

# Dealing with climate data uncertainty for agricultural impact assessments in West Africa (Paper in Review)

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## Motivation

- Crop production has already declined in West Africa due to climate change.
- Impacts of climate change on agriculture will become stronger in the near future.
- Uncertainties in climate impacts and suitability of adaptation strategies on a global and local scale are still high.

[nature](#) > [scientific reports](#) > [articles](#) > [article](#)

Article | [Open Access](#) | [Published: 06 September 2019](#)

### Evidence of crop production losses in West Africa due to historical global warming in two crop models

[Benjamin Sultan](#) , [Dimitri Defrance](#) & [Toshichika Iizumi](#)

[nature](#) > [nature food](#) > [articles](#) > [article](#)

Article | [Published: 01 November 2021](#)

### Climate impacts on global agriculture emerge earlier in new generation of climate and crop models

[Jonas Jägermeyr](#) , [Christoph Müller](#), [...] [Cynthia Rosenzweig](#)

[Nature Food](#) (2021) | [Cite this article](#)



Agricultural and Forest Meteorology

Volume 170, 15 March 2013, Pages 183-194



Variation in the global-scale impacts of climate change on crop productivity due to climate model uncertainty and adaptation

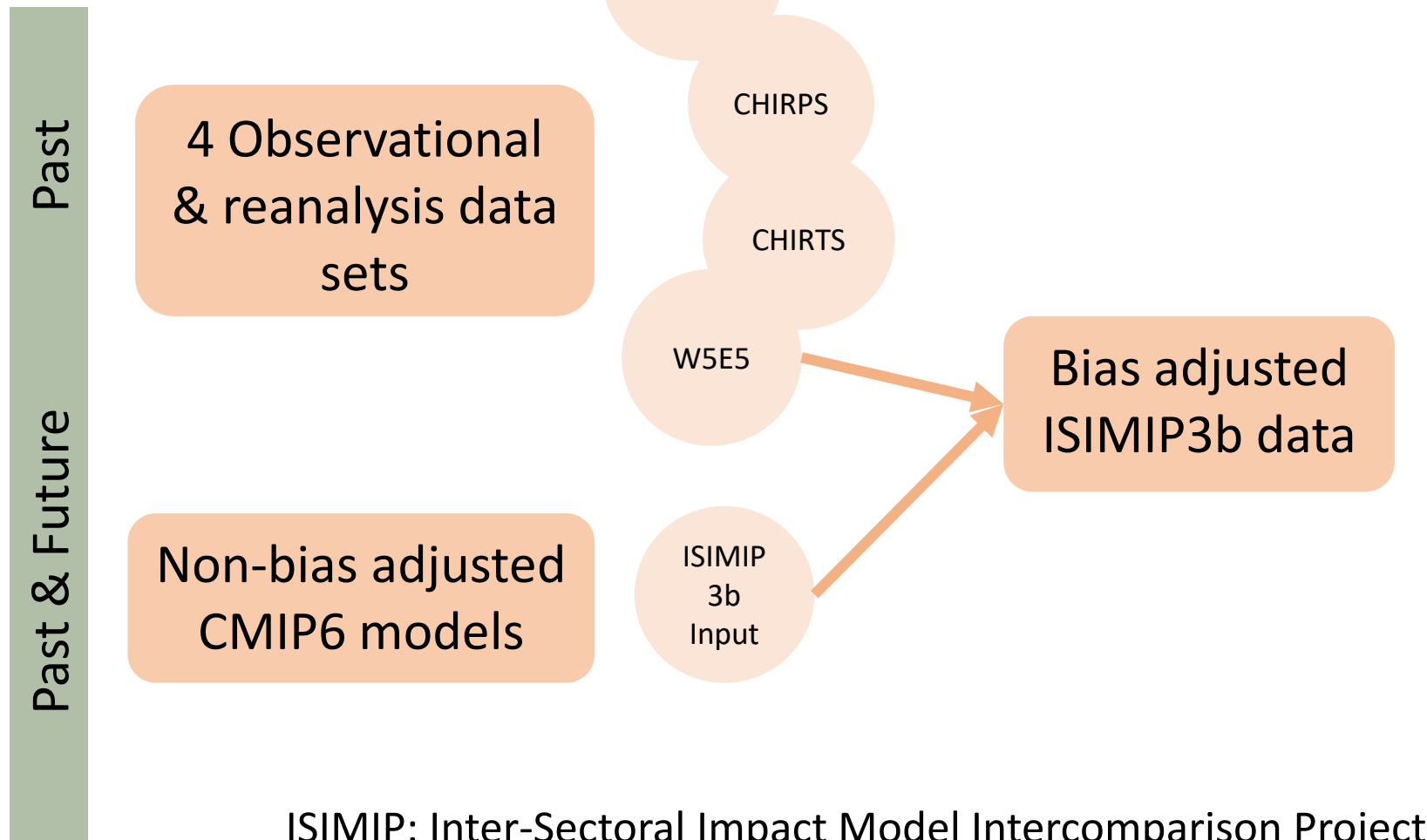
Tom Osborne <sup>a, b, c, ✉</sup>, Gillian Rose <sup>b, c</sup>, Tim Wheeler <sup>b, c</sup>

