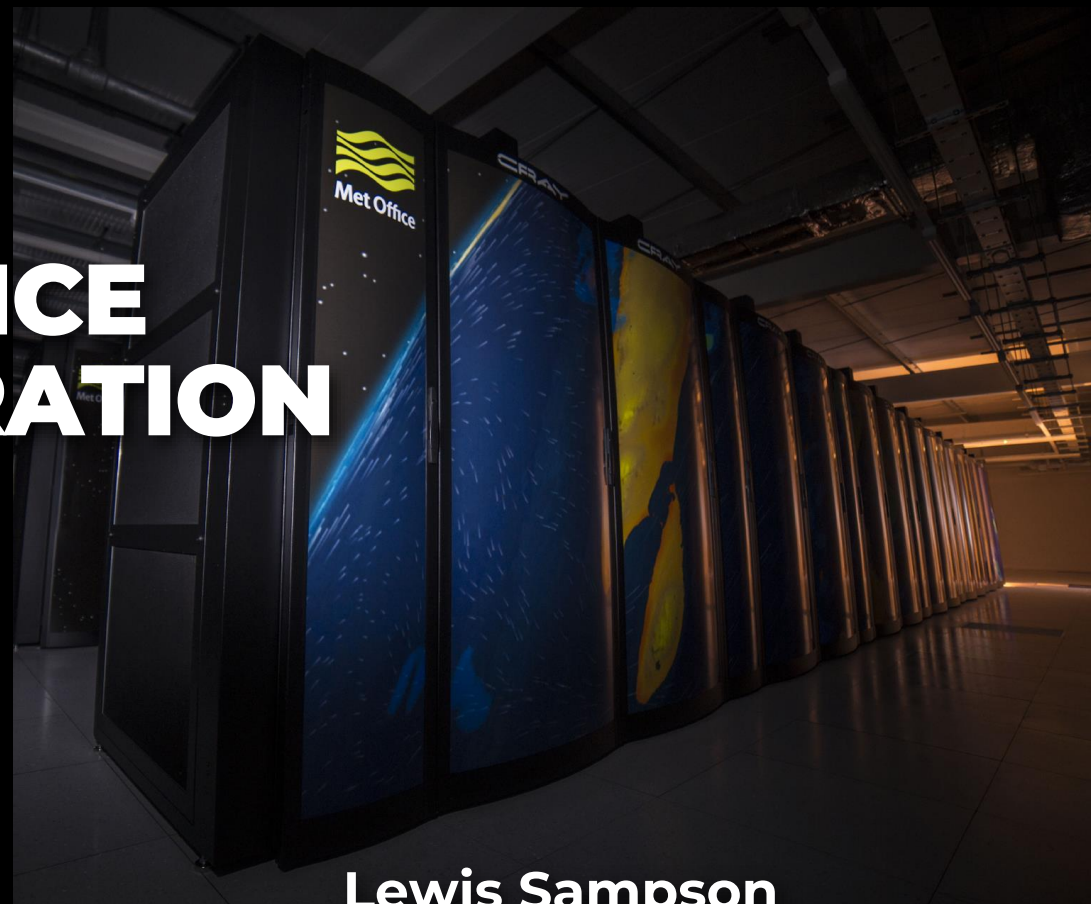
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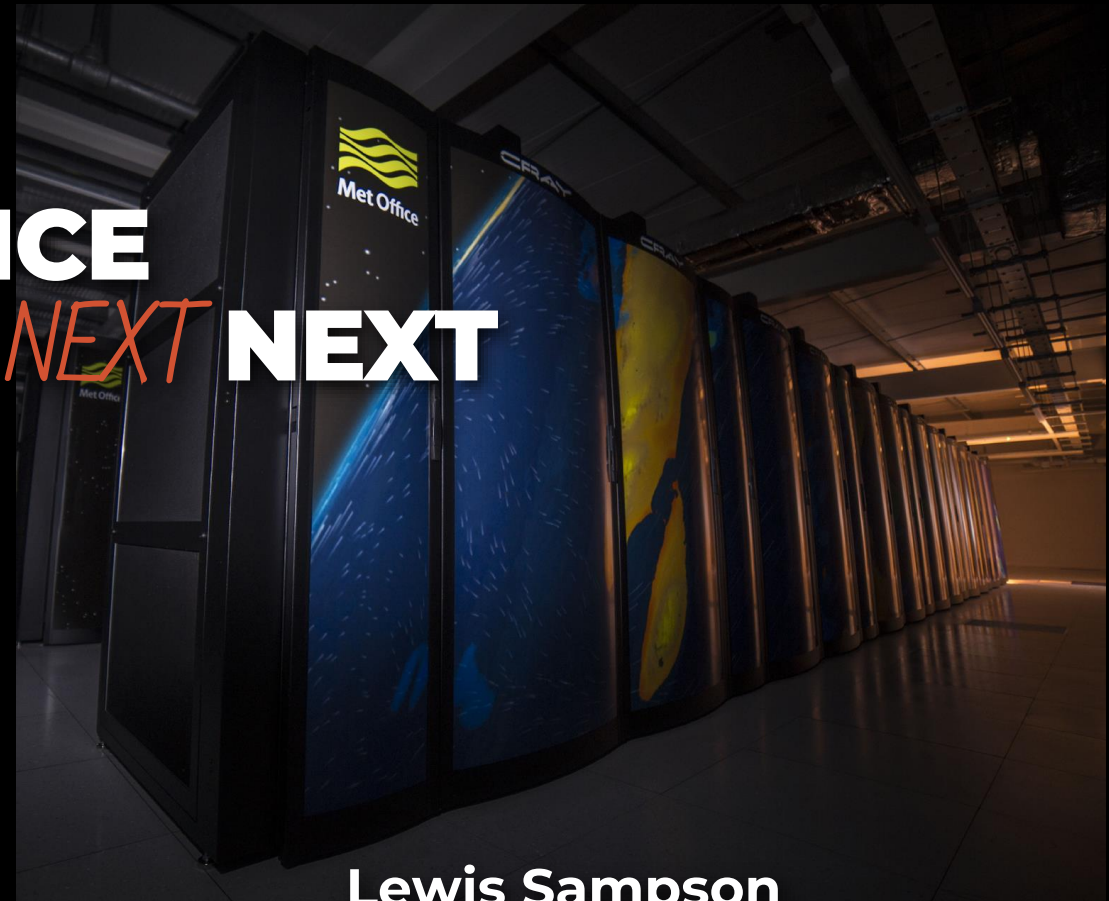
