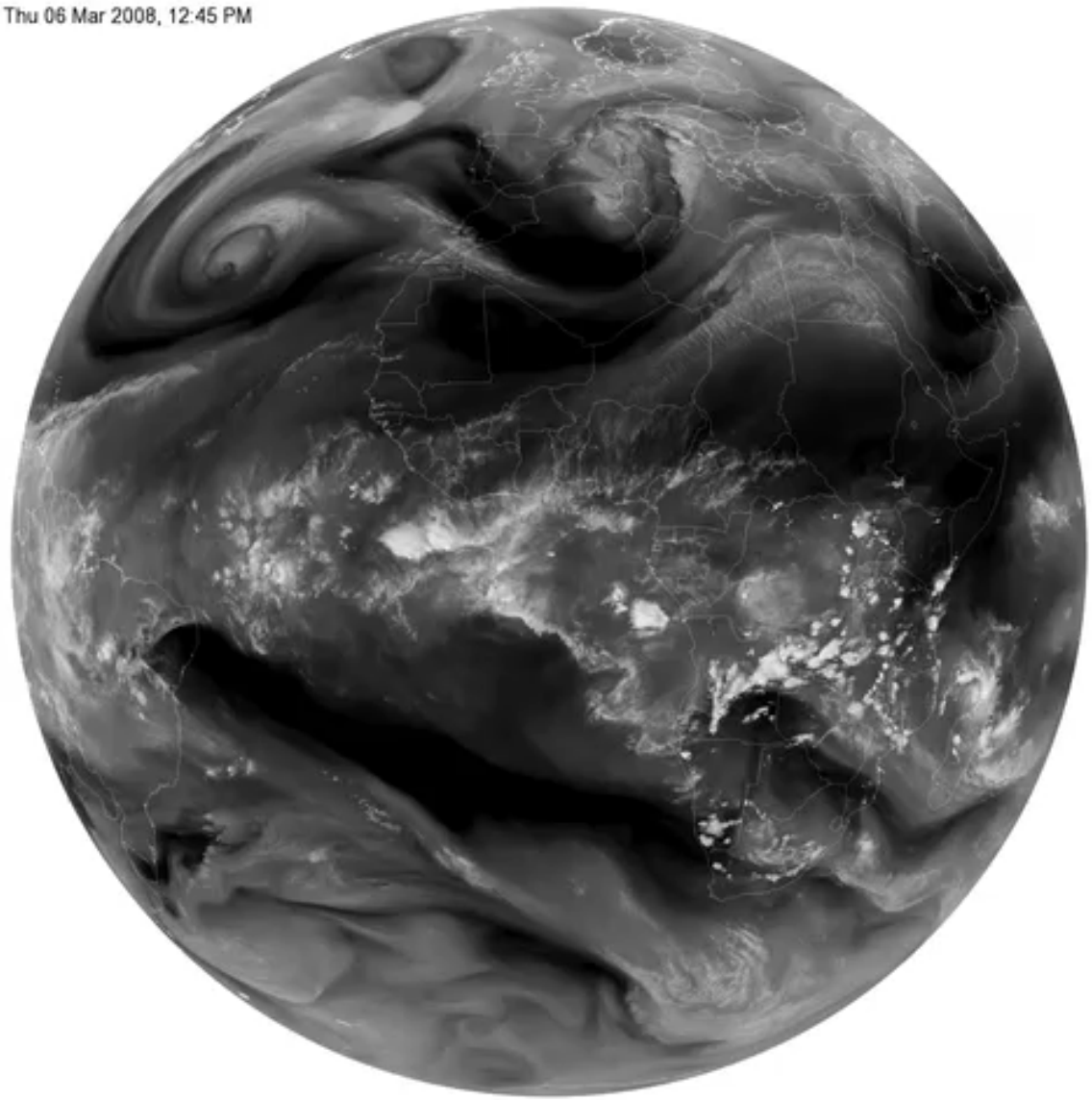
The CORDEX-Africa Impacts Atlas

The provision of regional climate information



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WCRP CORDEX

The CORDEX vision is to advance and coordinate the science and application of regional climate downscaling through global partnerships.

Motivation: Shifting climate perspectives

Africa's ambition for socio-economic transformation and transition to low-carbon (Agenda 2063): Climate resilience of the energy and agriculture systems, and infrastructure.

Climate change science:

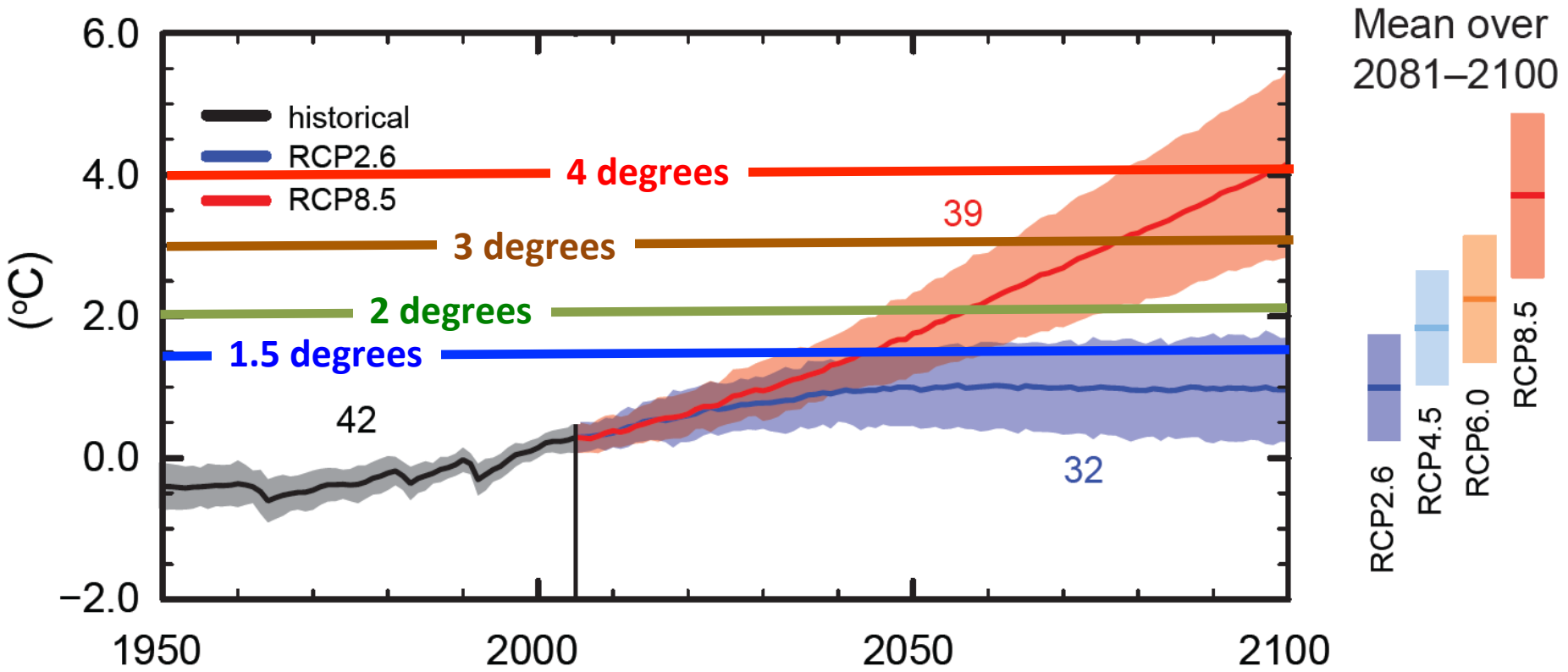
Respond to users-needs, e.g The influence of climatic conditions on the habitability of Africa.

