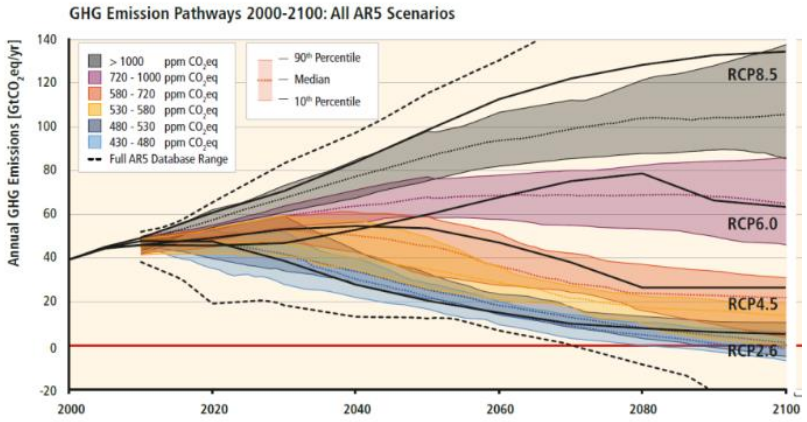
JULES-IMOGEN
a useful tool

Eleanor Burke and Chris Huntingford

What is IMOGEN?

- An intermediate complexity climate model used to evaluate global and region terrestrial impacts of a changing climate
- Uses a pattern-scaling approach to climate change to drive a gridded version of JULES
- Emulates a range of future pathways representative of the available GCM simulations
- Includes radiative forcing from both CO_2 and CH_4

GMD - IMOGEN: an intermediate complexity model to evaluate terrestrial impacts of a changing climate (copernicus.org)



