Resources for JULES*

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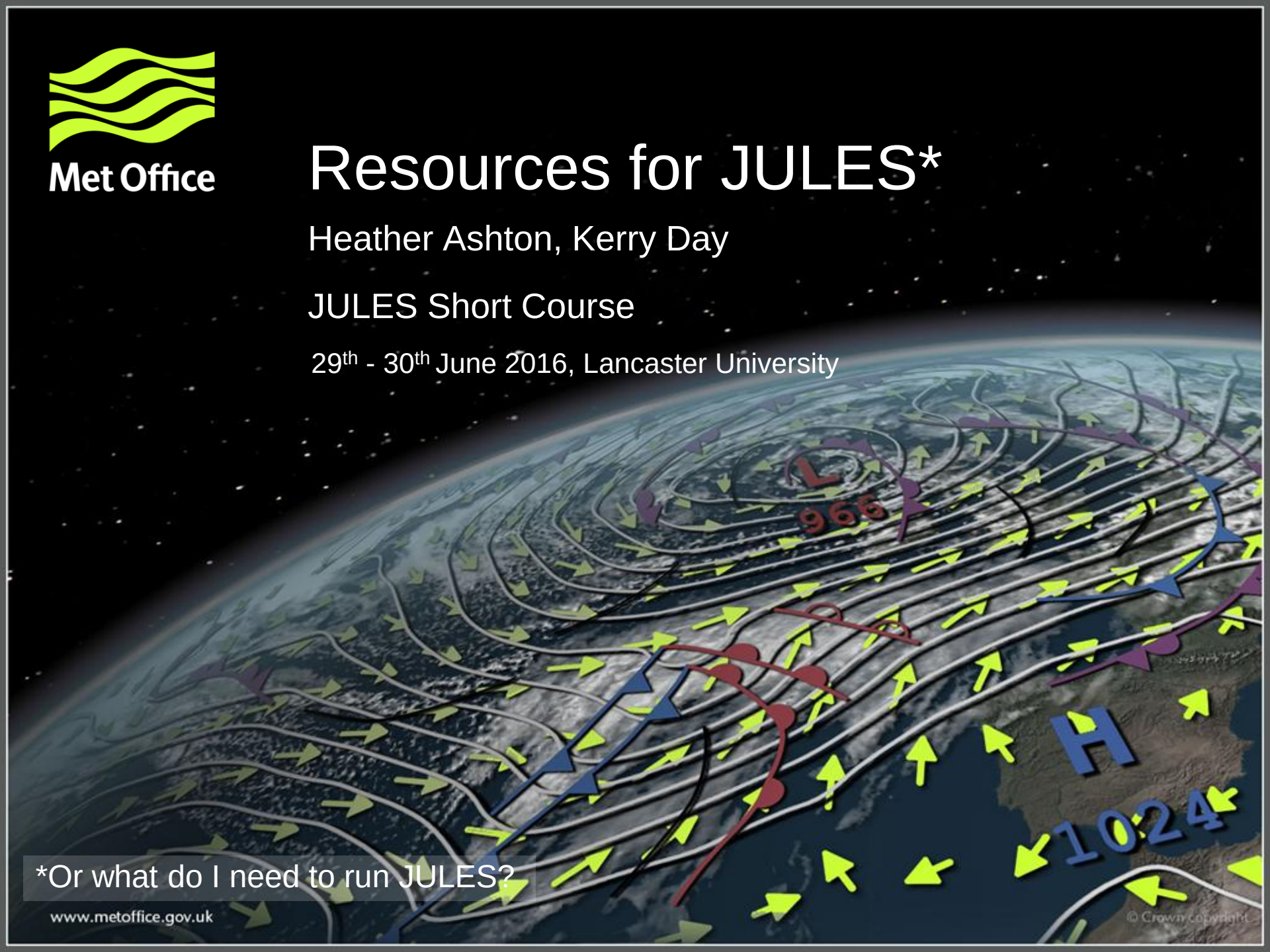
JULES Short Course

29th - 30th June 2016, Lancaster University

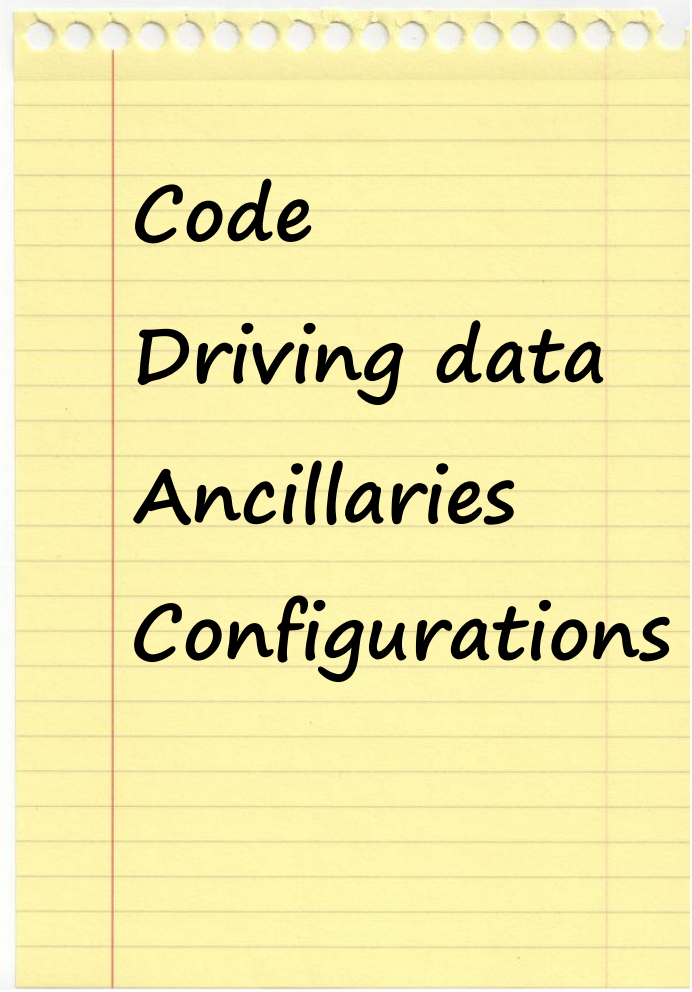


*Or what do I need to run JULES?

