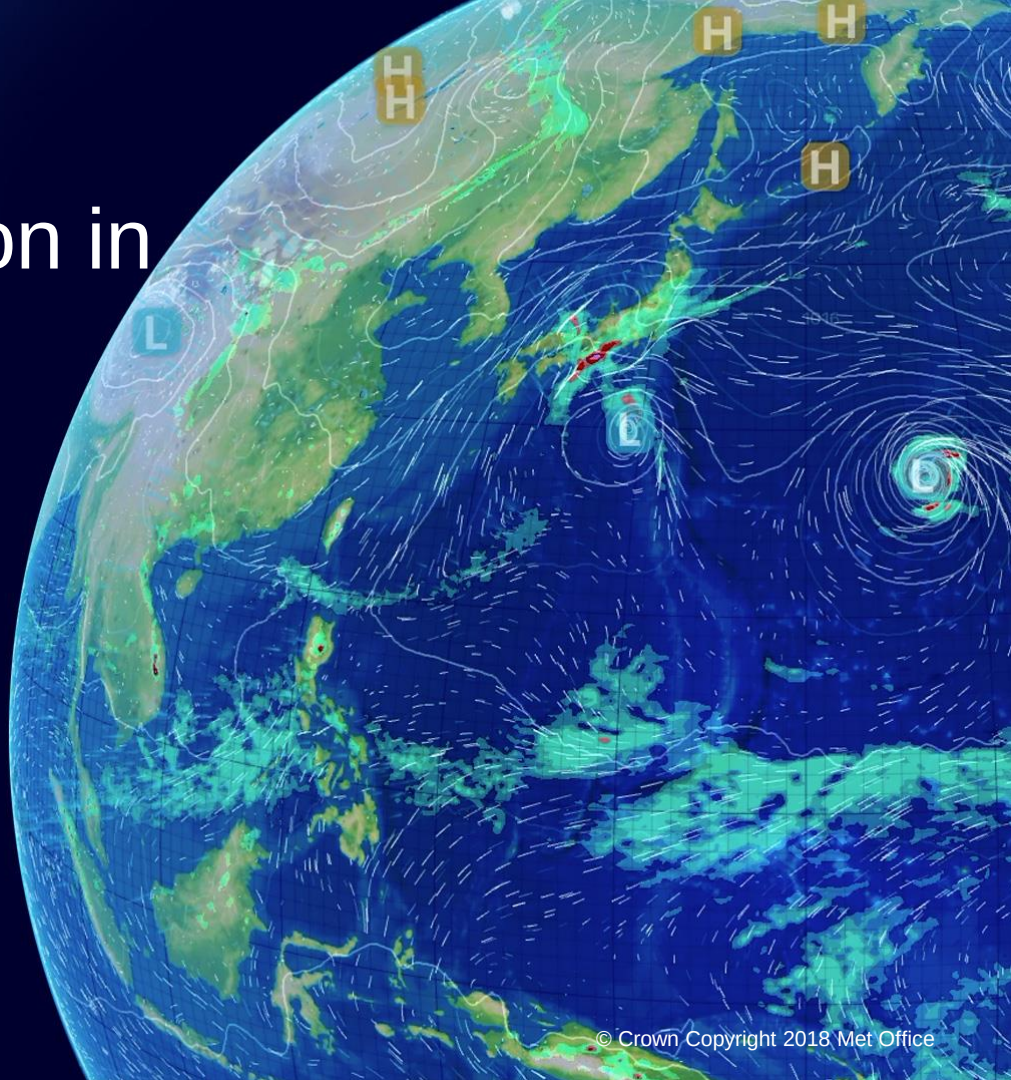
Meta data consolidation in rose suites for JULES

What does this actually mean? Why should you care?



