

# ISIMIP runs using JULES

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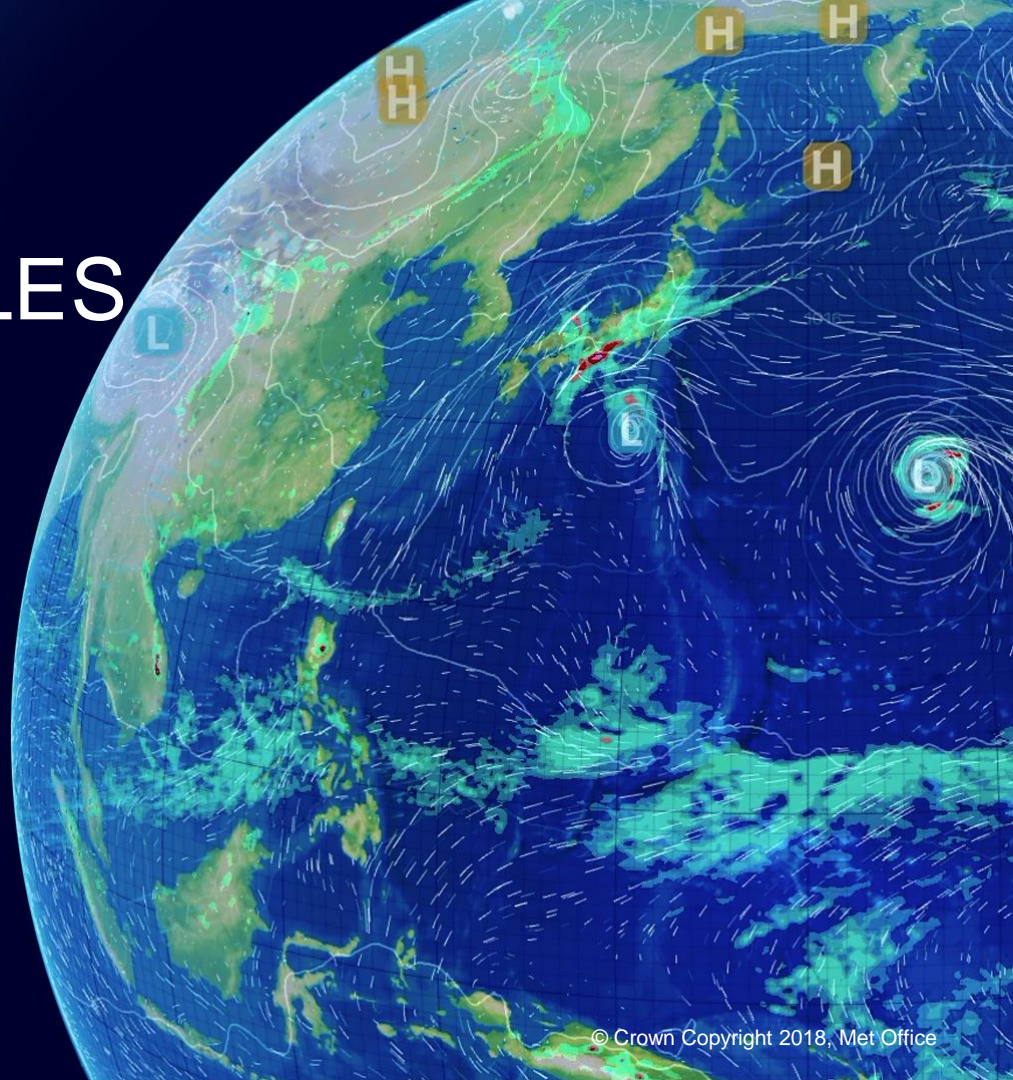
Anne Gädeke



