JULES soil biogeochemistry (and IMOGEN)

Eleanor Burke and Noah Smith

Ask people named on each slide for more details

Microbial heating from soil carbon decomposition

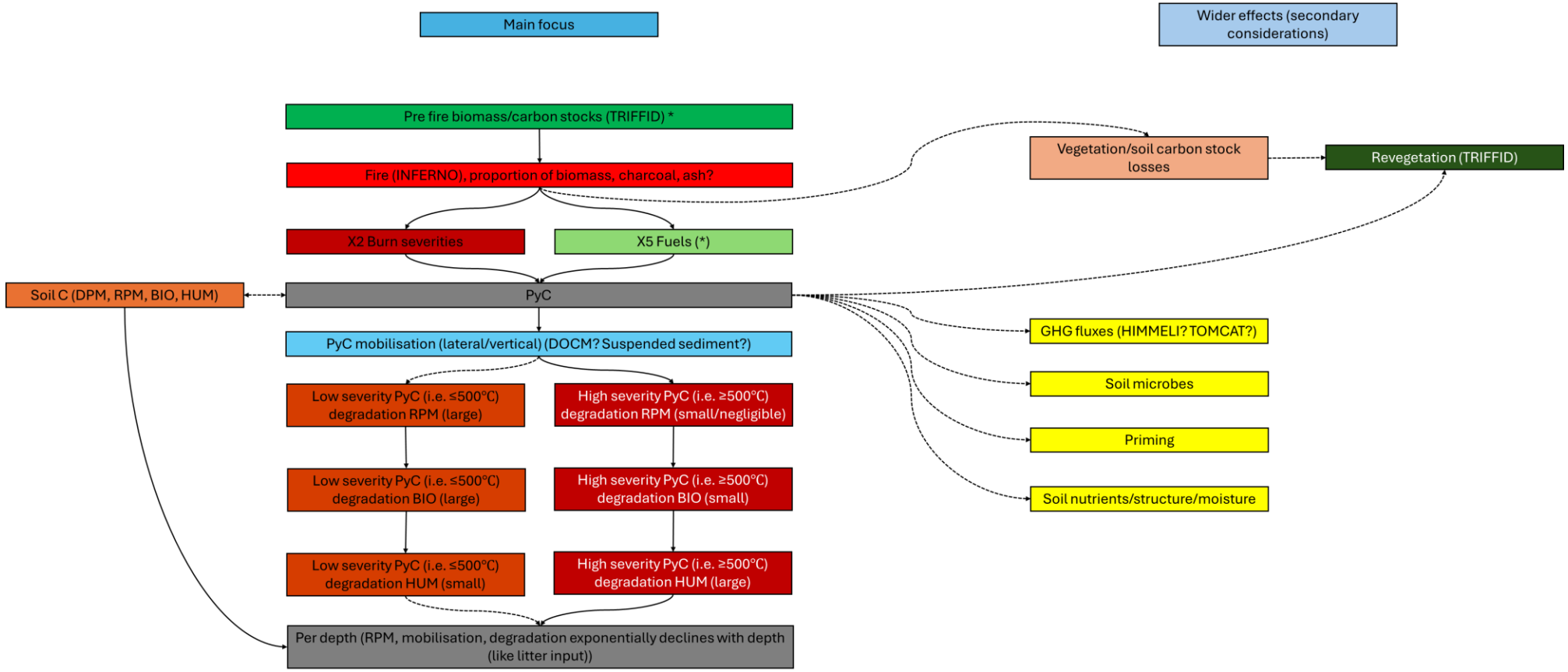
- Joe Clark, Exeter University

- Planning to get this into the trunk of JULES in the next few months.

Adding a pyrogenic carbon pool to JULES

- Oscar Kennedy-Blundell, University of Exeter
- RothC, INFERNO and TRIFFID used to model PyC production and subsequent degradation

Initial thoughts of processes required



Layered soil carbon and fire emissions interacting

- Eleanor Burke (UKMO) – for UKESM2
- JULES ticket #1514
- Can prescribe depth of burn in the soil and take the soil carbon fire emissions from the relevant soil carbon layer.