Prescribed Anthropogenic Emissions

Atmospheric Composition

Simple Ocean Uptake Model

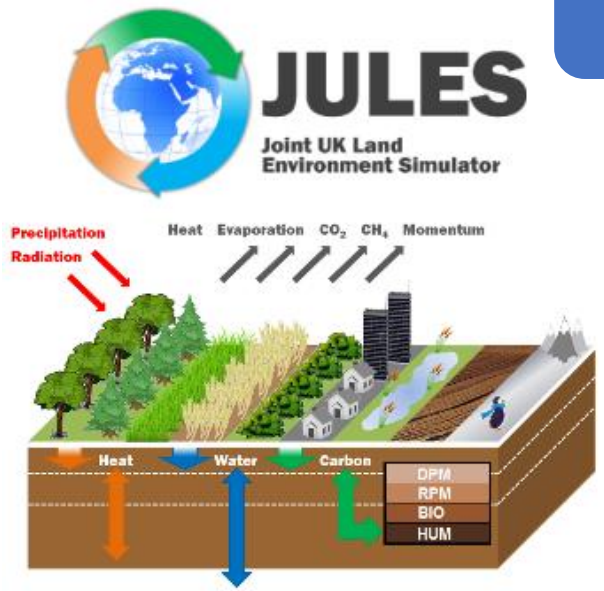
Energy Balance Model

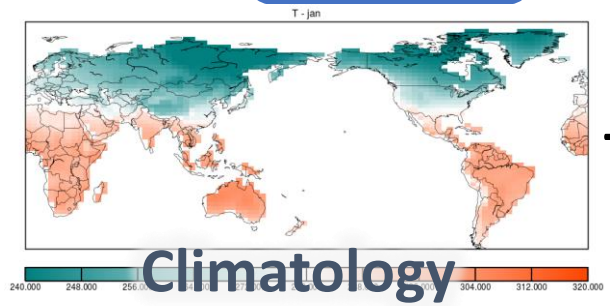
IMOGEN

JULES Estimates Land Carbon Exchange

Global Warming

Pattern Scale of Met Data from 34 GCMs





Climatology

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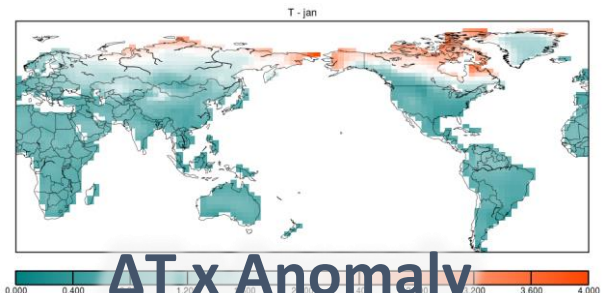
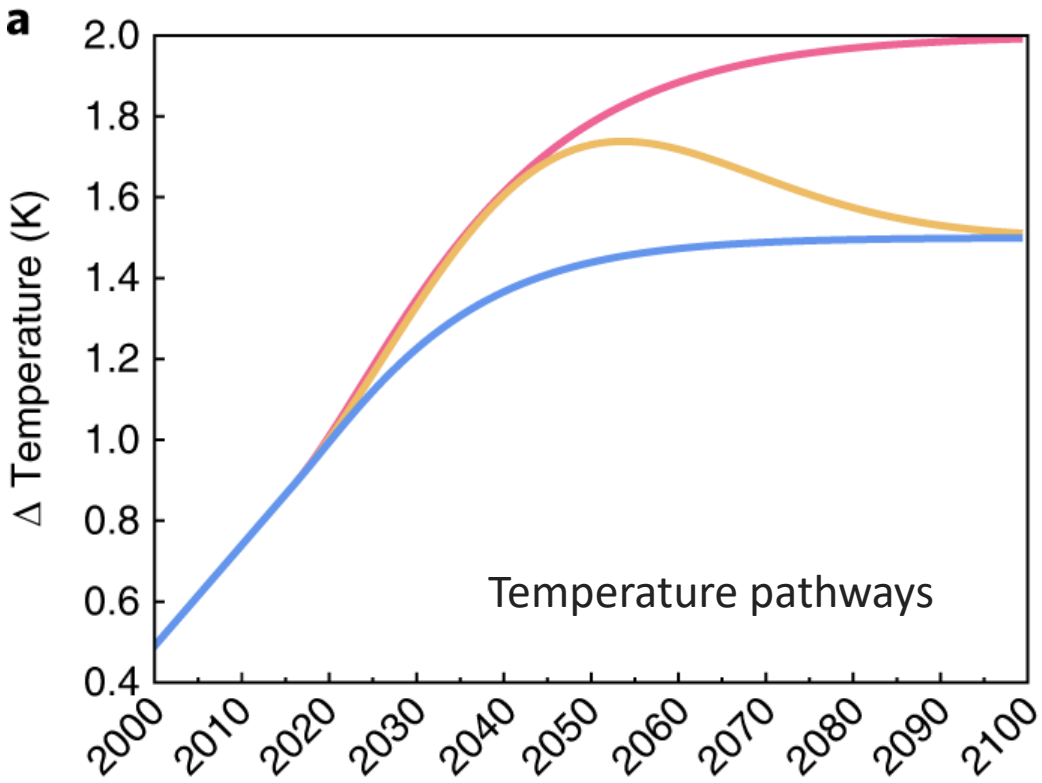


ΔT x Anomaly

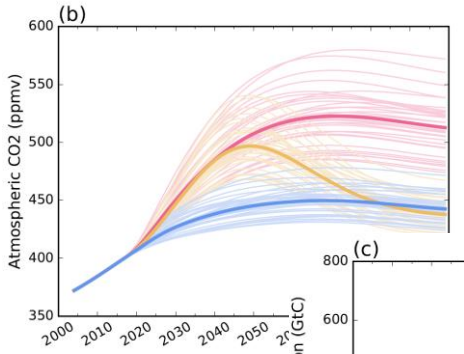
[GMD - IMOGEN: an intermediate complexity model to evaluate terrestrial impacts of a changing climate (copernicus.org)]

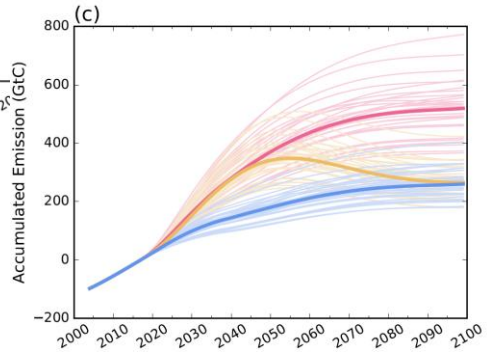
Inverted IMOGEN

- Follows prescribed global warming pathways



[ESD - Flexible parameter-sparse global temperature time profiles that stabilise at 1.5 and 2.0 °C (copernicus.org)]





