

Veg3/Demography Update

JULES Annual Science Meeting 2026

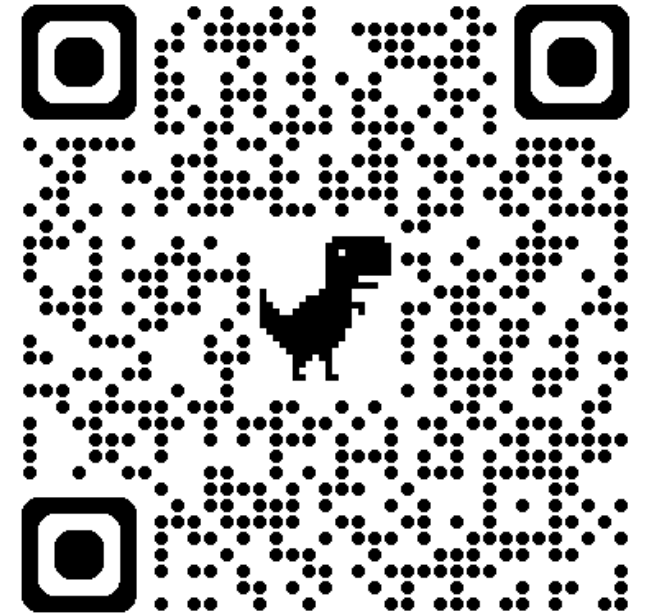
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Model Developments Updates - GitHub

1. A new JULES-RED / veg3 subproject on GitHub with aims to get developments done into the trunk for eventual UKESM2+:
<https://github.com/orgs/MetOffice/projects/487>.
2. We are currently focused on getting existing science developments into the trunk of JULES from
[r26886_vn7.3_test_add_red_sci_trendy](#)
(coupled phenology, soil carbon, canopy closure, net land use change), etc.



Link to JULES subproject

#1111 assigned enhancement

Opened 5 years ago
Last modified 11 months ago

RED Summary Ticket

Reported by: [andywiltshire](#)

Owned by: [andywiltshire](#)

Priority: [normal](#)

Milestone: [Not specified](#)

Keywords:

Cc: [arthurargles](#), [carolinaduranrojas](#)

Description (last modified by [arthurargles](#)) [Δ](#)

Summary ticket for implementing RED into JULES Code

~~#888~~ - Basic VEGGIE Structural code for RED

~~#902~~ - RED DGVM

~~#1034~~ - Couple JULES surf exchange with RED

~~#1102~~ - Add RED Diagnostics

~~#1230~~ - Add RED prognostics to dump

~~#1306~~ - N stem Bug fix @7.0

~~#1357~~ - Add more JULES-RED science developments (such as canopy closure)

~~#1425~~ - Add RED namelist and metadata to JULES

~~#1570~~ - Implementation of veg3 land use change

- Add default values data type for prognostics.

- Add RED rose-stem test

Development	Type	Target	Issue	PR	Branch	Status
Couple Phenology	Science	vn8.3	#90	#160	jules_red_veg3_couple_phenology	Review
Couple Soil Carbon Biogeochemistry	Science	vn8.3	#91		jules_red_veg3_couple_soil	Dev
Implement Closed Canopy Scheme	Science	vn8.3	#92		jules_red_veg3_closed_canopy	Dev
Implement Net Land Use Change Transitions	Science	vn8.4	#93			Todo
Implement Gross Land Use Change Transitions	Science	vn8.4	#95			Todo
Couple INFERNO	Science	vn8.4	#96			Todo
Couple Nitrogen Scheme	Science	TBD	#97			Todo
Couple SOX/Drought Mortality	Science	TBD	#98			Todo
Improve PFT parameterisation for RED	Science	TBD	#99			Todo
veg3/JULES-RED rose-stem tests	Testing	TBD	#100			Todo
Couple UKESM into veg3/JULES-RED	Science	TBD	#101			Todo

Projects & Plans (1)

CSSP Brazil - Arthur Argles (MO) & Eddy Robertson (MO), continue integration of older RED code and development of JULES-RED with more couplings. Goal to get veg3 in a state to run comparably well against veg2 and in UKESM.

AmazonFACE - Sarah McClory (Leeds) & Andy Wiltshire (MO), possibly running JULES-RED at Amazon FACE experiment.

AmazonSoS – Simon Jones (Exeter), Peter Cox (Exeter), coupling drought mortality from SOX into JULES-RED.

TipESM – Ceren Ekinici (IsGlobal), Dessie Petrova (IsGlobal), AW (MO) simulations of JULES-RED using stabilisation runs to investigate forest resilience to ENSO at different GWL.

CLARITY - Ananya Jattla (Exeter), AA (MO), Stephen Sitch (Exeter), Lina Mercado (Exeter). Improving representation of the humid and dry tropics in the JULE-RED dynamic vegetation model (i.e., “Rocker” / Live Fast Die Young PFT).