Overview

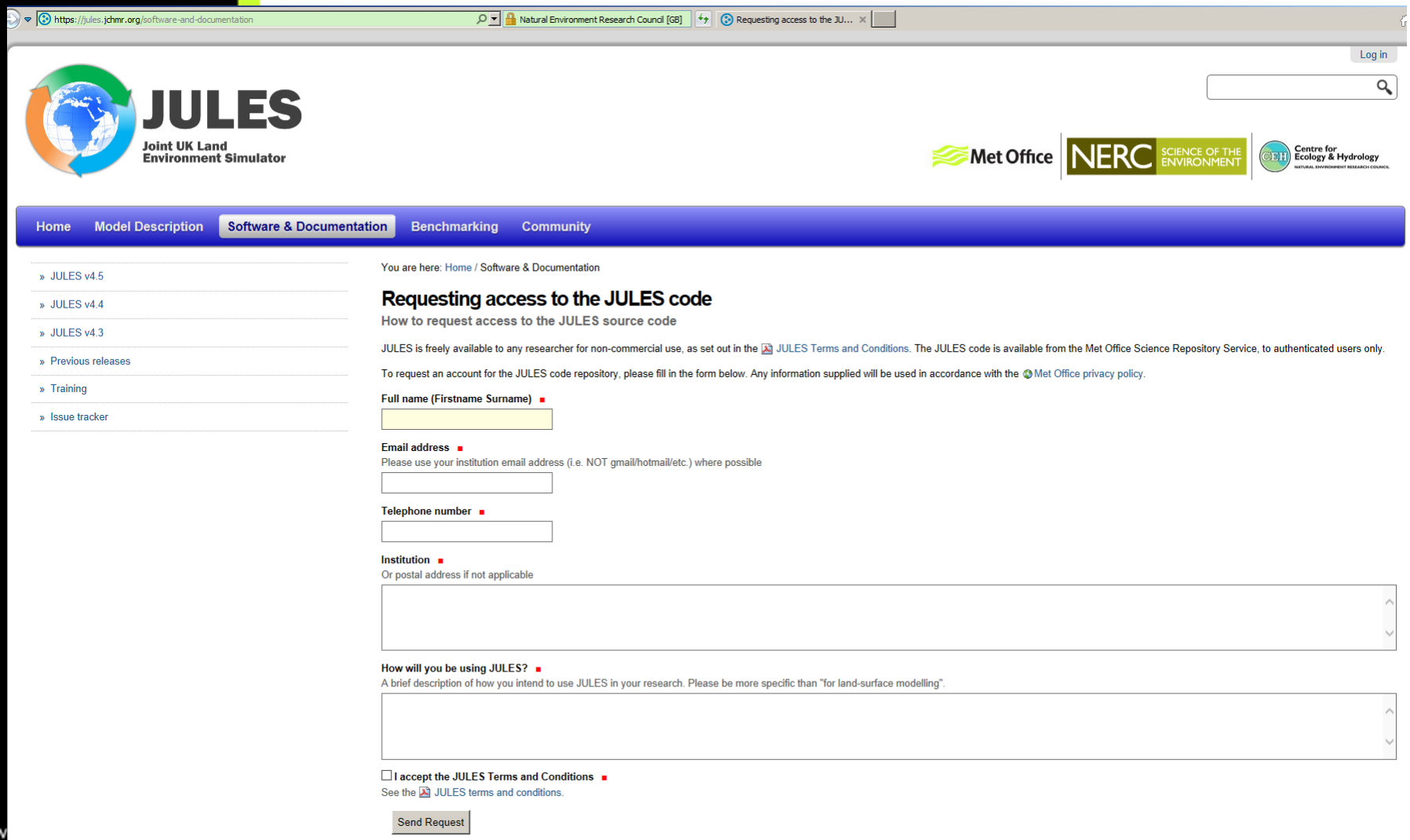
- What do I need to run JULES?
- FCM
- Rose and Cylc
- Virtual Machine
- Support

What do I need?