JULES-PEAT

Includes developments related to:

- Accumulating carbon
- Calculating water table depths (2 options: l_nic_zw, l_noah_zw)
- Soil moisture and baseflow
- Updating the soil hydraulic properties to take account of changing organic soil content (l_dynamic_soilprops)
- (very) basic ponding
- Reducing respiration at high soil moisture (fsth_wet_lessdecomp)
- moss pft

Suite available to run site simulations for range of sites: u-an231_accumulate_soil

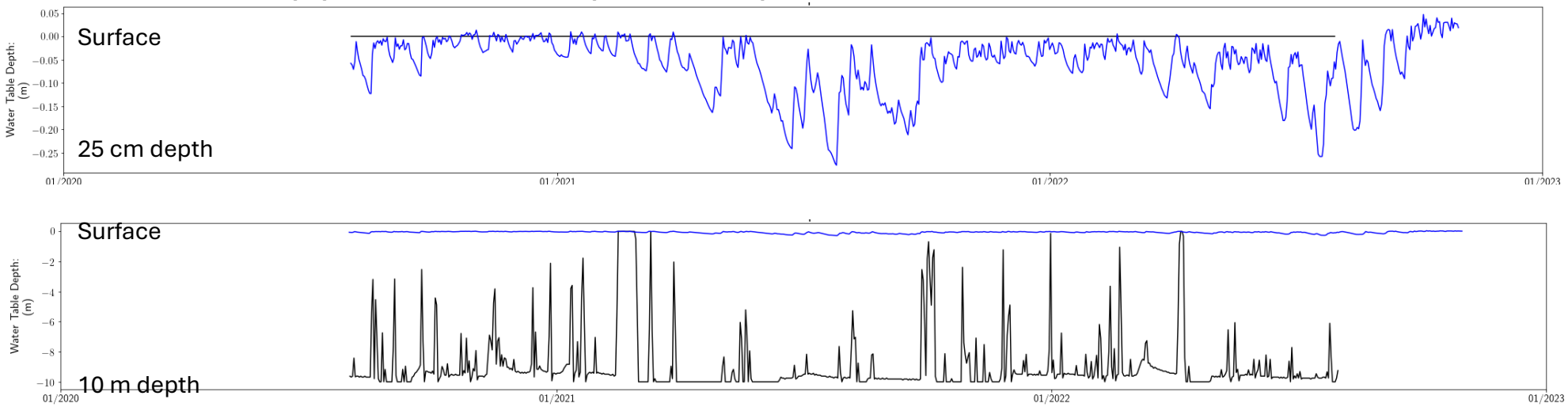
https://code.metoffice.gov.uk/trac/jules/browser/main/branches/dev/eleanorburke/vn7.4_accumulate_soil

JULES-peat in temperate peatlands

UKCEH (G Hayman, E Blyth, R Turton, J George), U. Exeter (N Smith, S Chadburn, A Gallego-Sala) & Met Office (E Burke)

- Develop peatland capability (both hydrological and carbon cycling) in JULES as part of the MotherShip NERC large grant,
- Suites developed to run JULES-PEAT at UK flux sites, using either local site meteorology or the CHESS Met dataset.

