Update from Hydrology and Surface Processes Group

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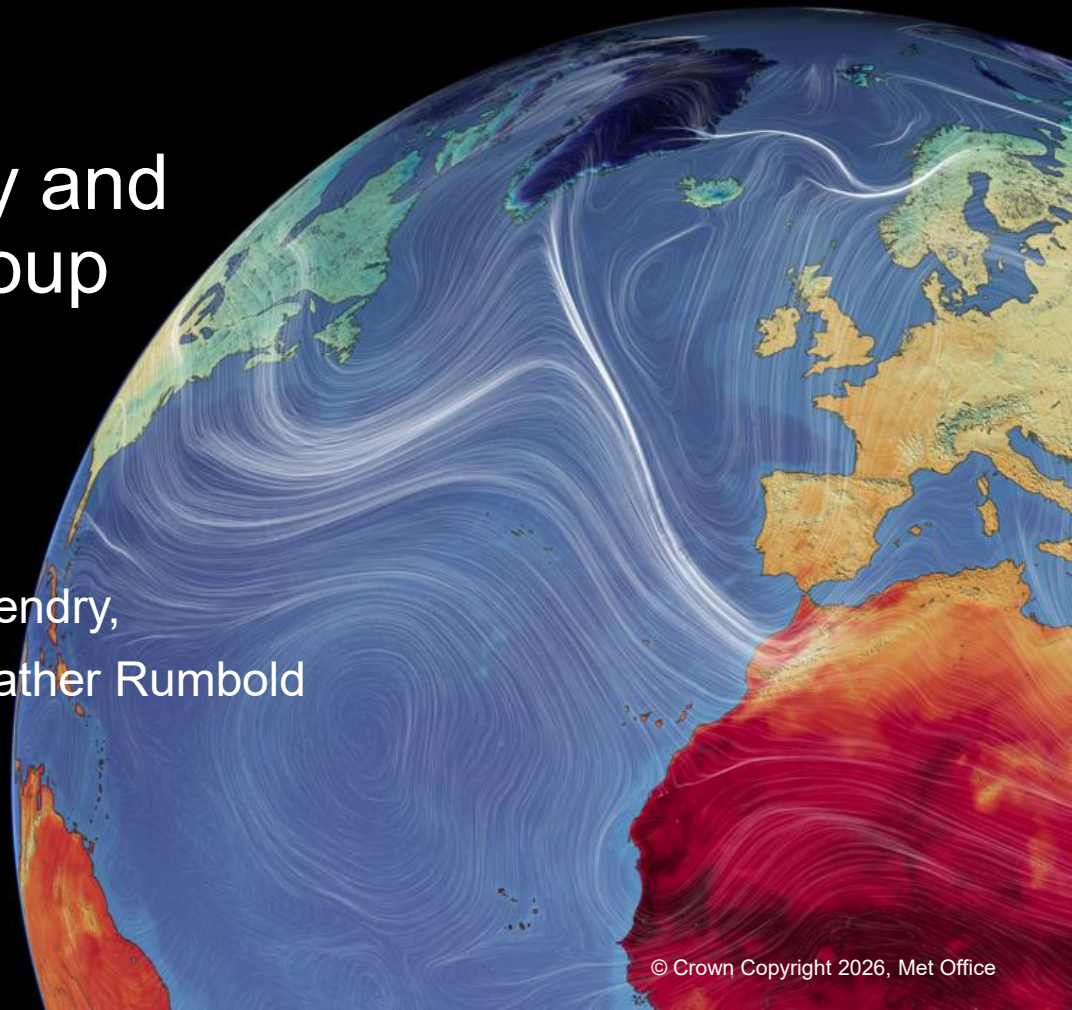
September 2026



This content has been created by the author.
AI [M365 Copilot] has also been applied to refine the document.

