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Tuesday, 24<sup>th</sup> May 2022

# On the detection of externally-forced decadal modulations of the Sahel rainfall over the whole 20th century in the CMIP6 ensemble

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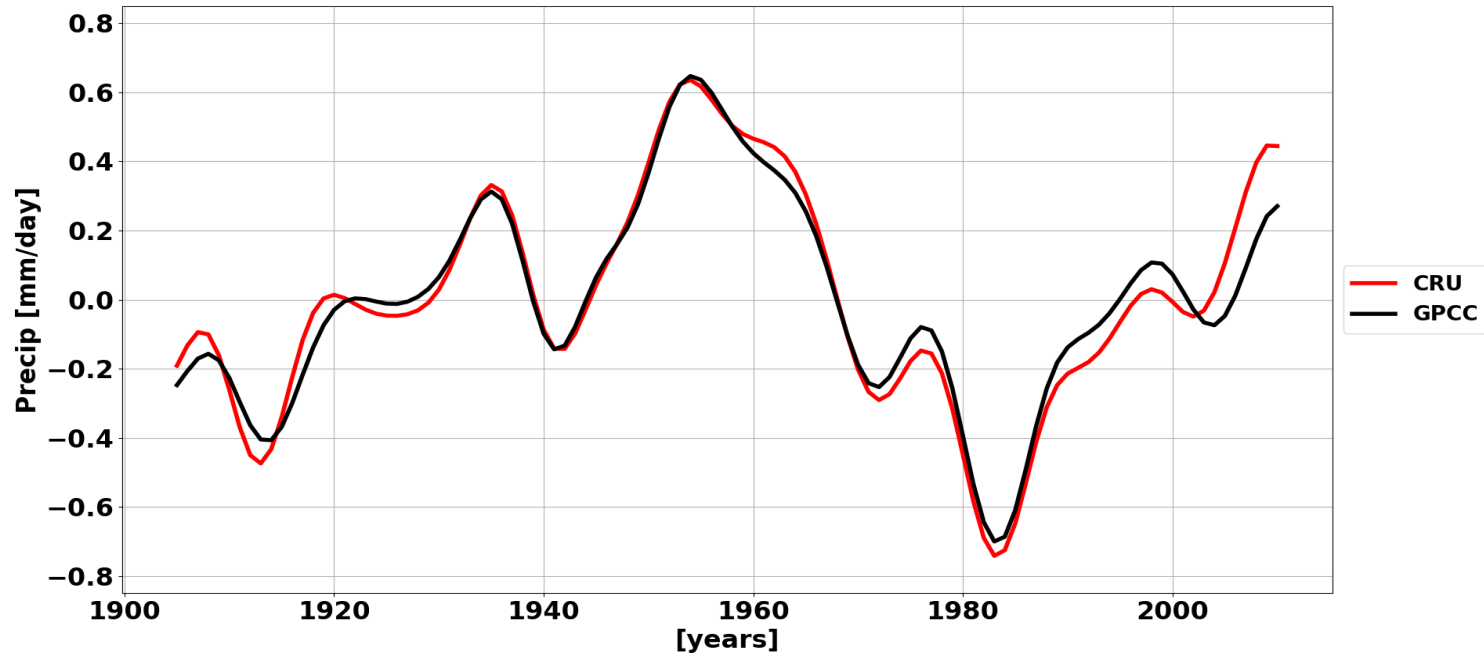
*Complutense University of Madrid-Spain*

