



Updates from the JULES-FACE Working Group

Eleanor Burke, Doug Clark, Martin De Kauwe, Hilary Ford, Anna Harper, Debbie Hemming, Felix Leung, André Nakhavali, Rebecca Oliver, Colin Prentice, Tristan Quaife, Andy Smith, Rachael Turton, Rebecca Varney, Karina Williams, Andy Wiltshire, Huiyi Yang

Report to JULES annual meeting 2021



JULES-FACE Working Group

- ▶ Free-air CO₂ enrichment (FACE) experiments are important for understanding the responses of ecosystems to a future CO₂-enriched atmosphere.
- ▶ The JULES-FACE Working Group is a network of people who are using data from FACE experiments to evaluate and improve JULES.



image credit: BIFoR



JULES-FACE Working Group

- ▶ Group trac page:

`https://code.metoffice.gov.uk/trac/jules/wiki/JulesFace`



Sites

FACE sites that have been modelled with JULES so far:

- ▶ **ORNL, Rhinelander, Duke, and KSC** Walker et al., 2019, CRESCENDO (Eleanor Burke, Andy Wiltshire, Debbie Hemming)
- ▶ **PHACE** De Kauwe et al., 2017, Ryan et al., 2016 + N (Rebecca Varney, Anna Harper)
- ▶ **AmazonFACE** Fleischer et al., 2019, + JULES-CNP (André Nakhavali) *
- ▶ **POPFACE** Oliver et al., 2014
- ▶ **BangorFACE** Hilary Ford, Debbie Hemming, Andy Smith, Karina Williams
- ▶ **BIFoR** Debbie Hemming, Karina Williams + JULES-CNP (André Nakhavali) *
- ▶ **SoyFACE-O3** Leung et al., 2020 *
- ▶ **ChinaFACE-O3** Huiyi Yang
- ▶ **ClimGrass** *



Updates

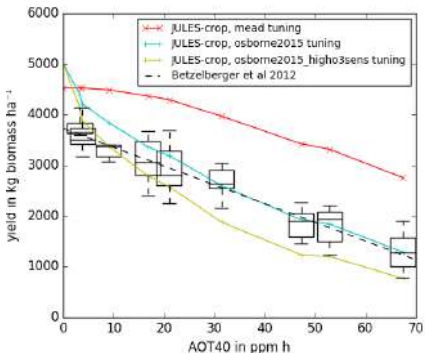


Paper published

Calibrating soybean parameters in JULES5.0 from the US-Ne2/3 FLUXNET sites and the SoyFACE-O3 experiment.

Felix Leung, Karina Williams, Stephen Sitch, Amos P.K. Tai, Andy Wiltshire, Jemma Gornall, Elizabeth A. Ainsworth, Timothy Arkebauer, and David Scoby, **GMD, December 2020**

- ▶ JULES-crop runs for soybean in ambient and elevated ozone rings.





JULES-CNP at AmazonFACE

- ▶ JULES-CNP: Carbon, nitrogen, phosphorus
- ▶ Paper in prep: Nakhavali et al
- ▶ See André's presentation at the JULES vegetation module meeting (video on the JULES Yammer group)

Representation of Phosphorus cycle in
JULES model

Mohd (André) Nakhavali
In UK: Lisa Marsden, Stephen Sibley, Jan Horley, Kelly Anderson
In Brazil: Beto Querido, Luíza Ináti, Fernanda V. Cunha, Raffaella d. Farias

JULES

Study site

Plant
Leaves, stem growth,
stem, roots, litter, wood,
stem and root C, N, P, LMA

Soil
Organic/inorganic C, N
and sulphur; Soil P,
Plant residues,
Occulted P

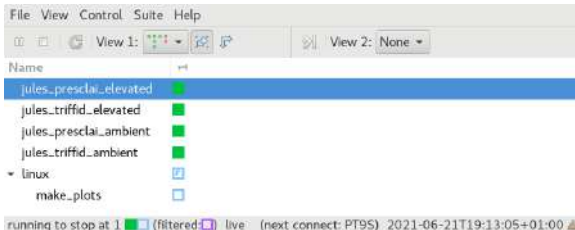


JULES at BIFoR FACE

The rose suite does 6 JULES runs:

- ▶ spinup, then ambient and elevated CO₂
- ▶ with LAI and canopy height prescribed from observations, or with LAI and canopy height calculated by TRIFFID model within JULES.

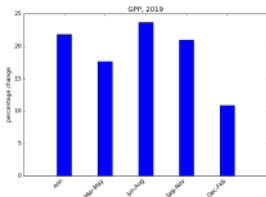
then creates plots of output variables.



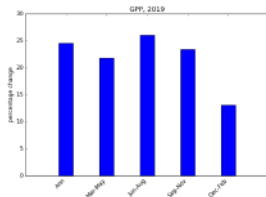


Preliminary results

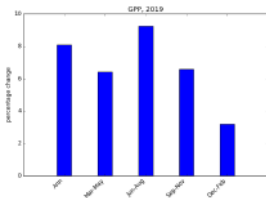
JULES-CN, (too) water stressed



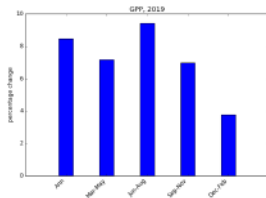
JULES-ES, (too) water stressed



JULES-CN, water stress switched off



JULES-ES, water stress switched off



All: prescribed LAI and canopy height, TOPMODEL on, nitrogen limitation off

→ link to sm-stress JPEG



QUINTUS at BIFoR FACE

- ▶ “Quinquennial (half-decadal) carbon and nutrient dynamics in temperate forests: Implications for carbon sequestration in a high CO₂ world”
- ▶ From JULES community: Lina Mercado, André Nakhavali, Debbie Hemming, Rachael Turton, Doug Clark.
- ▶ Includes André’s work on JULES-CNP at BIFoR FACE.



image credit: BIFoR



ClimGrass Model Intercomparison Project

- ▶ Coordinated by Silvia Caldararu, Sönke Zaehle, Jesse Radolinski, Michael Bahn
- ▶ Grassland, Alps
- ▶ Warming, elevated CO₂, drought (54 plots)





JULES-FACE Working Group

- ▶ FACE experiment results are a very useful resource for understanding and improving JULES response to CO₂ and O₃.
- ▶ JULES-FACE working group continues to build network, compile studies and suites.
- ▶ Lots of ongoing and planned work at these sites across the network.
- ▶ Link to other groups e.g. SM-stress JPEG.

Get in touch if you'd like to join the network:

<https://code.metoffice.gov.uk/trac/jules/wiki/JulesFace>