Paris Agreement: Holding the average global temperature to « well below 2°C above pre-industrial levels and to pursue efforts to limit temperature increase to 1.5°C », and perform a 5-yearly global Stocktake.

Invitation to IPCC: Provide a special report in 2018 on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways

Exploring regional responses to global warming targets

Figure SPM.7a
Global average surface temperature change



Regional information is critical

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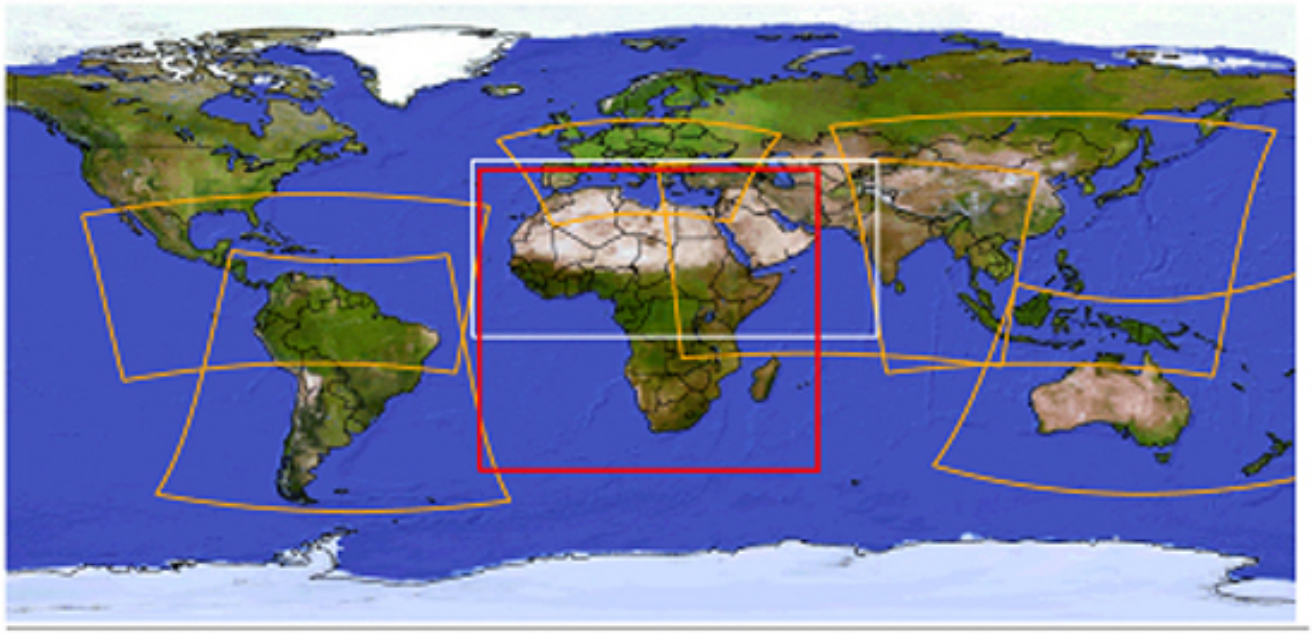

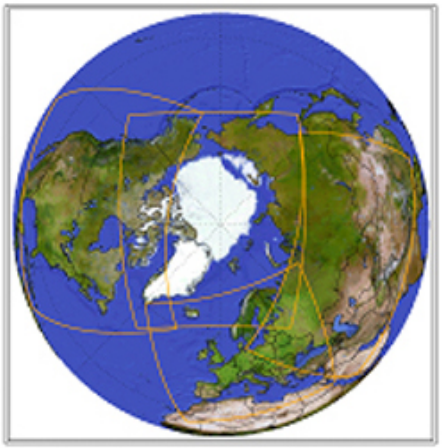

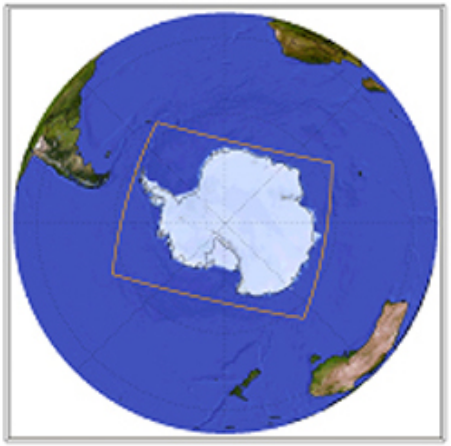

Cordex – Africa

A – Analysis; developing methods and tools to analyse atmospheric processes over Africa and how these may change into the future

F – Foci; addressing key meteorological and impacts knowledge gaps

R – Regional messages; presenting information for key regions of the continent

I – Integrated approach; bringing together climate and vulnerability-impact-adaptation scientists and relevant actors to identify and address key climate vulnerabilities

C – Capacity development; long-term collaboration between African scientists and key global institutions for career development

A – Application and Adaptation; bridging the science-society divide through transforming climate data into actionable information

http://www.csag.uct.ac.za/cordex-africa/

2018

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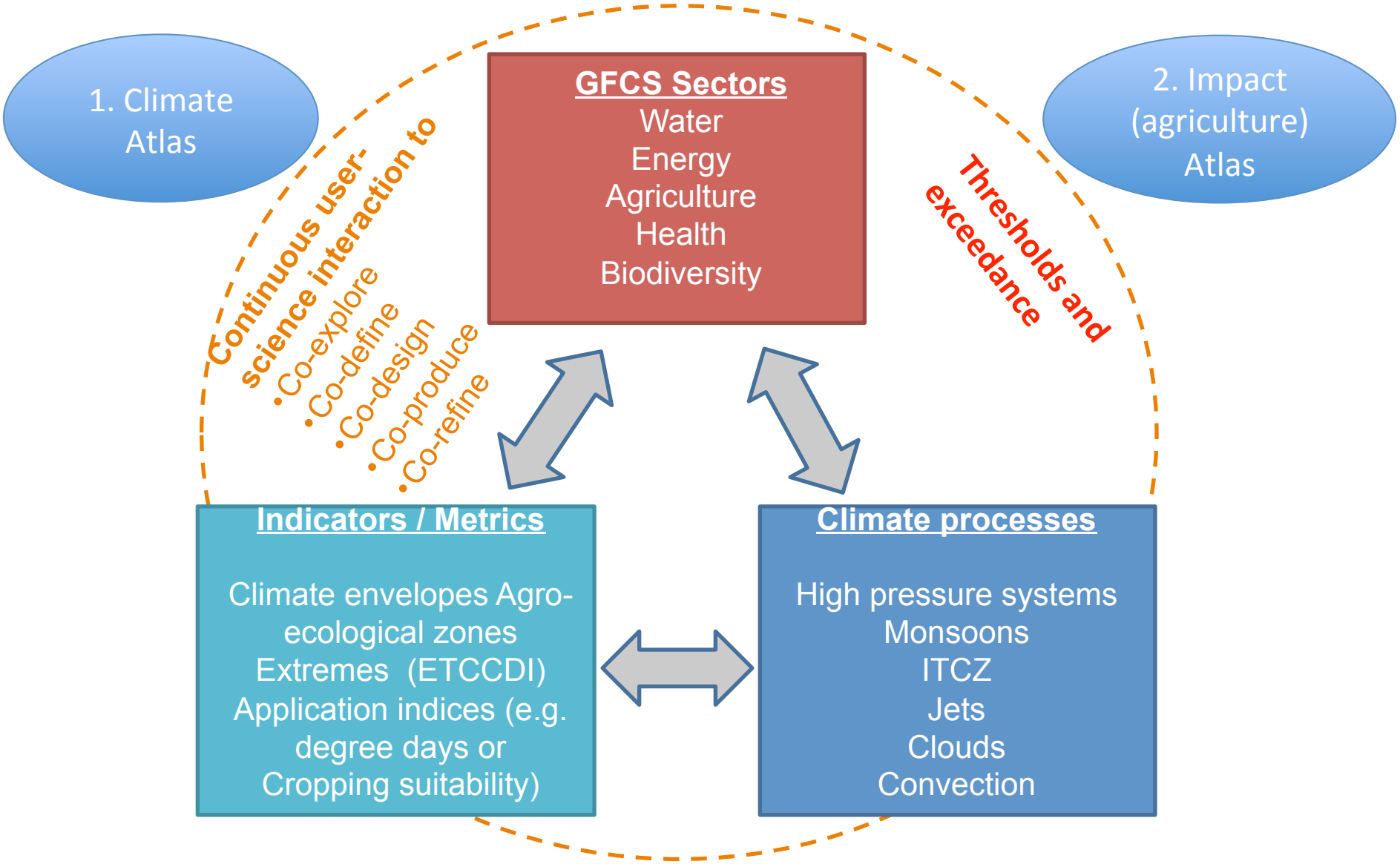
http://www.csag.uct.ac.za/cordex-africa/

