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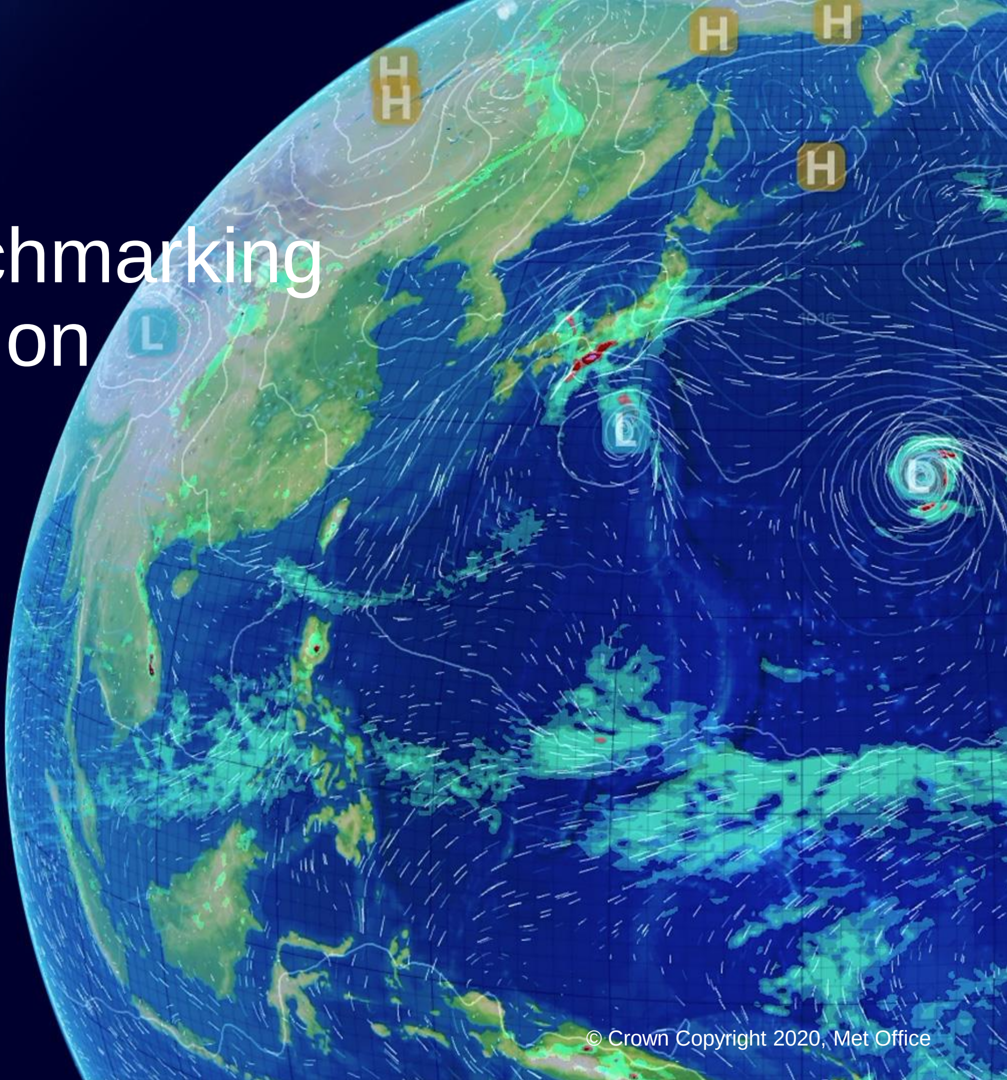

Developing the next benchmarking system for JULES based on ModelEvaluation.org

Heather Rumbold, Martin Best,
Gab Abramowitz, Adrian Lock

Configuration Manager for the Global Land

My role…

- Maintain the standalone physical land model configuration versions on both the Met Office and NERC systems.
    - GL9 standalone is being finalised on Jasmin, ready for use shortly
- Build and maintain the comprehensive benchmarking system that will be used to assess new components for future configurations.
    - Generating a new benchmarking tool using ModelEvaluation.org for use along side existing tools

