An update on urban plans and making JULES friendly

Annual JULES meeting, 22\textsuperscript{nd} July 2019
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An update on urban plans
Urban schemes

- **URBAN tile** = basic one-tile scheme
- **CANYON & ROOF tiles** = basic two-tile; different parameters
  - Albedo
  - Heat capacity (roof lower)
  - Roughness length
  - **NO EXTRA PHYSICS**
- **CANYON & ROOF tiles**
  - **EXTRA PHYSICS**
  - 4 physical processes parametrised
$G_0 = \sigma T^4_{\text{urban}} - \sigma T^4_{\text{soil}}$

$G_0 = \lambda (T_c - T_{\text{soil}})$

Best et al., 2006, Boundary-layer Meteorol., 118 (3): 503

MORUSES pros & cons

• Pros
  • More physically based representation of the urban surface energy balance
    • Depends on urban morphology (H, H/W & W/R)
  • Spatially variable unlike the urban-1t and urban-2t schemes
  • PILPS-urban analysis of results showed that MORUSES has smaller bias errors

• Cons
  • MORUSES strength is also it’s weakness…
  • Requires ancillary data; at the very least morphology data (H, H/W & W/R)
  • Non trivial to add to an existing urban-1t configuration
Non trivial: urban-1t ↔ MORUSES

Generate and add/change two ancillaries
1. Urban morphology
2. Consistent fraction of surface types

Change namelists to be consistent with jules_surface_types, currently:
1. jules_elevate
2. jules_nvegparm

Main switch
jules_surface=l_urban2

Other namelist changes:
1. jules_urban2t_param
2. jules_urban_switches all false by default so need switching on

Metadata helps with required parameters and surface types, but not with parameter values or where to put them i.e. jules_nvegparm and jules_surface_types.

6.3 “Switching between the urban models” UMDPC03
The Met Office configurations

- The only Met Office configuration to use MORUSES is UK Limited Area Models (LAMs).
  - Based on RAL (Regional Atmosphere-Land), which is thus RAL+MORUSES.
  - Operational since 15th March 2016 (OS37).
  - RAL needs to be globally applicable and therefore so does the means to produce global ancillary data.

- All other Met Office configurations use urban-1t, even though:
  - MORUSES is a better, more versatile model.
  - PILPS-urban and other work continually show two tiles are better than one.

- Interest from around the world to use MORUSES in regional configurations.
UKV (1.5 km) & London Model (333m)

Islington
Saturday 29th June
Beth Saunders
University of Reading
http://micromet.reading.ac.uk/modeval_tair/
So…

… we really need a globally applicable MORUSES
Baseline – Thoroughly evaluate what we have

• **Develop an automated verification system using OpenRoad data (UK)**
  - The standard verification system uses SYNOP sites and by definition these are rural.
  - Performance of the UK LAMs needs to be evaluated over the whole urban spectrum.
  - OpenRoad data:
    - Is not good quality data, but is of high volume, in urban areas, has a long timeseries and is ongoing.
    - The data are also used in DA and an evaluation against OpenRoad would be useful to our road forecast capability.
    - This would create a more complete framework for testing future model developments, increasing our confidence in the model.

• **Evaluate MORUSES worldwide using urban flux sites**
Develop globally applicable MORUSES

- MORUSES essentially sits on top of urban-2t, providing parameter values.
  - Two main differences, MORUSES has:
    - Solar zenith angle dependence of albedo.
    - Coupling through road surface only.
- Therefore globally applicable may mean either:
  - MORUSES configuration with a default morphology, or:
  - A tweaked urban-2t configuration.
- Either would allow users to:
  - Take advantage of a better “out-of-the-drawer” urban configuration.
  - OR more easily tailor the scheme to their own requirements with the inclusion of morphology ancillaries and other data where it exists.
Met Office urban resources

- Report on implementation and evaluation of MORUSES in the UKV (PS37)
- UMDPC03 "Coupling the JULES Land Surface Model to the Unified Model"
  - Section 6 “The two-tile urban schemes”
- That’s the urban side of things… now for…
Making JULES friendly 😊
UM-JULES metadata consolidation project

• Last year presented “Meta data consolidation in rose suites for JULES”
  • Creating a consistent set of UM-JULES metadata so we can move to a shared metadata
  • Reduce overheads in maintenance and stop divergence
  • Automated, fully traceable method to create UM configuration from JULES and vice versa
  • Let the metadata do the work

• Since the last meeting
  • #633 on trunk
  • Introduced the framework to allow this to happen demonstrated with jules_surface
  • https://jules-lsm.github.io/latest/namelists/model_environment.nml.html (l_jules_parent)
  • Working Practices for JULES development - Developing your change (diff)
    • New section added "Adding new science options"
#822 tackling jules_radiation... possibly others

Run rose app-upgrade
Create JULES suite from UM – jules_radiation

• Copy UM namelist to JULES then run “rose macro --fix”
Create JULES suite from UM – jules_radiation

• Much of jules_pftparm also affected by jules_radiation options
rose macro -V

- [V] rose.macros.DefaultValidators: issues: 3
  namelist:jules_pftparm=fsmc_mod_io=0 failed because: len(this) != namelist:jules_surface_types=npft
  Metadata instruction not added yet

- 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_jules_parent == 0

- namelist:jules_surface=iscrntdiag=2
  Value 2 not in allowed values ['0', '1']
  Manual changes required to jules_surface namelist
What you can do to help

• If you notice something not right in the metadata (if you’ve not got a suitable ticket open to fix it under)
  • Search for a ticket already open for that namelist (*metadata consolidation in the keywords*).
  • If there is one open please add it to the TicketDetails.
  • If not, please either:
    • Open a ticket, add a TicketDetails and describe the issue there.
    • OR, send me an email and I’ll open one with the information.

• If you fancy helping me sort out a namelist that’d be brilliant!

Thanks for listening