



# FLake in the Unified Model

The experience so far...

G.Rooney, September 2010



Devenish Island, Lough Erne, Northern Ireland



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- the Met Office Unified Model
- JULES versions
- adding Flake
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# Met Office Unified Model, MetUM



Met Office

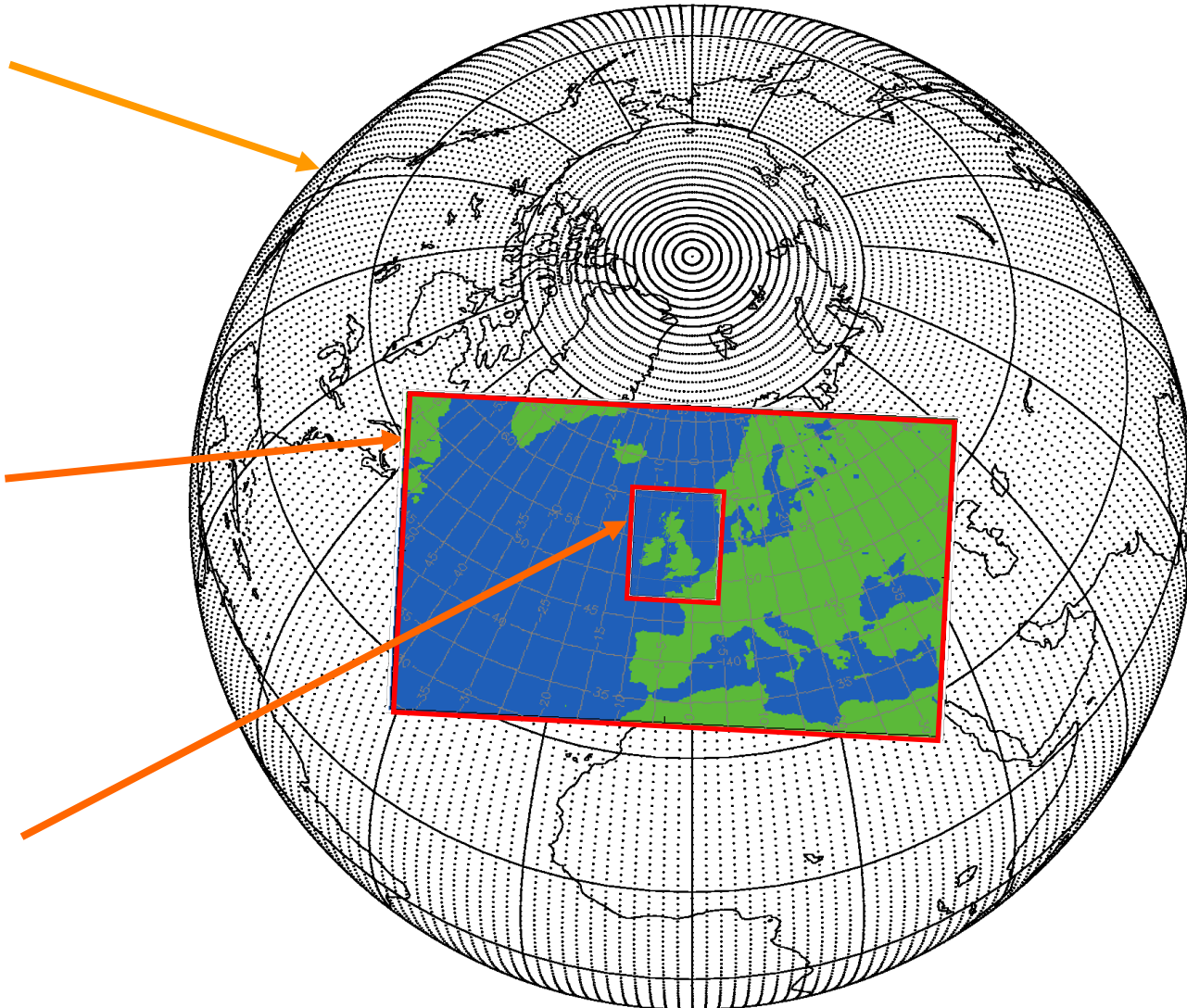
# Operational Configurations 2009

Global  
40km,  
L70

NAE  
12km,  
L38

UK4  
4km, L70