Aris Koutroulis and Manolis  
Grillakis



11<sup>th</sup> September 2020



# Outline

What is ISIMIP

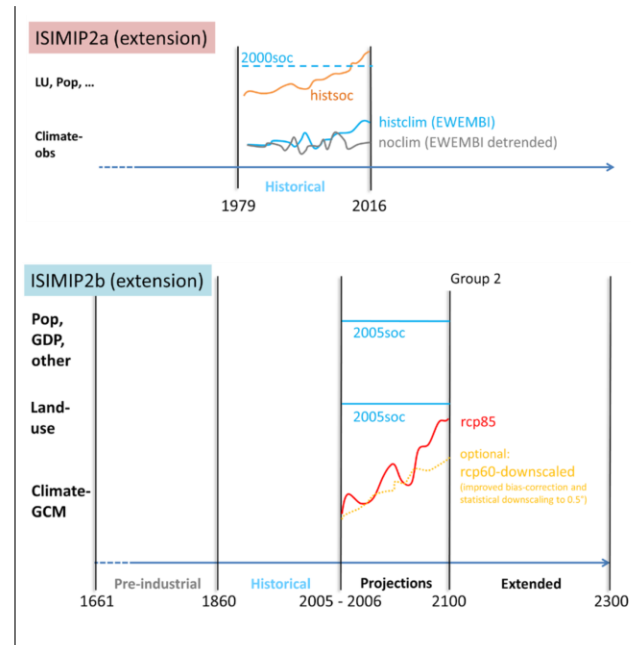
Running JULES for ISIMIP2b and 3

ILAMB analysis of ISIMIP2b runs

Details for keeping up to date or being involved

# What is ISIMIP?

- Intersectoral impact Model Intercomparison Project
- Applies a consistent framework for projecting the impacts of climate change across affected sectors and spatial scales.
- Aims to quantify the impacts of climate on multiple sectors, understand uncertainties and look at interactions between different sectors.
- The project began in 2012 with ISIMIP fast track with 35 modelling teams submitting model output.
  - CEH and Met Office contributed simulations for this
- University of Exeter and TUC (Greece) contributed JULES runs to ISIMIP2 through the HELIX project along with more than 60 other modelling groups.



# Running JULES for ISIMIP2b and 3a

## Met Office ISIMIP2b and 3a simulations start from JULES-ES config

- Includes N deposition, land-use (crops and pastures)
- Includes TRIP river routing.
- Includes triffid and triffid crops
- Yield is a possibility but not definite yet.
- No fire currently.

## Contributing to ISIMIP2b and 3 for

- Biomes
- Hydrology
- Permafrost

## ISIMIP2b simulations completed for historical, RCP2.6 and RCP6.0 and postprocessed (not yet submitted).

## ISIMIP2b simulations have been run through ILAMB

## Met Office ISIMIP3 simulations to include two simulations:

- 'Standard' simulation – JULES-ES configuration.
- 'Cutting edge' simulation – including newer model developments e.g. fire and permafrost.

## ISIMIP3 to include complementary simulations from the Technical University of Crete

The Crete runs plan to:

- Start from the same ancillaries as Met Office runs.
- Use a land cover fraction map provided from the Met Office.
- Include rivers (RFM or TRIP).
- No triffid or triffid crops.

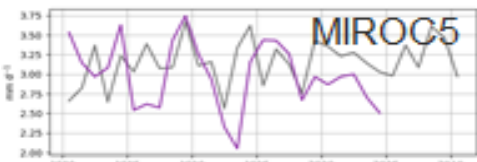
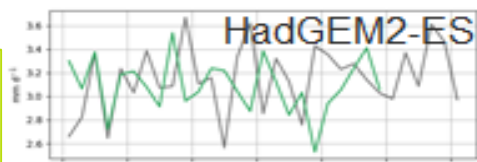
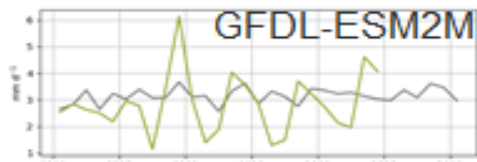


## Features of the simulations

- 0.5° resolution
- Daily timestep, requiring the disaggregator
- Bias corrected driving data.
- Provides information to standardise the inputs for all impacts models:
  - Landuse (crops and pasture)
  - Land sea mask
  - Nitrogen deposition
  - CO<sub>2</sub>
- Strict output protocols for submitting data.