JULES Annual Meeting, 4th September 2018
Maggie Hendry

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Can of worms…

- Upgrade the UKV app to using the latest UM configuration (PS39, #289).
  - Most satisfactory way of adding a MORUSES test.
  - UKV app didn't have a clear origin or configuration version.
- I thought that this would be easier now with Rose rather than UMUI -> .jin
  - Both use Rose, both have meta data.
  - Surely you could just copy the namelists over…

- HOW WRONG I WAS…

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UKV UM vs JULES

File Edit View Global Region Line Options Display Windows Help

/data/local/hadhm/um_work/vn10.9_vanilla/rose-stem/app/um_ukv1p5_eg_noda/rose-app.conf 699

```
[namelist:jules_surface]
all_tiles=1
cor_mo_iter=3
fd_stab_dep=1
formdrag=1
!!i_aggregate_opt=0
i_modiscopt=1
iscrntdiag=2
isrfexcnvgust=0
l_aggregate=.false.
l_anthrop_heat_src=.true.
l_elev_land_ice=.false.
l_elev_lw_down=.false.
l_epot_corr=.true.
l_flake_model=.false.
l_land_ice_imp=.true.
l_point_data=.false.
l_vary_z0m_soil=.false.
orog_drag_param=0.01
```

rose-stem/app/loobos_ukv/rose-app.conf 545 88

```
[namelist:jules_surface]
!!i_aggregate_opt=0
iscrntdiag=0
l_aggregate=.false.
l_anthrop_heat_src=.true.
l_elev_land_ice=.false.
l_elev_lw_down=.false.
l_epot_corr=.true.
l_land_ice_imp=.false.
l_point_data=.true.
```

Straw poll: Have you come across problems?

- UM-JULES users?
- Ever tried to find a UM configuration to run offline?
- Ever found a namelist item that you have no idea what it does and can’t find it in the documentation?
- Don’t know how to change something in the JULES-standalone?
  - e.g. Height of observations?
- Any other problems like these?

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Why is it so difficult?

- Why the differences between the UM and standalone?
- Science developed in one environment and not the other.
  - No standard way to allow for this resulting in varying approaches within the code.
  - Worst case scenario! “Do-nothing” approach…
    - Orographic form drag developed in the UM environment, but ancillary data not plumbed in for standalone.
    - Runs and changes model output… so what is it doing…?
  - “Change-it-to-something-else” approach. Better although still problematic.
    - Relies on the user noticing the warning in output; user thinks they are using a different option.
  - Best approach. Put the user in control.
    - Issue a fatal report, letting the user know what’s wrong and suggest how to change it.

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What's the solution?

- One solution (not my suggestion).
  - Don't allow any new science into JULES that is not available to both…
  - Barrier to model development and not exactly community minded.
- Pragmatic solution:
  - Create a standard way of adding science… (sorry no fanfare or fancy dress!).
  - Tools are already there, just need to make use of them.
  - Create one common (or shared) version of JULES meta data.
- Problem:
  - Need to agree on a shared meta data…
  - Need a framework to get there.

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Destination

- Reminder…
- Not all just about the UM-JULES user.
- Standalone user: Clearer how to change a JULES standalone configuration to suit user needs.
- UM-JULES user: Copy JULES namelists from UM configuration to create an equivalent standalone configuration.
  - This will also benefit the standalone user as it'll be easier to create and update configurations from known UM ones e.g. GA, RA, UKESM…

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How do we get there?

- All namelist items in meta data need to be compulsory=true.
  - If you can't see it, it's difficult to change it (transparency and code defaults…).
  - Suitable value added to apps using an upgrade macro.
- Trigger unused items off so they will not be visible.
  - This only works properly when compulsory=true.
  - Makes it clearer to see what is and is not being used.
  - There are currently many namelist items that could have triggers within JULES.
- This is all current UM working practice.

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So, what's new?

- Add regardless of whether they can be used by all environments.
- All UM-JULES only science can be triggered off with l_um_jules switch.
  - #633 "Make standalone and UM JULES meta data consistent (jules_surface)."
  - Tackles jules_surface namelist only.
  - The GUI does not look any different.
- Add checks to direct the user where an inappropriate value is used.
  - Depending on the l_um_jules switch.
  - Add fail-ifs/warn-ifs (before run-time checks).
  - Add parallel fatal ereports in the code (run-time checks).

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Previous topic

6.4. model_environment.nml

This file sets the model environment options e.g. whether JULES is coupled to the UM or run in a standalone environment. It contains one namelist called **JULES_MODEL_ENVIRONMENT**.