**Saidou M. Sall**

*Cheikh Anta Diop University of Dakar-Senegal*

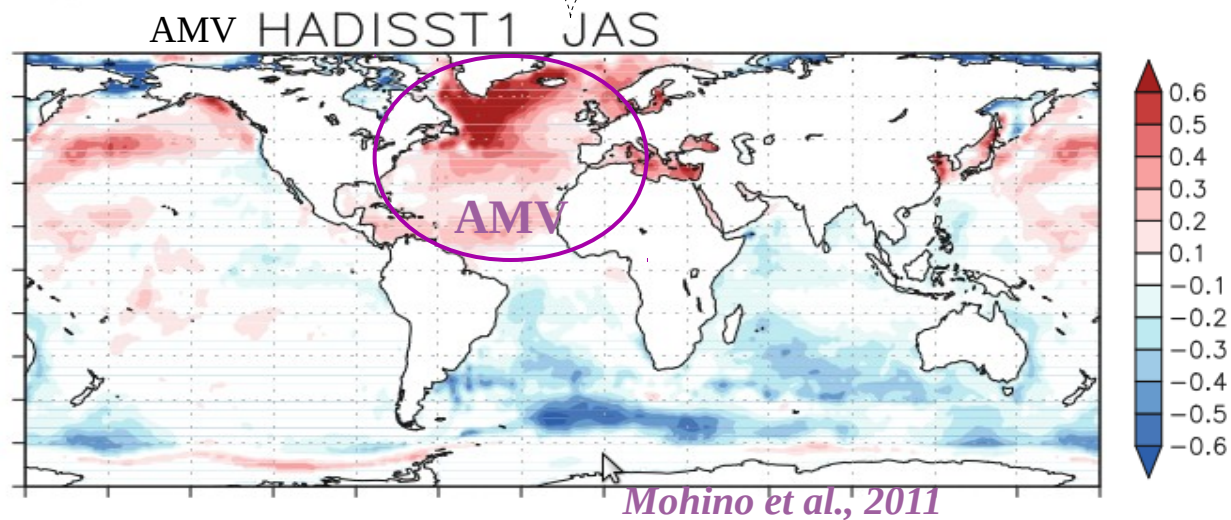
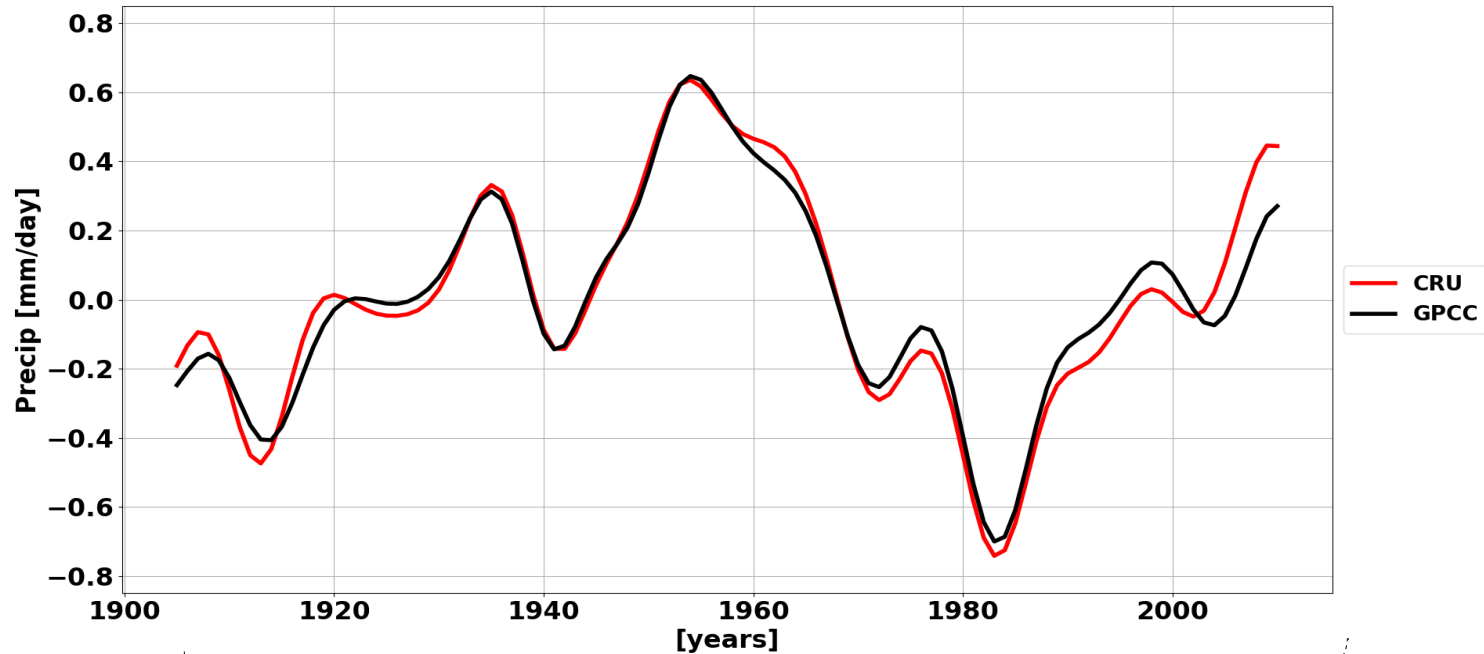
## Context