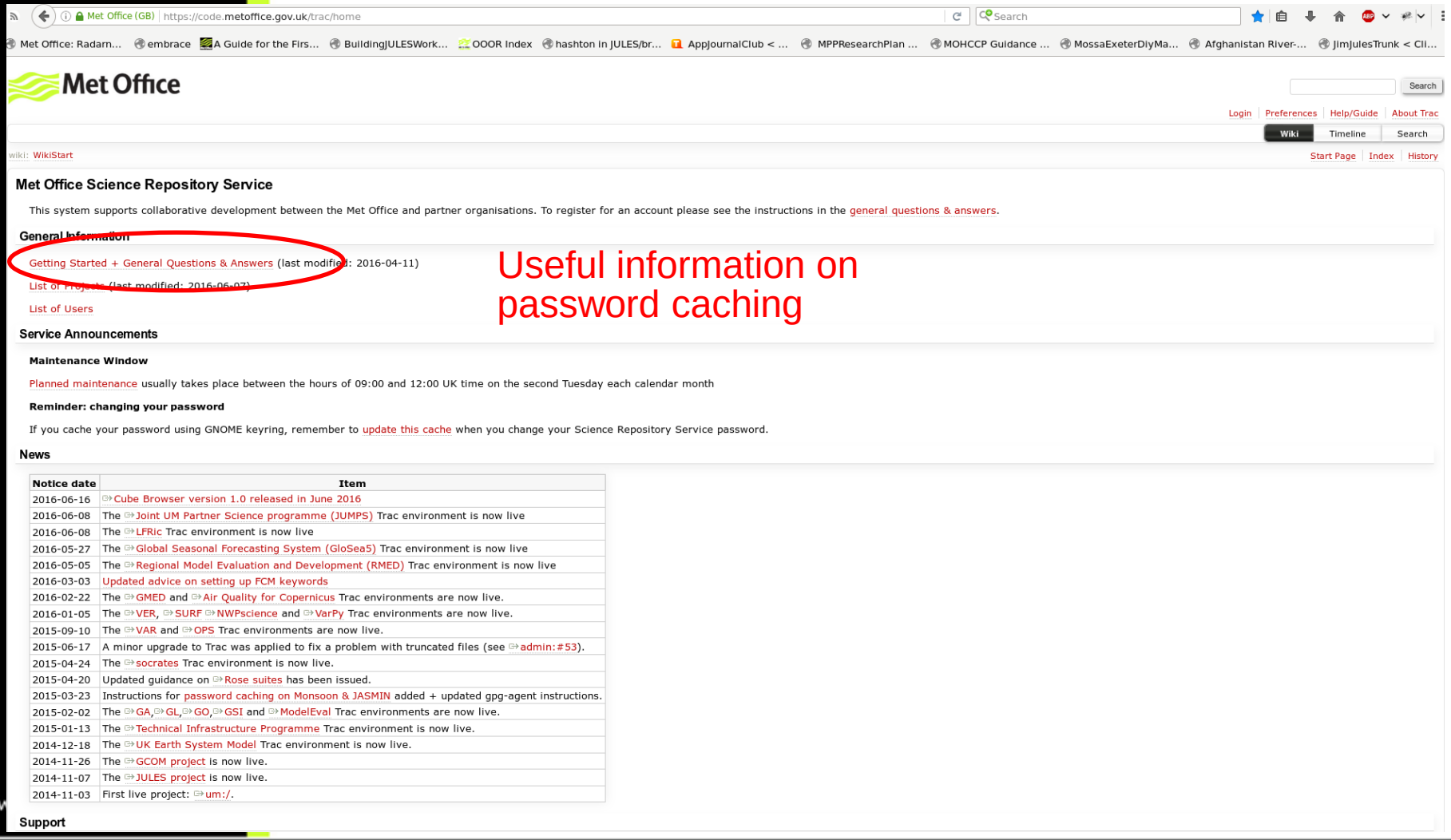
Getting the code

https://jules.jchmr.org/software-and-documentation



Met Office Science Repository Service (MOSRS)

https://code.metoffice.gov.uk



Met Office (GB) | https://code.metoffice.gov.uk/trac/home

Search

Met Office: Radarn... | embrace | A Guide for the Firs... | BuildingJULESWork... | OOOR Index | hashton in JULES/br... | AppJournalClub < ... | MPPResearchPlan ... | MOHCCP Guidance ... | MossaExeterDiyMa... | Afghanistan River-... | JimJulesTrunk < Cli...

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Met Office Science Repository Service

This system supports collaborative development between the Met Office and partner organisations. To register for an account please see the instructions in the general questions & answers.

General Information

Getting Started + General Questions & Answers (last modified: 2016-04-11)

List of Projects (last modified: 2016-06-07)

List of Users

Useful information on password caching

Service Announcements

Maintenance Window

Planned maintenance usually takes place between the hours of 09:00 and 12:00 UK time on the second Tuesday each calendar month

Reminder: changing your password

If you cache your password using GNOME keyring, remember to update this cache when you change your Science Repository Service password.

News

Notice date	Item
2016-06-16	Cube Browser version 1.0 released in June 2016
2016-06-08	The Joint UM Partner Science programme (JUMPS) Trac environment is now live
2016-06-08	The LFRic Trac environment is now live
2016-05-27	The Global Seasonal Forecasting System (GloSea5) Trac environment is now live
2016-05-05	The Regional Model Evaluation and Development (RMED) Trac environment is now live
2016-03-03	Updated advice on setting up FCM keywords
2016-02-22	The GMED and Air Quality for Copernicus Trac environments are now live.
2016-01-05	The VER, SURF NWPscience and VarPy Trac environments are now live.
2015-09-10	The VAR and OPS Trac environments are now live.
2015-06-17	A minor upgrade to Trac was applied to fix a problem with truncated files (see admin:#53).
2015-04-24	The socrates Trac environment is now live.
2015-04-20	Updated guidance on Rose suites has been issued.
2015-03-23	Instructions for password caching on Monsoon & JASMIN added + updated gpg-agent instructions.
2015-02-02	The GA, GL, GO, GSI and ModelEval Trac environments are now live.
2015-01-13	The Technical Infrastructure Programme Trac environment is now live.
2014-12-18	The UK Earth System Model Trac environment is now live.
2014-11-26	The GCOM project is now live.
2014-11-07	The JULES project is now live.
2014-11-03	First live project: um:/.

Support

FCM

Q. What is it? A. version control system (subversion)

Allow users to:

- Share code and encourage collaboration.
- Track the progression and incremental changes to versions/revisions of code.
- Allow multiple flavours of the some code to investigate the impact of a change.
- Traceability of work, for example what version of the code was used and when.
- To revert a change, branch from a version, merge in changes etc.

FCM is simply a wrapper for the version control system with features added to make it easier for the user to manage the code.

More info at: http://metomi.github.io/fcm/doc/user_guide/

Accessing to the Repository...

```
$ fcm ls https://code.metoffice.gov.uk/svn/jules/main/trunk
benchmark/
bin/
etc/
includes/
rose-meta/
rose-stem/
src/
utils/
$
$
```

It is useful to set up FCM location keywords for the JULES code and documentation projects. This enables the usage of:

```
$ fcm ls fcm:jules.x_tr
```

Instead of:

```
$ fcm ls https://code.metoffice.gov.uk/svn/jules/main/trunk
```

See https://code.metoffice.gov.uk/trac/jules/wiki/JULESKeywords for setup

Accessing to the Repository...

1. fcm branch-create <branch name> <source>

```
$  fcm bc jules_training https://code.metoffice.gov.uk/svn/jules/main/trunk
[info] Source: https://code.metoffice.gov.uk/svn/jules/main/trunk@4225 (4229)
[info] emacs: starting commit message editor...
Change summary:
------------------------------------------------------------------------
A    https://code.metoffice.gov.uk/svn/jules/main/branches/dev/heatherashton/r42
25_jules_training
------------------------------------------------------------------
Commit message is as follows:
------------------------------------------------------------------
branch created for demo'ing
Created /main/branches/dev/heatherashton/r4225_jul
225.
------------------------------------------------------------------
Create the branch?
Enter "y" or "n" (or just press <return> for "n")

Committed revision 4230.
[info] Created: https://code.metoffice.gov.uk/svn/
rashton/r4225_jules_training
$
```

JULES
Joint UK Land Environment Simulator

source: main / branches / dev / heatherashton

Name
../
r359_vanilla
r2248_jules_shetran
r2875_jules_shetran
r3853_vn4.5_vanilla
r4225_jules_training
vn3.1_lisfloodjules
vn3.4.1_vn3.4.1_1km_soiltiling

Accessing to the Repository...