There are many JULES science options that are in shared namelists, so they can be read both by standalone and by a model driving JULES e.g. the UM. However some options either make no scientific sense or the necessary input data is not available to the environment in which JULES is being driven as the plumbing has not yet been done. This causes problems for example when creating standalone apps from UM configurations. This namelist allows the environment in which JULES is being run to be specified so that options that are unavailable can be made so and warnings given if options are inappropriately set.

6.4.1. JULES_MODEL_ENVIRONMENT namelist members

JULES_MODEL_ENVIRONMENT::**l_um_jules**

Type:	logical
Default:	F

Switch to identify whether JULES is being run within the UM environment. The switch should only be used to allow specific JULES-standalone and JULES-UM science options to be trigger ignored and checked that they are set appropriately at run-time.

Warning

No science code should be associated with this switch, only what science options are available.

TRUE

JULES is being run coupled to the UM. Options not available to the UM are trigger-ignored.

FALSE

JULES is not run coupled to the UM. UM-JULES only options are trigger-ignored.

Note

It is not appropriate to include a list of the unavailable options here as this is evolving. However, the following checking routines should contain a comprehensive list for the revision that you are using (once work is completed).

- src/control/standalone/check_um_jules_options_mod.F90
- src/control/um/check_um_jules_options_mod.F90

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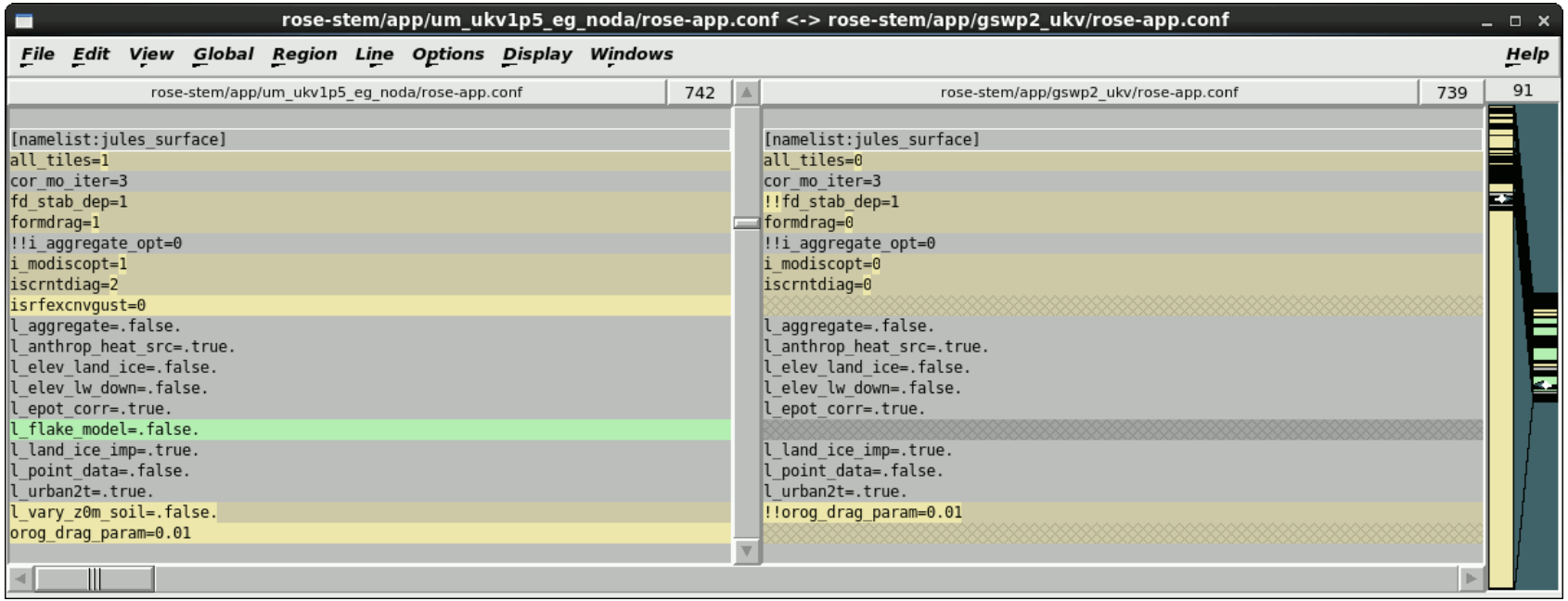
```
[namelist:jules_model_environment=l_um_jules]
compulsory=true
description=Switch to identify whether JULES is being run within the UM environment.
          =No science code is associated with this switch, only what science options are available.
fail-if=this == '.true.'; # This is JULES standalone run and therefore this should be FALSE.
trigger=namelist:jules_urban_switches=l_urban_empirical: .false.;
       =namelist:jules_surface=l_flake_model: .true.;
       =namelist:jules_surface=l_vary_z0m_soil: .true.;
       =namelist:jules_surface=formdrag: .true.;
       =namelist:jules_surface=i_modiscopt: .true.;
       =namelist:jules_surface=isrfexcnvgust: .true.;
type=logical
url=http://jules-lsm.github.io/vn5.2/namelists/model_environment.nml.html#JULES_MODEL_ENVIRONMENT::l_um_jules
```

