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# Influence of strong South Atlantic Ocean Dipole on the Central African rainfall's system

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## INTRODUCTION

Central Africa's rainfall system is driven by factors acting at local and large scales. Among the large-scale factors, oceanic forcings resulting from different basins such as the Atlantic Ocean through SST variability, have been identified as playing an important role in rainfall variability and change. in this study we adopt an approach based on composite analysis to examine the interlinkages between the South Atlantic Ocean Dipole and Central Africa rainfall variability from June to August, spanning from 1981 to 2018, using observational and reanalysis datasets.

## Data and methods

- ERA5 reanalysis data (0.25° x 0.25°); MERRA2 reanalysis data (0.5° x 0.65°)

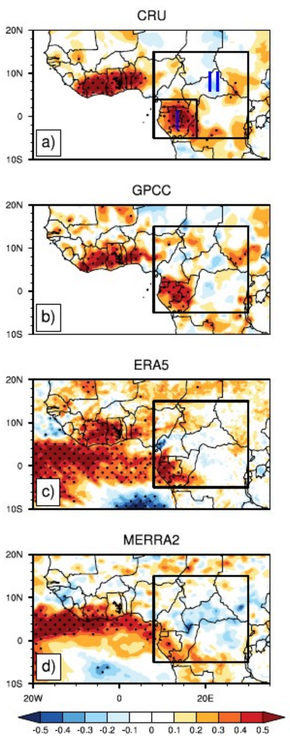
Monthly satellite or gauge-based data (CRU-TS4, GPCC; 0.5° x 0.5°)

Monthly satellite SST data (ERSSTv5; 2° x 2°)

$SAODI = SST_{NEP} - SST_{SWP}$ (1)

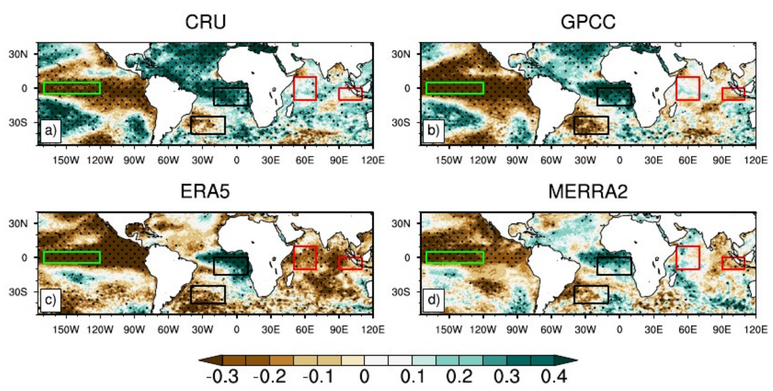
NEP (10°E-20°W, 15°S-0°)
SWP (10°-40°W, 40°-25°S)

## Results



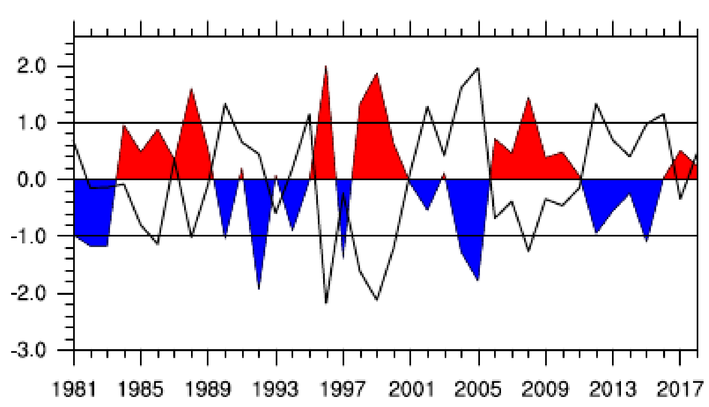

- The SAODI features strong (weak) and positive (negative) correlation values over the termed as zone I hereafter (elsewhere, termed as zone II hereafter) of Central Africa (CA).

