# *Quantifying Weather and Climate Impacts on Health in Developing Countries (QWeCI)*

*Science Talk*

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# SEASONAL PREDICTION OF THE INTRASEASONAL VARIABILITY OF THE WEST AFRICAN MONSOON PRECIPITATION

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SPECS

Seasonal-to-decadal climate Prediction for the improvement of European Climate Services

QWeCI

SEVENTH FRAMEWORK PROGRAMME

# Contents

- Introduction and objectives
- Data
- Methods
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# Climate prediction

- Probabilistic in nature → Quantify sources of uncertainty
- Initial conditions → Ensemble of forecasts
- Model inadequacy → Multi-model ensemble

# Objective

- Combine the ECMWF System 4, the NCEP CFSv2, the Météo-France System 3 and a simple statistical model to predict the two main modes of the WAM rainfall variability: Guinean and Sahelian regimes
- Assess the deterministic and probabilistic forecast quality of the single forecast systems and their combinations in an operational forecasting context

# Data

## Observations:

- GPCP: land and ocean (1982 - 2010) → Forecast verification
- GPCC: land only (1951 - 2010)
- Observation uncertainty
- ERSST

## Forecast systems:

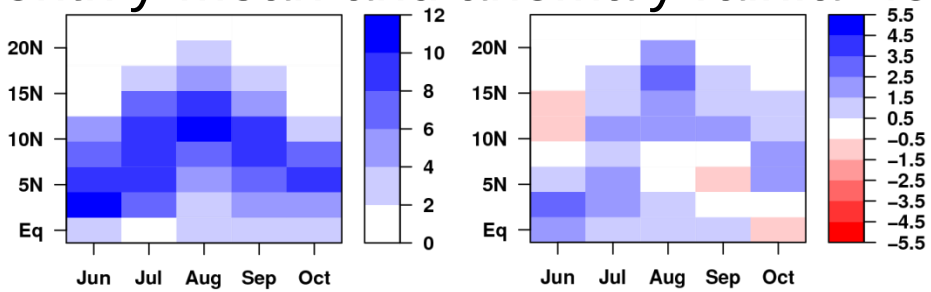
- ECMWF System 4 (S4)
- NCEP CFSv2 (CFSv2)
- Météo-France System 3 (MF3)
- Statistical model
  - Simple linear regression
  - ERSST **AMO** → GPCC **Sahelian** regime
  - ERSST **Niño3.4** → GPCC **Guinean** regime
  - Retrospective mode → First training period: 1951 - 1981, adding a new year at a time

# Methods

## Intraseasonal evolution diagram (1982 - 2010):

- Diagrams averaged over 10ºW - 10ºE
- y-axis: Eq - 20ºN
- x-axis: Jun - Oct

Monthly-mean and anomaly rainfall for 1999




- Estimate the modes of rainfall variability → PCA (EOFs and PCs)

