

JULES Soil Biogeochemistry

Module leaders – Eleanor Burke and Noah Smith

Current activities

Fortnightly soil biogeochemistry chats, Wednesday morning, please do join! (email n.smith7@exeter.ac.uk)

- New bgc configuration (WEIMIP, see Juliette Bernard's talk)
- Methane (Juliette Bernard and Janice Liu)
- JULES-Peat (Mothership NERC large grant)
- JULES-CNP (Peter Cook)
- Pyrogenic carbon (Oscar Kennedy-Blundell)
- UKESM2 Permafrost Carbon (Eleanor Burke)

New biogeochem config (JULES-WEIMIP)

→ **See Juliette Bernard's talk!** (J.Bernard@exeter.ac.uk)

- Dependence of soil respiration on soil moisture @ Sarah Chadburn & Elise Dehaen et al. (2025)
- Geothermal Heat flux @Noah Smith
- Biogenic heating of soil carbon decomposition @Joe Clarke
- Permafrost developments @Eleanor Burke & Rémi Gaillard
- BVOC Emissions, emission factors as used in UKESM2 @Garry Hayman
- Changes in soil ancillaries
 - account for organic matter @Rémi Gaillard's talk
 - account for tropical altered soils @Juliette Bernard & Nic Gedney
- Wetland methane emissions @Sarah Chadburn & Juliette Bernard
- Fires: dependence of flammability on environmental conditions @Eleanor Burke & Eddy Robertson & Chantelle Burton

JULES-Peat (mainly Mothership)

Moss PFT – Rachael Turton → Emma Littleton

- Moss photosynthesis and productivity (no stomatal control)
- Physics of surface layer

Peatland hydrology – Noah Smith

- Parametrising and upscaling drainage (and rewetting) from bogs in England and Scotland

New accumulation scheme – Noah Smith

- Dynamically variable layers and decoupling of carbon & physics layers

ISIMIP peat sector – Rachael Turton

- Hydrology paper (Michel Bechtold), Carbon paper (Rachael Turton)

Site flux suite and future scenarios – Garry Hayman & Katie Blackford

Elise Dehaen – completed PhD using JULES peat in tropics!

Pyrogenic carbon

Oscar Kennedy-Blundell - O.J.Kennedy-Blundell@exeter.ac.uk **(see talk!)**

- Site runs in the Amazon
- Set quantities of IOM are added to soil per fire alongside RPM
- Different degradation constants applied to the IOM pool
- Standard INFERNO ignition approaches used (i.e. constant ignitions)

Future plans:

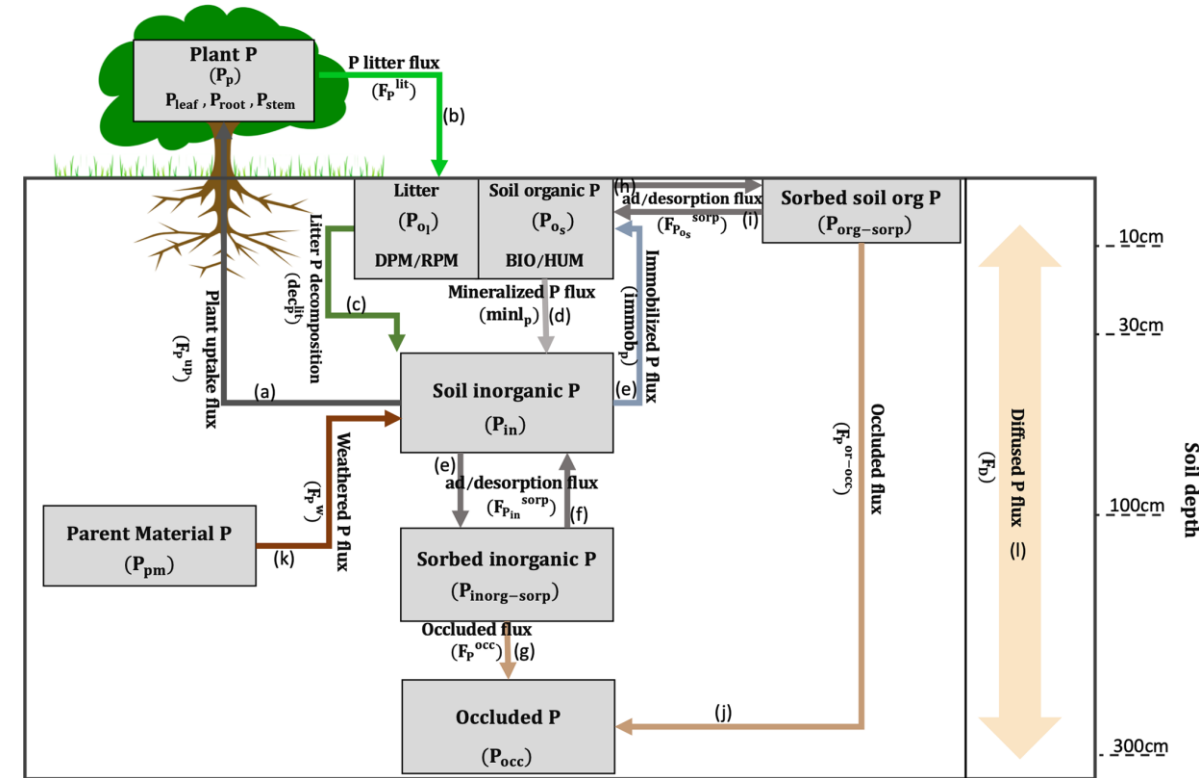
- Prescribed burnt area applied alongside standard ignition methods
- Multi-pool approach with fires producing RPM, HUM and IOM alongside emissions
- PFT-specific pool quantities
- Pool relative proportions varying with flammability