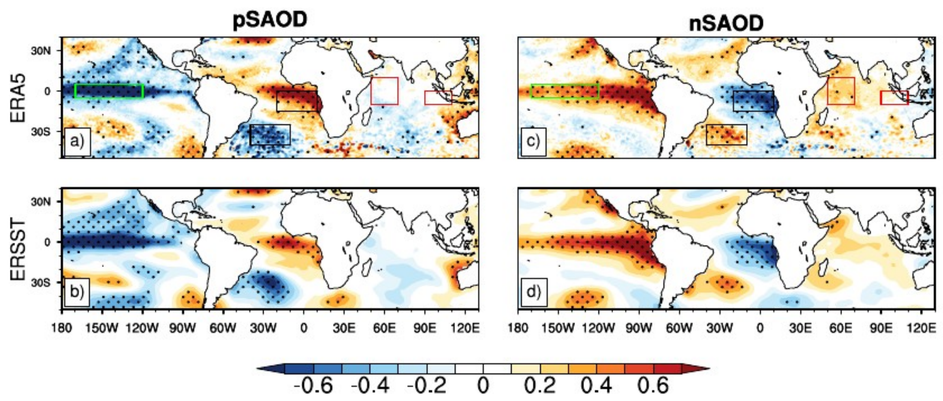
- CA rainfall exhibit significant and positive (negative) correlation values with SSTA over the NEP (SWP); As a result, cooling of the SST in the SWP and warming of SST in the NEP advantage (disadvantage) rainfall over zone I (zone II). The equatorial Pacific highlighted by the Niño-3.4 index shows strong significant and negative correlations.




- positive SAOD (pSAOD) event when the normalised value of the SAODI is greater than or equal to + 1 SD and the SWP index is lesser than or equal to -1 SD.

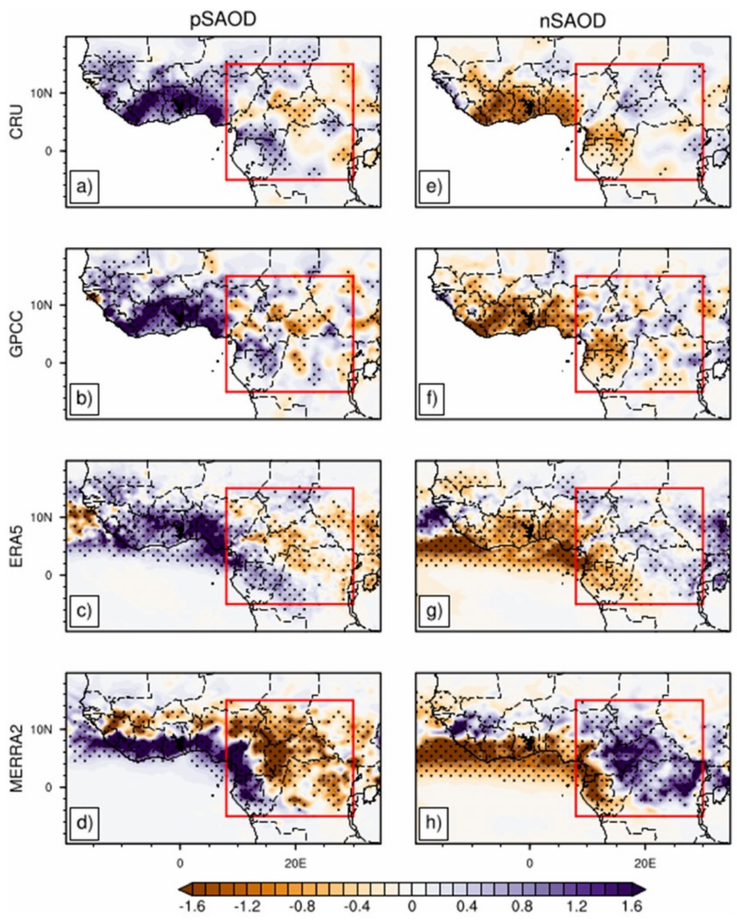
- Negative SAOD (nSAOD) event, when the normalised value of the SAODI is lesser than or equal to -1 SD.