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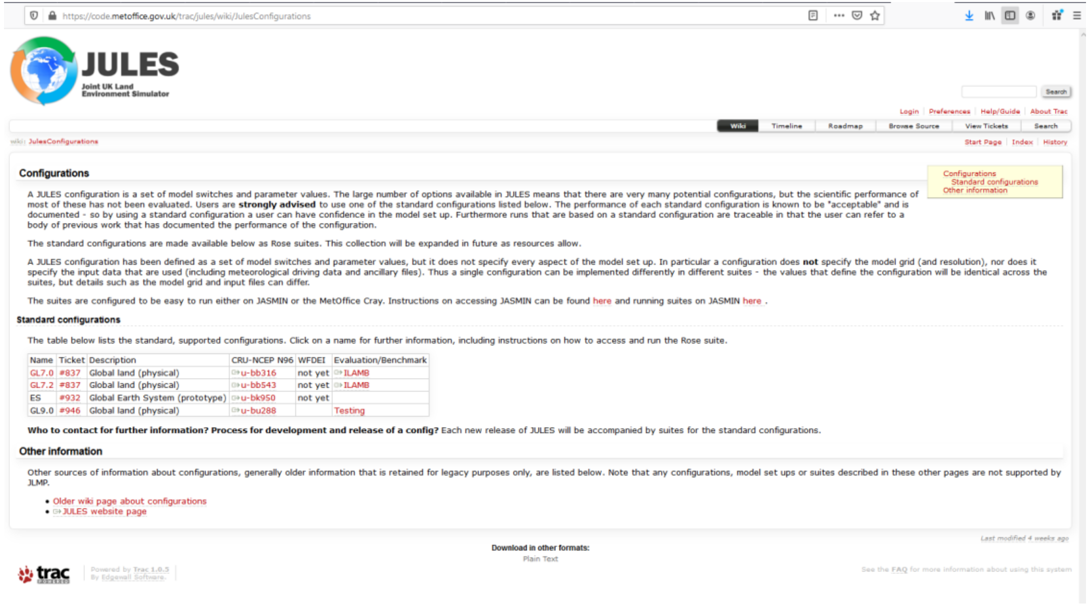
JULES Standard Configuration

https://code.metoffice.gov.uk/trac/jules/wiki/JulesConfigurations


https://code.metoffice.gov.uk/trac/jules/wiki/JulesConfigurations
JULES
Joint UK Land
Environment Simulator
Search
Login | Preferences | Help/Guide | About Trac
Wiki | Timeline | Roadmap | Browse Source | View Tickets | Search
wiki: JulesConfigurations
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Configurations
Standard configurations
Other information

Configurations

A JULES configuration is a set of model switches and parameter values. The large number of options available in JULES means that there are very many potential configurations, but the scientific performance of most of these has not been evaluated. Users are **strongly advised** to use one of the standard configurations listed below. The performance of each standard configuration is known to be "acceptable" and is documented - so by using a standard configuration a user can have confidence in the model set up. Furthermore runs that are based on a standard configuration are traceable in that the user can refer to a body of previous work that has documented the performance of the configuration.

The standard configurations are made available below as Rose suites. This collection will be expanded in future as resources allow.

A JULES configuration has been defined as a set of model switches and parameter values, but it does not specify every aspect of the model set up. In particular a configuration does **not** specify the model grid (and resolution), nor does it specify the input data that are used (including meteorological driving data and ancillary files). Thus a single configuration can be implemented differently in different suites - the values that define the configuration will be identical across the suites, but details such as the model grid and input files can differ.

The suites are configured to be easy to run either on JASMIN or the MetOffice Cray. Instructions on accessing JASMIN can be found here and running suites on JASMIN here .

Standard configurations

The table below lists the standard, supported configurations. Click on a name for further information, including instructions on how to access and run the Rose suite.

Name	Ticket	Description	CRU-NCEP N96	WFDEI	Evaluation/Benchmark
GL7.0	#837	Global land (physical)	u-bb316	not yet	ILAMB
GL7.2	#837	Global land (physical)	u-bb543	not yet	ILAMB
ES	#932	Global Earth System (prototype)	u-bk950	not yet	
GL9.0	#946	Global land (physical)	u-bu288		Testing

Who to contact for further information? Process for development and release of a config? Each new release of JULES will be accompanied by suites for the standard configurations.

Other information

Other sources of information about configurations, generally older information that is retained for legacy purposes only, are listed below. Note that any configurations, model set ups or suites described in these other pages are not supported by JLMP.

- Older wiki page about configurations
- JULES website page

Last modified 4 weeks ago

Download in other formats:
Plain Text

trac Powered by Trac 1.0.5
By Edgewall Software.

See the FAQ for more information about using this system

- Set of model and ancillary generation switches and parameter values

- GL/RL/ES are all required for the coupled system.
- Standalone only requires configurations for:
  1. Physical Land (weather/climate)
  2. Earth System

JULES Standard Configuration

A configuration is not:

- Driving data
- The resolution
- The ancillary files (but can include the data sources)
- Application specific

Best combination of settings to give the best description of the physical environment

How do we know when we have a better description of the environment?

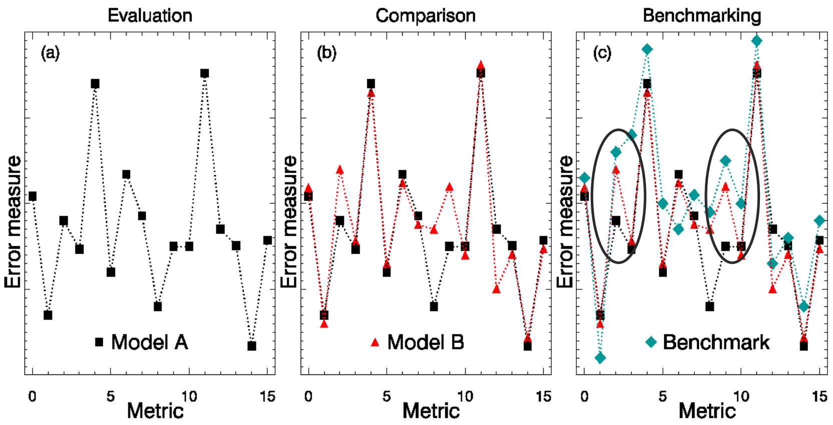
Met Office

What is benchmarking?