2. fcm checkout <JULES URL> <branch name>

```
$ fcm co https://code.metoffice.gov.uk/svn/jules/main/branches/dev/heatherashton/r4225_jules_training
A    r4225_jules_training/utils
A    r4225_jules_training/utils/mpi_dummy
A    r4225_jules_training/utils/mpi_dummy/mpi_mod.F90
A    r4225_jules_training/utils/mpi_dummy/mpi_routines.F90
A    r4225_jules_training/utils/drhook_dummy
A    r4225_jules_training/utils/drhook_dummy/yomhook.F90
A    r4225_jules_training/utils/drhook_dummy/parkind1.F90
A    r4225_jules_training/utils/netcdf_dummy
A    r4225_jules_training/utils/netcdf_dummy/jules_netcdf_dummy.F90
A    r4225_jules_training/includes
A    r4225_jules_training/includes/shared
...
A    r4225_jules_training/rose-stem/include/queues.rc
A    r4225_jules_training/rose-stem/include/variables.rc
A    r4225_jules_training/rose-stem/rose-suite.conf
A    r4225_jules_training/rose-stem/meta
A    r4225_jules_training/rose-stem/meta/rose-meta.conf
A    r4225_jules_training/rose-stem/bin
A    r4225_jules_training/rose-stem/bin/gen_gswp2_drive_file
A    r4225_jules_training/rose-stem/bin/suite_report.py
A    r4225_jules_training/rose-stem/bin/compare_all
A    r4225_jules_training/rose-stem/suite.rc
 U   r4225_jules_training
Checked out revision 4230.
$
```

```
$ pwd
/data/local/hashton/code/jules/external_repos/r4225_jules_training
$ ls
benchmark  bin  etc  includes  rose-meta  rose-stem  src  utils
```

Driving Data

Some examples...

WFDEI: **W**ATCH **F**orcing **D**ata methodology applied to **E**RA **I**nterim reanalysis data.

• 33 years (1979 – 2012), 3 hourly, half-degree (~ 50 x 50 km) global forcing dataset.

Weedon *et al*.(2014), The WFDEI meteorological forcing data set: WATCH Forcing Data methodology applied to ERA-Interim reanalysis data, Water Resour. Res., 50, 7505–7514

CHESS-met: **C**limate **H**ydrology **E**cology **S**upport **S**ystem

• 52 years (1961 – 2012), daily 1km UK forcing dataset.

https://catalogue.ceh.ac.uk/documents/80887755-1426-4dab-a4a6-250919d5020c

Robinson et al. (2016) Trends in evaporative demand in Great Britain using high-resolution meteorological data. Hydrology and Earth System Sciences Discussions.

Loobos: Fluxnet site, Netherlands. 20 year (1996-2015), hourly single point dataset. http://fluxnet.ornl.gov/site/667

Ancillaries

- Met Office is currently working on a new ancillary toolkit, 'ANTS', which is Python-based, work in progress.

- Currently putting together global ancillaries to work with WFDEI driving data.

- Existing ANCIL is on MOSRS but needs MONSOON

- Suggested (gridded) datasets:

Soil – HWSD soil textures + functions by Cosby et al. (1984)

http://webarchive.iiasa.ac.at/Research/LUC/External-World-soil-database/HTML/

Vegetation fractions – Various datasets that use IGBP vegetation classes. These can be mapped onto JULES surface types (see Jones 2008) e.g. MODIS

Domain latitude/longitude/land – Also required but can be derived from driving data dimensions.

Configurations

- Settings, switches, parameter values etc.
- NOT the code!
- Contained within the JULES namelists
- Details in the JULES Users Guide (here for vn4.5):

http://jules-lsm.github.io/vn4.5/namelists/contents.html

- Examples on the JULES MOSRS page:

https://code.metoffice.gov.uk/trac/jules/browser/doc/trunk

Standard Rose suites- Please add your own here to help others!

There are some standard Rose suites for standalone JULES, all hosted in the MOSRS `roses-u` repository:

Suite ID	Configuration / GL version	Forcing	Platform	Suite revision for JULES versions
u-ad408	N/A	CRU-NCEP	Met Office Cray XC40	4.5
u-aa797	GL6.0	WFDEI	Met Office Cray XC40	4.5 : r7346
u-aa798	GL6.0	WFDEI	Met Office Linux	4.5 : r7351
u-aa799	GL6.0 (no TOPMODEL)	GSWP2	JULES VM	4.5 : r7352
u-ae053	GL4.0	Loobos	JULES VM	4.5 : r13659
u-ab236	N/A	WFDEI	Met Office Cray XC40	4.4 : r4821

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

Rose and Cylc

What is Cylc?

- A scheduling system for running suites, initially designed for meteorological data.
- cylc makes your Rose stuff happen!

What is Rose?

- A user friendly interface to Cylc
- Provides useful tools such as;
- Rosie go - a GUI based browser for finding suites
- Rose edit - a GUI based suite editor
- Rose Bush - a web browser for looking at output from suites
- roses/ - a directory where the suite can be edited and run from

A Rose suite is a collection of events (tasks/applications) that need to be performed in a specific order.

(where and 'event' can be: triggering JULES to compile, setting a parameter, reading in a file etc.)

Why Rose?

Advantages:

- Traceability, means you can prove the exact configuration and version that was run
- Everything is text based
- Nothing is hidden
- Useful GUI's to support changes
- GUI's to check that the suite matches the metadata and the suite can run
- rose-stem tests
- Helpful tools
- Can be run/demo'd on a Virtual Machine
- A big database of examples, previously run suites and standard configurations

Why not Rose?