## Combination of the PCs:

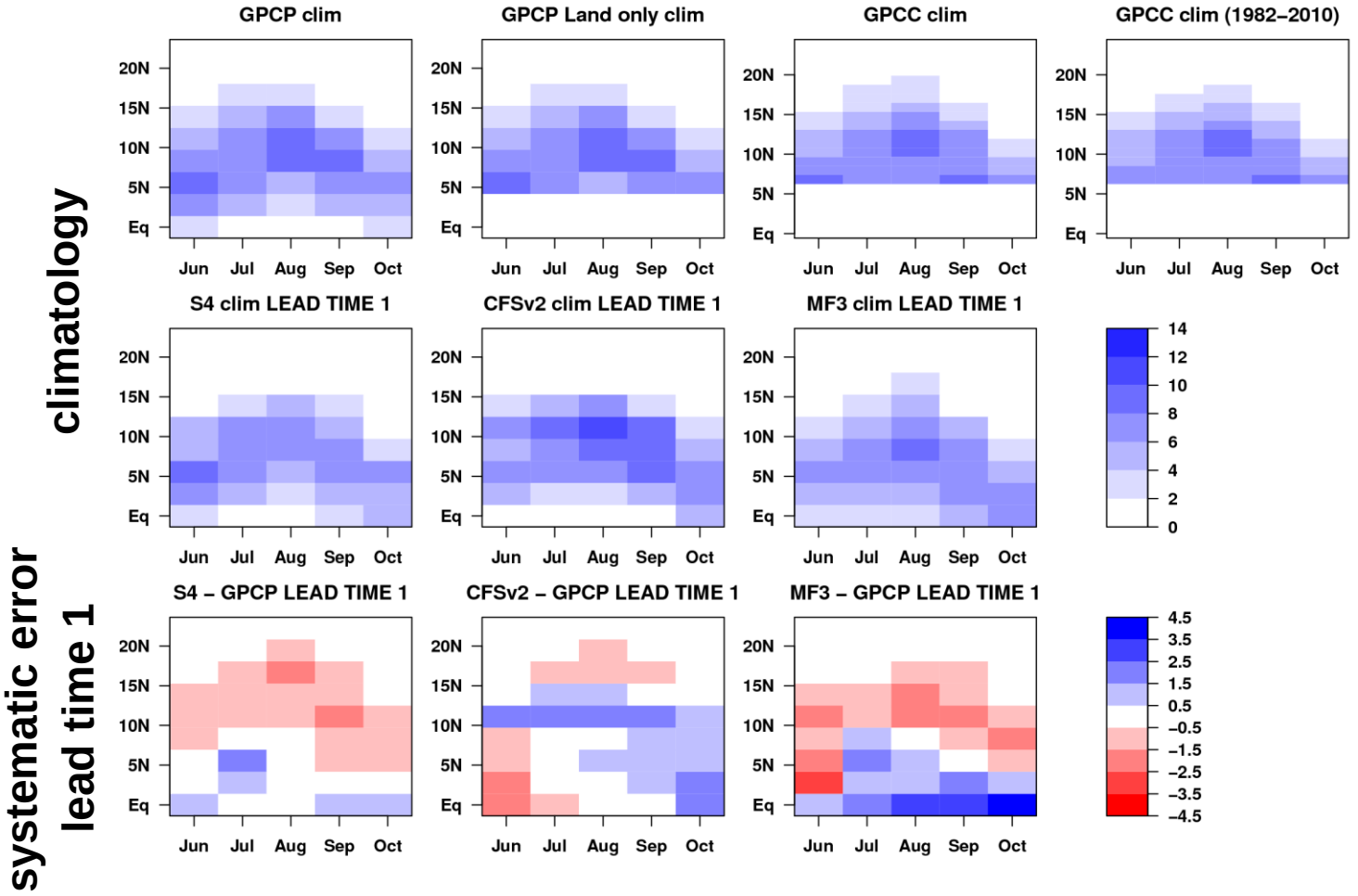
- Equal (SMM) and unequal (FA) methods of combination
- 3-years out cross-validation to avoid artificial skill

## Forecast quality assessment:

- Deterministic and probabilistic point of view

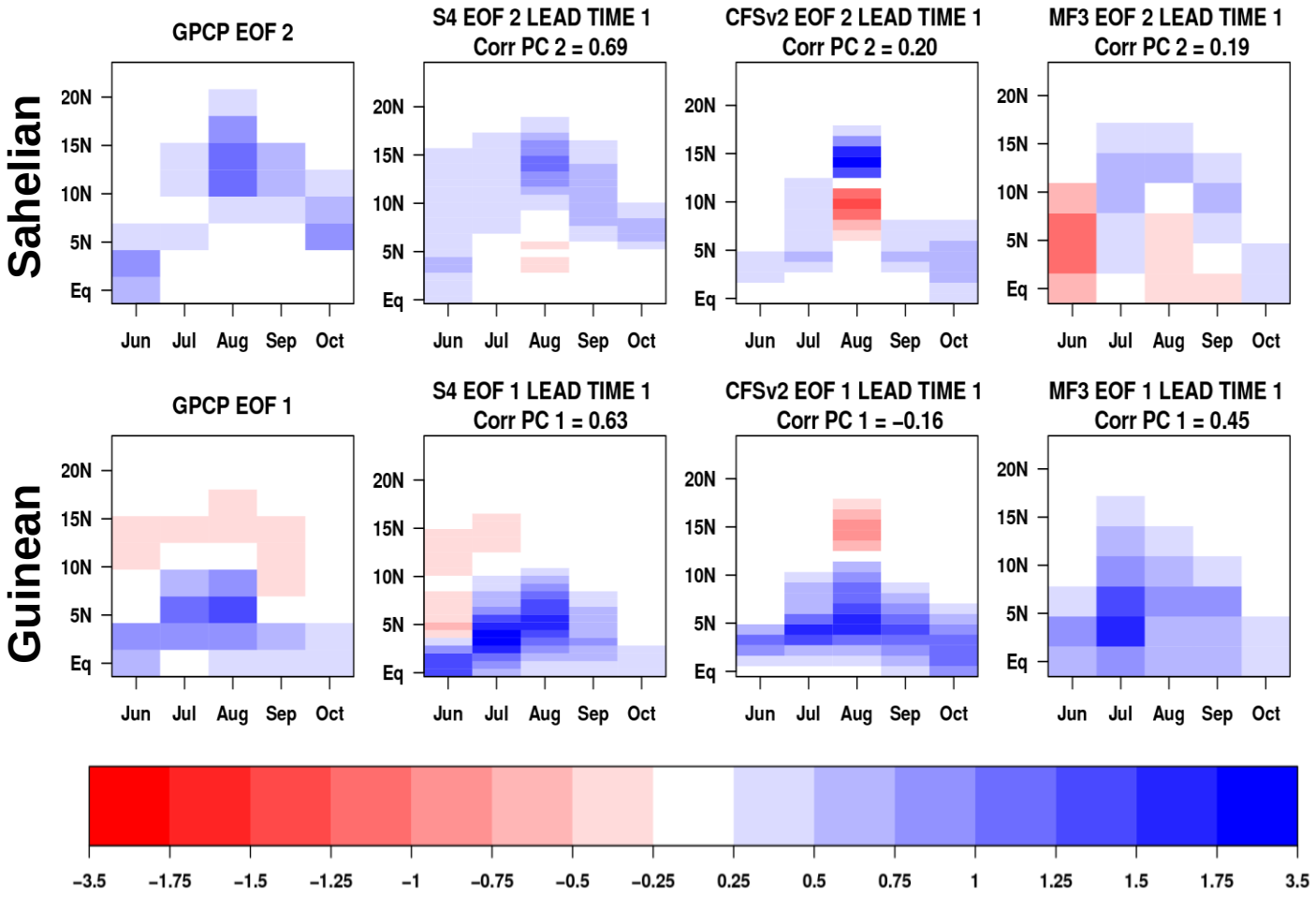
# West African Monsoon: climatology and systematic error