The Plumbing of Land Surface Models: Benchmarking Model Performance

M. J. BEST,[a] G. ABRAMOWITZ,[b] H. R. JOHNSON,[a] A. J. PITMAN,[b] G. BALSAMO,[c] A. BOONE,[d]
M. CUNTZ,[e] B. DECHARME,[d] P. A. DIRMEYER,[f] J. DONG,[g] M. EK,[g] Z. GUO,[f] V. HAVERD,[h]
B. J. J. VAN DEN HURK,[i] G. S. NEARING,[j] B. PAK,[k] C. PETERS-LIDARD,[j]
J. A. SANTANELLO JR.,[j] L. STEVENS,[k] AND N. VUICHARD[l]

(2015) Journal of Hydrometeorology, 16, 1425-1442.



- ➢ Model outputs are compared to a predefined benchmark
- ➢ 3 types of benchmark:

1. Is it better than another model?
2. Is it fit for a particular application?
3. Can it effectively utilise available information?

"Ultimate" benchmark – model to be within the observational error

What will benchmarking do for JULES?

- JLMP – Require a single configuration which generates the best simulation of JULES as a whole system
  - Is the new JULES configuration better the previous model configuration? (i.e. no 1)
  - E.g. Does adding X piece of new science code improve JULES compared to the previous configuration?
  - Old configuration version will become the benchmark

- JULES community are aiming for 2 or 3 – Best science for a specific area
  - E.g. Can the new configuration capture specific impacts (e.g. the river flow or snow depth) better than the old configuration?
  - E.g. If supplied with better inputs (e.g. high resolution veg ancillaries) it should be expected to perform better than a configuration without this.

Met Office

A new benchmarking suite

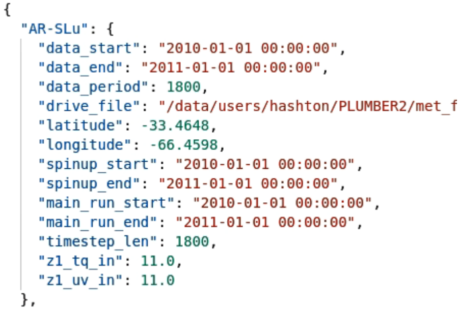
PLUMBER2 data
170 sites from
FLUXNET2015,
FLUXNET La Thuile
& OzFlux
+
canopy height, LAI
reference height &
IGBP vegetation
+
HWSD soils

Python script →
convert jules input
variables into json file

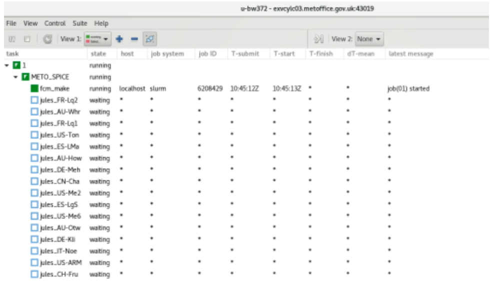
Rose suite
Run JULES for all
sites in json file

Upload data to
modelevaluation.org

Coming soon… upload
automated within the suite

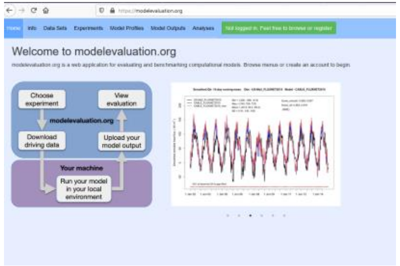


```
{
  "AR-SLu": {
    "data_start": "2010-01-01 00:00:00",
    "data_end": "2011-01-01 00:00:00",
    "data_period": 1800,
    "drive_file": "/data/users/hashton/PLUMBER2/met_f
    "latitude": -33.4648,
    "longitude": -66.4598,
    "spinup_start": "2010-01-01 00:00:00",
    "spinup_end": "2011-01-01 00:00:00",
    "main_run_start": "2010-01-01 00:00:00",
    "main_run_end": "2011-01-01 00:00:00",
    "timestep_len": 1800,
    "z1_tq_in": 11.0,
    "z1_uv_in": 11.0
  },
```