The CORDEX-Africa Impacts Atlas



What is the broader context

- A lot of climate data (and more coming) but increasingly challenging to explore and **distill** into relevant applicable information for different context (for climate scientists, let alone others!)
- **Rapidly growing demand** for projections to inform VIA work
- A lot of VIA work is still based on **single models** and conditional on **significant assumptions** about the driving data
- A tendency to **download data to feed your model** without engaging with the information content of the data
- Unclear where (time, space, variables, statistics, etc.) **downscaled projections add value** and **what that value is** (for projections)
- Complex analyses and tools hide a lot of implicit or explicit **decisions with consequences**
- We need ways to support **low effort but defensible** use of climate data for VIA and other related work

What are we doing?

- **Experimenting** with ways to quickly explore **multiple** multi-model ensemble projections
  - This will happen with the inclusion (pending) of the CORDEX data as well as observed records
- Trying to **support distillation** of **key defensible messages of change** for different **geographic regions**
- Avoiding difficult to interpret/understand **representations of uncertainty**, trying to be **explicit/transparent** wherever possible
- Trying to guide people **away from interpreting "noise" or ensemble means** and **towards general directions of change and messages of agreement/disagreement**
- Trying to support **engagement with the possible (but not always) added value** of downscaling etc.
- Exploring the **utility of interactive web based tools**

What are we not trying to do?

- **Create another "better than all the others" climate information portal!**

"The typology reveals strong contrasts in content, complicated interfaces, and an overload of choice making it difficult to converge on a stable outcome." Hewiston et al., 2017

- Provide a "plug and play" climate data tool for impacts modelers

- Probably a lot of other things!

Technically speaking

- ✓ Full CMIP5 historical, RCP 2.6 4.5 and 8.5 ensemble dataset (+- 39 models for RCP 8.5)
- ✓ *tas* and *pr* (for now) **aggregated to monthly, seasonal and annual** ETCDMI indices
- ✓ **Spatially aggregated** to countries and major hydrological basins (for Africa only right now)
- ✓ **60 levels of Global Warming Level** (GWL) (0K to 6K) calculated for each CMIP5 model member under RCP 8.5 (for now)
- ✓ Area aggregated *tas* and *pr* indice **anomalies calculated for each GWL** relative to 1981-2010 baseline (with bootstrapped 90% confidence interval)
- ✓ Made **available through HTTP API** (dice server) to web application
- ✓ Web application (python Flask, vue.js webkit.js and d3.js) **enables interaction**

Still to do

- ✓ Add CORDEX indice anomalies (data processed, pending web application development)
- ✓ More relevant/useful spatial aggregation (countries are pretty indefensible climate regions!)
- ✓ Develop agriculture component of the atlas (crop suitabiity)

CMIP5/ CORDEX Atlas *prototype!*

1. Climate Atlas

CORDEX and CMIP5 projections a

localhost:5000/map

ABOUT MAP

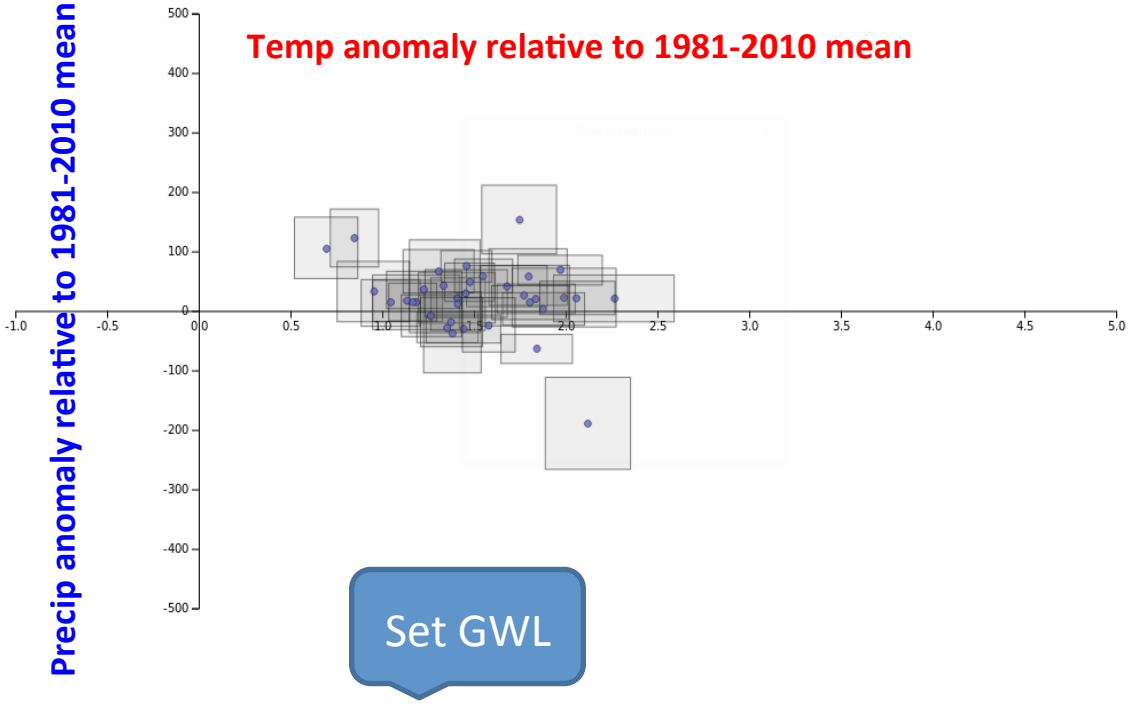
CMIP5/CORDEX atlas (prototype)