## Aim

Providing a better understanding of the quality and limitations of climate data sets which are used in agricultural impact assessments in West Africa.

## Data

## Method



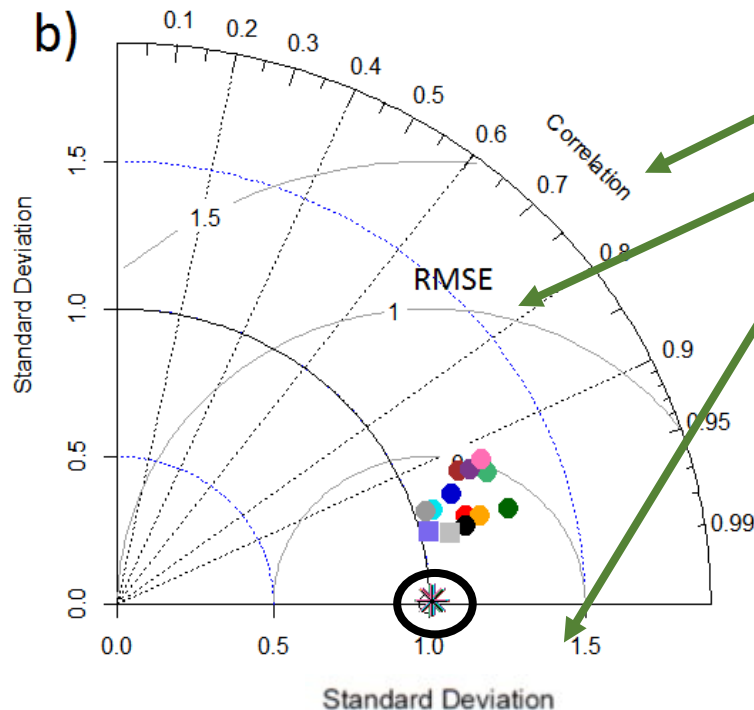
Compare observational, CMIP6 and ISIMIP3b data in:

- Mean climatology
- Agroclimatic Indices (rainy season onset, dry spells, heat extremes,...)

# Comparing GCMs and observational data regarding mean climatology

■ observational data  
● CMIP6  
✱ ISIMIP3b

◇ ERA5  
◇ CHIRPS/CHIRTS  
◇ MIROC  
◇ MRI  
◇ IPSL  
◇ GFDL  
◇ UKE  
◇ MPI  
◇ EC  
◇ CNES  
◇ CNCM  
◇ Can  
◇ \*MEAN\*