Disadvantages:

- New so takes effort to learn
- Needs to be configured at your site (but support can be provided).
- Need an (MO)SRS account (but you need this anyway to access JULES!)

create_rose_app

Script which creates a JULES Rose suite from existing namelists (vn3.4 or later)

Two arguments:

- The JULES version that the namelists work at (vn3.4 or later)
- The JULES version that the Rose suite should be at (vn4.0 or later)
- To convert namelists to a Rose suite without upgrading the version, just give the same version for both.

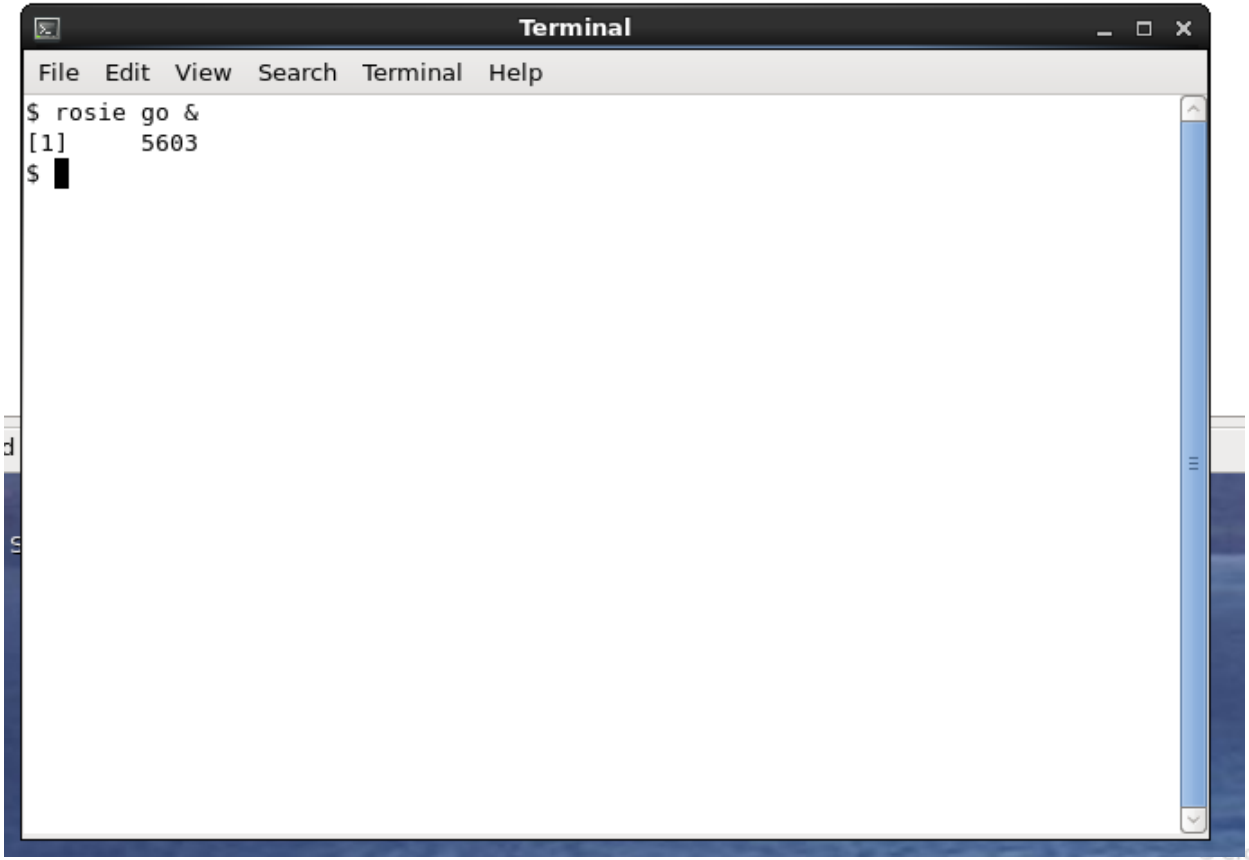
```
# This will convert vn3.4 namelists to a vn4.1 Rose suite
$JULES_ROOT/bin/create_rose_app vn3.4 vn4.1

# This will convert vn4.1 namelists to a vn4.1 Rose suite
$JULES_ROOT/bin/create_rose_app vn4.1 vn4.1
```

$JULES_ROOT = <path to jules source>

Using an existing Rose suite

Rose suites for JULES standalone live in their own repository

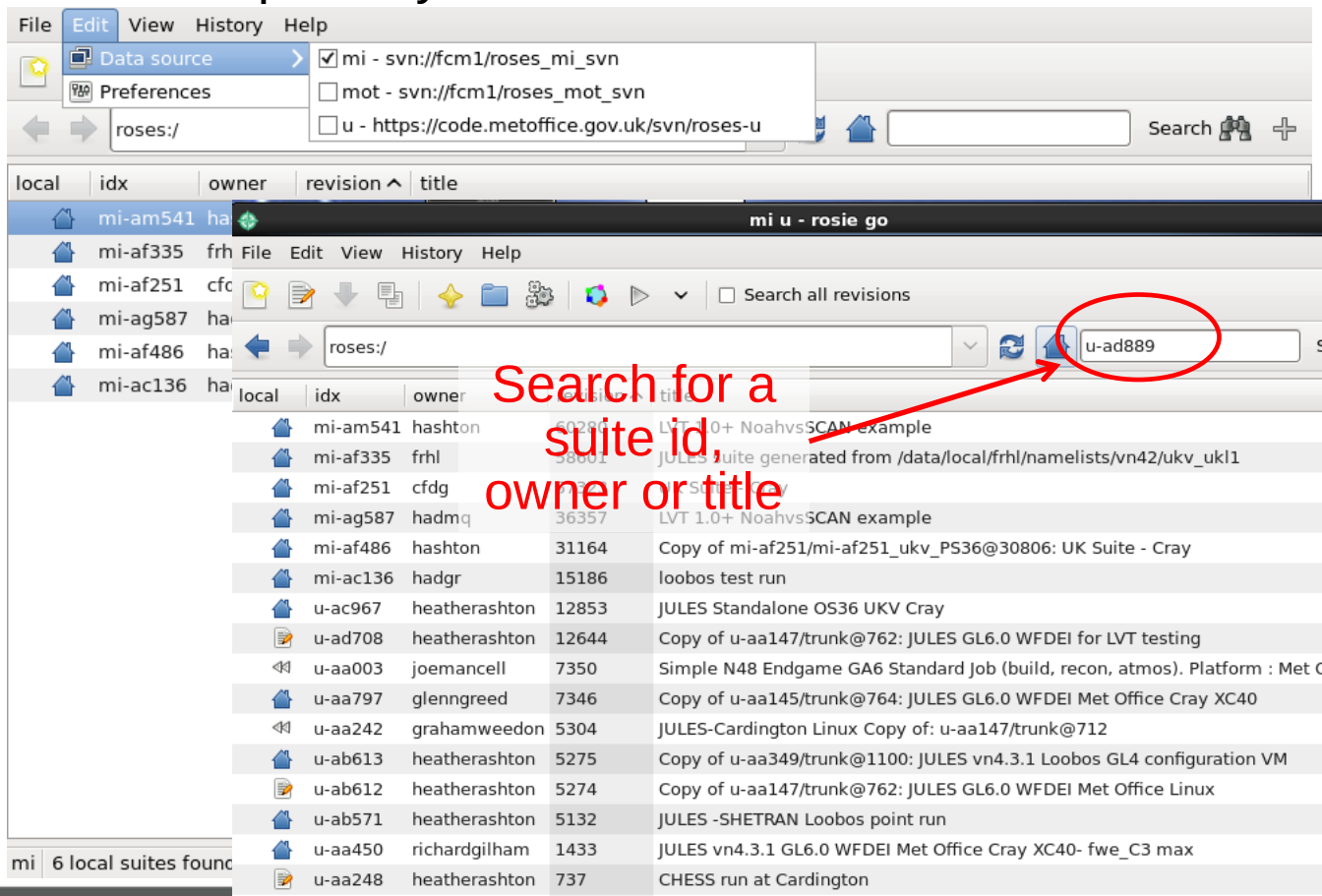
We will use ‘rosie go’ to get hold of an appropriate suite....