UKV  
1.5km, L70

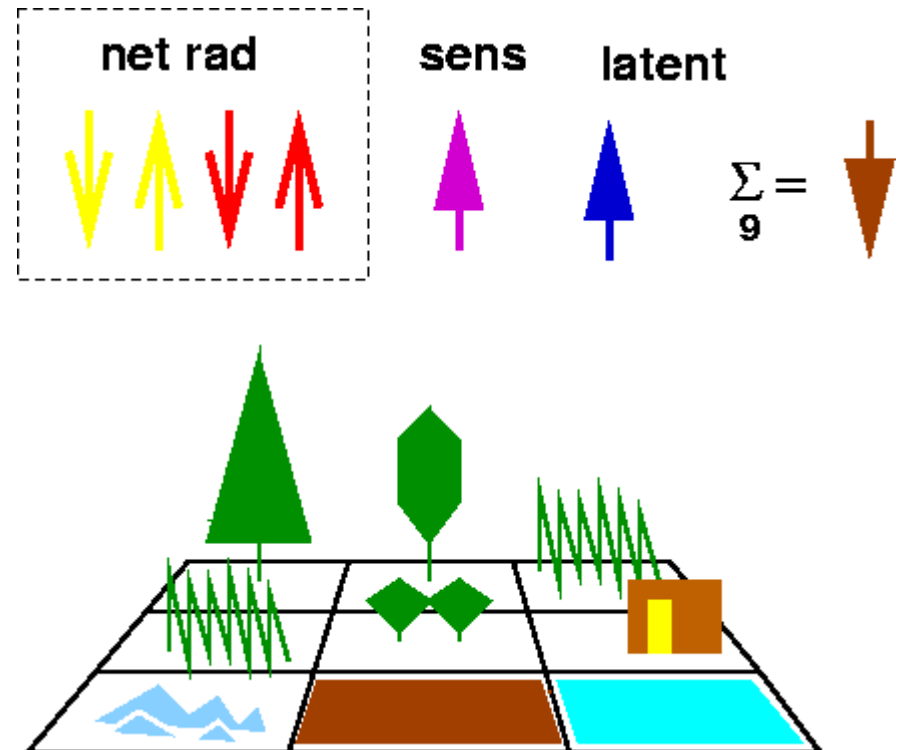


# MetUM surface exchange

9 tiles, 5 veg + 4 non-veg

Forced with observables:  
T, P, q, DWSW, DWLW,  
windspeed, rain, snow

Yields:  
surface (canopy) T,  
sensible + latent heat fluxes,  
soil temperature and moisture





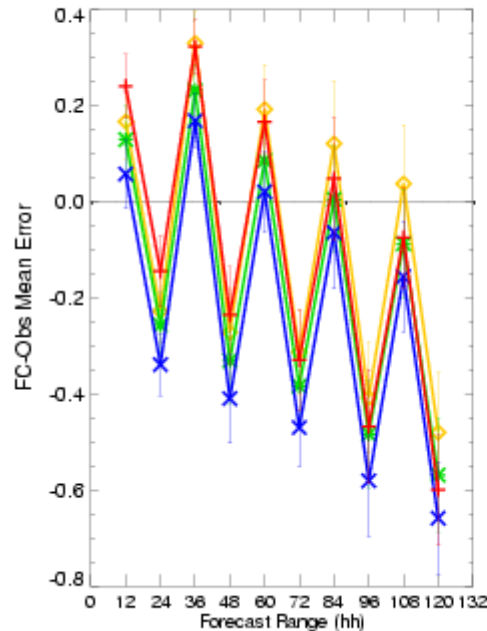
# MetUM surface schemes

**MOSES** : Met Office Surface Exchange Scheme

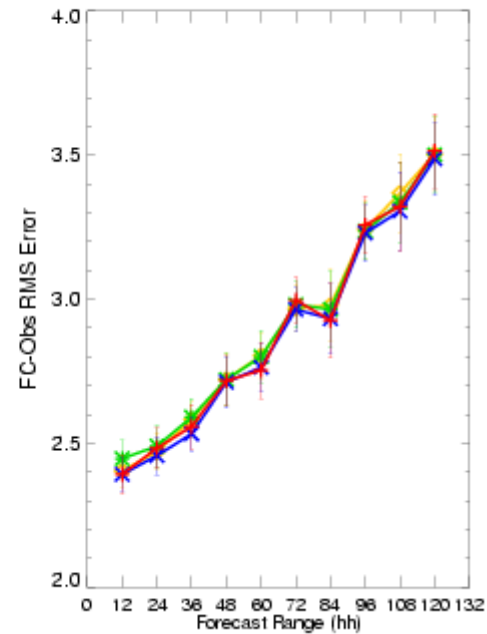
**JULES** : Joint UK Land Environment Simulator