Projects & Plans (2)

Windthrow Mortality – Komal Kumari (Exeter), Mike O Sullivan (Exeter), Anna Harper (Georgia US through ISWAE), Toby Jackson (Bristol, gathering data for use in the future).

UK Afforestation – NetZeroPlus + LandClimate Programme, Emma Littleton (Exeter), Hsi-Kai (Exeter), PC (Exeter), Chris Huntingford (CEH), AA (MO), Rich Betts (MO), AH (Georgia). Working on various papers including evaluation of Broadleaf deciduous at Alice Holt.

UKESM2+ integration. AA, ER, AW (MO).

Update on Papers

Published:

Eckes-Shephard A., et al "Demography, dynamics and data: building confidence for simulating changes in the world's forests." New Phytologist 248.6 (2025): 2722-2749.

In review/revisions:

Chou H., et al "Evaluation of national Greenhouse Gas Removal potential under a changing climate using a process-based land surface model." EGU sphere 2025 (2025): 1-18. (Preprint)

Price., et al. "Individual versus statistical-dynamical representations of forests: when is an individual-based model required?", in review (In Silico)

In prep:

Argles, A., et al "Amazon Dieback Understood through Tree Recruitment, Growth, and Mortality"

Littleton., et al. "Quantifying the Potential for Afforestation to allow the United Kingdom to reach Net Zero"

Planned:

Argles, A., et al GMD model paper on JULES-RED global setup and comparison against JULES-TRIFFID.

Eckes-Shephard, A. et al., Follow up Demography paper on multi model global evaluation.

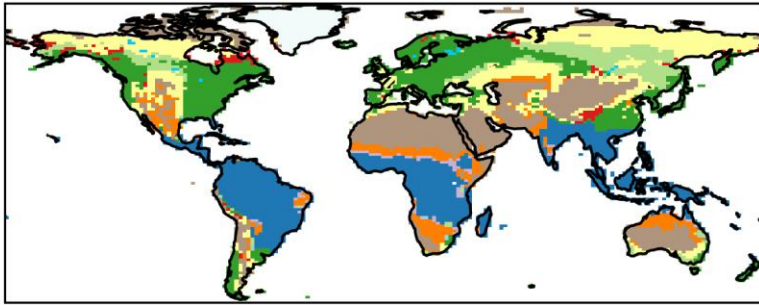
Some Brief Highlights

JULES-RED Global Simulations (Talk Tomorrow)

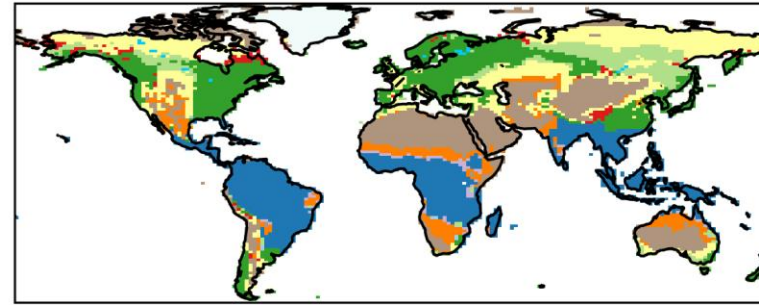
Dominant Land Surface Type - Year: 1700

a) JULES-TRIFFID

a.i) S2 Fixed 1700 Land Use

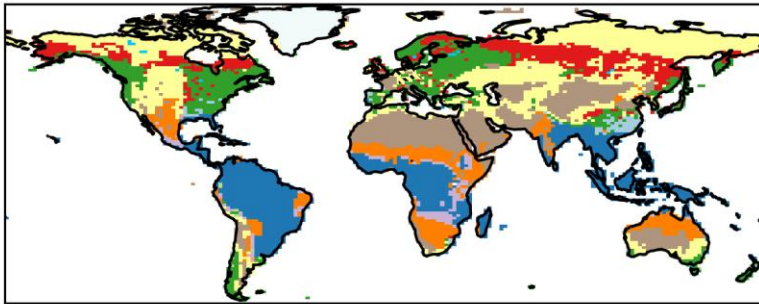


a.ii) S3 Historical Land Use Change

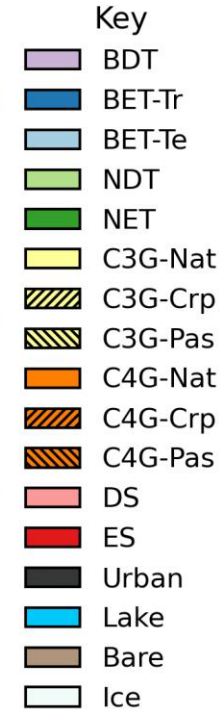
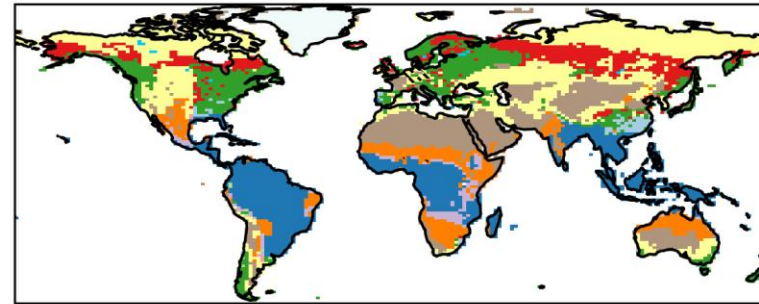