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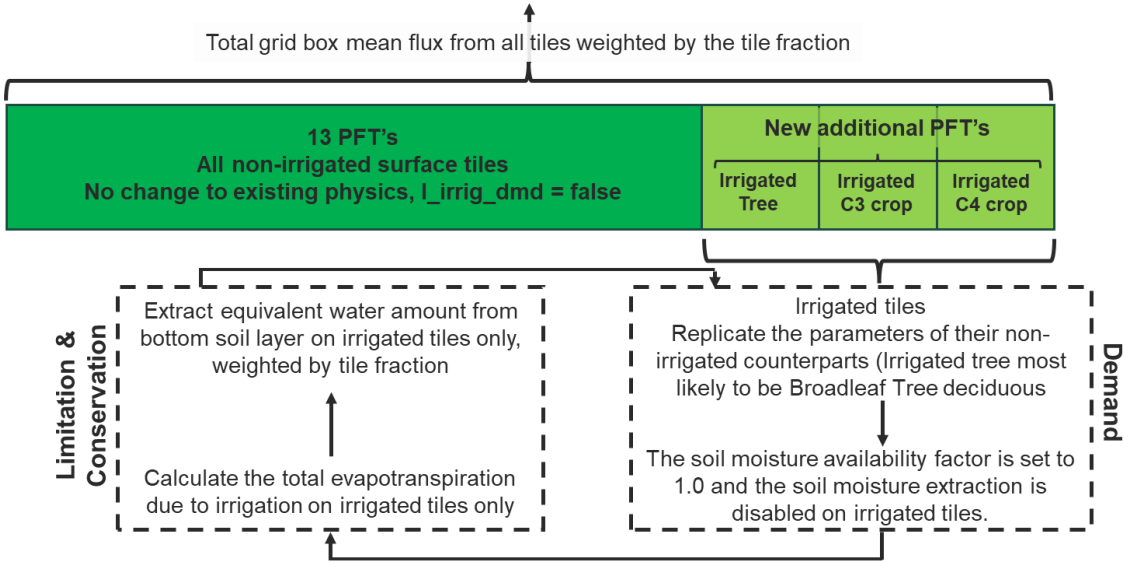
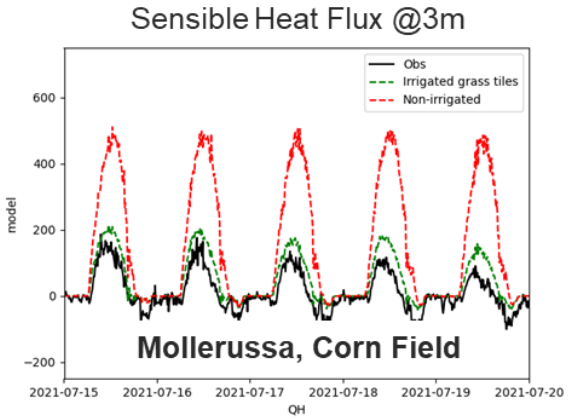
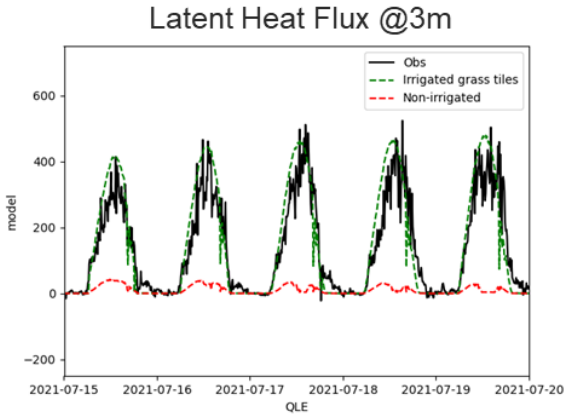
Development of the new tile-based irrigation scheme







Developed a new **tile-based irrigation scheme** for JULES which **meets future requirements.**

Priorities:

- **Global and regional** testing of the scheme implemented in LFRic
- Implementation of **water conservation** and **water extraction.**
- Developing code for **irrigation ancillaries** within **ANTS**.
- Scoping the practicalities for integrating with the existing **JULES soil tiling** code.