Cases: + PS24ish x JULES neutral change \* JULES new snow scheme ◇ JULES 9 tiles

FX-Obs,  
mean



FX-Obs,  
rms



N Hemisphere, all seasons, 132 hour Temp. forecast



Met Office



# JULES stand-alone versions



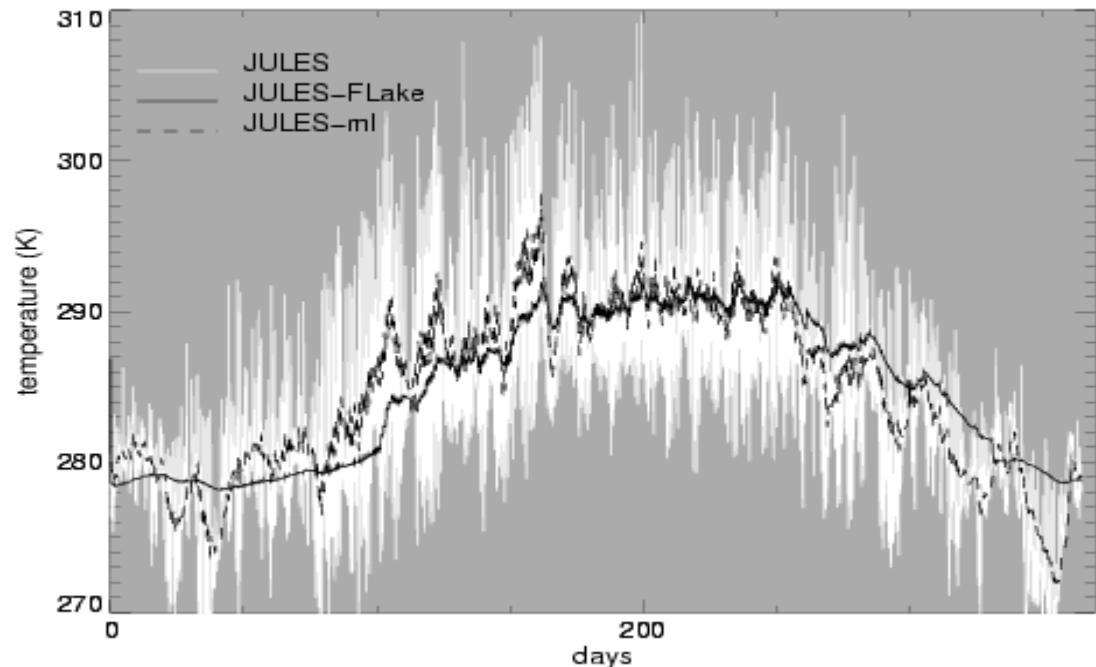


# JULES outside the MetUM

<http://www.jchmr.org/jules/index.html>

Previously used **JULES v1**, stand-alone, for coupled JULES/FLake studies.

Rooney & Jones  
BorEnvRes 2010





# Surface energy balance solver

The SEB expansion has changed between **JULES v1** and **JULES v2.1**  
e.g.

$$\mathbf{v1} \quad G_0 \approx \left[ 4f_r \sigma T_s^3 + (1 - f_r) \frac{2\lambda}{\Delta z_s} \right] (T_* - T_s)$$

$$\mathbf{v2.1} \quad G_0 = G_{0ex} + [f_r(4\epsilon_c \epsilon_s \sigma (T_*^n)^3 + c_p R K_{Hcan}) + (1 - f_r) \frac{2\lambda}{\Delta z_s}] \Delta T_*$$

This has implications for FLake implementation.