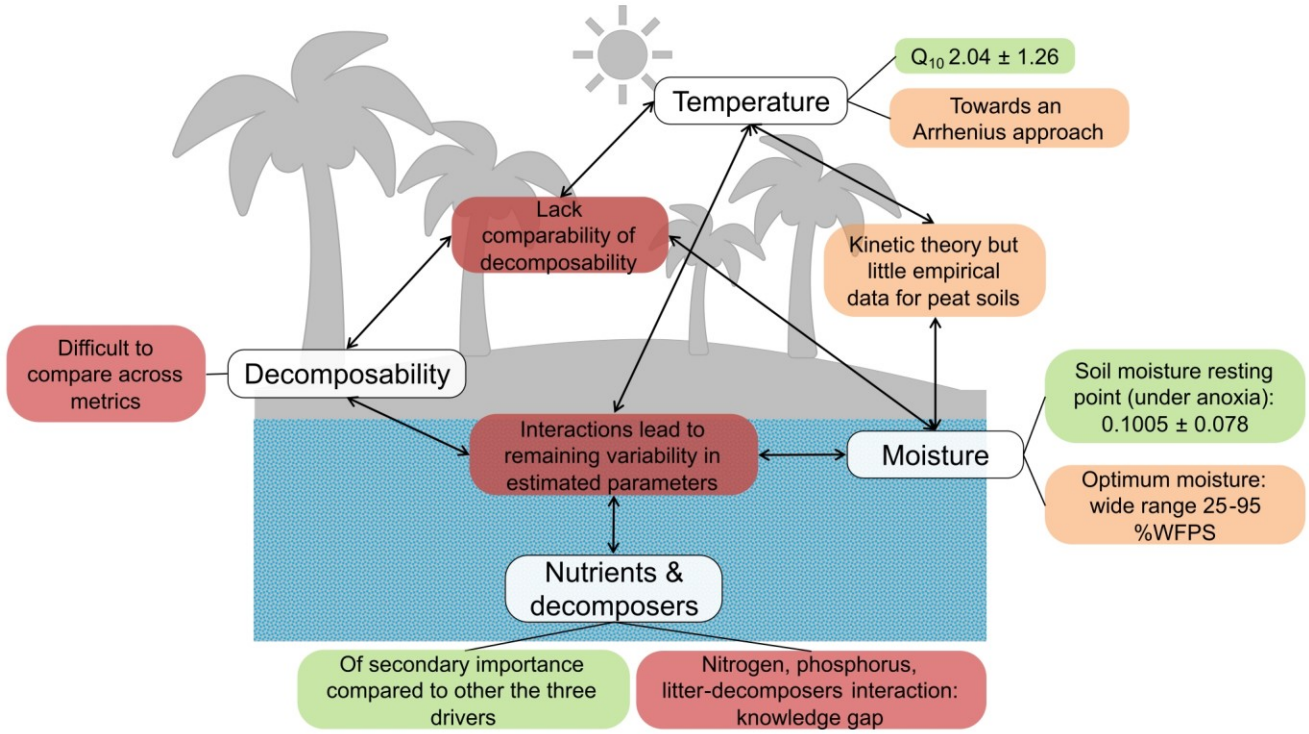
Water table depth highly dependent on settings (black model, blue obs). Difference between top plot and bottom plot is the presence of baseflow in JULES.



Hydrology is being developed as part of MotherShip to improve representation of peat

JULES-peat in tropics

- Elise Denham and Angela Gallego-Sala, University of Exeter
- Peter Cook (see talk) and Richard Betts, University of Exeter

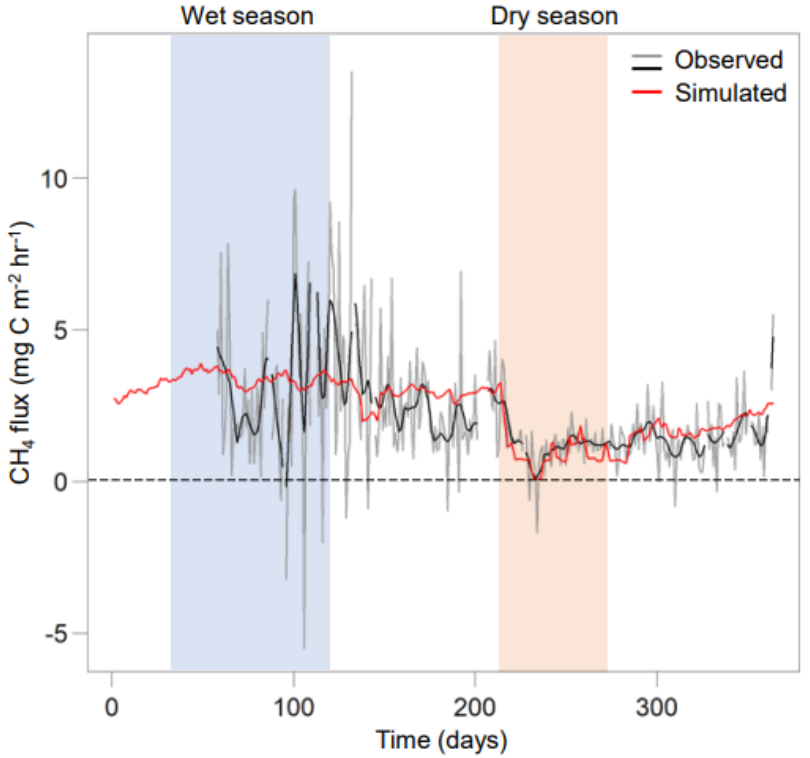


Parametrisation of the soil heterotrophic respiration in RothC using observations (Elise).