Intraseasonal evolution diagram of monthly rainfall averaged over 10ºW - 10ºE and for the period between June and October



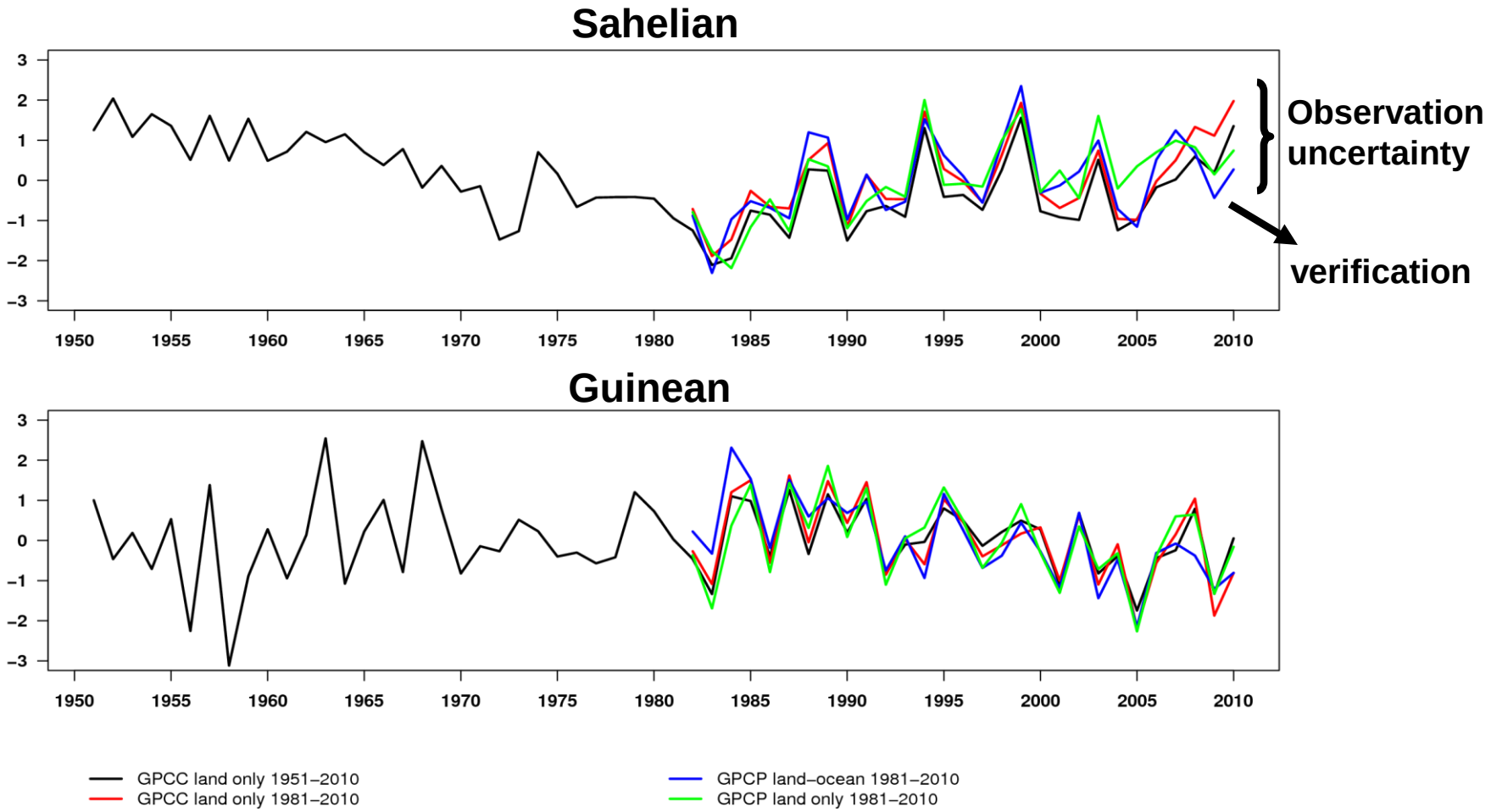
# West African Monsoon: modes of rainfall variability