Explore ΔTas x ΔPr projections for Nigeria (NGA)

ΔTas (x axis) and ΔPr are relative to 1981-2010 baseline

Global warming level is relative to the 1860-1890 'pre-industrial' baseline

Grey boxes represent 90% confidence interval around the mean anomaly (blue dots)



Global Warming Level 2 °C

back to the map

CORDEX and CMIP5 projections a

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ABOUT MAP

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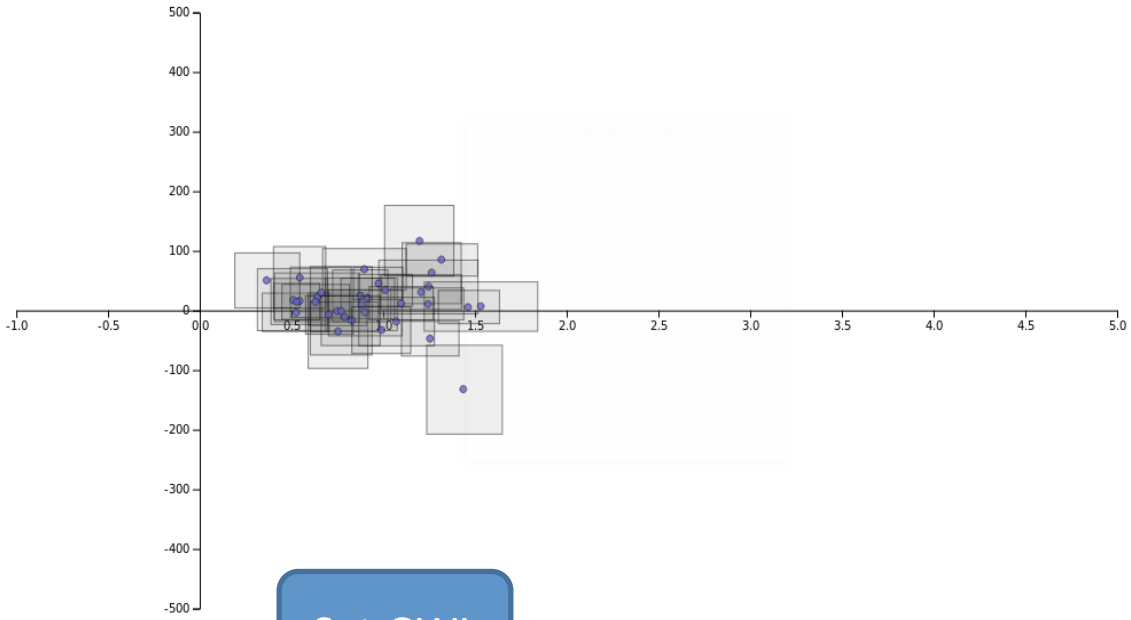

Set GWL

Global Warming Level 1.5 °C

back to the map

Allahabad

Cape Town

CORDEX and CMIP5 projections a

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ABOUT MAP

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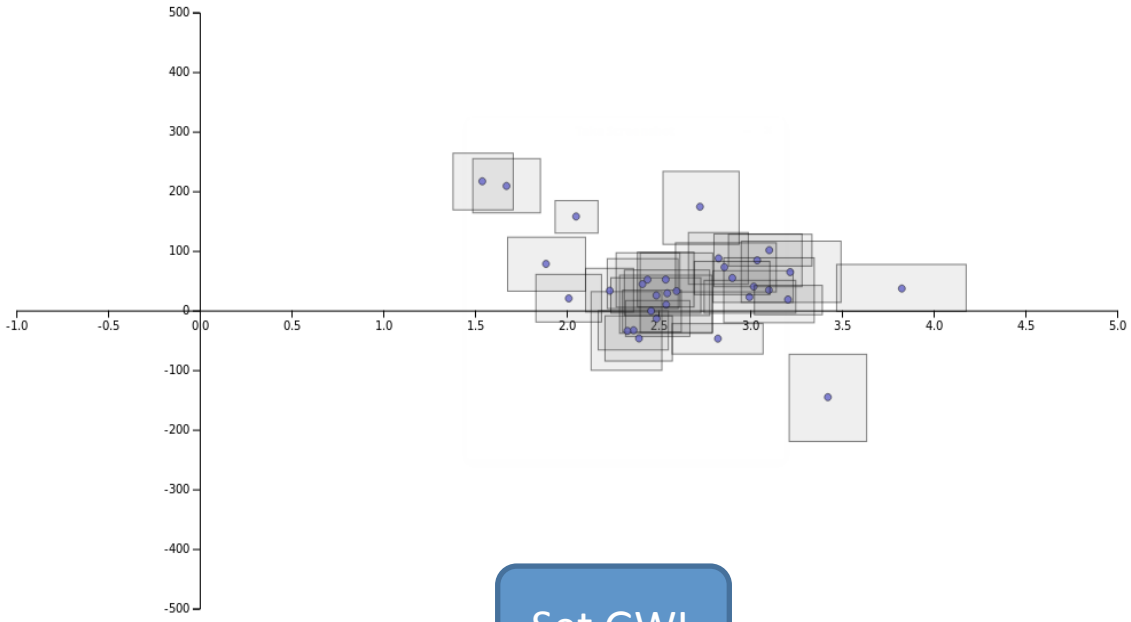


Set GWL

Global Warming Level 3 °C

back to the map

Allahabad

Cape Town

CORDEX and CMIP5 projections a

localhost:5000/map

ABOUT MAP

CMIP5/CORDEX atlas (prototype)

CORDEX and CMIP5 projections a

localhost:5000/map

ABOUT MAP

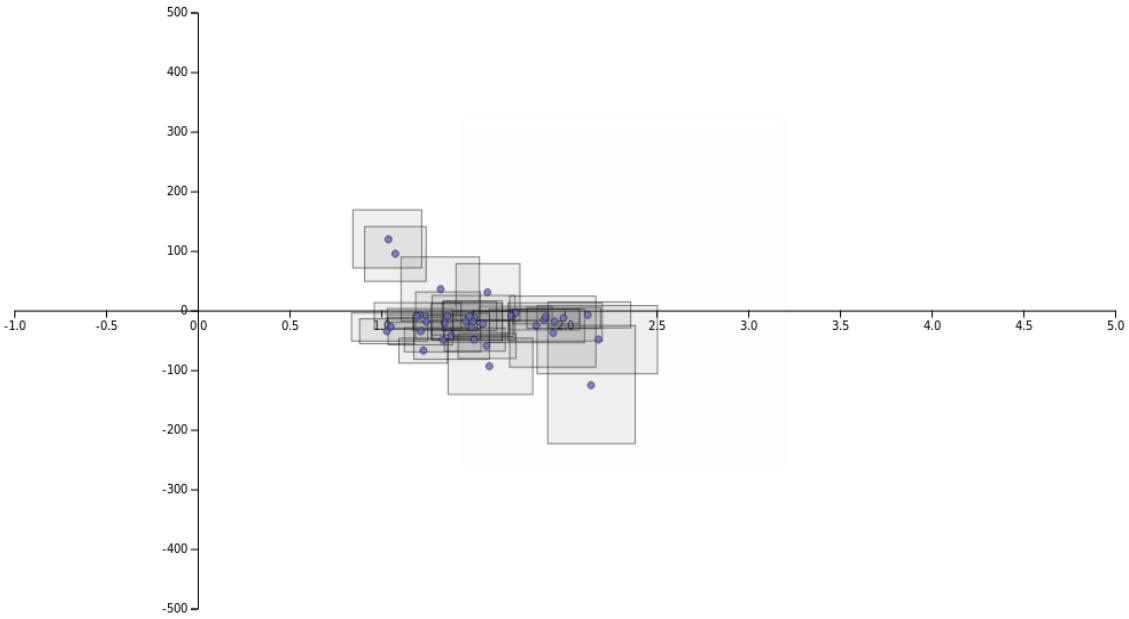
CMIP5/CORDEX atlas (prototype)