Microbial modelling of CH4 in tropical peatlands

- Jorge Ramirez and Angela Gallego-Sala, University of Exeter
- Vacancy to work with Eleanor Burke and Richard Betts at Exeter (https://jobs.exeter.ac.uk/hrpr_webrecruitment/wrd/run/etrec179gf.open?WVID=171839ediw&LANG=USA&VACANCY_ID=557359l2Pm)

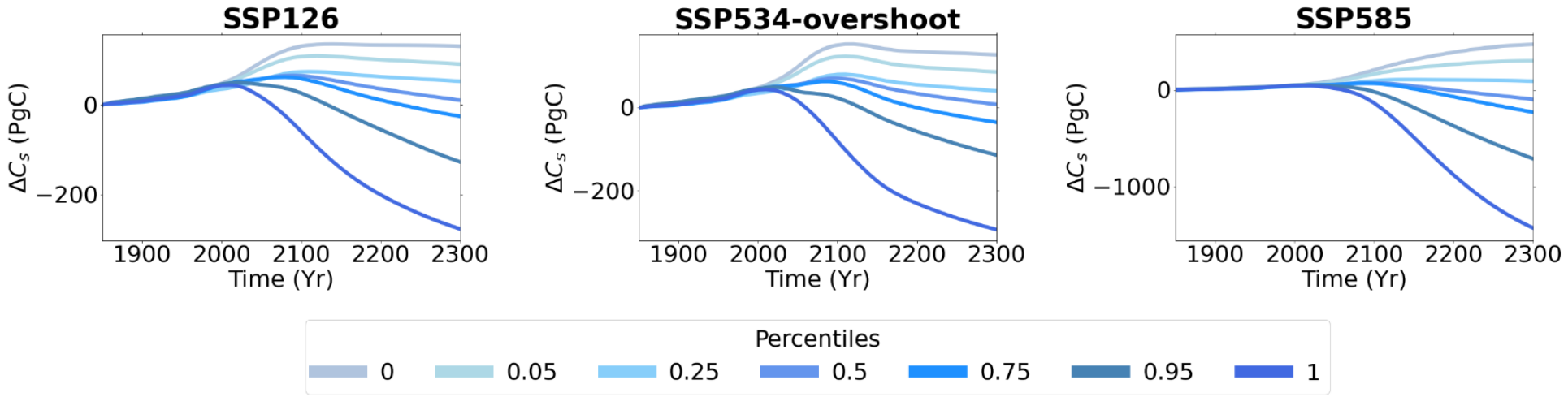
Methane fluxes from a site in Peru using the microbial methane model from JULES.



IMOGEN driven by global mean temperature

Rebecca Varney, Eleanor Burke et al.

- Used in a framework called PRIME (EGUsphere - A rapid application emissions-to-impacts tool for scenario assessment: Probabilistic Regional Impacts from Model patterns and Emissions (PRIME) (copernicus.org))