- In pSAOD events, the SAO shows significant warming (cooling) over NEP (SWP) while the Niño-3.4 area significant cooling.
- Opposite pattern is observed during the nSAOD years

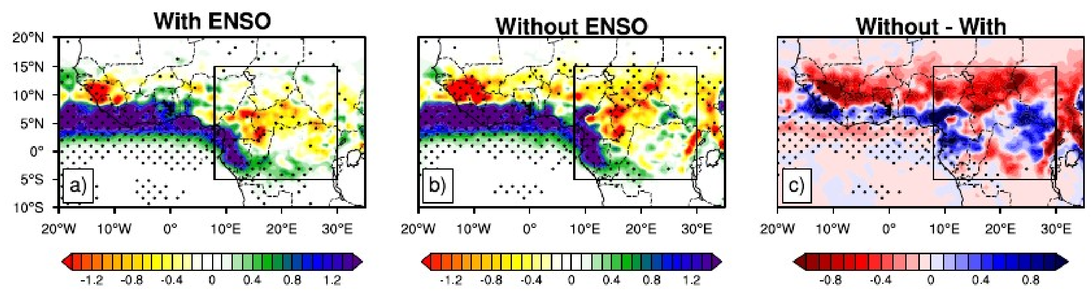
## Results

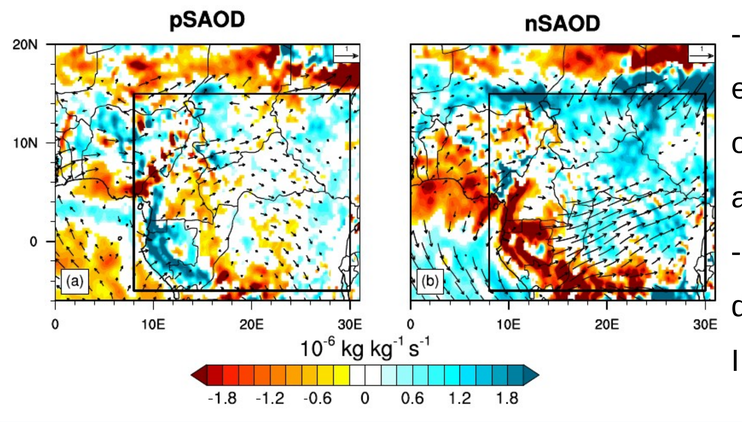



- During the pSAOD events, zone I (zone II) experiences positive (negative) rainfall anomalies.

- During the nSAOD events, zone I (zone II) experiences negative (positive) rainfall anomalies.

Since some years in which extreme SAOD events occur also coincide with the occurrence of ENSO events, the regression between CA rainfall and SAODIs in which the linear relationship with the Niño-3.4 index has been removed (pure SAOD) is also investigated, in order to gain insight into the single modulating effect of SAOD.




- During pSAOD events, zone I experiences significant convergence of humidity while zone II has mixed and low values.
- The nSAOD events show strong divergence (convergence) over zone I (II).

## Conclusion

The main findings of this study are as follows:

1) The results show that during positive SAOD events termed pSAOD, positive (negative) rainfall anomalies feature the southwestern CA termed zone I (the rest of CA landmass, termed zone II) more pronounced in reanalysis data. The reverse rainfall anomalies' pattern characterises negative SAOD events termed nSAOD,

2) However, the impact of ENSO on the SAOD is contrasted between the northern and southern CA, so that ENSO compensates for the reduced rainfall associated with the SAOD north of 10°N. South of 10°N, ENSO attenuates wetness over the southwestern zone, and reinforces the dryness over the southeastern zone.

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## Reference

This work is a publisher article in Climate Dynamics.
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