b) JULES-RED

b.i) S2 Fixed 1700 Land Use



b.ii) S3 Historical Land Use Change



- Uses suite [u-dr976](#) with [r26886_vn7.3_test_add_red_sci_trendy](#).
- Now working on Jaguar (Exeter, Mike O Sullivan) and Monsoon3 (Ananya)

Evaluation of National Greenhouse Gas Removal Potential in Great Britain under a Changing Climate

- Evaluating the GGR potential under different climate scenario (Fig 1).
- Identify the most effective location of plantation (Fig 2).
- Wales and southwest England exhibit the highest growth potential for Sitka Spruce, consistent with their mild, wet climates and favourable radiation conditions
- Under the baseline low-warming scenario, annual removals of approximately 15 Mt CO₂ by 2080 could be achieved if new-woodland creation targets are met and planting locations are carefully selected.

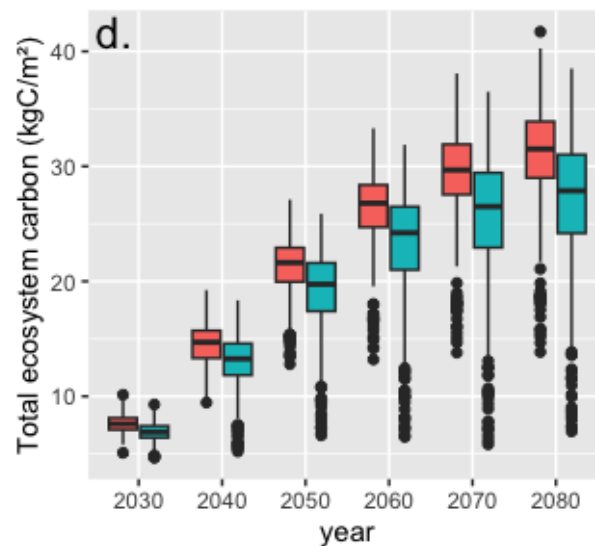


Figure 1. Total ecosystem carbon under low-warming (red) and drying (blue) climate projections.

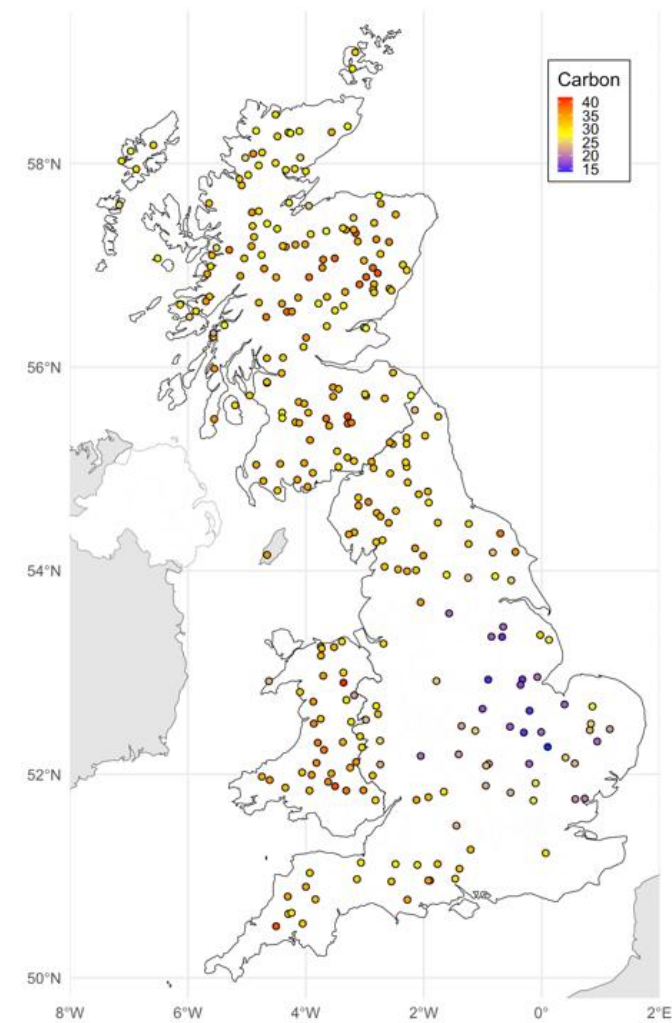


Figure 2. Ecosystem carbon stock across the Great Britain in 2080 under the low-warming climate scenario.