JULES-CNP

Peter Cook – see talk!

(P.A.Cook@exeter.ac.uk)

- JULES with Phosphorus chemistry, developed by Mahdi Andre Nakhavali, working code by Jefferson Goncalves De Souza
- Running at AmazonFACE
- Suite by Carolina Duran Rojas (u-dk173)



(Nakhavali et al., 2022)

Methane

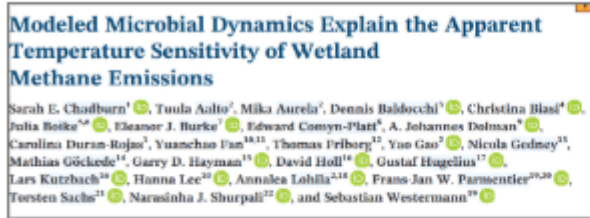
Juliette Bernard (see talk!)

juliette.bernard@obspm.fr

Wetland microbial methane with WTD subgrid

- microbial module

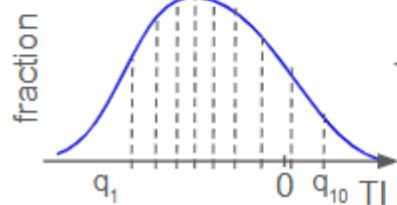
@Sarah Chardburn et al. (2020)



- accounting for a water table subgrid

@Sarah Chardburn & Juliette Bernard

10 topographic index subgrid



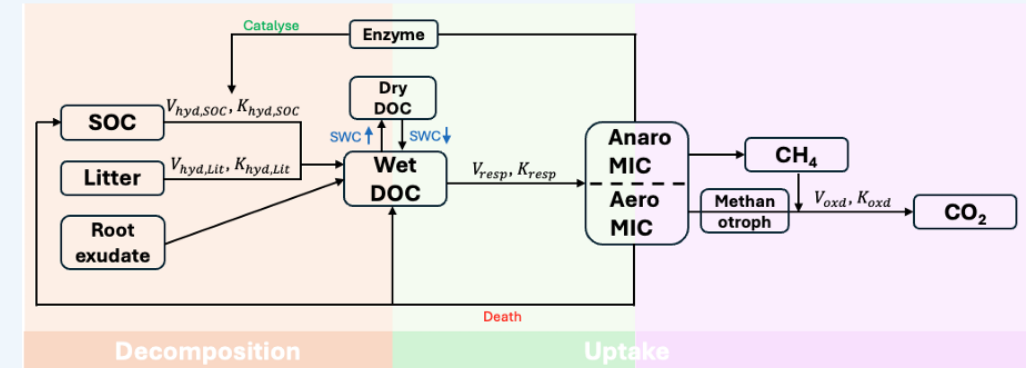
JULES
calculation

10 water table subgrids

topographic index (TI) distribution provided as ancillaries derived from [Marthews et al. \(2015\)](#)