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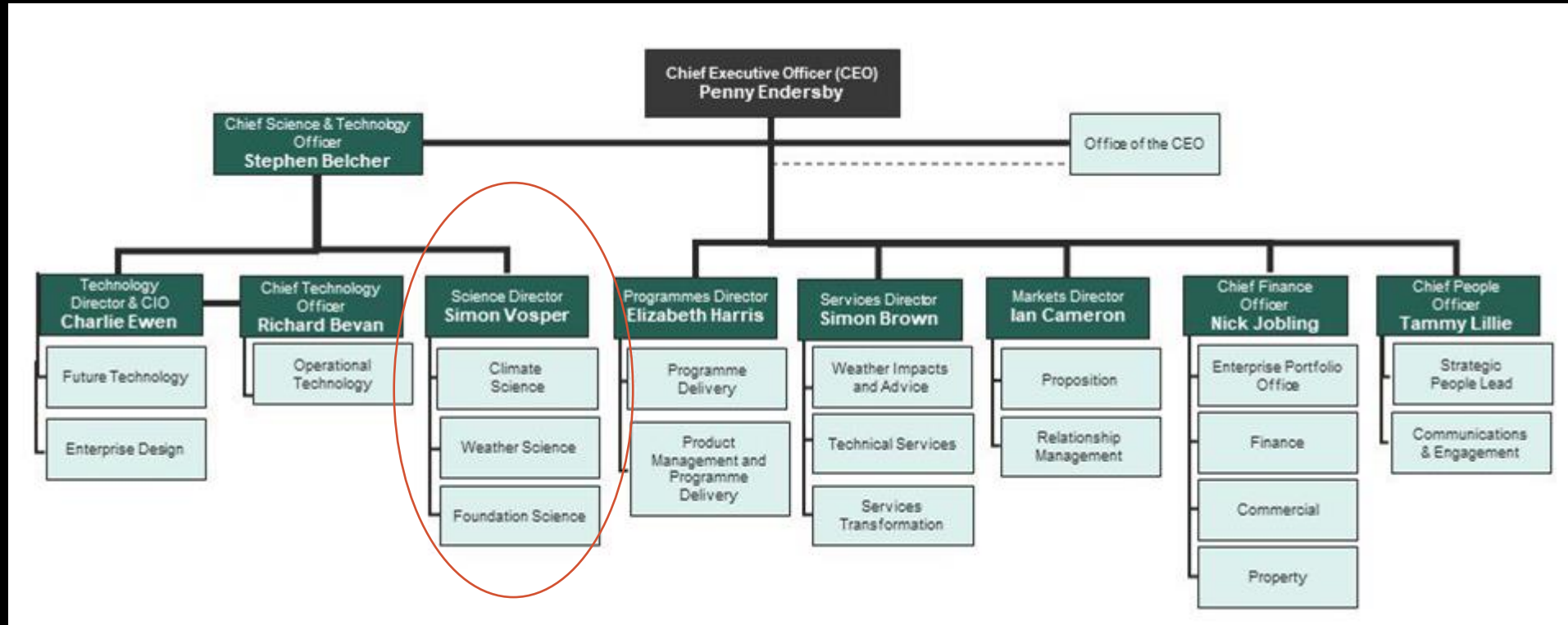
**Lewis Sampson**