Using an existing Rose suite

The GUI should start up. This allows us to browse various rose suite repositories.

Select the 'u' data source. This is the roses repository on the shared repository service...

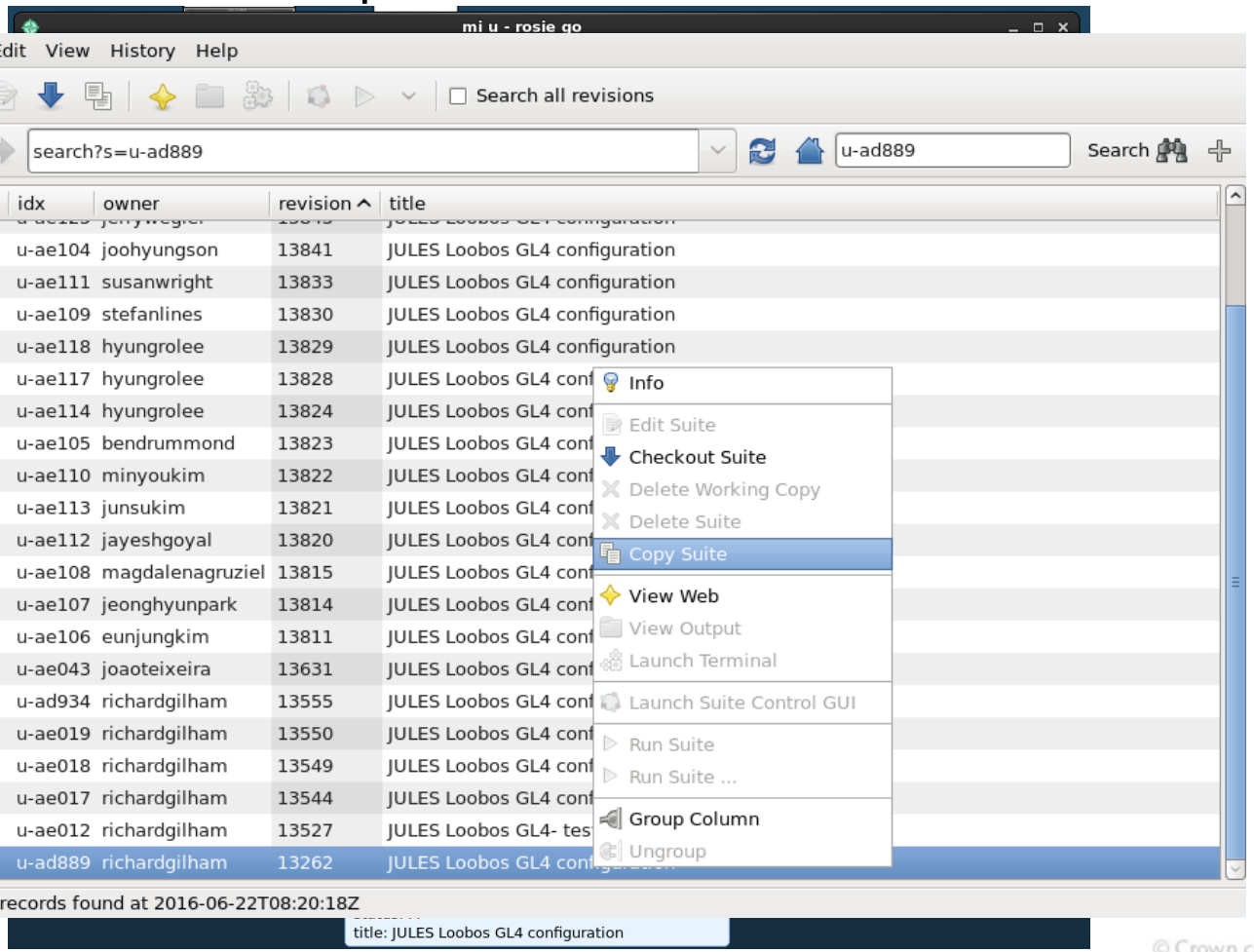


Using an existing Rose suite

Right-click to make a copy of the suite.