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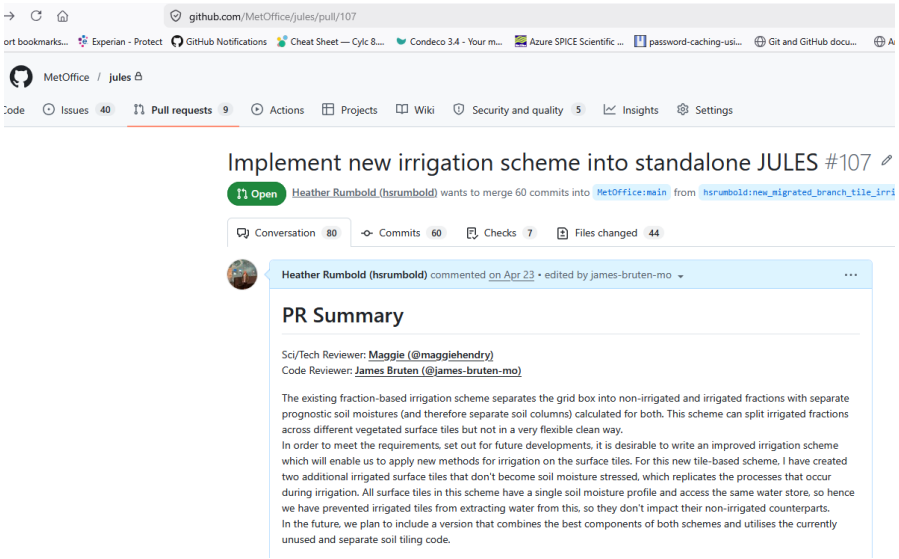
Code is in the JULES vn8.2 release - Pull Request #107

- Technical code to add **two new surface tiles** - C3_irrig and C4_irrig
- The science code required to calculate irrigation on the new surface tiles. The β **is set to 1.0** and the **soil moisture extraction is disabled** on irrigated tiles.



- A new variable added to the pftparm namelist to **enable irrigation to be switched on** for individual surface tiles. Plus, associated metadata and upgrade macro required for JULES (and UM).
- A new **irrig_option switch** has been added to allow this code to be used without impacting the existing irrigation code and allows code to be switched off.
- Standalone **Rose-stem** test to protect the new science added.
- **Technical infrastructure** to allow the code to **couple** to the **LFRic** in a future issue.

Updates to LAI and canopy height ancillaries

Current Leaf Area Index (LAI) ancillary is based on 5 years of MODIS data at 4km resolution.

Updating the ancillary offers the opportunity to increase the resolution, average over more years of satellite data and make use of improved data processing algorithms.

Two new ancillaries have been produced, one based on MODIS, the other using Copernicus data. Both averaged over 20 years of data.

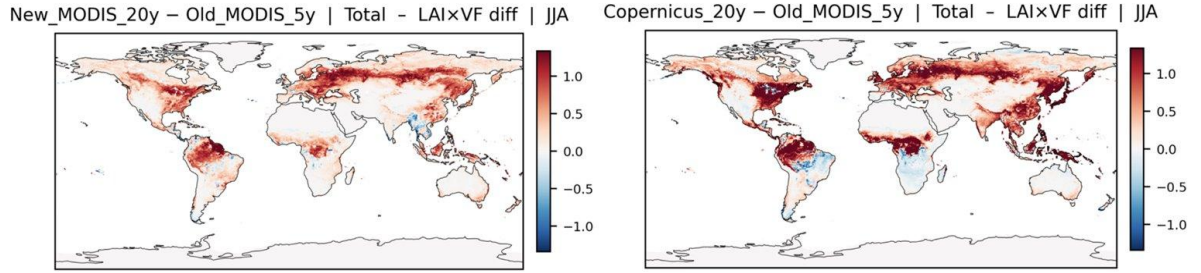


Figure 4—JJA-mean LAI differences relative to the current 4 km ancillary, weighted by vegetation fraction. New MODIS-based ancillary (left) and new Copernicus-based ancillary (right). Red indicates increased LAI; blue indicates decreased LAI.