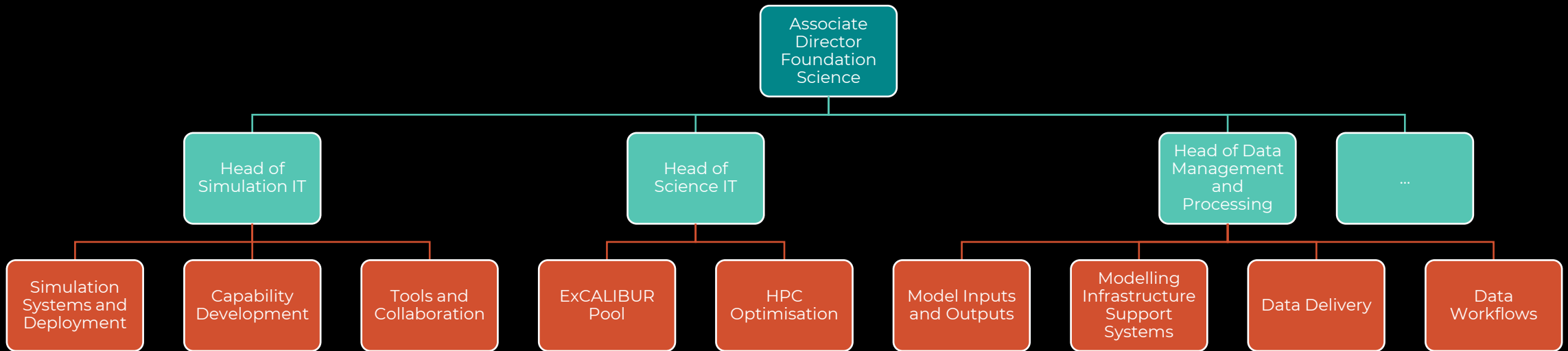
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# Major Themes