*Decadal modulations of Sahel rainfall (JAS) over the whole 20<sup>th</sup> century*



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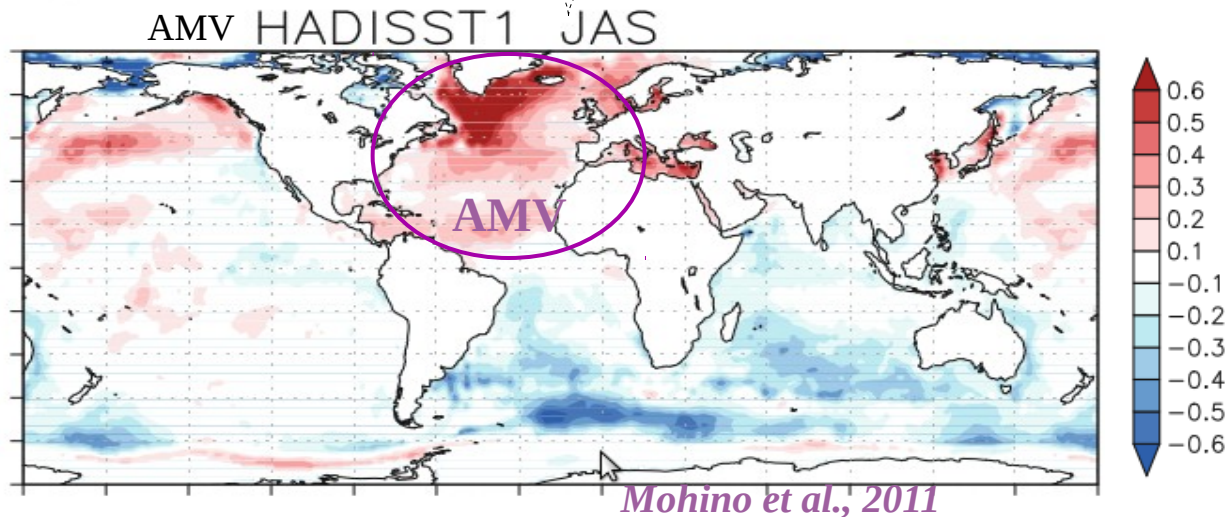
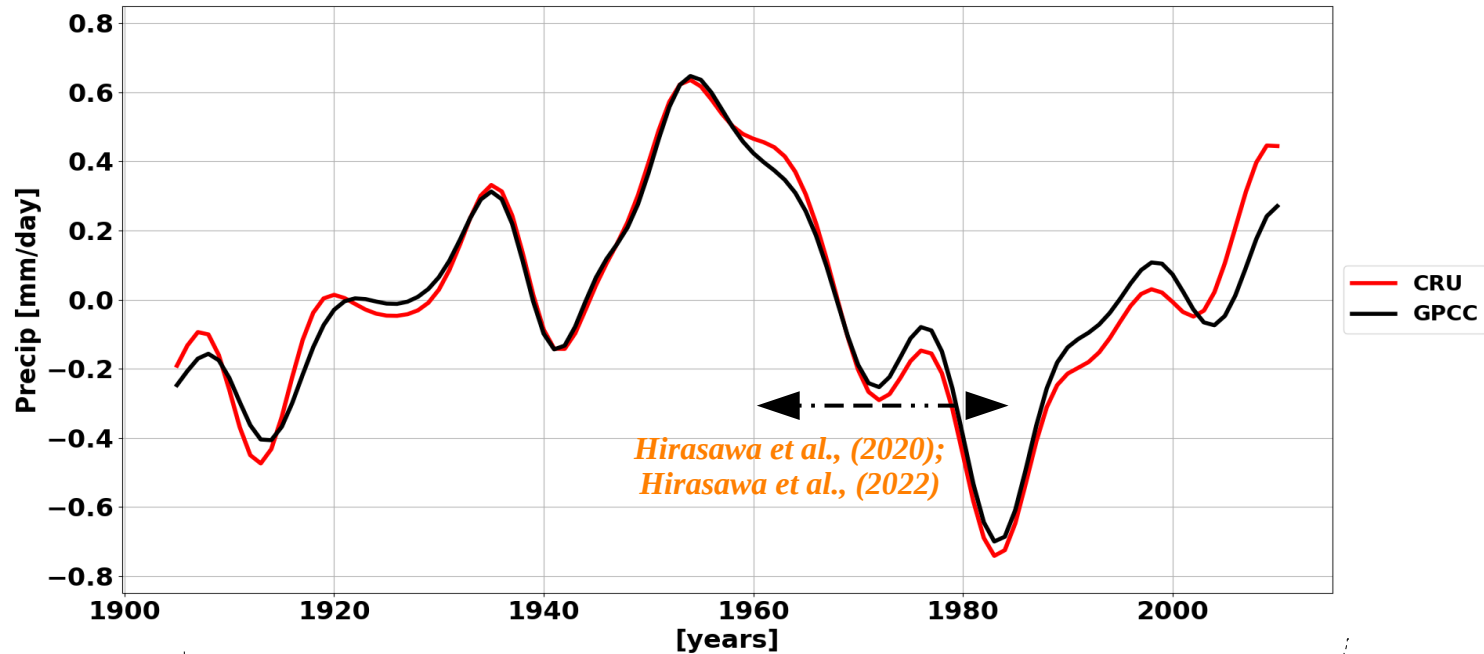