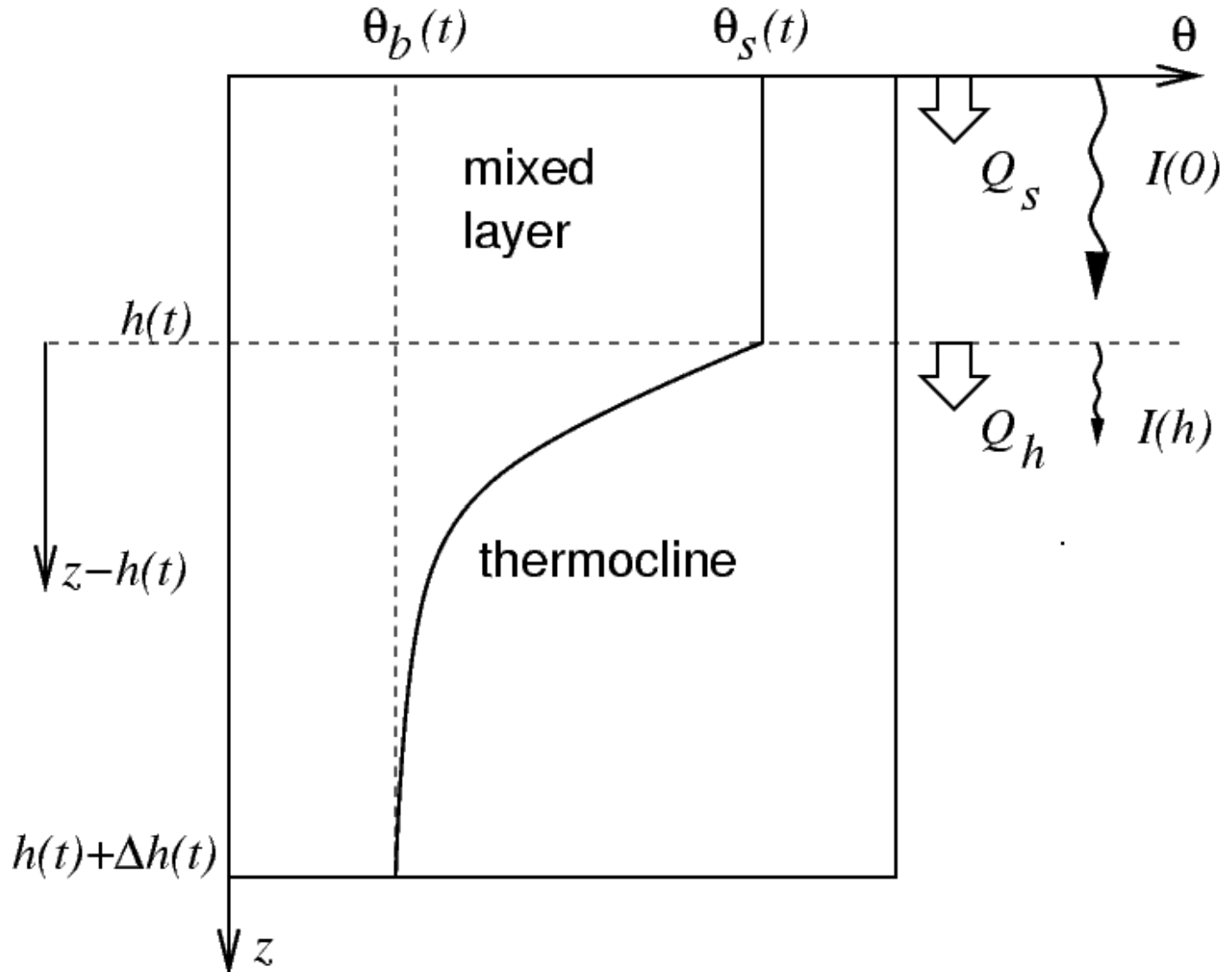
Met Office



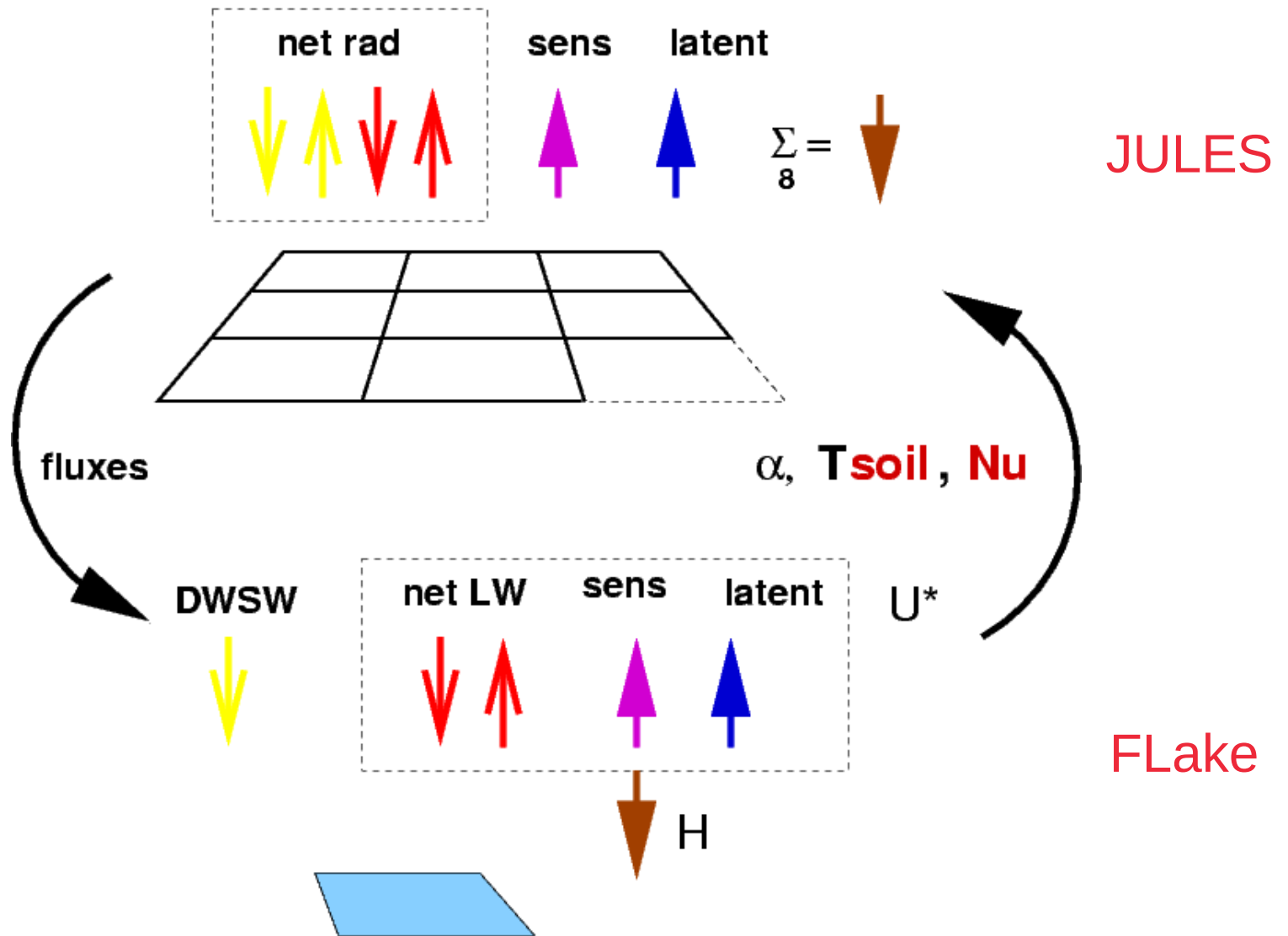