# ISIMIP2b ILAMB analysis: Hydrology

Amazon Runoff versus Dai and Trenberth (2002)

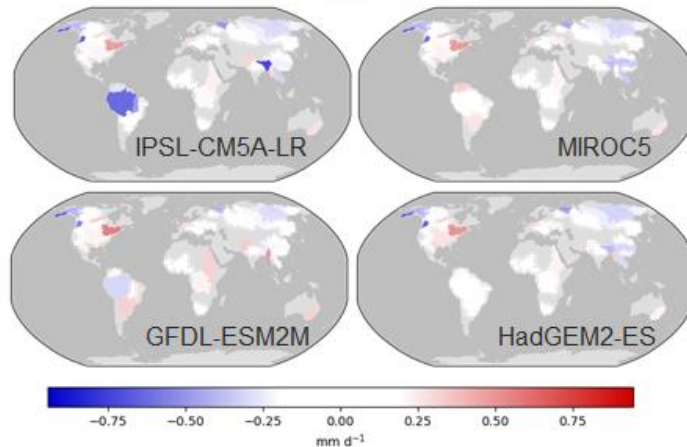


mm d<sup>-1</sup>

1990 to 2010

- Biases in run off vary between the models and catchments.
- Larger biases for all four models for some higher latitude rivers e.g. St Lawrence, Churchill, Yukon, Fraser and the Pechora in Russia.

Runoff Bias versus Dai and Trenberth (2002)



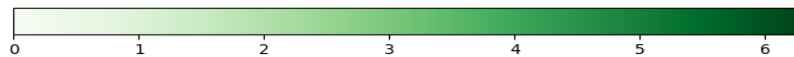
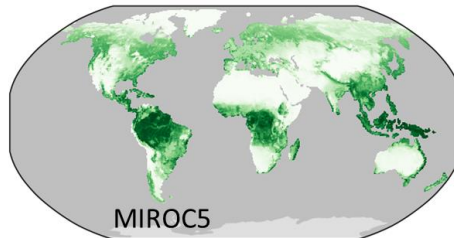
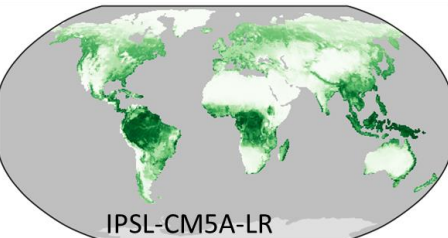
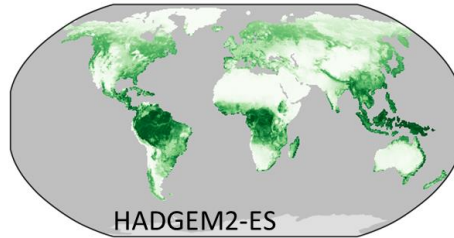
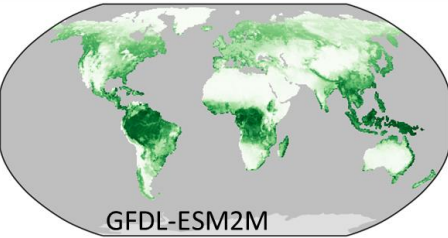
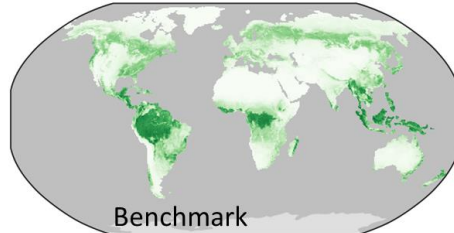
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ISIMIP2b runs include a historical run with the climate from four GCMS superimposed on the driving data.