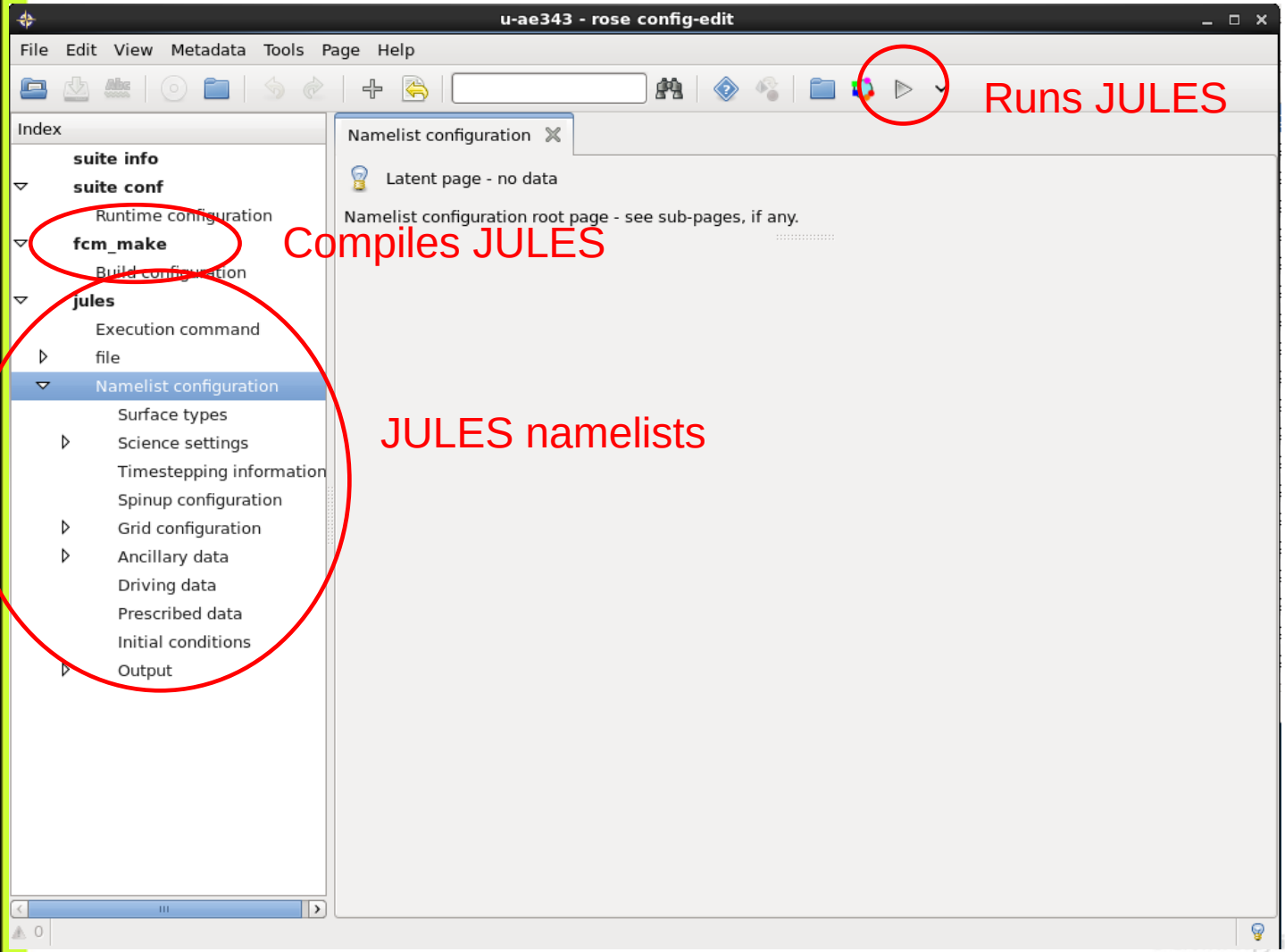
Double-click to open the new suite.