# FLake, JULES and MetUM

putting it all together

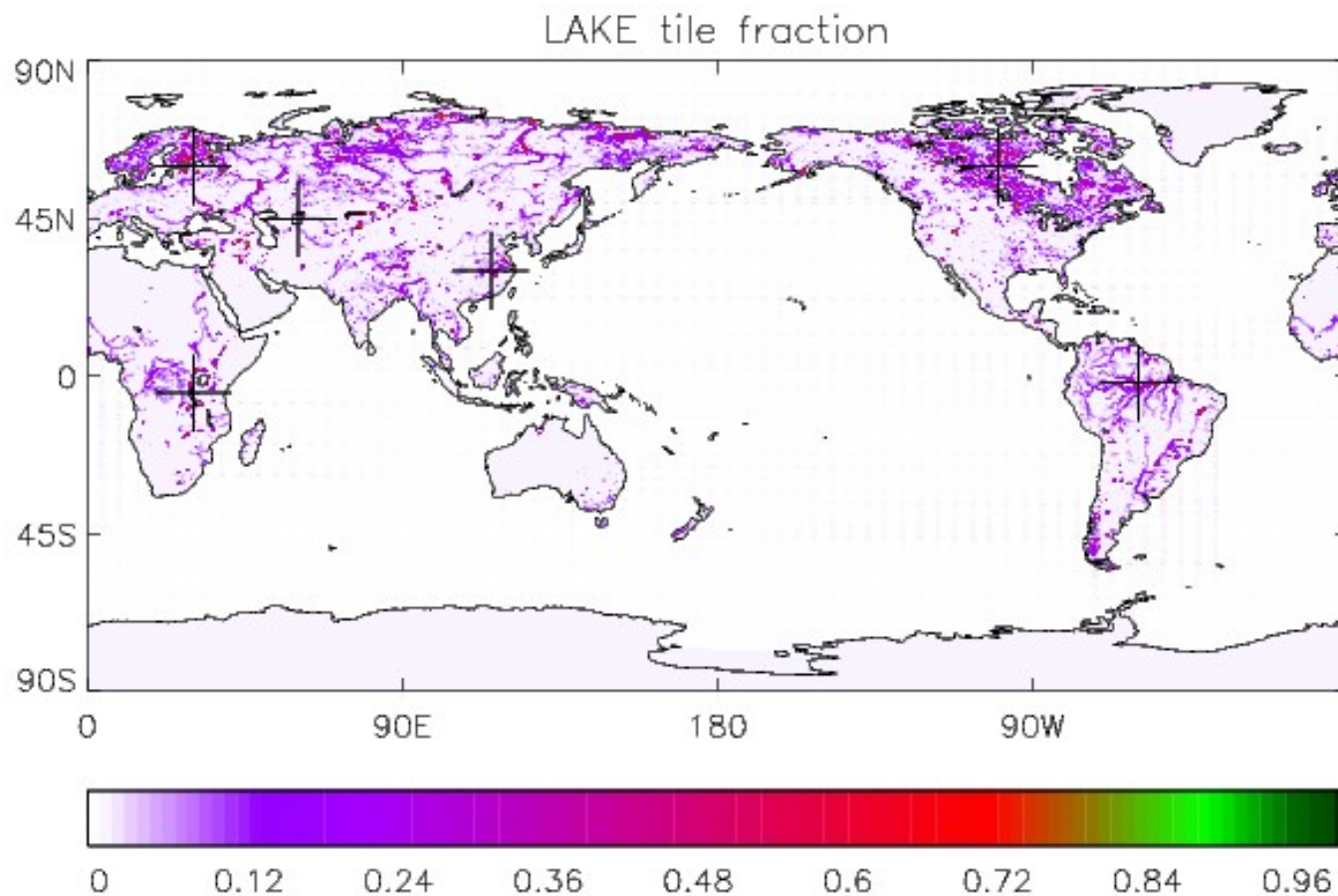
do I have to explain **FLake** (Mironov et al. 2010) ?