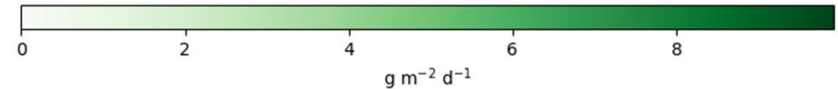
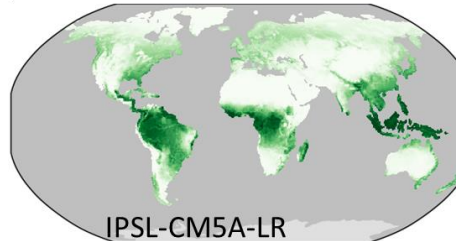
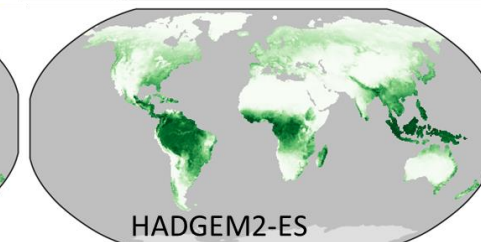
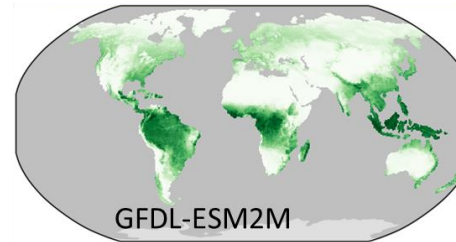
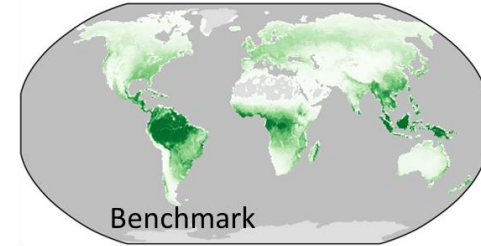


# ISIMIP2b ILAMB analysis: LAI and GPP

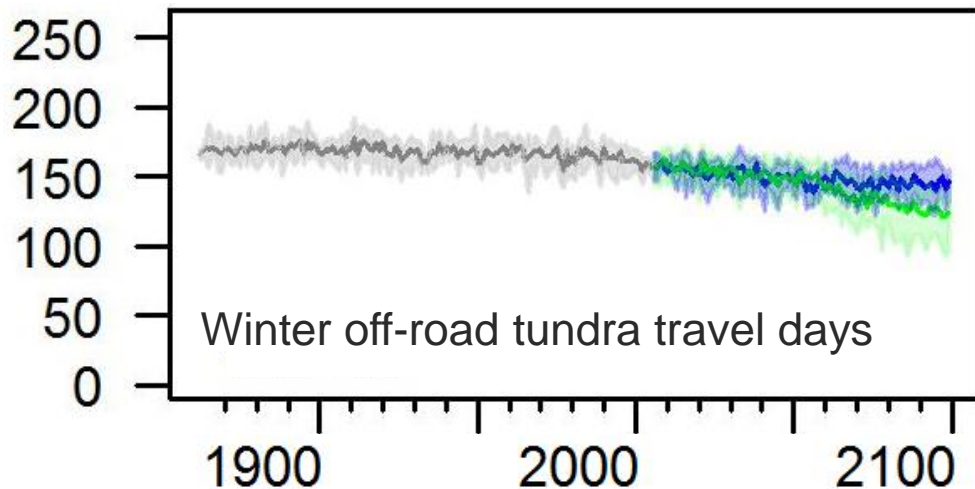
ILAMB ISIMIP2b  
analysis: MODIS Leaf  
Area Index 2000-2005



ILAMB ISIMIP2b  
analysis: GBAF Gross  
Primary Productivity  
1982-2008



- Loss of tundra travel days in high arctic ( $T < -5^{\circ}\text{C}$ , snow depth  $> 20\text{cm}$ )



— Historical  
— RCP2.6  
— RCP6.0

- Historical, 2005: 160 days
- RCP2.6, 2100: 145 days
- RCP6.0, 2100: 129 days

Frozen ground provides a hard surface for vehicles to travel across the otherwise boggy tundra environment and sufficient snow cover is necessary to protect the sensitive tundra vegetation

# Summary and next steps...

## ISIMIP2b simulations have been run for historical, rcp2.6 and rcp6.0

- To make future submissions to large MIPs easier our ISIMIP runs include:
  - New output profiles: designed for use with large MIPs to make postprocessing easier.
  - New postprocessing: designed for use with the new output profiles.
- ISIMIP2b suite provides a starting point for the ISIMIP3 simulations.

## ISIMIP3a simulations:

- Generating new, traceable ancillaries using ANTS.
- Sharing information with the Technical University of Crete.
- Preparing to run ISIMIP3a



# Thanks for listening!

If you want to be involved or keep up-to-date on progress ....

You can email me: [camilla.mathison@metoffice.gov.uk](mailto:camilla.mathison@metoffice.gov.uk)

Or have a look on MOSRS at this page:  
<https://code.metoffice.gov.uk/trac/jules/wiki/JULESIsiMip>