u-bw372 - exvcylc03.metoffice.gov.uk:43019

```
task              state    host       job system  job ID   T-submit   T-start    T-finish  dT-mean  latest message
▾ 1               running
  ▾ METO_SPICE    running
      fcm_make    running  localhost  slurm       6208429  10:45:12Z  10:45:13Z  *         *        job(01) started
    □ jules_FR-Lq2  waiting  *        *           *        *          *          *         *        *
    □ jules_AU-Whr  waiting  *        *           *        *          *          *         *        *
    □ jules_FR-Lq1  waiting  *        *           *        *          *          *         *        *
    □ jules_US-Ton  waiting  *        *           *        *          *          *         *        *
    □ jules_ES-LMa  waiting  *        *           *        *          *          *         *        *
    □ jules_AU-How  waiting  *        *           *        *          *          *         *        *
    □ jules_DE-Meh  waiting  *        *           *        *          *          *         *        *
    □ jules_CN-Cha  waiting  *        *           *        *          *          *         *        *
    □ jules_US-Me2  waiting  *        *           *        *          *          *         *        *
    □ jules_ES-LgS  waiting  *        *           *        *          *          *         *        *
    □ jules_US-Me6  waiting  *        *           *        *          *          *         *        *
    □ jules_AU-Otw  waiting  *        *           *        *          *          *         *        *
    □ jules_DE-Kli  waiting  *        *           *        *          *          *         *        *
    □ jules_IT-Noe  waiting  *        *           *        *          *          *         *        *
    □ jules_US-ARM  waiting  *        *           *        *          *          *         *        *
    □ jules_CH-Fru  waiting  *        *           *        *          *          *         *        *
```

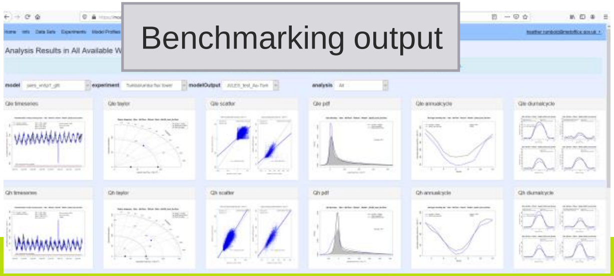


https://modelevaluation.org

Welcome to modelevaluation.org

modelevaluation.org is a web application for evaluating and benchmarking computational models. Browse menus or create an account to begin.