Derived Anthropogenic Emissions

Atmospheric Composition

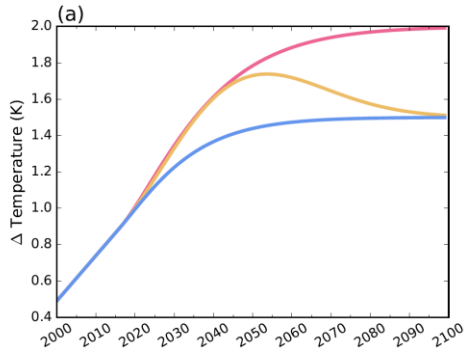
Simple Ocean Uptake Model

Inverted Energy Balance Model

IMOGEN^{-1}

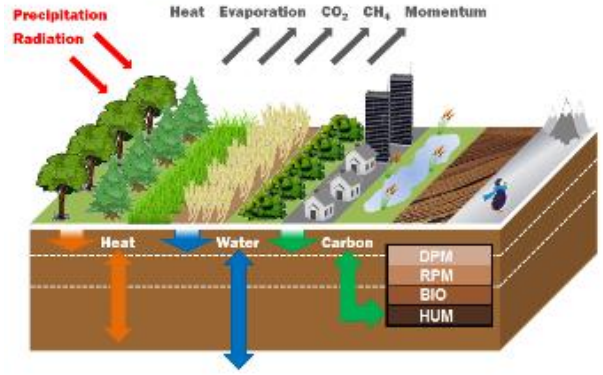
JULES Estimates Land Carbon Exchange

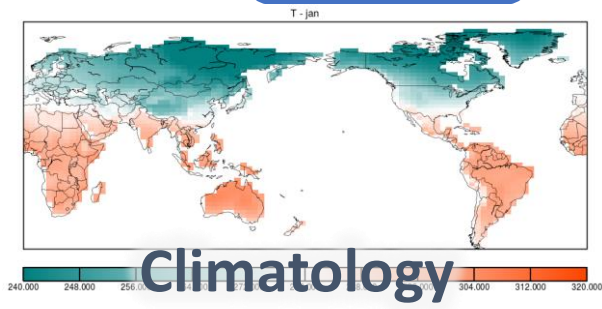
Global Warming



Pattern Scale of Met Data from 34 GCMs

JULES
Joint UK Land Environment Simulator





Climatology

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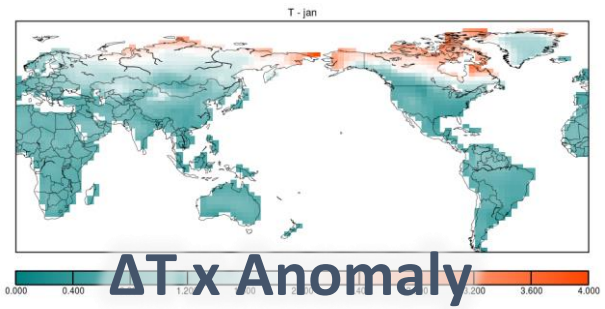


ΔT x Anomaly

Carbon budgets for 1.5 and 2 °C targets lowered by natural wetland and permafrost feedbacks | Nature Geoscience

Selected applications

Significant feedbacks of wetland methane release on climate change and the causes of their uncertainty (iop.org)

Carbon budgets for 1.5 and 2 °C targets lowered by natural wetland and permafrost feedbacks | Nature Geoscience

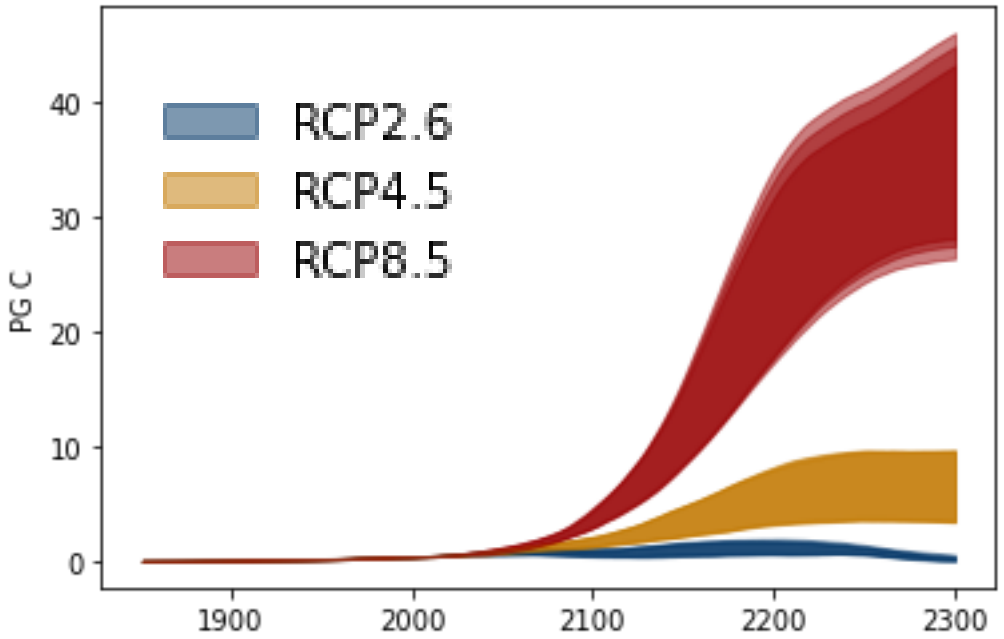
Land-use emissions play a critical role in land-based mitigation for Paris climate targets | Nature Communications