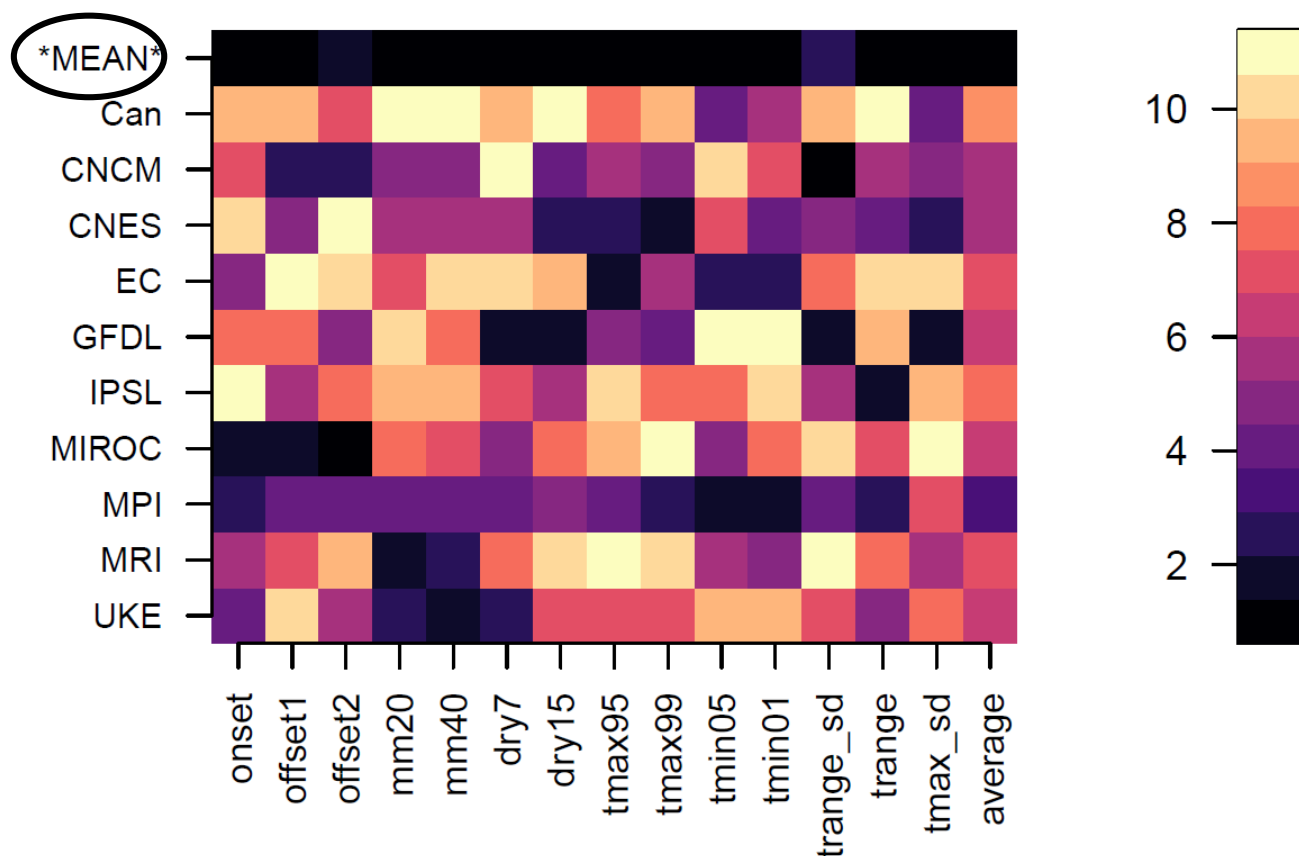
Comparison according to three statistics:

- Correlation coefficient
- Root-mean-square error
- Standard deviation

- High observational uncertainty
- CMIP6 models show similar systemic biases over West Africa than CMIP5 models
- Bias-adjusted mean climatology aligns well to reference data set

Taylor diagram: spatial and temporal agreement of monthly precipitation compared to W5E5 data