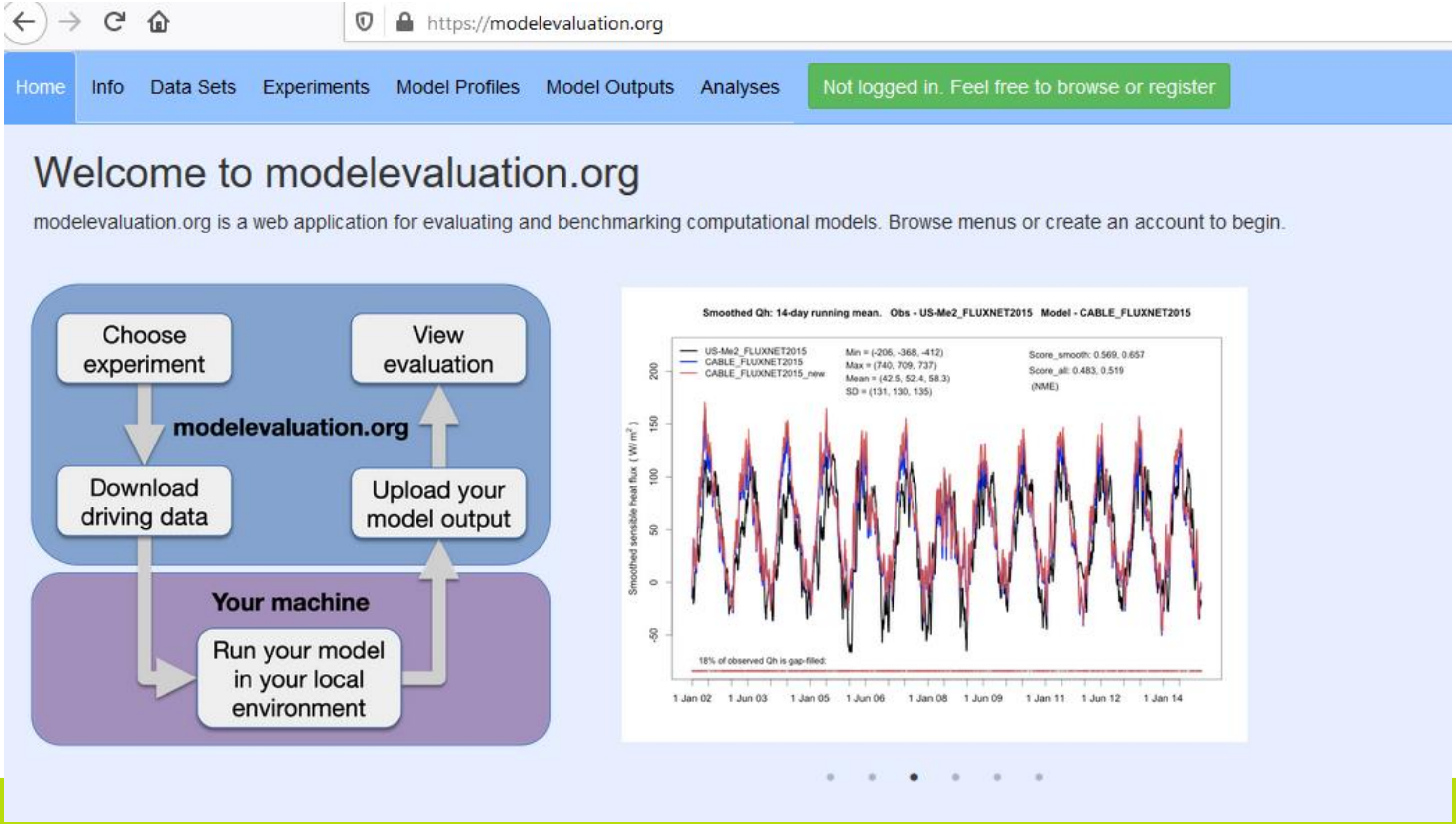
Perform
analysis



Benchmarking output

Met Office

ModelEvaluation.org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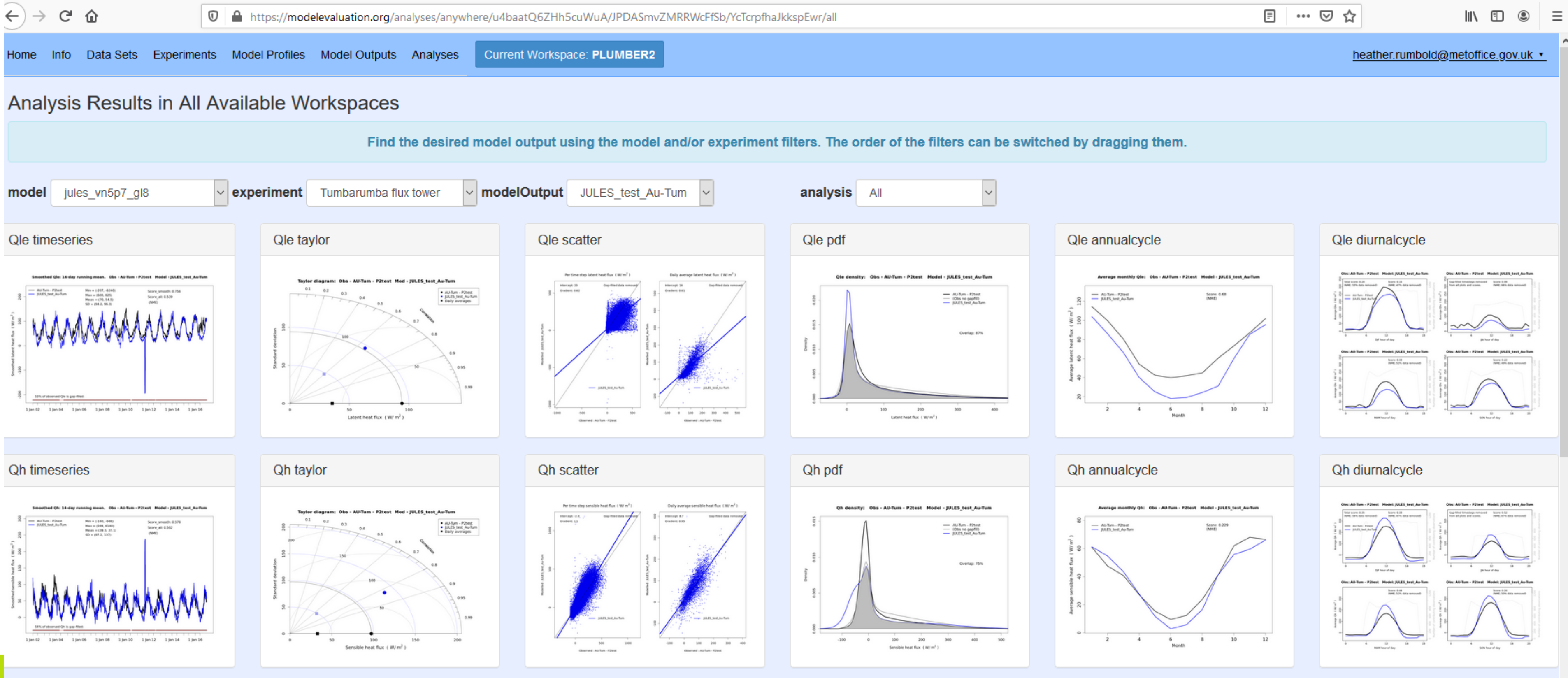
Single site vs Observations



https://modelevaluation.org/analyses/anywhere/u4baatQ6ZHh5cuWuA/JPDASmvZMRRWcFfSb/YcTcrpfhaJkkspEwr/all

Analysis Results in All Available Workspaces

Find the desired model output using the model and/or experiment filters. The order of the filters can be switched by dragging them.