NB: Two directories created on your local drives:
(i) roses/
(ii) cylc-run/

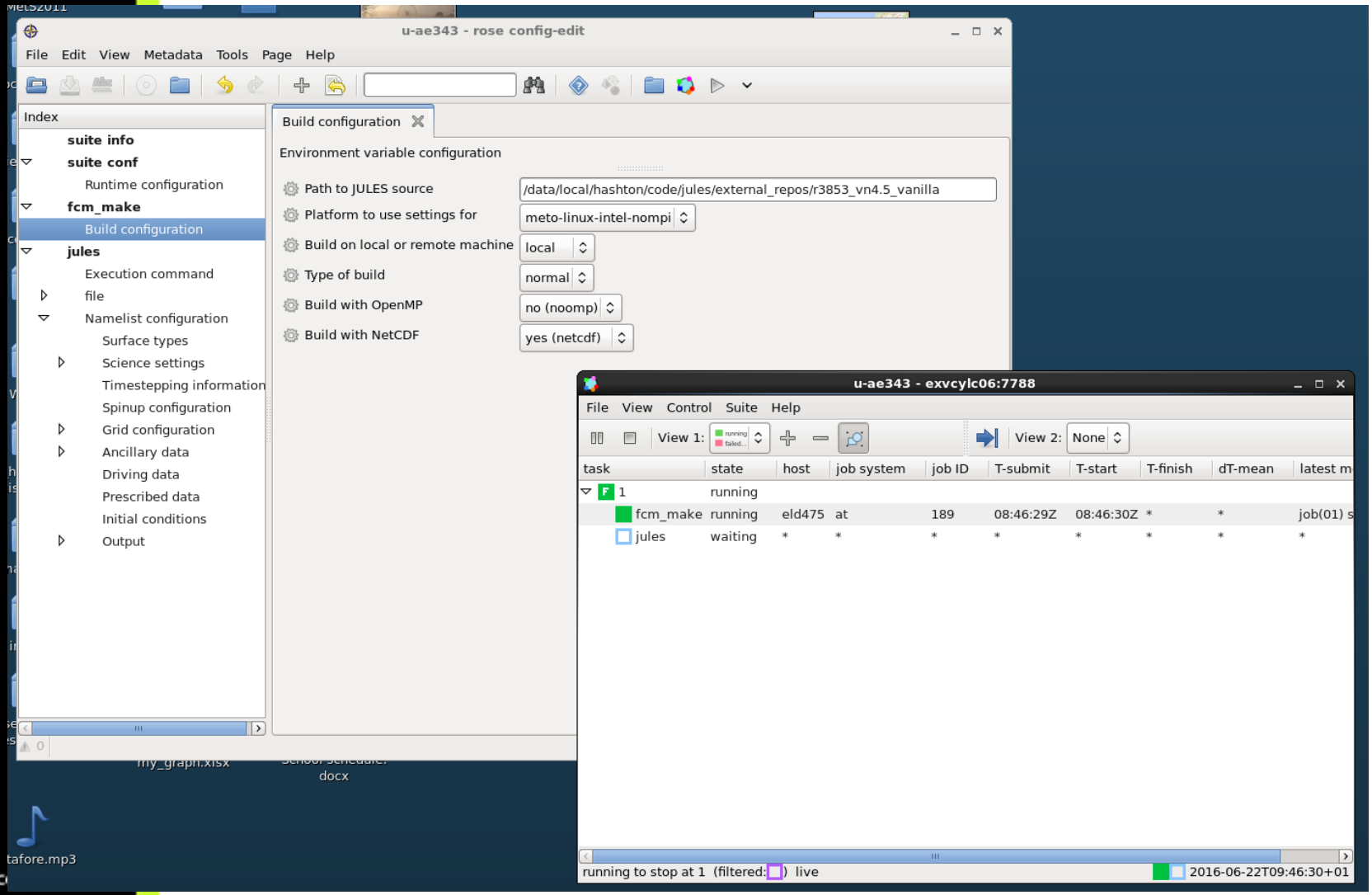


Using an existing Rose suite

Suite contains 2 applications: - fcm-make and jules



Using an existing Rose suite



Using an existing Rose suite

Screen output: Rose-bush, rose suite-log

Terminal

File Edit View Search Terminal Help

```
$ cd roses
$ ls
aonva-rose   mi-af335   mi-am541   u-a
mi-ac136     mi-af486   mot-ab149  u-a
mi-af251     mi-ag587   mot-ab156  u-a
$ cd u-ae343/
$ rose suite-log
$
$
$
$
$
$
$
$
```

Terminal

File Edit View Search Terminal Help

```
$ tail -40 cylc-run/u-ae343/log/job/1/jules/01/job.out
[INFO] next_time: Timestep: 17517; Started at: 1997-12-31 21:00:00
[INFO] next_time: Timestep: 17518; Started at: 1997-12-31 21:30:00
[INFO] next_time: Timestep: 17519; Started at: 1997-12-31 22:00:00
[INFO] next_time: Timestep: 17520; Started at: 1997-12-31 22:30:00
[INFO] jules: Run completed successfully
[INFO] file_ncdf_open: Opening file ./output/jules.dump.19971231.82800.nc for writing
[INFO] write_dump: canopy
[INFO] write_dump: cs
[INFO] write_dump: gs
[INFO] write_dump: snow_tile
[INFO] write_dump: sthuf
[INFO] write_dump: t_soil
[INFO] write_dump: tstar_tile
[INFO] write_dump: sthzw
[INFO] write_dump: zw
[INFO] write_dump: rho_snow
[INFO] write_dump: snow_depth
[INFO] write_dump: snow_grnd
[INFO] write_dump: frac
[INFO] write_dump: b
[INFO] write_dump: sathh
[INFO] write_dump: satcon
[INFO] write_dump: sm_sat
[INFO] write_dump: sm_crit
[INFO] write_dump: sm_wilt
[INFO] write_dump: hcap
[INFO] write_dump: hcon
[INFO] write_dump: albsoil
[INFO] write_dump: fexp
[INFO] write_dump: ti_mean
[INFO] write_dump: ti_sig
[INFO] write_dump: frac_agr
[INFO] write_dump: co2_mmr
[INFO] write_dump: latitude
[INFO] write_dump: longitude
[INFO] file_ncdf_close: Closing file ./output/jules.dump.19971231.82800.nc
[INFO] file_ascii_close: Closing file ./Loobos_1997.dat
[INFO] file_ncdf_close: Closing file ./output/jules.all.nc
cylc (scheduler - 2016-06-22T08:50:32Z): succeeded at 2016-06-22T08:50:32Z
JOB SCRIPT EXITING (TASK SUCCEEDED)
$
$
```

Rose Bush @ els032 hashton u-ae343 cycles list jobs list

Display Options

Suite ■ is stopped, last activity 2016-06-22T08:50:32Z

jules

fcm_make

Virtual Machine (VM)

Set up instructions available here:

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

- The FCM/Rose team at the Met Office have set up a VM with FCM, Rose and Cylc installed and configured.
- Easy way to get started if you are a new to JULES.
- Useful tool to use if you are trying to set up these systems and want to see how it should work!
- Please seek advice from Jules-Support if you plan to install Rose/Cylc yourself!

Support

Mailing list that users are signed up to after account request:

https://www.lists.rdg.ac.uk/mailman/listinfo/jules-users

Simply email: jules-users@lists.reading.ac.uk - used to ask general questions to the whole JULES community.

Mailbox for very specific questions (e.g. Rose, FCM, VM, code reviews etc):

jules-support@metoffice.gov.uk

Useful Links

- JULES User Documentation

http://jules-lsm.github.io/

- JULES Website:

https://jules.jchmr.org/

- Trac environment for JULES:

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

- Rose documentation:

http://metomi.github.io/rose/doc/rose.html

- Useful scientific computing resources:

http://software-carpentry.org/

References

M.J. Best et al., 2011, The Joint UK Land Environment Simulator (JULES), Model description, Part 1: Energy and water fluxes. *Geosci. Model Dev.*, 4, 677-699

D.B. Clark, et al., 2011, The Joint UK Land Environment Simulator (JULES), Model description, Part 2: Carbon fluxes and vegetation. *Geosci. Model Dev.*, 4, 701-722

B. Cosby, G. Hornberger, R. Clapp, and T. Ginn, 1984: A statistical exploration of the relationships of soil moisture characteristics to the physical properties of soils. Water Resources Research, 20 (6), 682–690

C. P. Jones, 2008: Ancillary file data sources. Unified Model Documentation 70. Tech. rep., Met Office, Exeter, United Kingdom.

Questions and answers