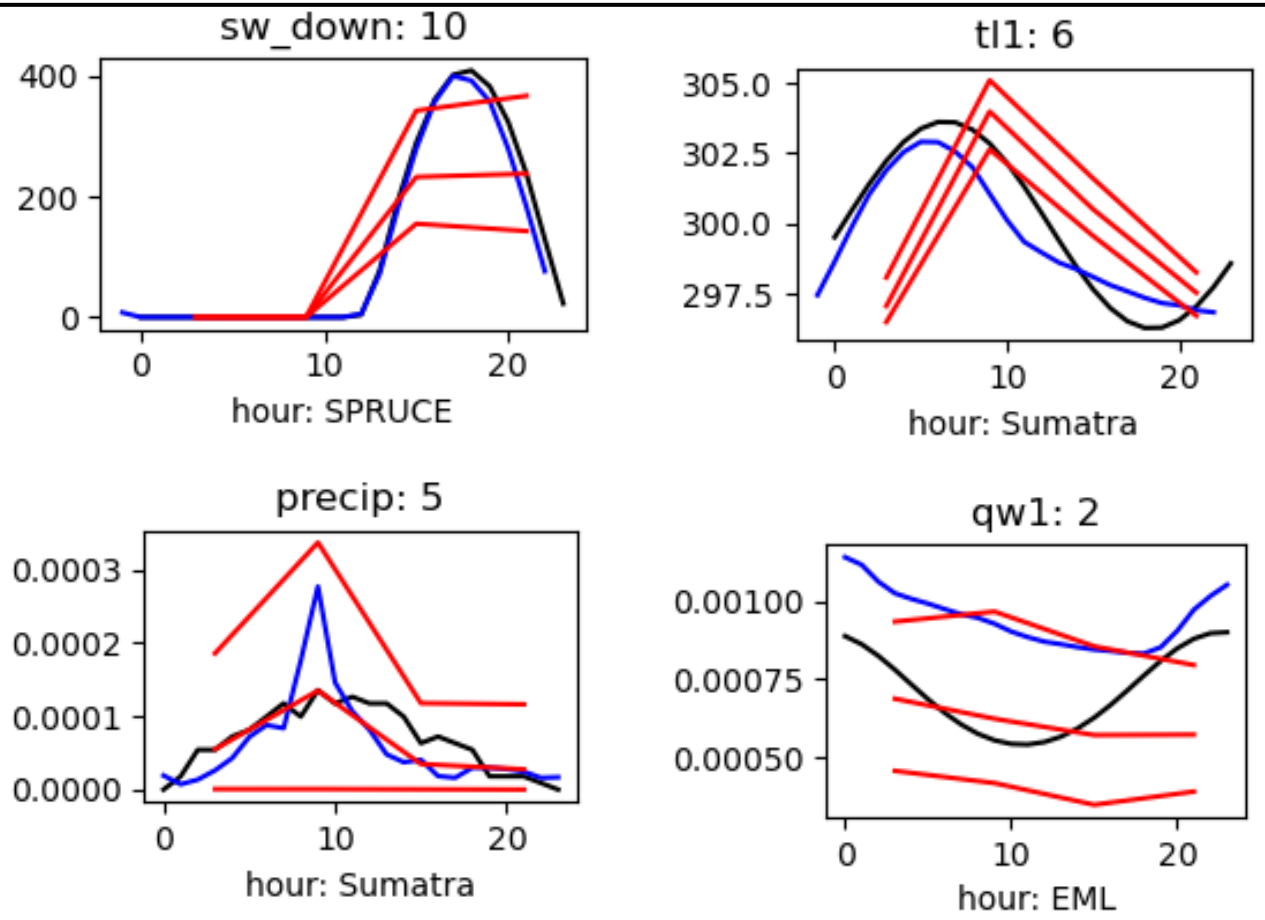


Probabilistic change in soil carbon under future scenarios simulated using the PRIME framework.

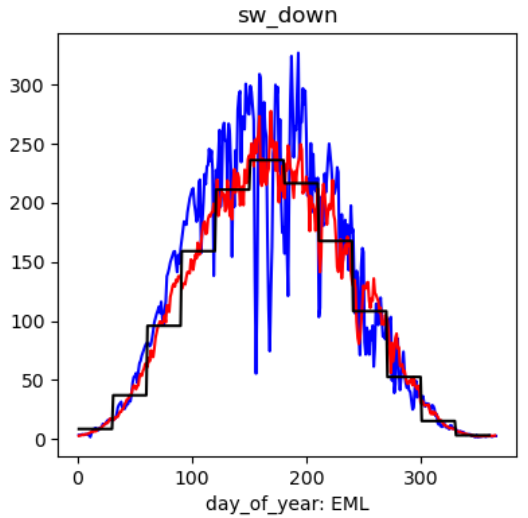
Planning to put the ability to drive IMOGEN by global mean temperature into the trunk.

Create driving data for future scenarios for JULES using IMOGEN

Patterns of climate change from CMIP6 models multiplied by global mean temperature as anomalies superimposed on a given climatology.



Comparison of diurnal variation for given month of year, given variable and given location. Blue – ERA5, Red – 6 hourly CRU-JRA, with uncertainty range, Black IMOGEN weather generator.



Ideally apply anomalies to a daily climatology – black monthly climatology, red daily climatology.