## Context

### External forcings

Anthropogenic  
aerosols (AA)

### *Decadal modulations of Sahel rainfall (JAS) over the whole 20<sup>th</sup> century*



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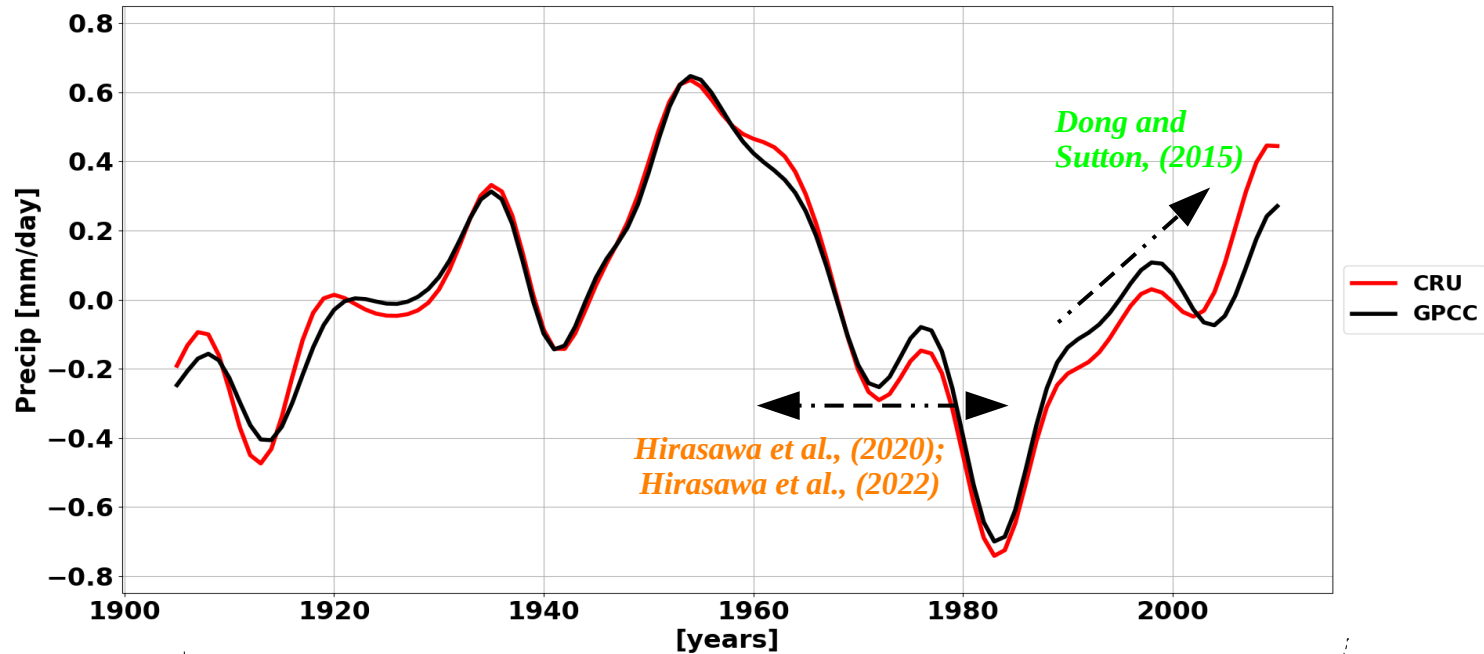
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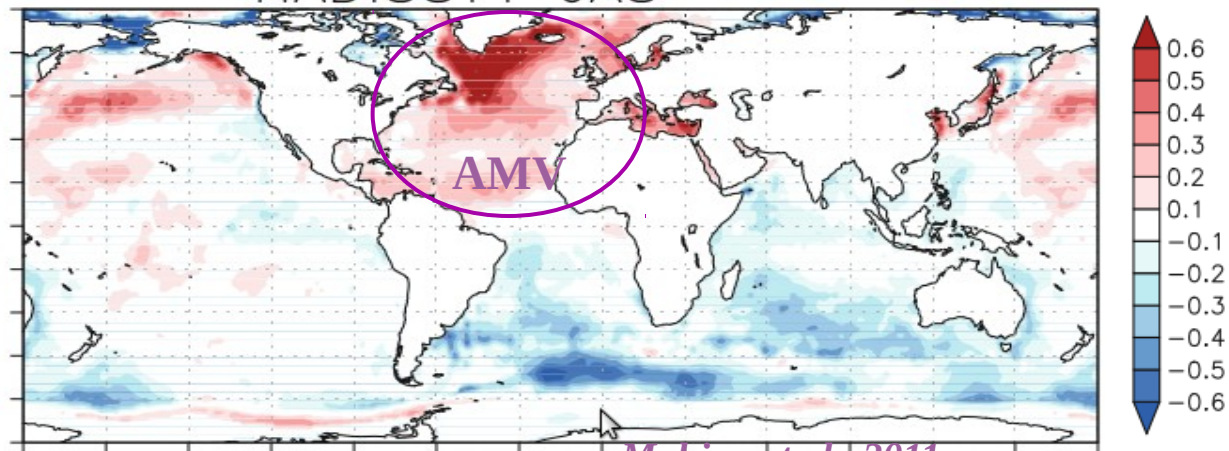


Green-house  
gases (GHG)