Run upgrade macro



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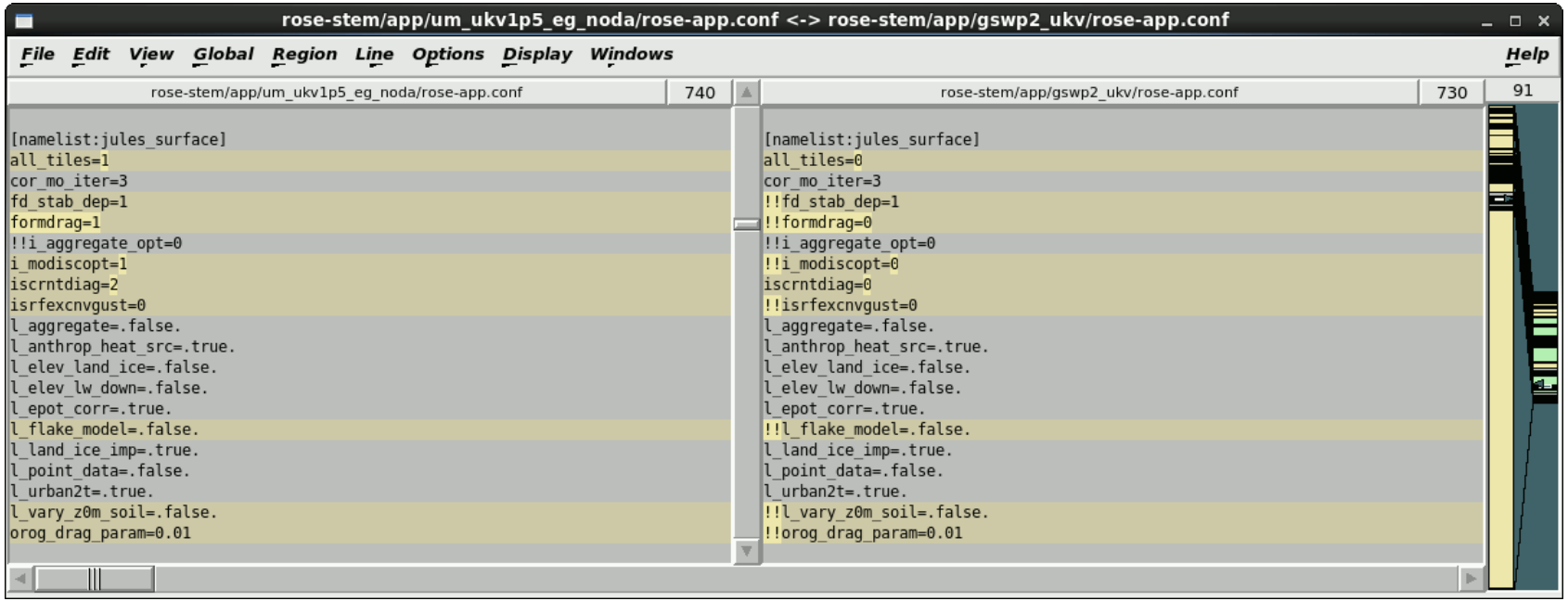