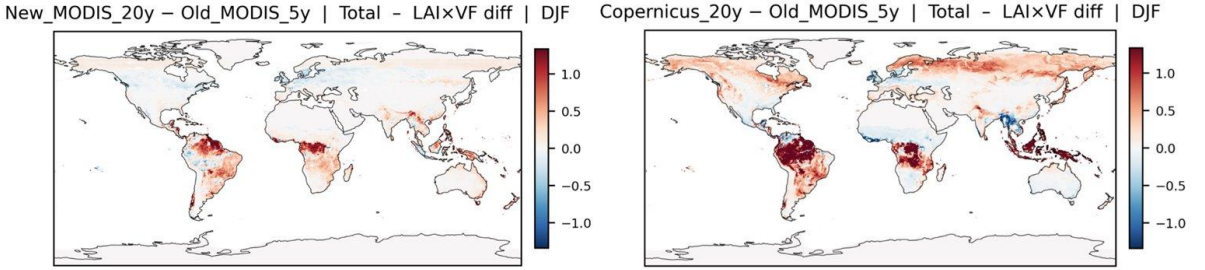


Figure 6—DJF-mean LAI differences relative to the current 4 km ancillary, weighted by vegetation fraction. New MODIS-based ancillary (left) and new Copernicus-based ancillary (right). Red indicates increased LAI; blue indicates decreased LAI.

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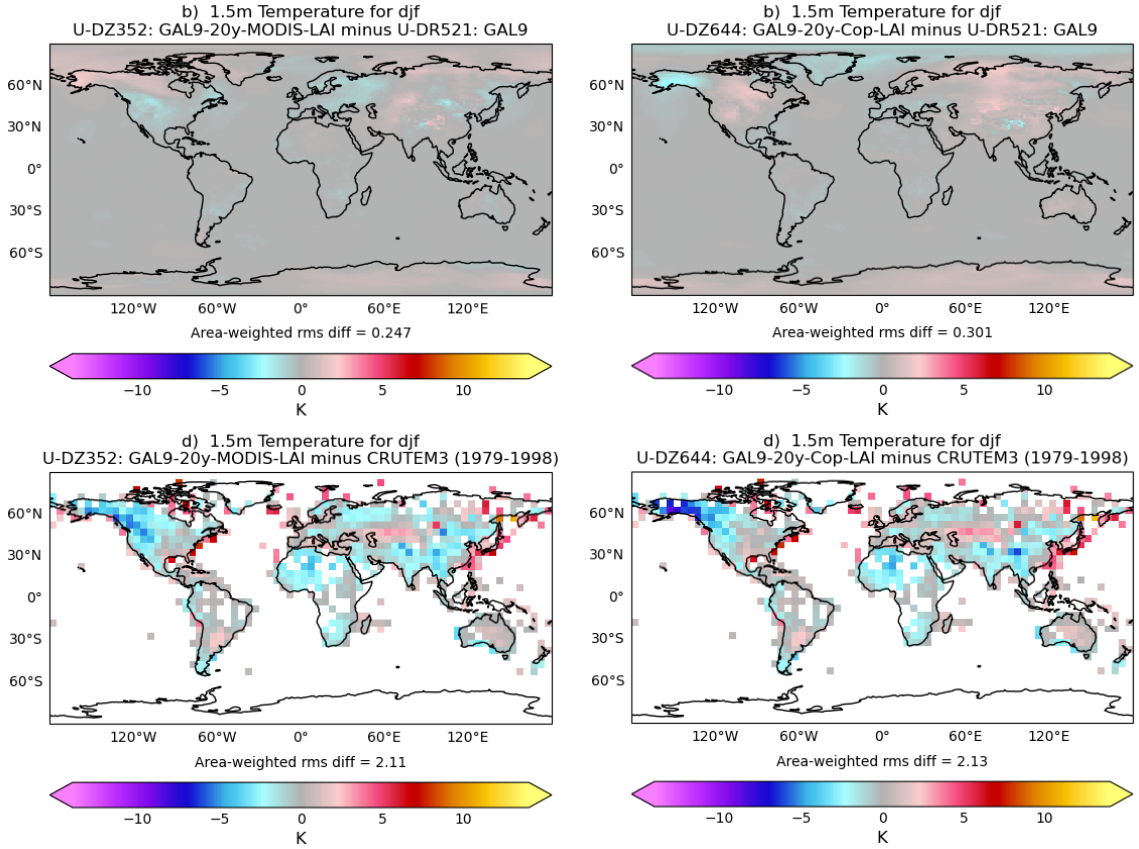
Updates to LAI and canopy height ancillaries

The vegetation canopy height ancillary, which is calculated from LAI, has also been updated. In both cases, changes to canopy heights were minimal.