### *Decadal modulations of Sahel rainfall (JAS) over the whole 20<sup>th</sup> century*



AMV HADISST1 JAS



*Mohino et al., 2011*

*Attribution of decadal modulations of Sahel rainfall during the entire 20th century*

- *Influence of SST changes ?*
- *Effect of Greenhouse Gases ?*
- *Effect of Anthropogenic Aerosols ?*
- *Etc ...*

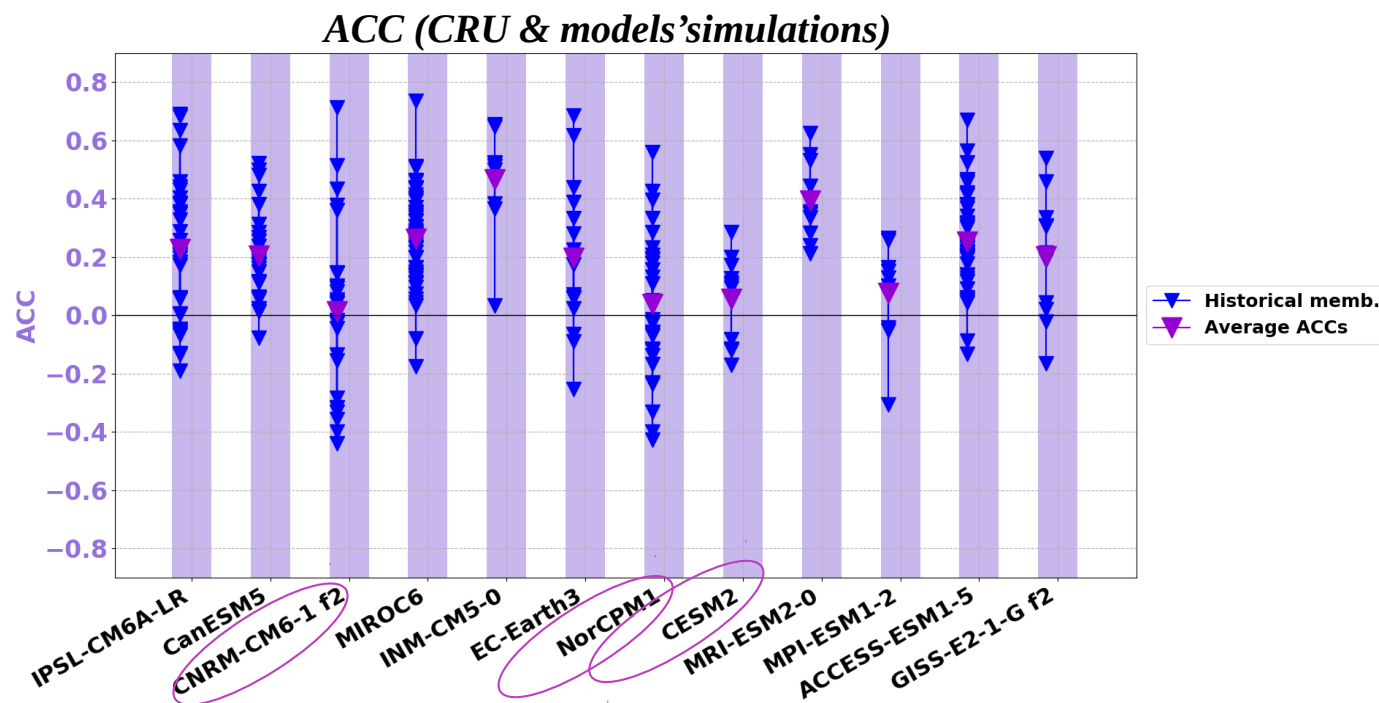
*Aim of this study :*

*Quantify the contribution of external forcings and the internal variability on the synchrony of decadal rainfall modulations in the Sahel during the 20th century in the model ensembles from the sixth coupled model intercomparison exercise (CMIP6)*



- 12 CMIP6 models, chosen because of availability of at least 10 historical members.