**EXCALIBUR  
10**

# MIXED PRECISION ALGORITHMS



UK Research  
and Innovation



UK Atomic  
Energy  
Authority



# Mixed Precision Algorithms - Key Contributors:

Ben  
Shipway<sup>1</sup>

Steve  
Mullerworth<sup>1</sup>

Richard  
Malone<sup>1</sup>

Tom  
Bendall<sup>1</sup>

Mike  
Hobson<sup>1</sup>

Chris  
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Tom Melvin<sup>1</sup>

Iva Kavcic<sup>1</sup>

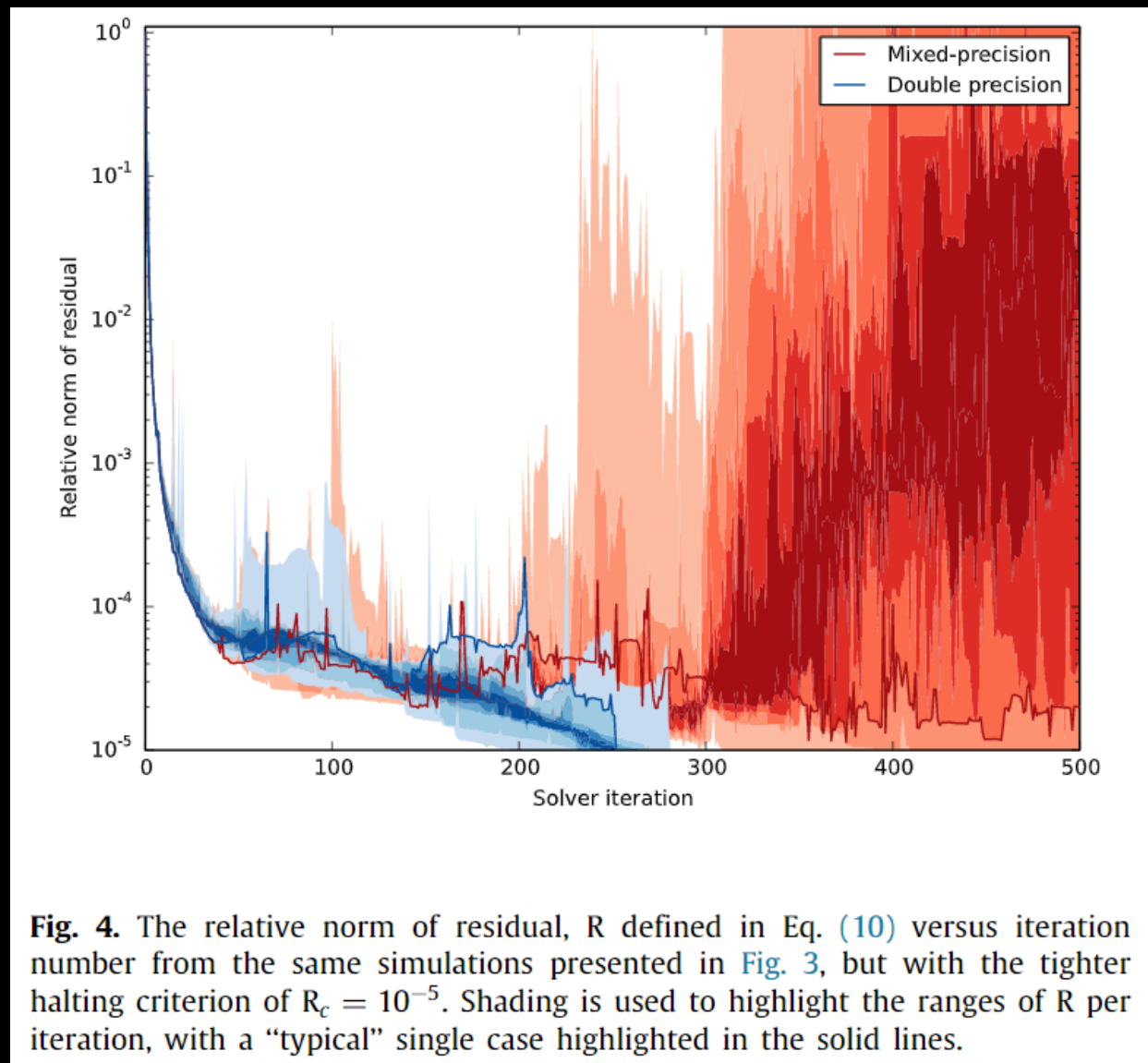
Andrew  
Porter<sup>2</sup>

Rupert  
Ford<sup>2</sup>

Sergi Siso<sup>2</sup>

1:  **Met Office**

2:  **UKRI** Science and  
Technology  