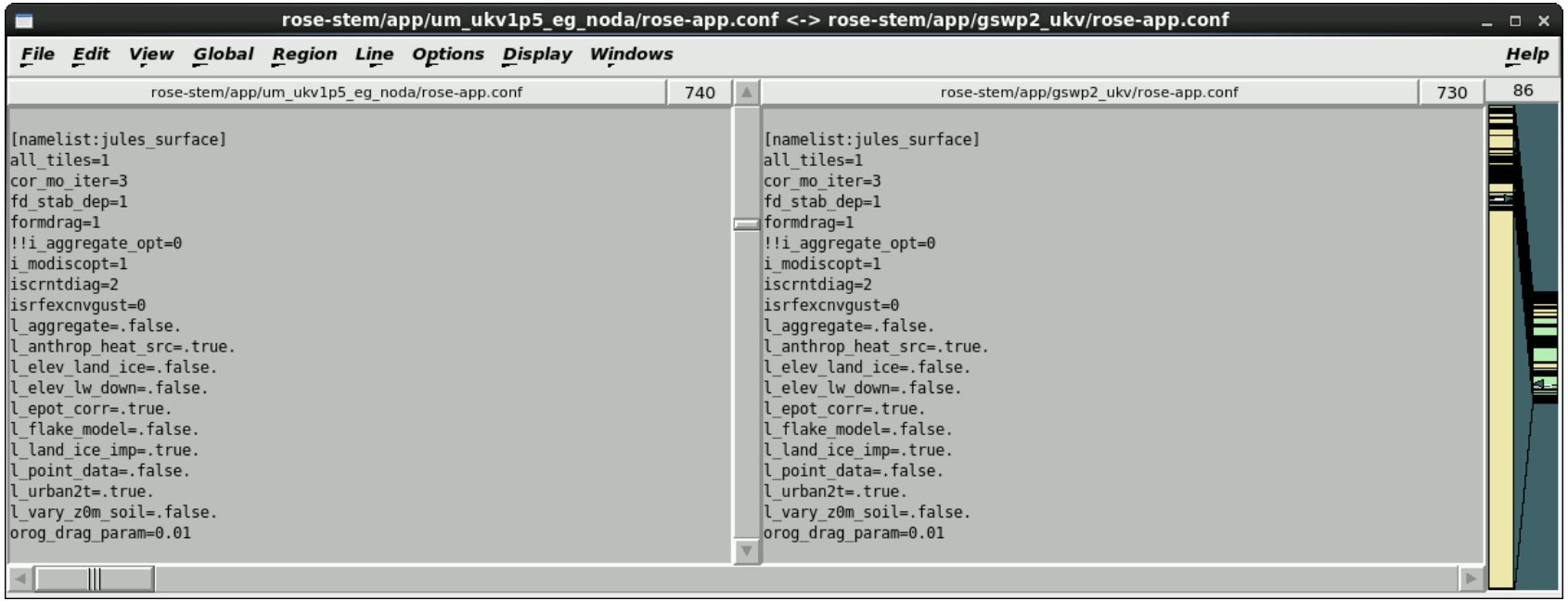
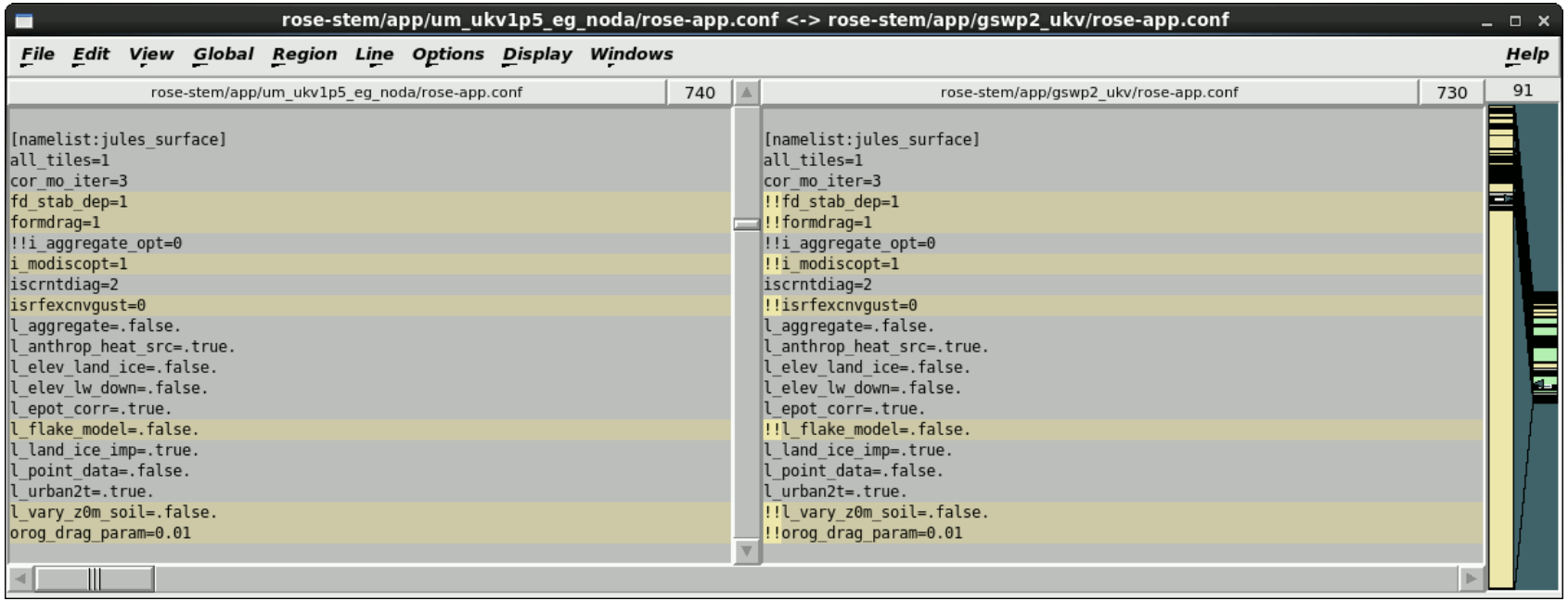
By the power of meta data…