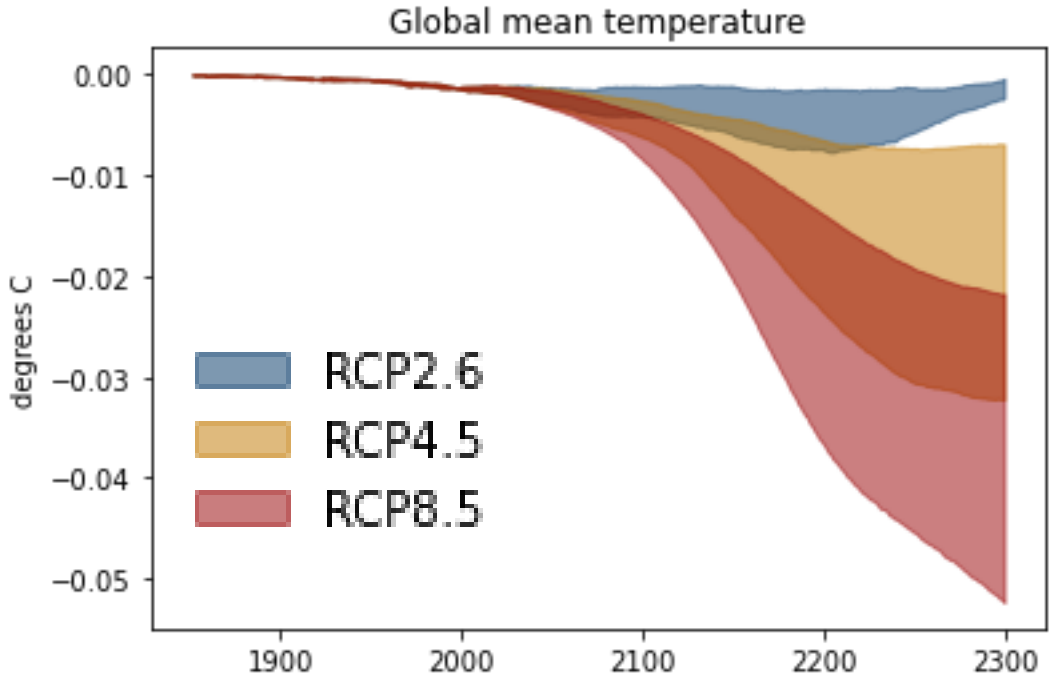
ESD - Regional variation in the effectiveness of methane-based and land-based climate mitigation options (copernicus.org)

CO2 loss by permafrost thawing implies additional emissions reductions to limit warming to 1.5 or 2 °C - IOPscience