Both new sets of ancillaries have a neutral impact in global climate simulations. This is good, as it will make adopting an updated ancillary straightforward.



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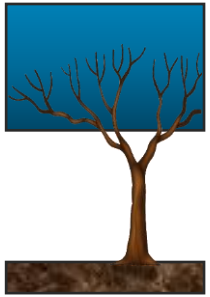
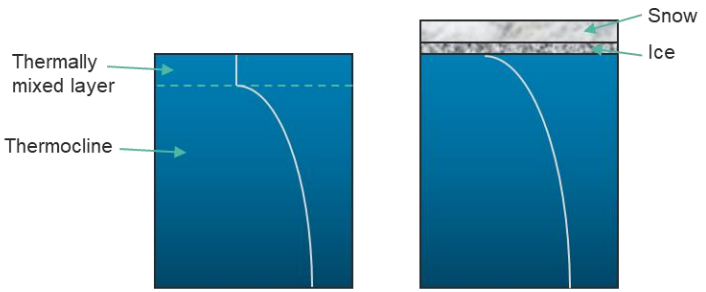
Improving lake representation with FLake



Currently, our operational models are using the **vegetation canopy scheme** to represent lakes:

- Specify large canopy water capacity and canopy heat capacity to mimic a 5m deep lake
- No freezing processes – snow can settle regardless



The Freshwater Lake model '**FLake**' will allow:

- Different lake depths to be specified for different gridboxes
- Freezing and thawing processes
- Vertical thermal mixing processes

- Currently working to implement FLake in LFRic
- Targeting RAL5 and GC7 configurations