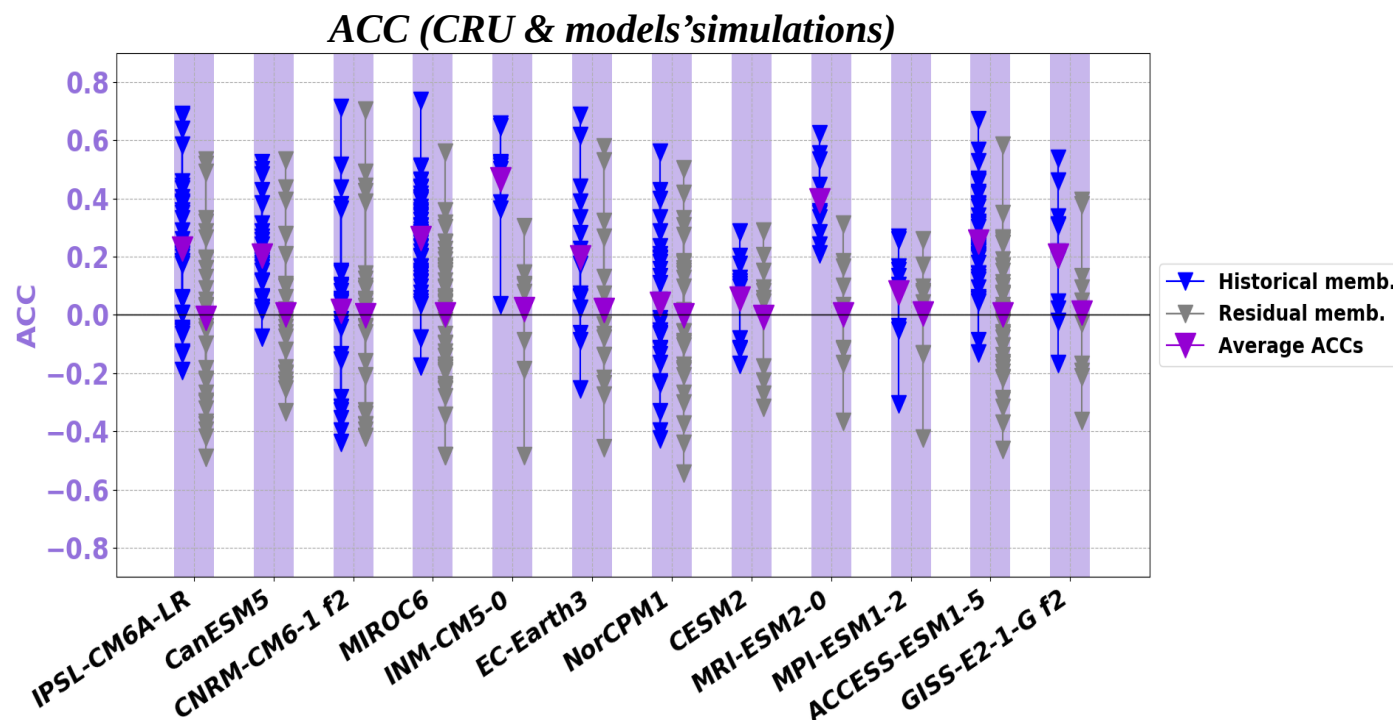
## Synchrony of the Sahel rainfall Decadal modulations between observation and models



- Strictly positive average correlation for all models except CNRM-CM6-1, NorCPM1 and CESM2.