rose macro --fix



rose macro -V


rose-stem/app/um_ukv1p5_eg_noda/rose-app.conf <-> rose-stem/app/gswp2_ukv/rose-app.conf
File Edit View Global Region Line Options Display Windows Help
rose-stem/app/um_ukv1p5_eg_noda/rose-app.conf 740
rose-stem/app/gswp2_ukv/rose-app.conf 730
91
[namelist:jules_surface]
all_tiles=1
cor_mo_iter=3
fd_stab_dep=1
formdrag=1
!!i_aggregate_opt=0
i_modiscopt=1
iscrntdiag=2
isrfexcnvgust=0
l_aggregate=.false.
l_anthrop_heat_src=.true.
l_elev_land_ice=.false.
l_elev_lw_down=.false.
l_epot_corr=.true.
l_flake_model=.false.
l_land_ice_imp=.true.
l_point_data=.false.
l_urban2t=.true.
l_vary_z0m_soil=.false.
orog_drag_param=0.01
[namelist:jules_surface]
all_tiles=1
cor_mo_iter=3
!!fd_stab_dep=1
!!formdrag=1
!!i_aggregate_opt=0
!!i_modiscopt=1
iscrntdiag=2
!!isrfexcnvgust=0
l_aggregate=.false.
l_anthrop_heat_src=.true.
l_elev_land_ice=.false.
l_elev_lw_down=.false.
l_epot_corr=.true.
!!l_flake_model=.false.
l_land_ice_imp=.true.
l_point_data=.false.
l_urban2t=.true.
!!l_vary_z0m_soil=.false.
!!orog_drag_param=0.01

rose macro -V

- [V] rose.macros.DefaultValidators: issues: 2
- namelist:jules_surface=iscrntdiag=2
- (The preferred option in standalone is 0. The decoupled option specified is not recommended until driving JULES with a decoupled variable is fully tested.) failed because: (this == 2 or this == 3) and namelist:jules_model_environment=l_um_jules == '.false.'
- namelist:jules_surface=iscrntdiag=2
- Value 2 not in allowed values ['0', '1']