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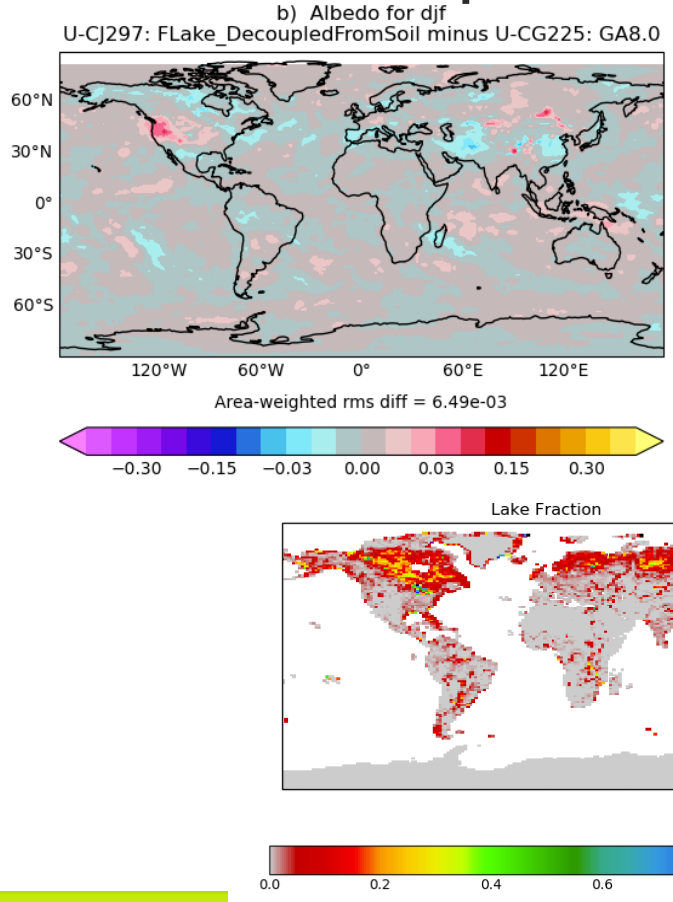
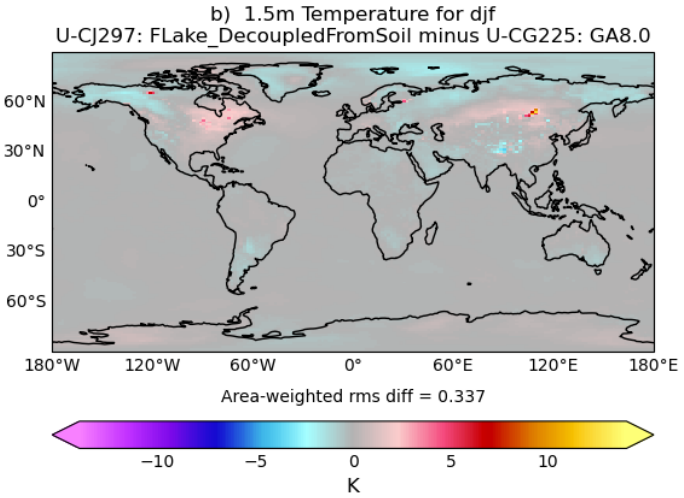
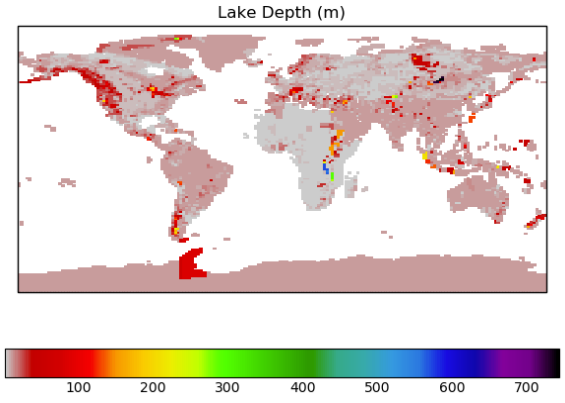
Improving lake representation with FLake







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Sharing JULES metadata

- Migrated and updated the wiki Sharing JULES metadata to JULES GitHub containing
  - Structure of metadata description, What goes where, Making changes to **jules-shared**, Implications for users & developers including required LFRic app changes
  - Feedback and suggestions of improvements welcome to maggiehendry via GitHub
- All JULES metadata will reside in the JULES repository
  - From JULES vn8.3 (next release) 🤞
  - Remove duplicate JULES metadata in UM repository · Issue #154 · MetOffice/jules
  - Some metadata used by LFRic apps still requiring full migration to **jules-shared** (marked “partial” on wiki)
  - jules_triffid requires consolidation before migration
  - These will be dealt with in separate tickets

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Converting pftparm to one namelist per tile

- From JULES vn8.3 (next release) 🤞
- Convert `jules_pftparm` to a duplicate namelist · Issue #115 · MetOffice/jules
- Namelists with items of size npft, nnvg are challenging to maintain and upgrade with convoluted and incomplete upgrade macros
- Converting to duplicate namelists makes things simpler and more robust
- Will be documented on GitHub wiki
  - Redesigning JULES tile input · MetOffice/jules Wiki
  - Including Rich Gilham's summary of the issues with the current design from six years ago which this change goes some way to address

