



# Development of a UK (hydrology) configuration for JULES

Douglas Clark, July 2019

With input past and future from various others!  
e.g. Blyth, Dadson, Marthews, Martinez-de la Torre, Robinson

# JLMP configurations

- **Global Land**

underpins the weather and climate models, globally applicable, should be the best model for simulating exchange of heat, water and momentum.

- **Earth System**

builds on global land to include interactive carbon, nitrogen and methane cycles, land-use and cover change. The best model for understanding carbon cycle and ecosystem processes

- **~~UK Hydrology~~ Land**

a regional configuration ~~best suited to UK hydrological applications~~

should be the best model for simulating exchange of heat, water and momentum over the UK

# Previous work

CHES (Climate Hydrology and Ecology research Support System)

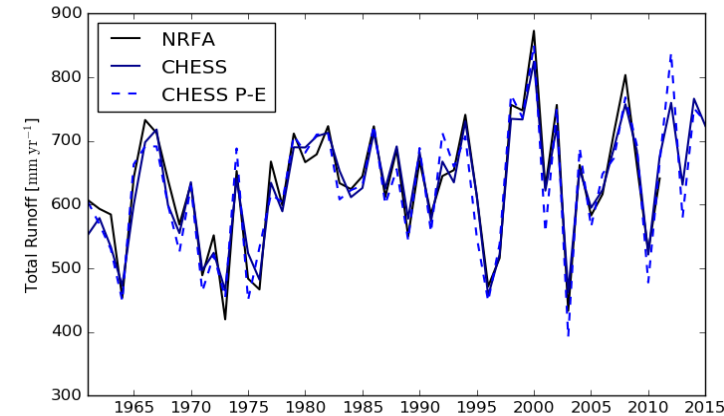
Robinson et al., 2017, HESS, 21, 1189–1224

At the core of this is the CHES-LAND configuration (e.g. suite u-au394).

Gradual evolution of a best-guess-type starting config?

Has been used and evaluated in various ways.

Modelled and observed  
runoff



UKEP (UK Environmental Prediction)

Coupled land-atmos-ocean-wave system.

UKC3, UKA3 (Lewis et al., 2019, GMD)

e.g. suite u-ar588

UKV

Operational NWP

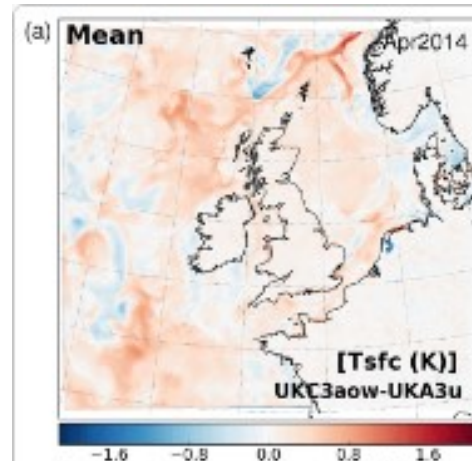


Fig.9a, Lewis et al.

# Hydrology

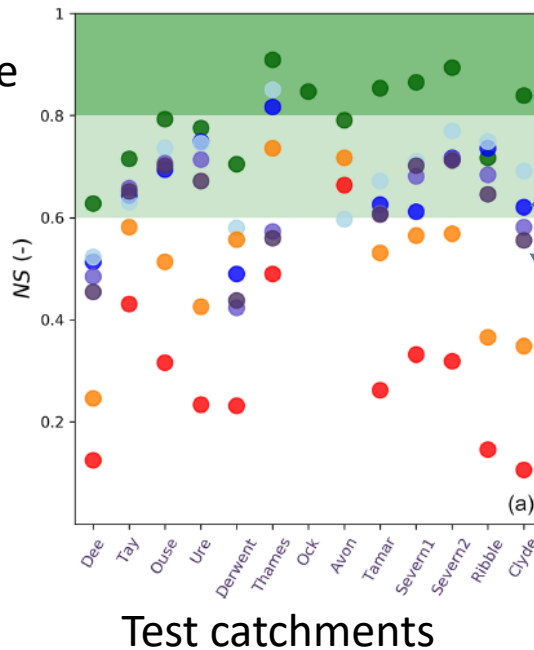
CHES-LAND and UKC3 both use PDM with slope-dependent parameters, based on Martinez et al. (2019), GMD

Slope-dependent threshold  $S_0/S_{max}$

$$b = 2.0$$

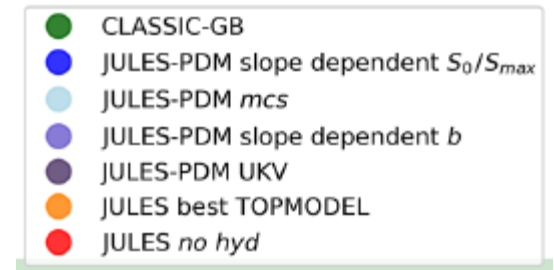
$$S_0/S_{max} = \max\left(1 - \frac{s}{s_{max}}, 0.0\right)$$

Nash-Sutcliffe  
for daily  
riverflow



slope-dependent  
generally better than  
PDM UKV

No parameterisation



Note that there are other differences in the hydrology, e.g. `l_vg_soil` (u-au394 & u-ar588).

# Proposed approach

Rather than adopting e.g. UKA3, I propose to:

- Start from an existing JLMP configuration  
Gives a known relationship to other configurations.  
e.g. GL7.2, GL9
- Make targeted changes based on UKA3/CHESS-LAND  
where we have evidence (admittedly from other configs!) that a better approach exists.  
e.g. slope-dependent  $S_0/S_{\max}$

An initial suite will use a 1km grid and CHESS meteorological data.

To be investigated: differences between UKA3, CHESS-LAND, GL7/9.