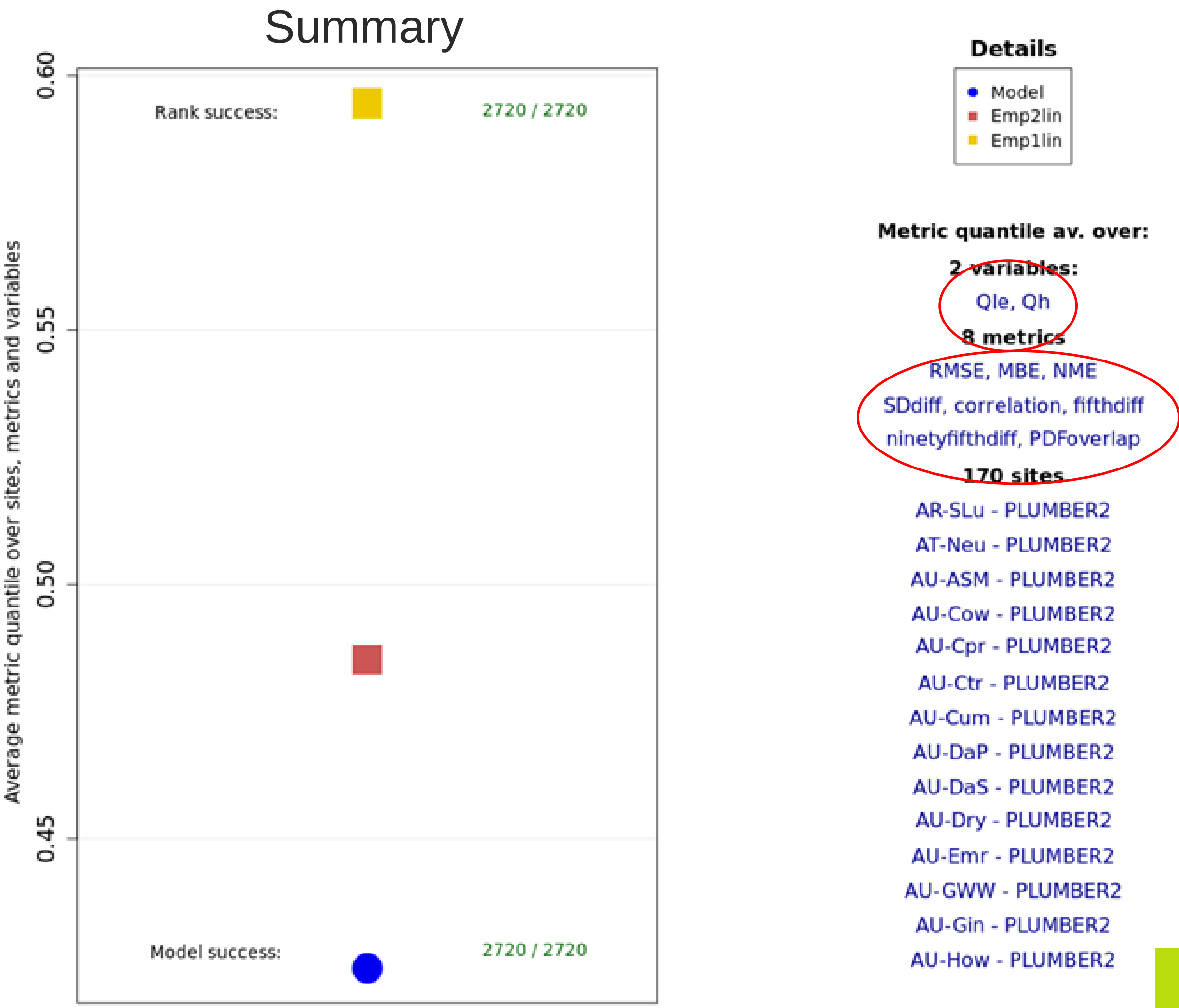
model jules_vn5p7_gl8 **experiment** Tumbarumba flux tower **modelOutput** JULES_test_Au-Tum **analysis** All

Multi site analysis

- Each model is ranked according to every metric, variable and site
- Ranks are averaged to give a single value….
- 3 models: JULES GL8, 1 var linear regression, 2 var linear regression

0 = Perfect model
1 = Worst model

JULES is better than the linear regression models!