Thawing permafrost as a nitrogen fertiliser: implications for climate feedbacks

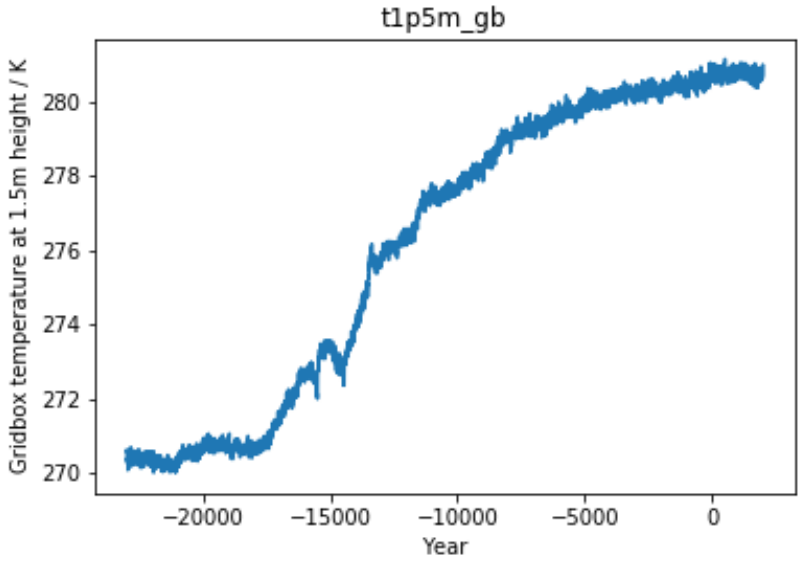
Increase in vegetation C after N fertilization from thawing permafrost.





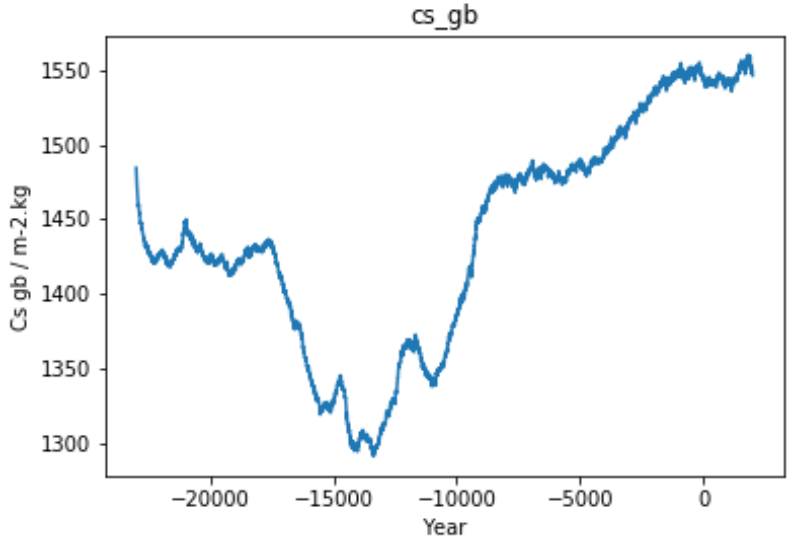
Negative feedback onto global mean temperature

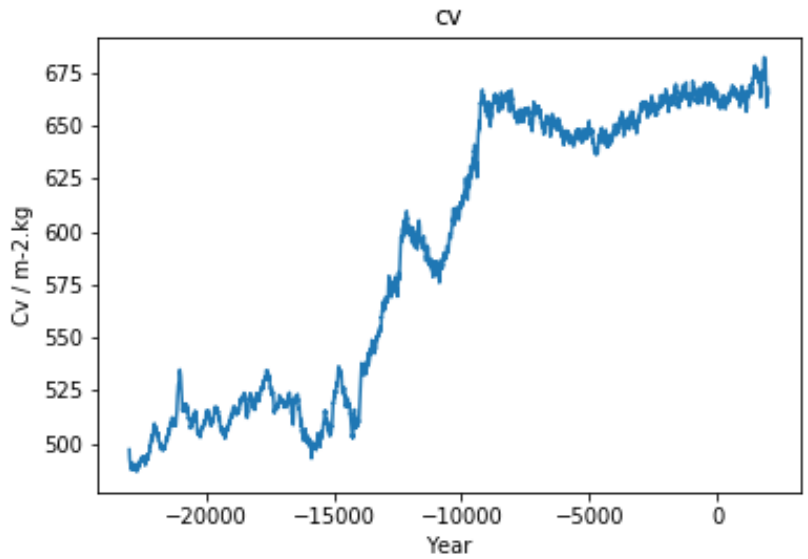
Paleo-JULES-IMOGEN



Preliminary work setting up a paleo simulation with JULES-IMOGEN.

Not quite finished because has a present-day ice-sheet.





Future directions

Testing the impact of multiple climate feedbacks including permafrost, fire and landuse.

Updating scenarios and driving GCM patterns to CMIP6 and increasing resolution to 0.5 degrees.

Possible linking with the FAIR climate model.