Explore ΔTas x ΔPr projections for Senegal (SEN)

ΔTas (x axis) and ΔPr are relative to 1981-2010 baseline

Global warming level is relative to the 1860-1890 'pre-industrial' baseline

Grey boxes represent 90% confidence interval around the mean anomaly (blue dots)



Global Warming Level 2 °C

back to the map

CORDEX and CMIP5 projections a

localhost:5000/map

ABOUT MAP

CMIP5/CORDEX atlas (prototype)

Explore ΔTas x ΔPr projections for Somalia (SOM)

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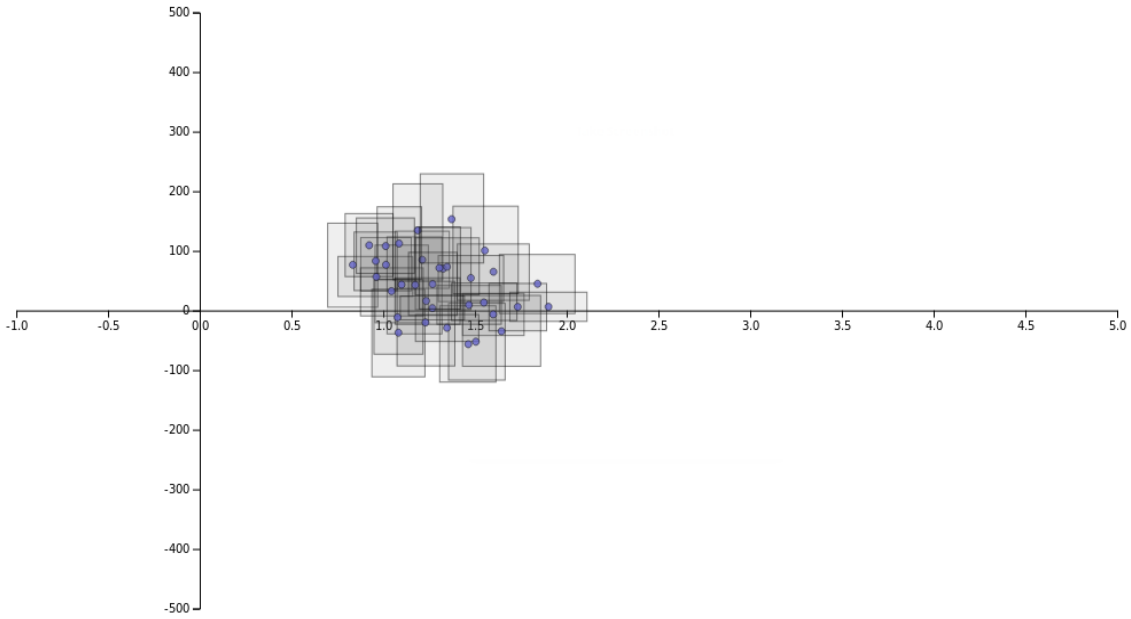

Global Warming Level 2 °C

back to the map

CORDEX and CMIP5 projections a

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ABOUT MAP

CMIP5/CORDEX atlas (prototype)

Explore ΔTas x ΔPr projections for Congo (Kinshasa) (COD)

ΔTas (x axis) and ΔPr are relative to 1981-2010 baseline

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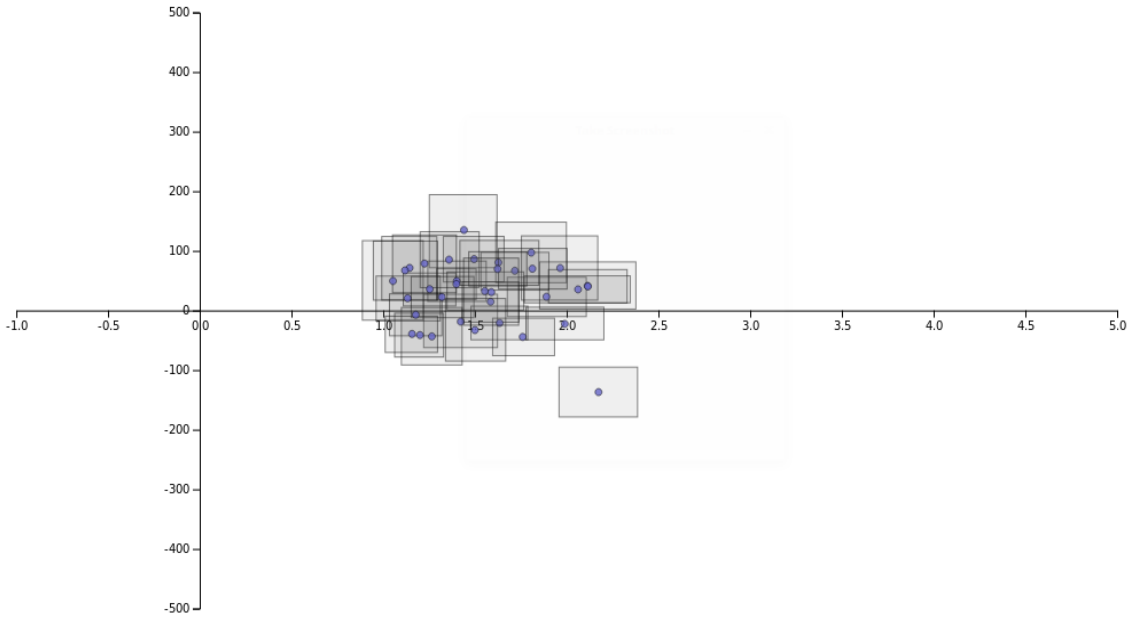
Grey boxes represent 90% confidence interval around the mean anomaly (blue dots)



Global Warming Level 2 °C

back to the map

CORDEX and CMIP5 projections a

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ABOUT MAP

CMIP5/CORDEX atlas (prototype)

Explore ΔTas x ΔPr projections for Botswana (BWA)