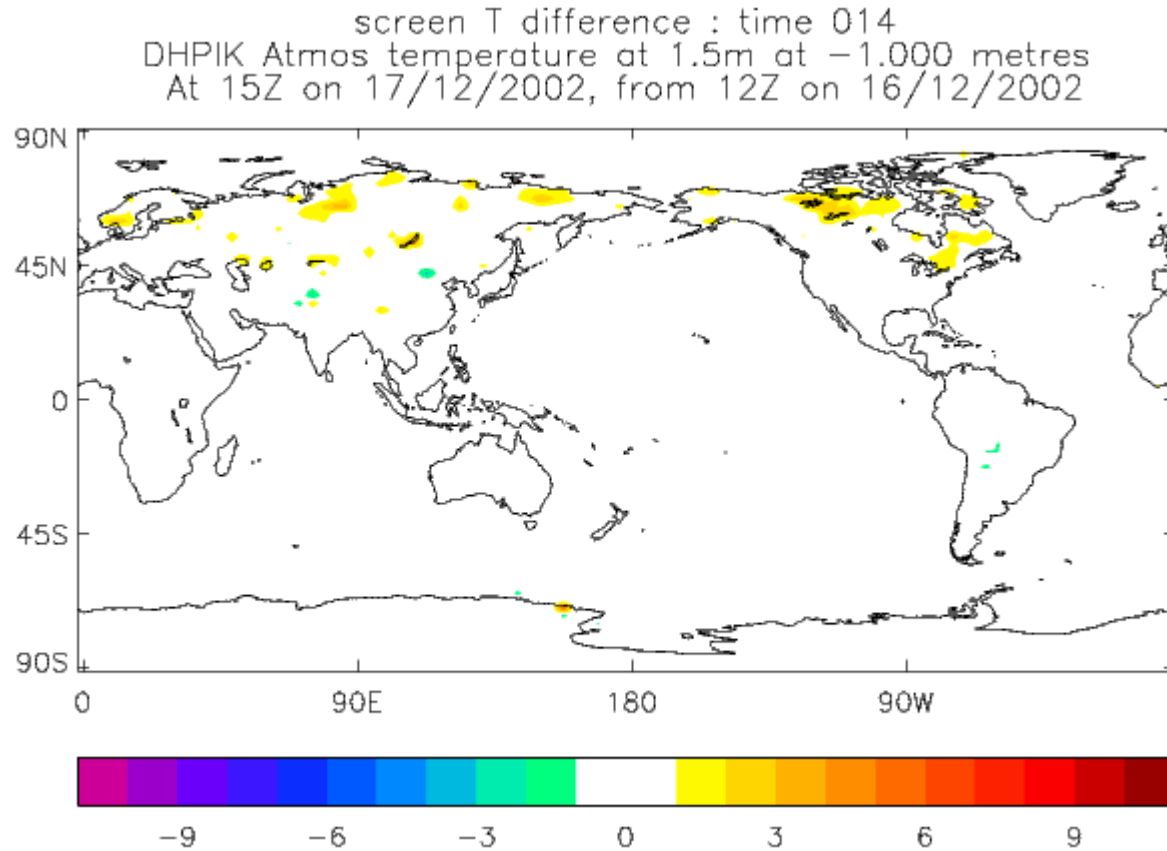
# coupling JULES and FLake



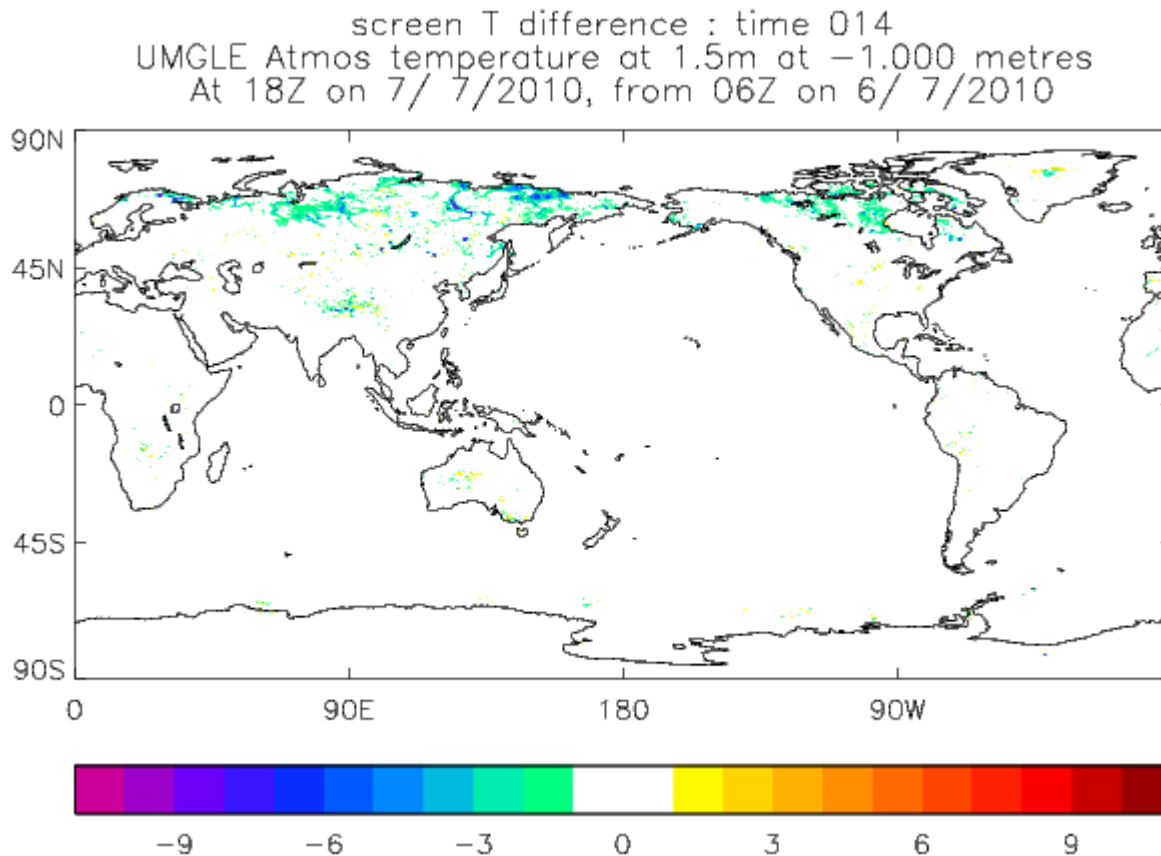
# Lake fraction in the Global Model



# effect on screen T : winter



# effect on screen T : summer







Met Office



evaluation



# 'Case studies'

- a set of forecast runs
- 15 dates in winter, summer, spring
- 1<sup>st</sup> stage to making an operational change
- help to understand the impact of new physics
- various 'flavours' of JULES are at this stage
  - **neutral**
  - **9 tiles**
  - **new snow scheme**
  - **FLake**
  - **combinations...**