Facilities Council



**Fig. 4.** The relative norm of residual,  $R$  defined in Eq. (10) versus iteration number from the same simulations presented in Fig. 3, but with the tighter halting criterion of  $R_c = 10^{-5}$ . Shading is used to highlight the ranges of  $R$  per iteration, with a “typical” single case highlighted in the solid lines.

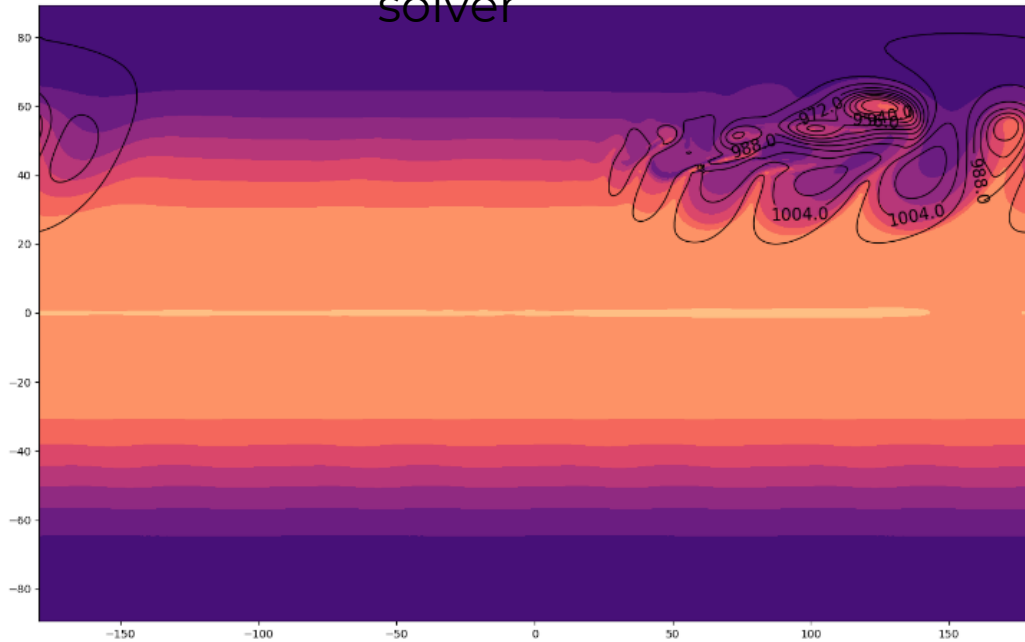
Mixed-precision arithmetic in the ENDGame dynamical core of the Unified Model, a numerical weather prediction and climate model code

C.M. Maynard and D.N. Walters /  
 Computer Physics  
 Communications 244 (2019) 69–  
 75