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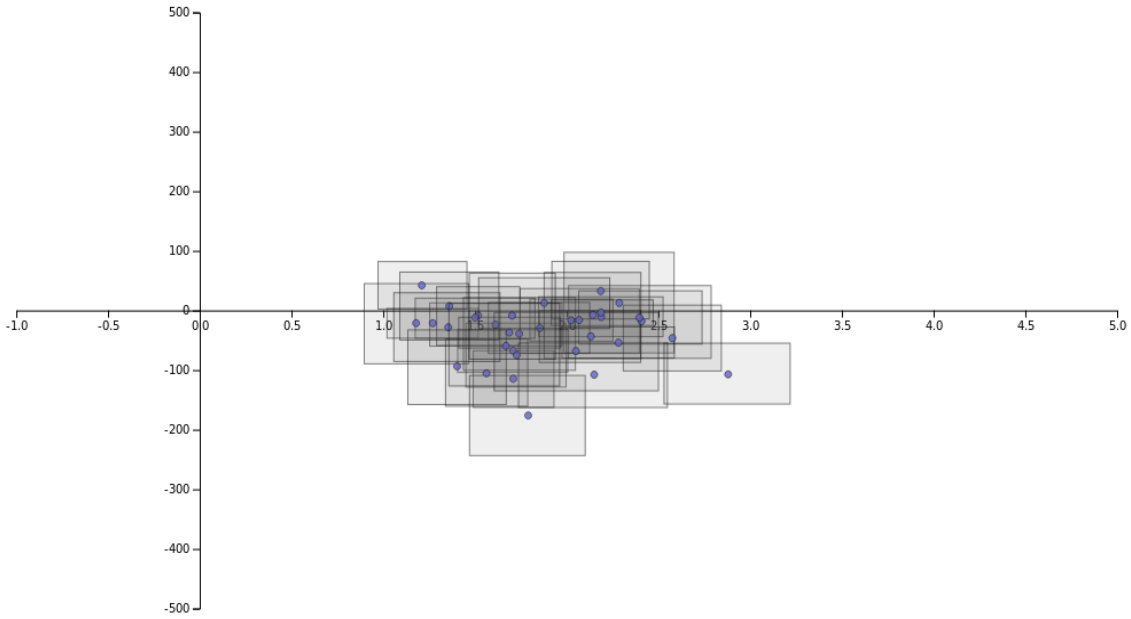

Global Warming Level 2 °C

back to the map

CORDEX and CMIP5 projections a

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ABOUT MAP

CMIP5/CORDEX atlas (prototype)

Explore ΔTas x ΔPr projections for United Kingdom (GBR)

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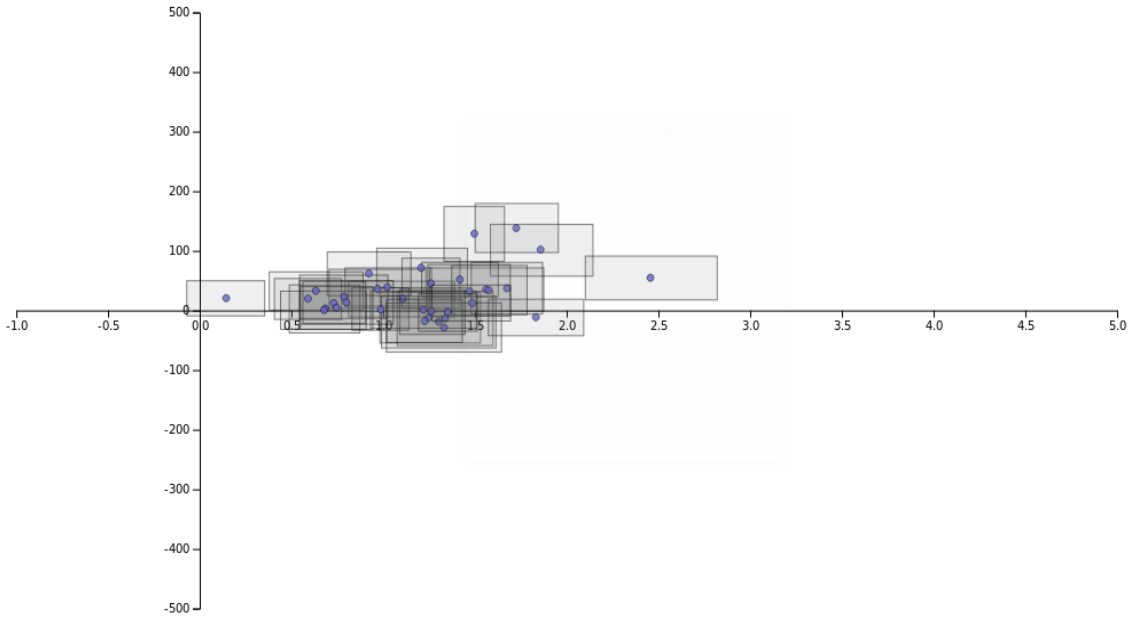
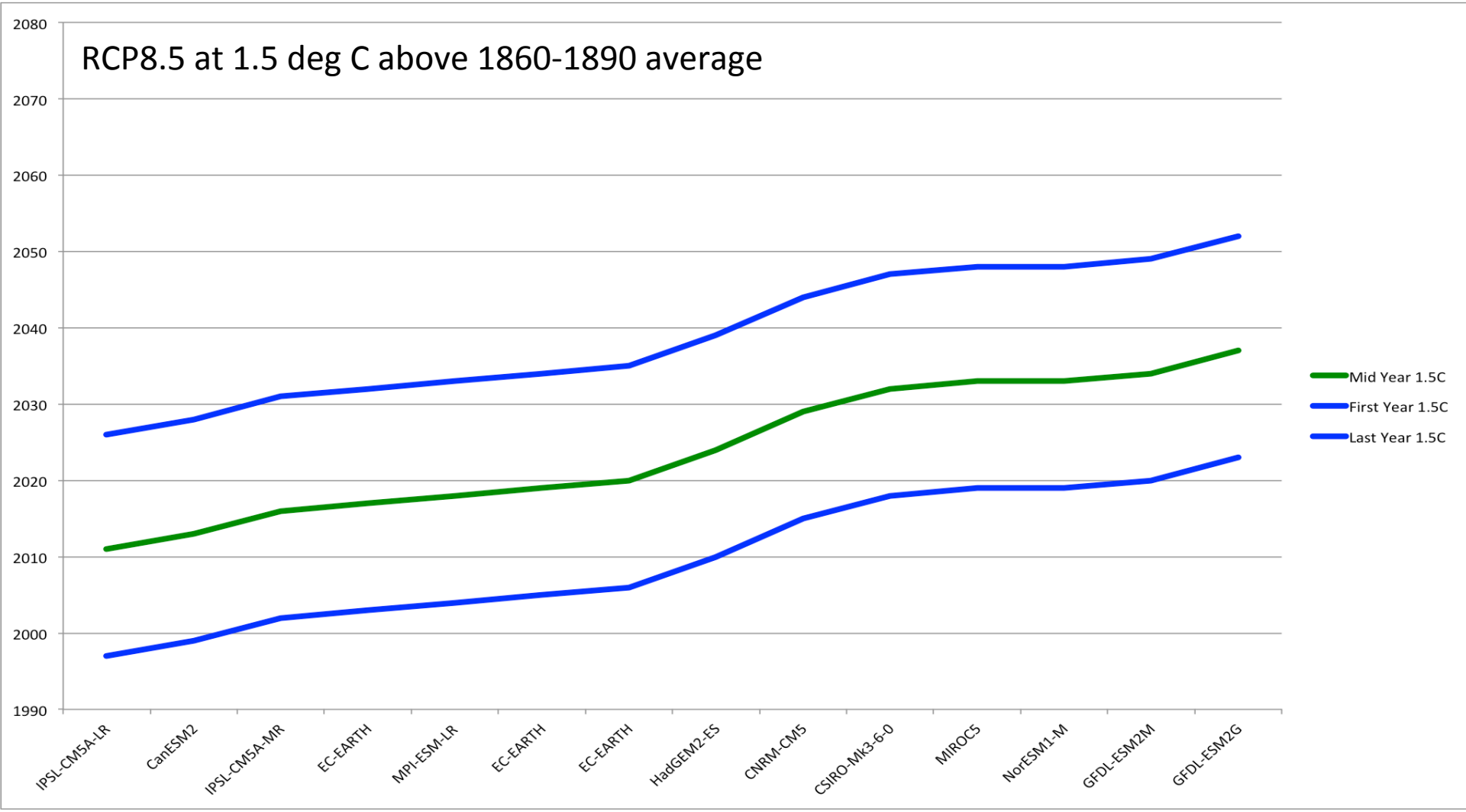