Janice Liu - Y.Liu13@exeter.ac.uk

Dual Microbial Pools Process-based Soil GHG Emission Model



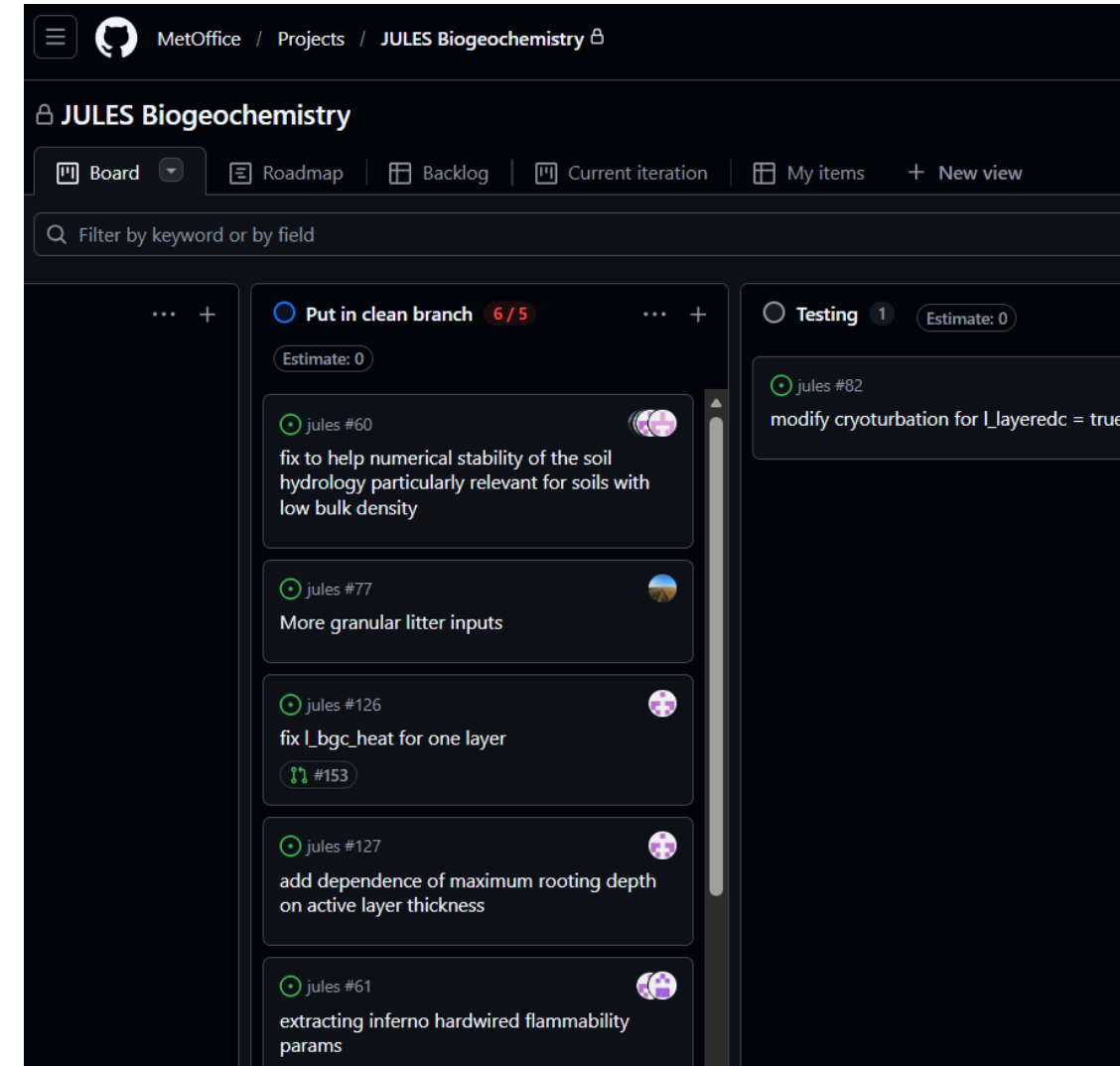
Highlights:

- Coupled CO₂–CH₄ framework under fluctuating water tables.
- Unified oxygen–moisture control on aerobic – anaerobic microbial dynamics
- Soil carbon inputs of different degradation kinetics (SOC, litter, root exudate).
- Wet–Dry DOC pool transition to capture the Birch effect.
- Simplified diffusion representation avoids fine vertical discretisation while enabling gas accumulation–loss dynamics

Trunk submissions

8.2

- The form of the relationship between soil decomposition and soil moisture is controlled by cs_decomp_soil_moist_func, allowing for reduced decomposition in very wet soils. (#72)
- Heating from decomposition of soil is included via switch l_bgc_heat. (#111)



Github 'Project' board