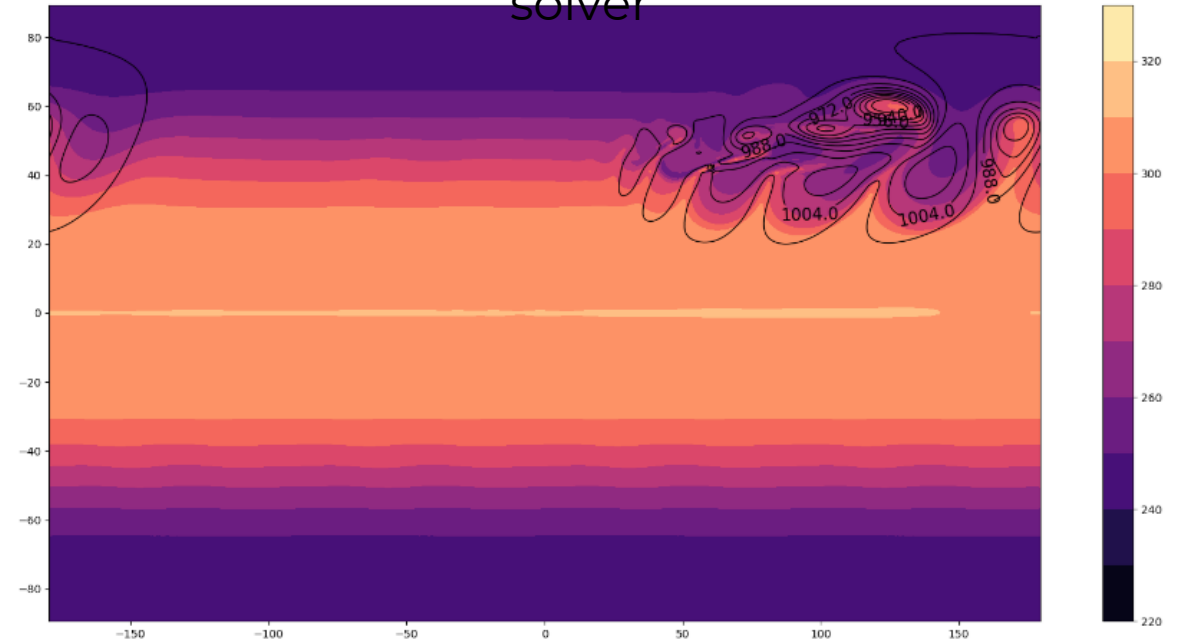
# Scientific Evaluation

## GungHo Baroclinic wave test

64-bit solver



32-bit solver



```
#if (R_TRAN_PRECISION == 32)
  use field_r32_mod, only: r_tran_field_type      => field_r32_type,      &
                        r_tran_field_proxy_type => field_r32_proxy_type, &
                        r_tran_field_pointer_type => field_r32_pointer_type
#else
  use field_r64_mod, only: r_tran_field_type      => field_r64_type,      &
                        r_tran_field_proxy_type => field_r64_proxy_type, &
                        r_tran_field_pointer_type => field_r64_pointer_type
#endif
```





**EXCALIBUR  
10**

# GPU EXPLORATIONS

**Victoria Smart  
Lewis Sampson**



**UK Research  
and Innovation**



**UK Atomic  
Energy  
Authority**

# Marine Systems GPU Projects - Key Contributors:

Lewis Sampson <sup>1</sup>	Victoria Smart <sup>1</sup>	Chris Bunney <sup>1</sup>	Martin Price <sup>1</sup>	Mike Bell <sup>1</sup>
Matthew Martin <sup>1</sup>	Muhammad Asif <sup>1</sup>	Joseph Wallwork <sup>1</sup>	Wayne Gaudin <sup>2</sup>	David Norton <sup>2</sup>
Seth Camp <sup>2</sup>	Andrew Porter <sup>3</sup>	Rupert Ford <sup>3</sup>	Sergi Siso <sup>3</sup>	

1:  **Met Office**

2:  **nVIDIA.**

3:  **UKRI** Science and Technology Facilities Council



Desired API

Actual API