Global Warming Level 2 °C

back to the map

The CORDEX-Africa Impacts Atlas

Information on timing of change



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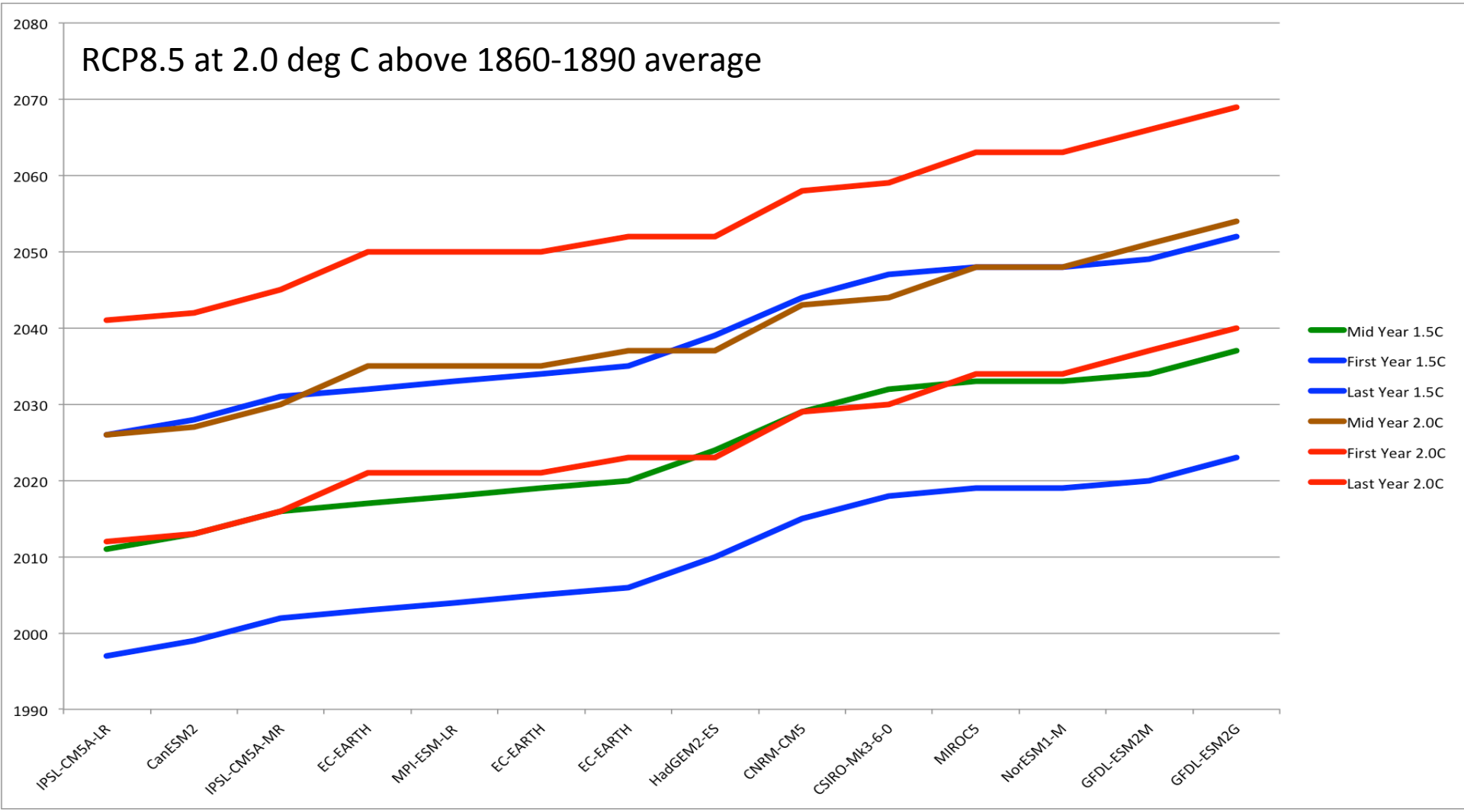