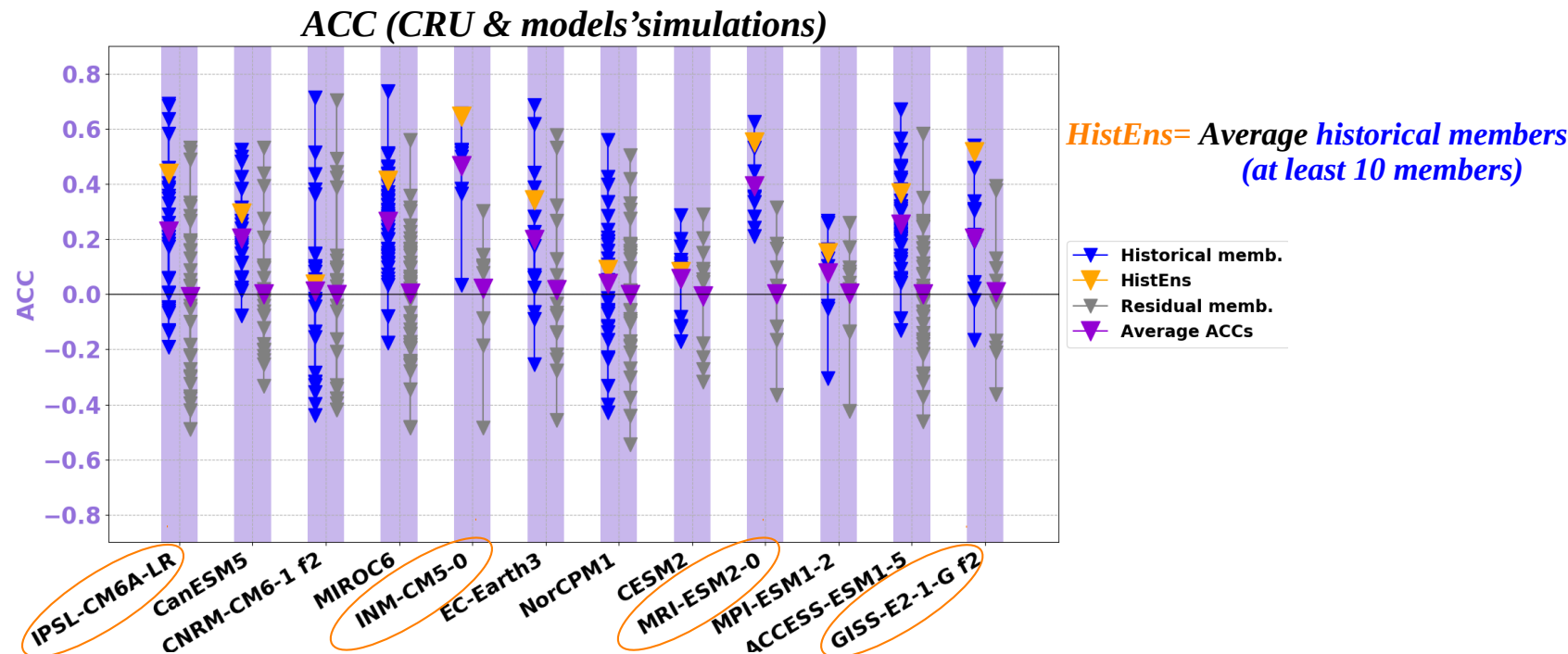
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- Strictly positive average correlation for all models except CNRM-CM6-1, NorCPM1 and CESM2.
- For all models, the average correlation of the residual variability with the observations is close to 0.
- Significant correlation (95 %) of externally forced modulations of Sahel rainfall in **IPSL-CM6A-LR**, **INM-CM5-0**, **MRI-ESM2-0** and **GISS-E2-1-G** models.

## Conclusions

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- Positive influence of external forcings on the synchrony of decadal modulations of Sahel rainfall in CMIP6 ensemble.
- Significant correlations (95 %) of the response to external forcings in 1/3 of models used.
- All these correlations (significant or not) could be influenced by the uncertainty of the response to external forcings in these models.

*Ndiaye et al., 2022 (minor revisions for Journal of climate)*

A background image showing rain falling over a body of water, likely a lake or river. In the foreground, there are dark, silhouetted leaves on the left and palm fronds on the right. The rain is captured as many vertical white streaks against the darker background.

**Thank you  
for your  
attention.**