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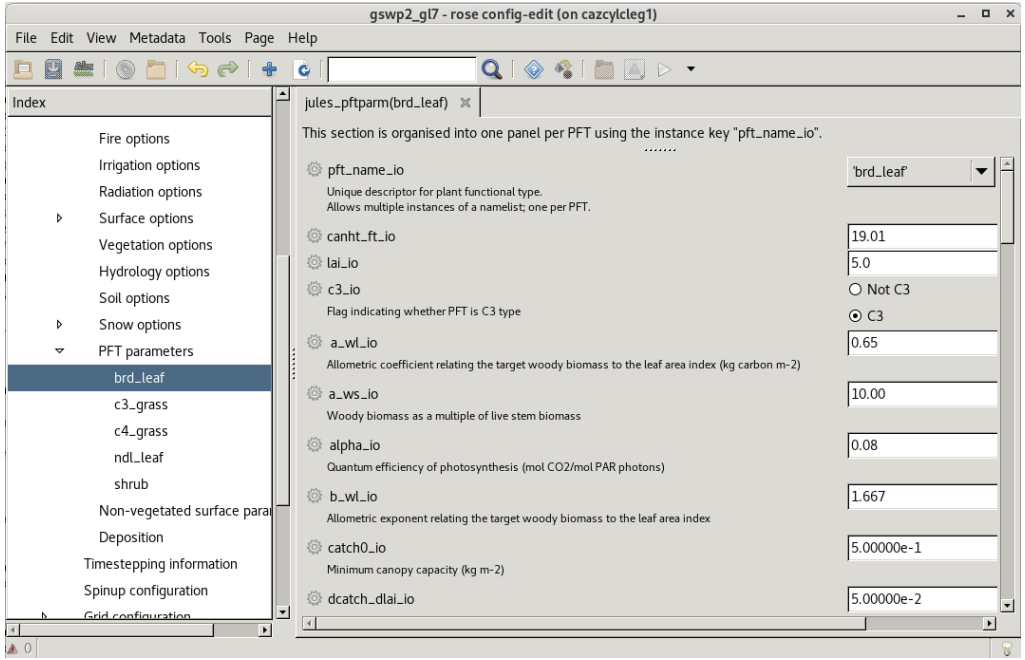
Converting pftparm to one namelist per tile

- GUI has one panel per PFT
- Labelled with pft_name_io based on jules_surface_types



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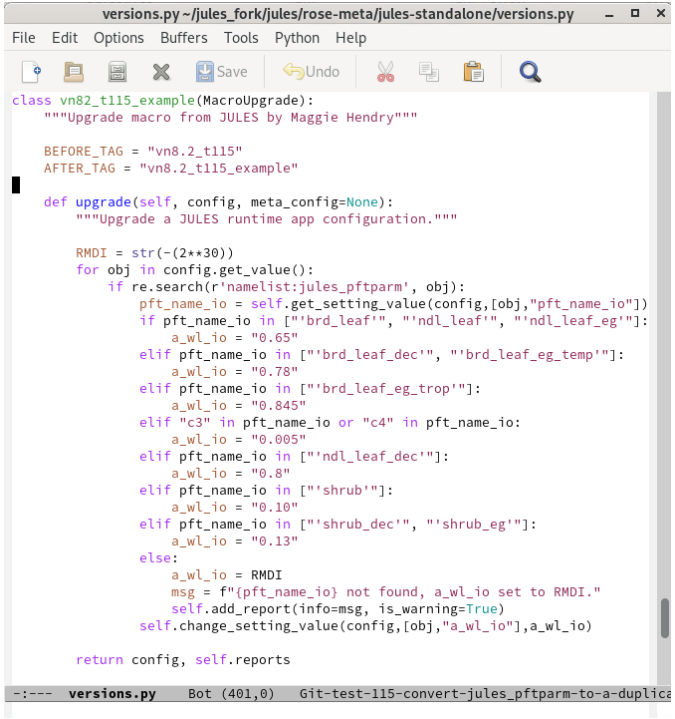
Converting pftparm to one namelist per tile

- Simpler, more robust upgrade macros
  - Removes the need for a list of npft=5 or npft=9 (ncpft=0 or ncpft=4) or npft=13 or … which only accounts for know configurations, leading to incomplete macros
  - Does require surface types to be defined in jules_surface_types in the code
  - Values are specified by surface type with a default (missing data value) for unspecified types

NB This is an example. I am not changing a_wl_io.



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JULES move to public repository on github

- JULES vn8.2 (July 2026)
- The JULES repository is now publicly visible, meaning existing forks will have been disconnected on GitHub.
- Please see https://metoffice.github.io/simulation-systems/FurtherDetails/visibility_changes.html for advice on reattaching a fork.
- Ensure you have setup verified commits before beginning work on a branch that is targetting being merged to main.