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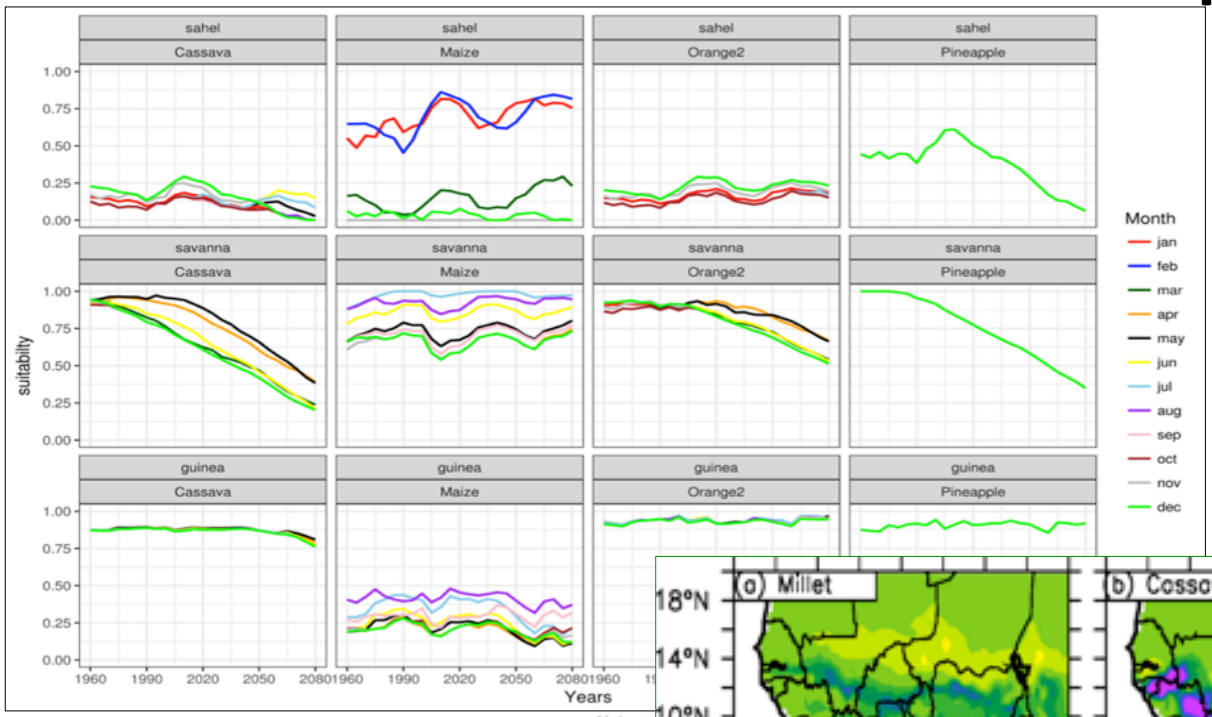
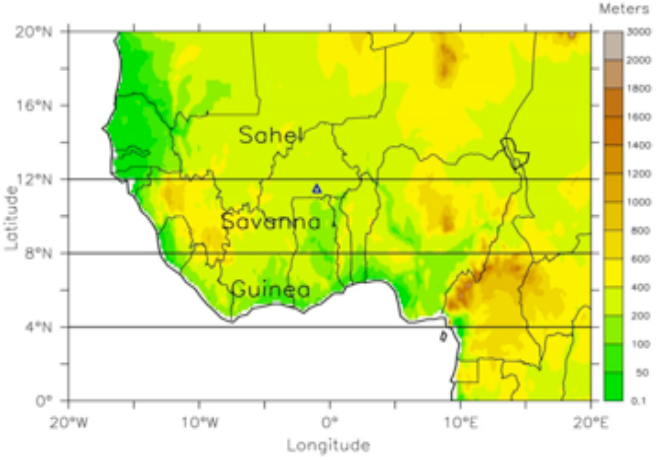
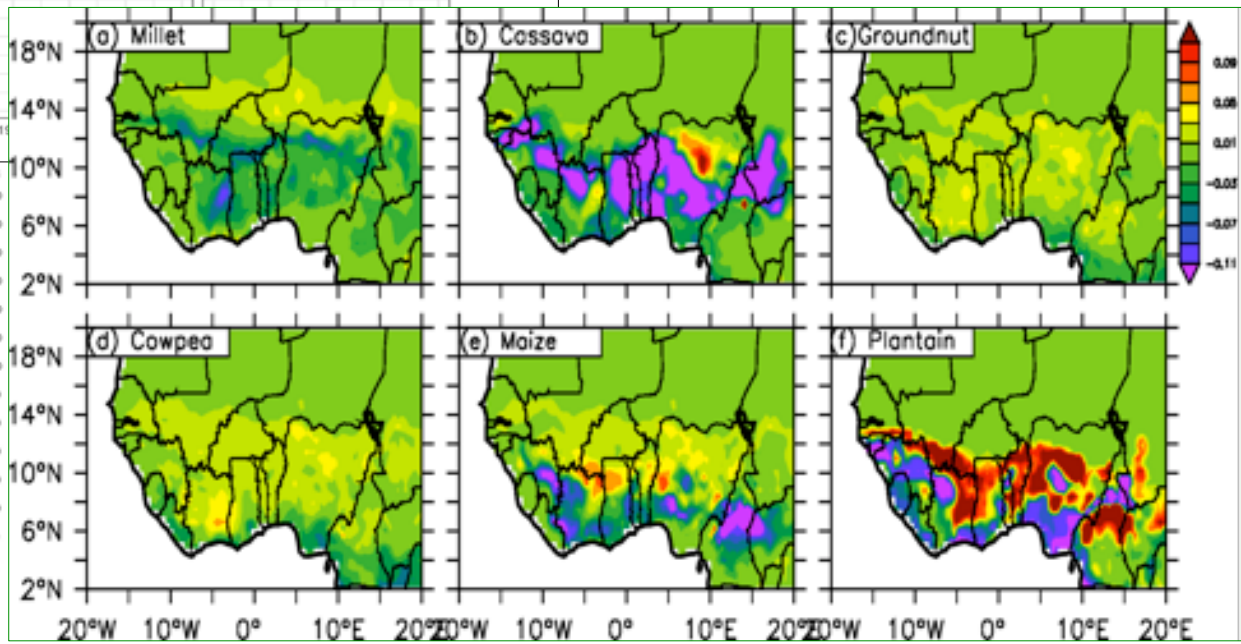
The CORDEX-Africa Impacts Atlas

Impacts (Agri) Information Atlas







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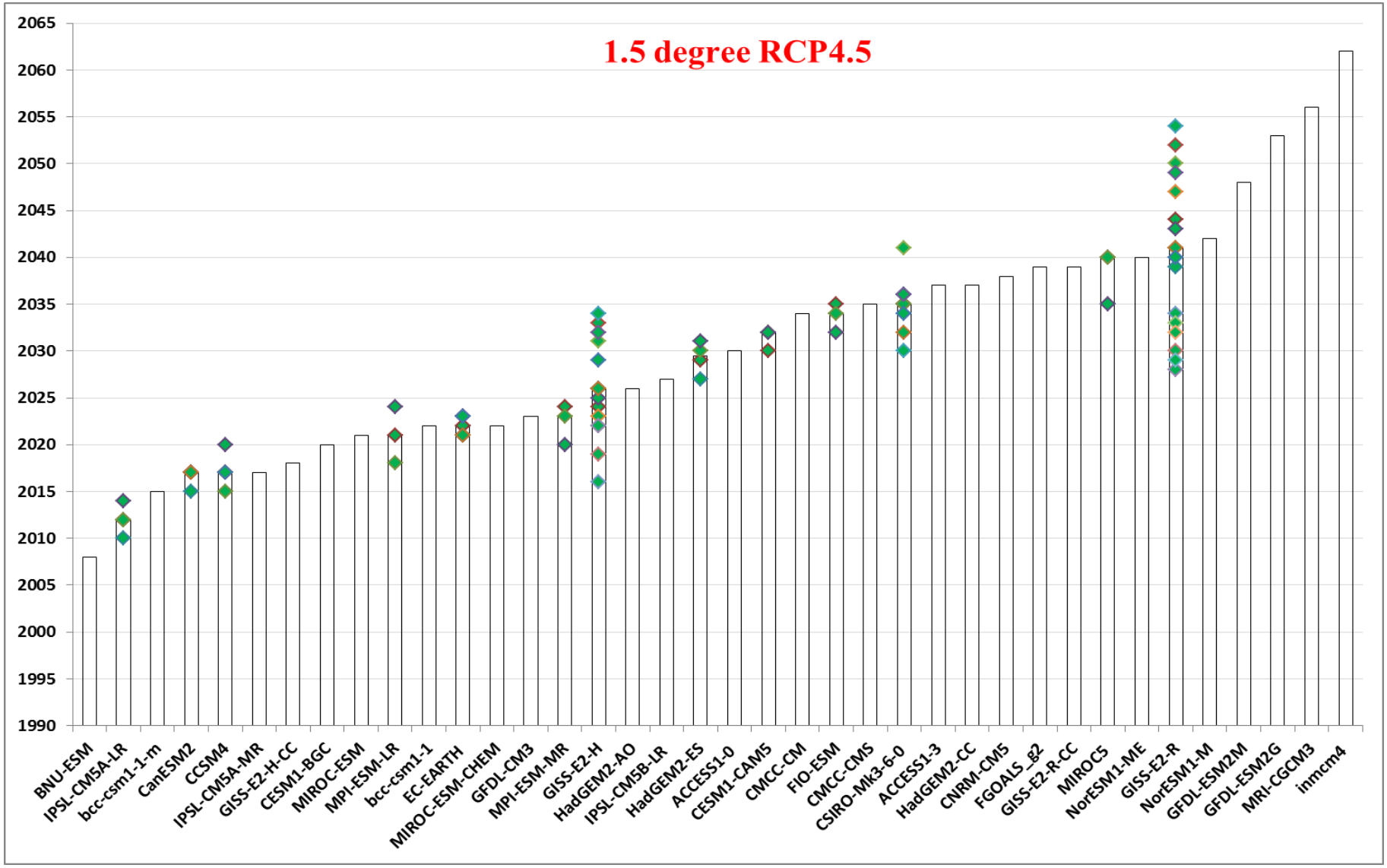

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