# JULES-FLake evaluation: UK

all seasons

RMS error

MOSES

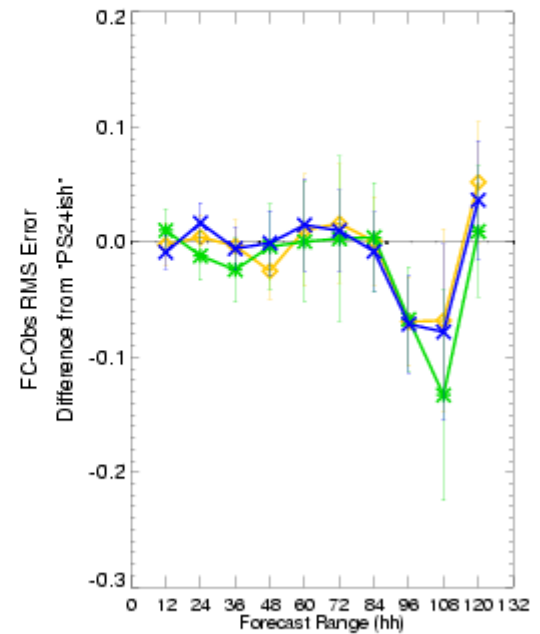
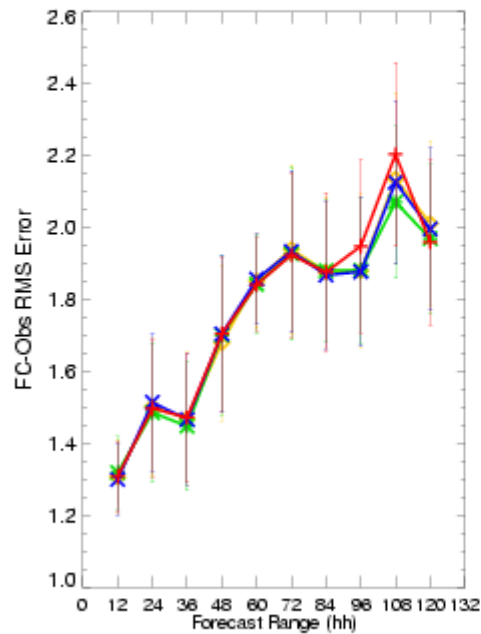
JULES-n

JULES-9

JULES-FL

Temperature (Kelvin) at Station Height: Surface Obs  
WMO Block 03 station list  
Equalized and Meaned from 1/2/2006 00Z to 31/1/2007 12Z

Cases: + PS24ish x JULES neutral change \* JULES FLake 9 tiles ◇ JULES 9 tiles





# JULES-FLake evaluation: Global

all seasons

mean error

MOSES

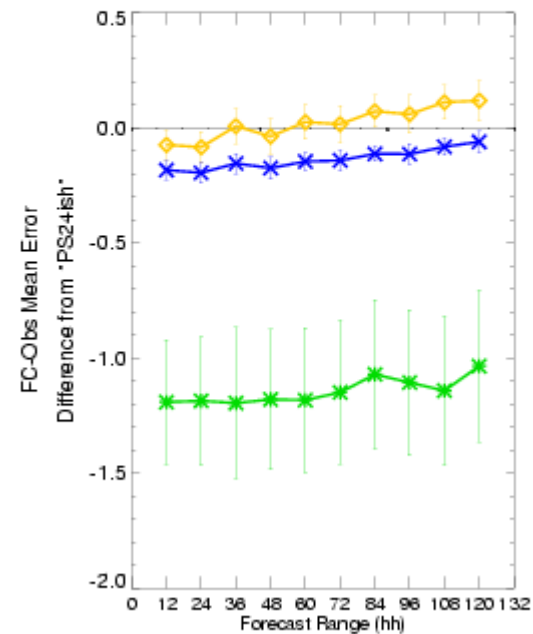
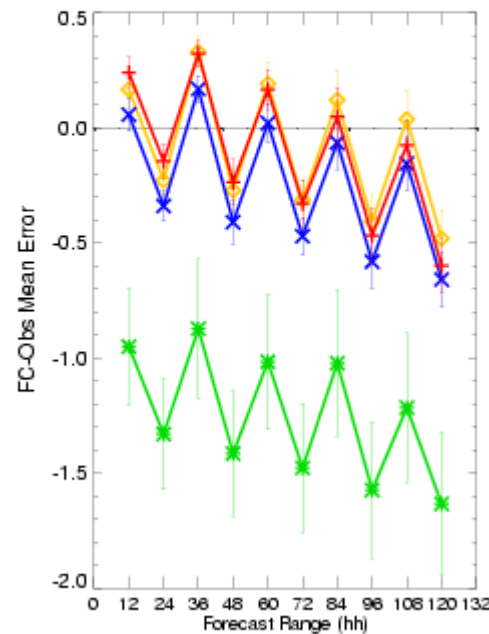
JULES-n

JULES-9

JULES-FL

Temperature (Kelvin) at Station Height: Surface Obs  
Northern Hemisphere (CBS area 90N-20N)  
Equalized and Meaned from 1/2/2006 00Z to 31/1/2007 12Z

Cases: + PS24ish \* JULES neutral change \* JULES FLake 9 tiles ◇ JULES 9 tiles





# plans for JULES and FLake

- Global model
  - fairly rigid trial schedule
  - JULES next year
  - what kind of JULES?
- UKV
  - more flexible
  - JULES sooner



# conclusion and future work

- FLake is currently in the MetUM 'system'
- implementation and evaluation are under way
- there are still issues to address
- I haven't mentioned initialisation or ancillaries!
- implemented within a year ?



# Questions and answers