## Summary of all agroclimatic indices



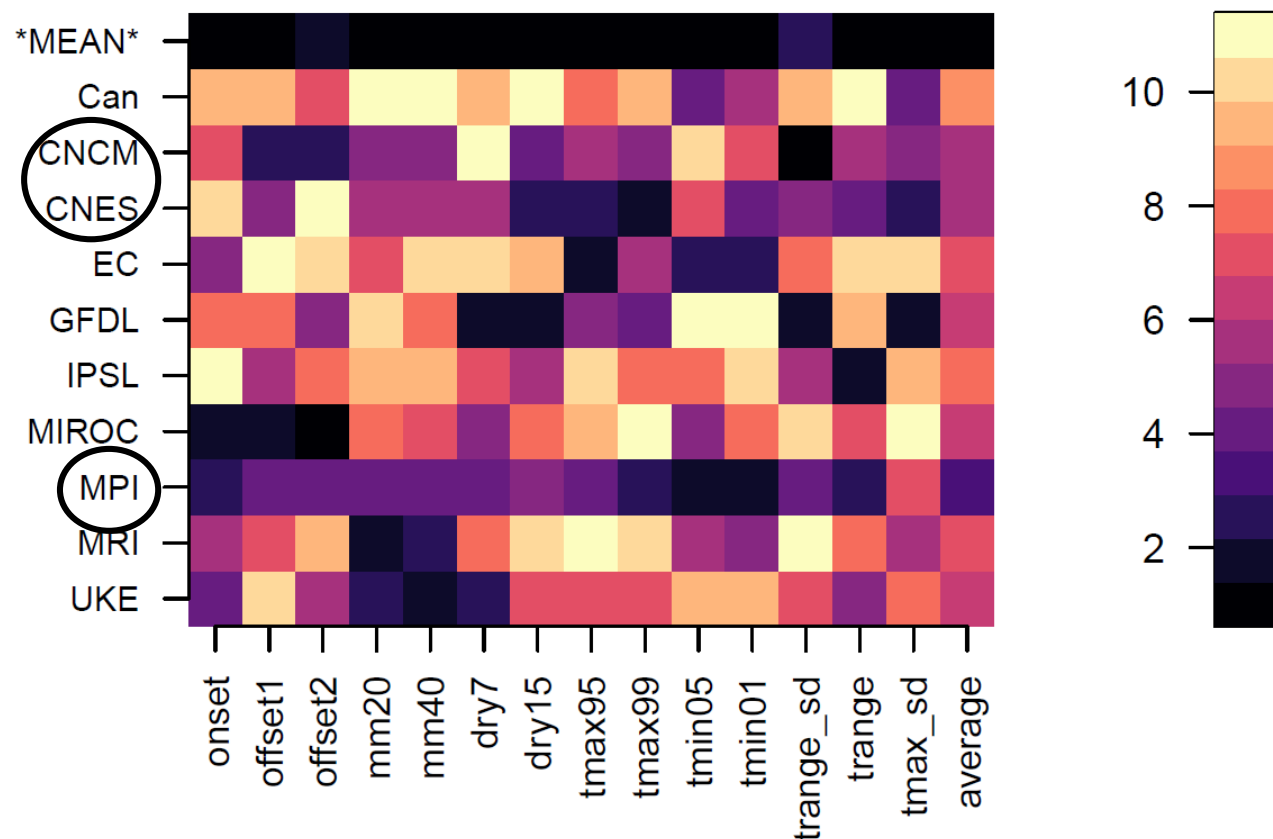
Ranking of correlation coefficient for 14 agroclimatic indices in comparison to W5E5

Bias-adjusted ISIMIP3b data shows some regionally dependent variances in agroclimatic extremes from the observational data set.

No single model outperforms the other models in all aspects.

The multi-model ensemble mean is consistently closer to the reference data set for the agroclimatic indices.

## Summary of all agroclimatic indices



→ Subensemble of three best performing models could not improve the agreement of the multi-model mean.

Ranking of correlation coefficient for 14 agroclimatic indices in comparison to W5E5

## Conclusions for using ISIMIP3b data over West Africa in agricultural modelling

- Using **multi-model mean of whole ensemble**
- Detailed regional specific results can help to understand crop model behavior
- Considering results from all **individual models** helps to **understand the range of uncertainties** associated with climate models
- Further efforts needed in:
  - Decreasing observational uncertainties
  - Improving representation of West African Monsoon in climate models





Thank you.



U N I K A S S E L  
V E R S I T Ä T

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