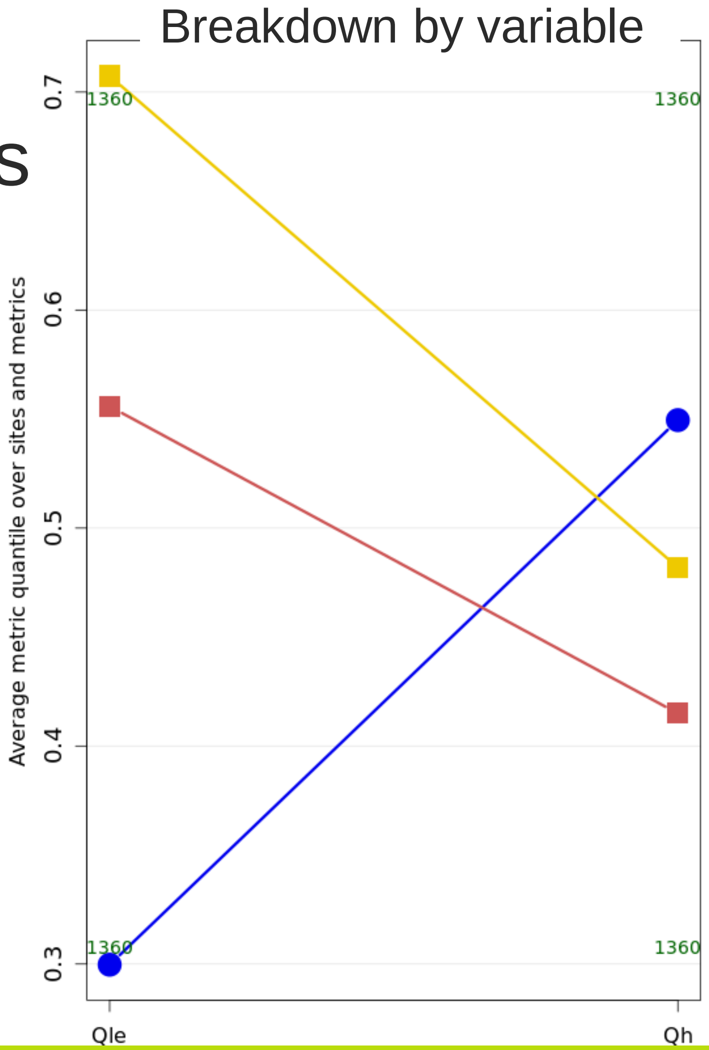


Multi site analysis

- Variable breakdown…
- JULES LE beats the linear regression models
- H does not, however:

quantile value =
(highest rank – JULES model)/
(lowest rank – highest rank)

- H isn't as bad as it looks!
- Overall JULES is as good as or better than the benchmarks



Breakdown by variable

Details

- ● Model
- ■ Emp2lin
- ■ Emp1lin

Metric quantile av. over:

8 metrics

RMSE, MBE, NME
SDdiff, correlation, fifthdiff
ninetyfifthdiff, PDFoverlap

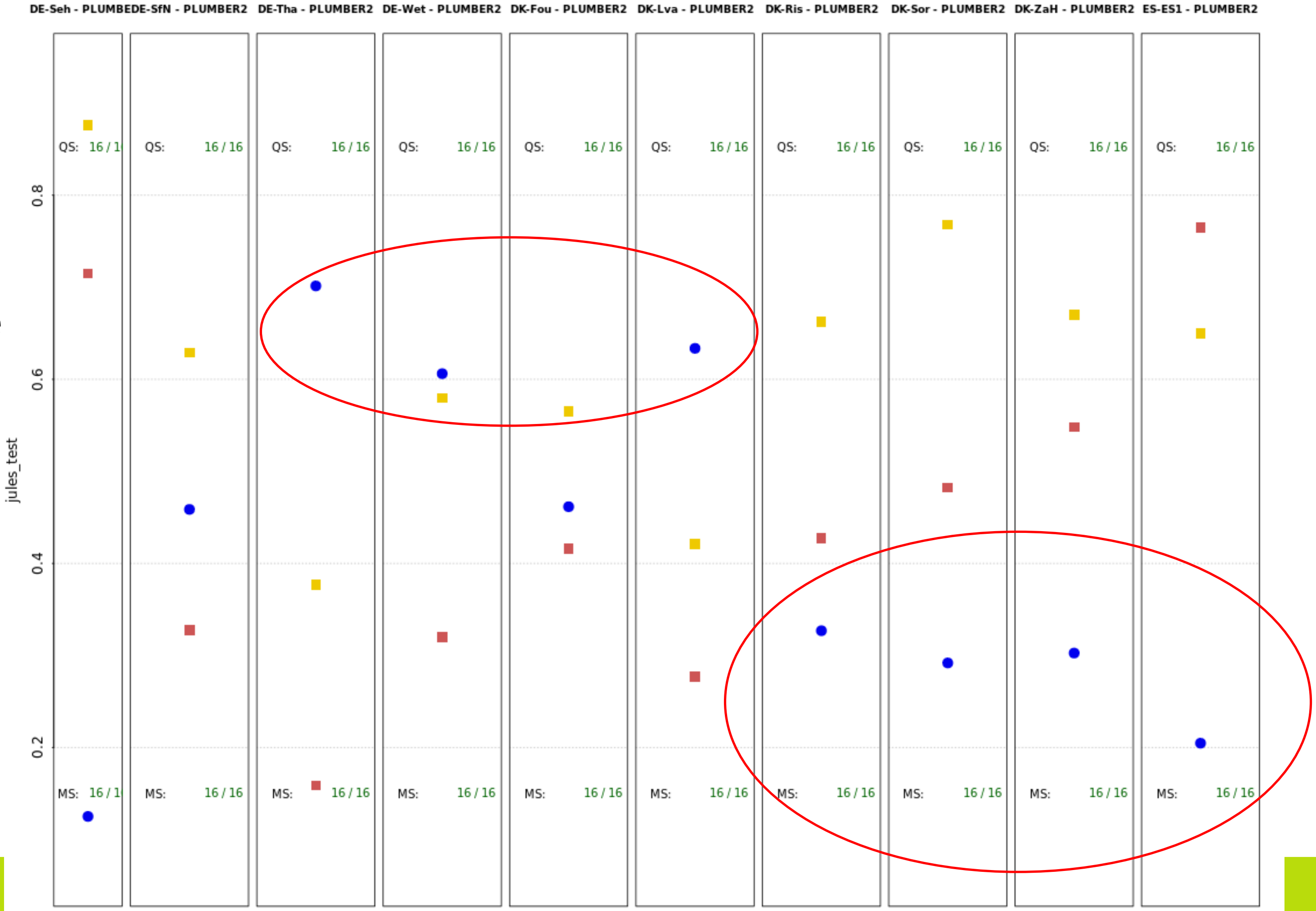
170 sites

AR-SLu - PLUMBER2
AT-Neu - PLUMBER2
AU-ASM - PLUMBER2
AU-Cow - PLUMBER2
AU-Cpr - PLUMBER2
AU-Ctr - PLUMBER2
AU-Cum - PLUMBER2
AU-DaP - PLUMBER2
AU-DaS - PLUMBER2
AU-Dry - PLUMBER2
AU-Emr - PLUMBER2
AU-GWW - PLUMBER2
AU-Gin - PLUMBER2
AU-How - PLUMBER2
AU-Lit - PLUMBER2
AU-Otw - PLUMBER2

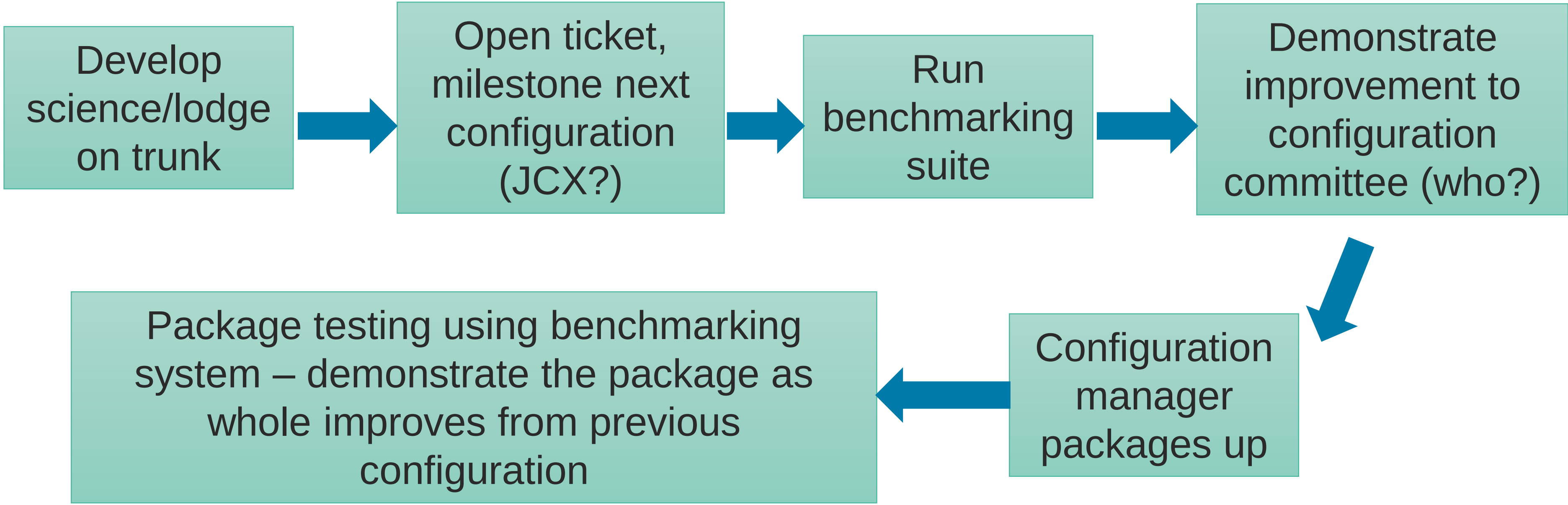
Multi site analysis

Breakdown by site

Overall there are more sites where we are doing well compared to the empirical benchmarks



Development Process for standalone Physical Land configurations (work in progress)



Develop science/lodge on trunk

Open ticket, milestone next configuration (JCX?)

Run benchmarking suite

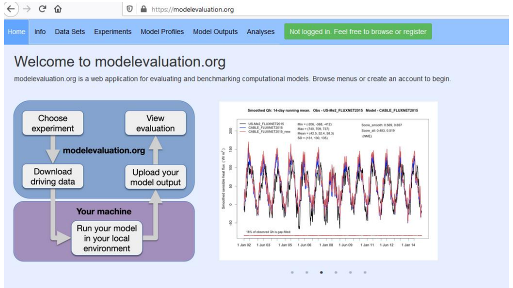
Demonstrate improvement to configuration committee (who?)

Configuration manager packages up

Package testing using benchmarking system – demonstrate the package as whole improves from previous configuration

Benchmarking is an important part of this process!!

How does this fit in with other tools going forward?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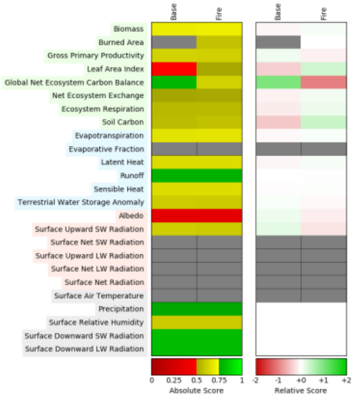
Physical Land



Earth System

Plus others….?

AutoAssess & Validation Notes

Is the new JULES configuration better the previous model configuration?