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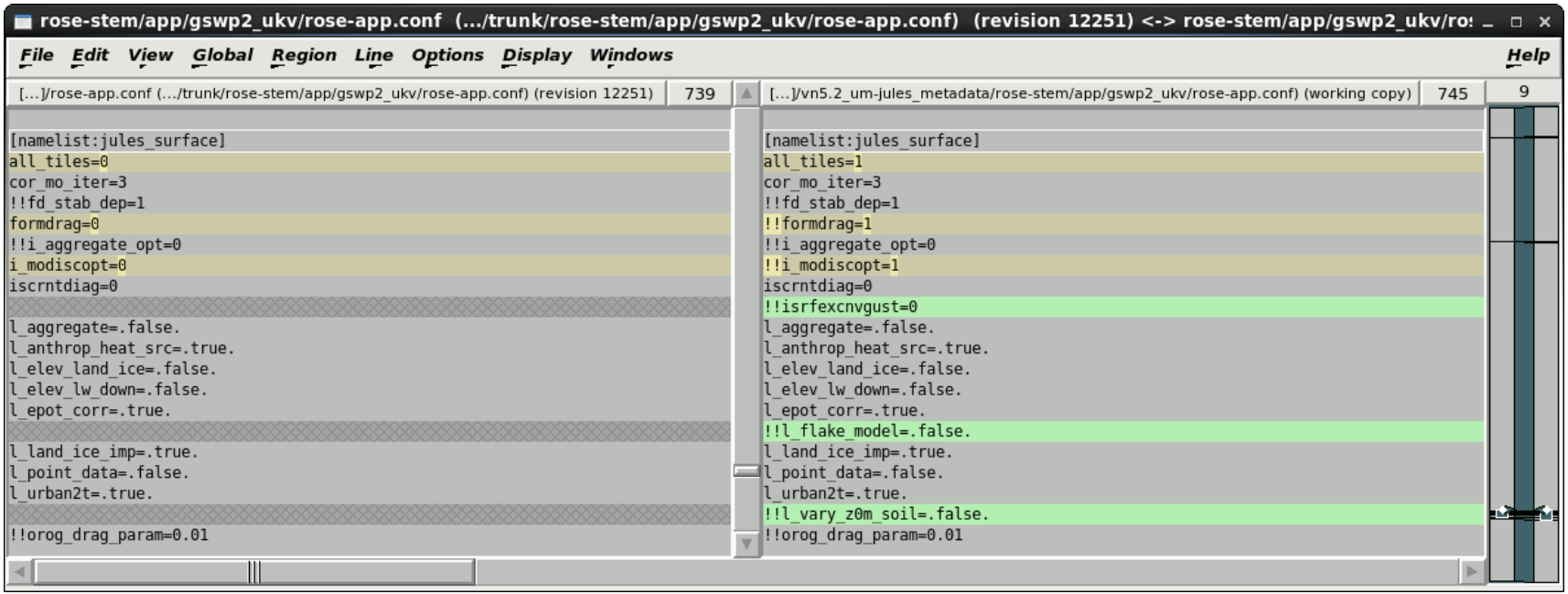
By the power of meta data…



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What's next?

- Confident that this is an acceptable code management solution.
  - Majority already through review once at vn5.1.
  - Only waiting for additional science review at vn5.2.
- Endorsement from community…?
- This is not UM specific.
  - Same approach could be adopted for other environments e.g. LIS, MONC, CABLE.
- All the other namelists need attention.
  - In particular jules_radiation and jules_vegetation.

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What's next?

- All meta data components should merge towards being identical.
  - Currently triggering differs between the UM and standalone; neither are complete.
- Until we have a meta data that is common to both.
  - We will need to maintain the separate UM and standalone meta data.
  - At risk of diverging.
- Once we have a meta data that is common to both.
  - The JULES meta data can then be adopted by the model environment (e.g. UM).
  - The duplicate UM meta data removed.
- Any volunteers to help with remaining namelists…?

Please, please, please…

- I hope I have convinced you of the benefits of this framework.
- Please, if you are adding new science/namelist items, could you add it following this framework?
- The framework will not be written into the JULES working practices.
  - Unless it is the wish of the community.
- Thanks for listening and I hope it wasn't too dull!

Any questions or discussion points?

- You can also email me:
  - margaret.hendry@metoffice.gov.uk