First two EOFs of the predicted intraseasonal evolution diagram by S4, CFSv2 and MF3



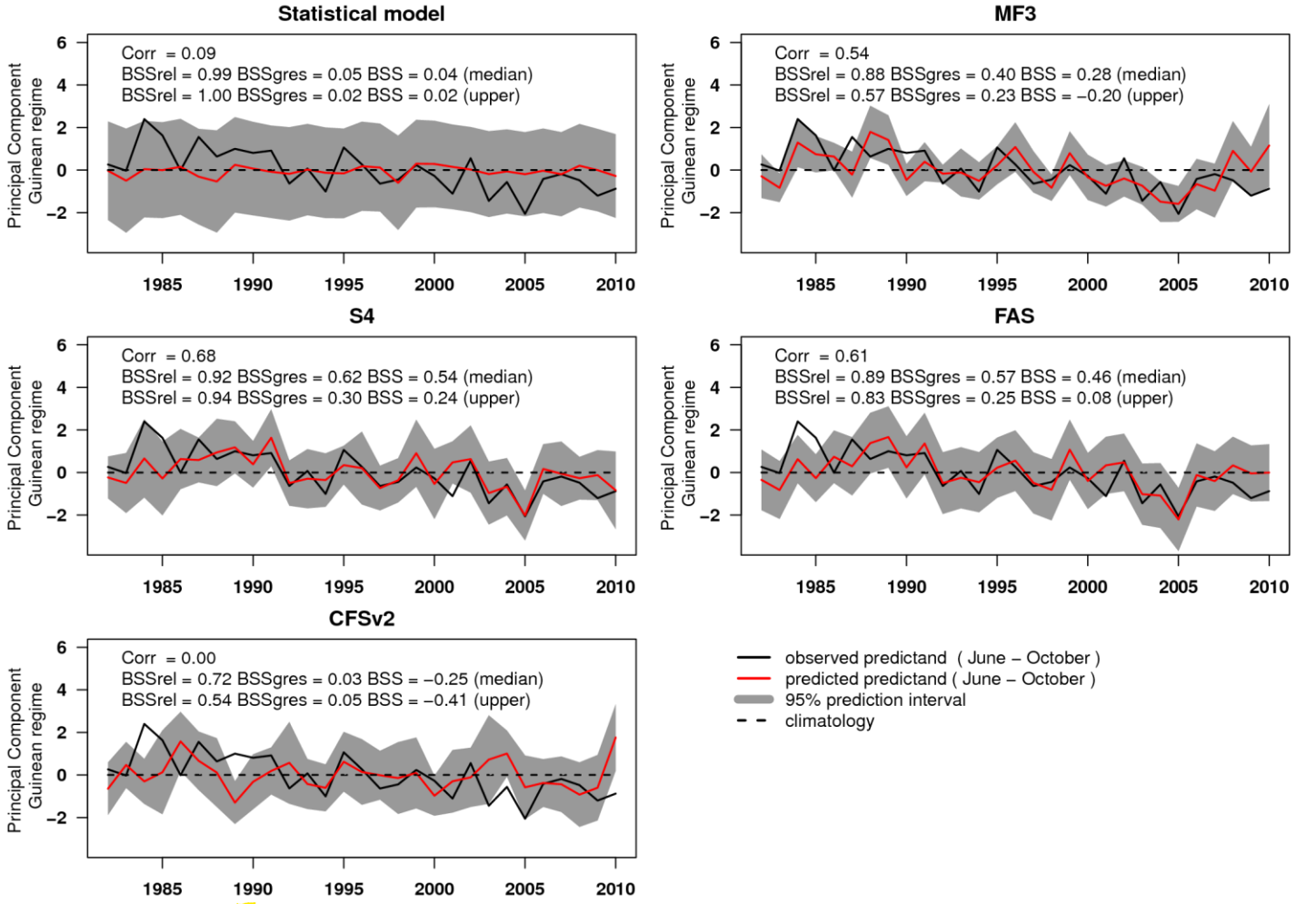
# West African Monsoon: observed principal components

First two PCs of the observed intraseasonal evolution diagram by GPCP and GPCC

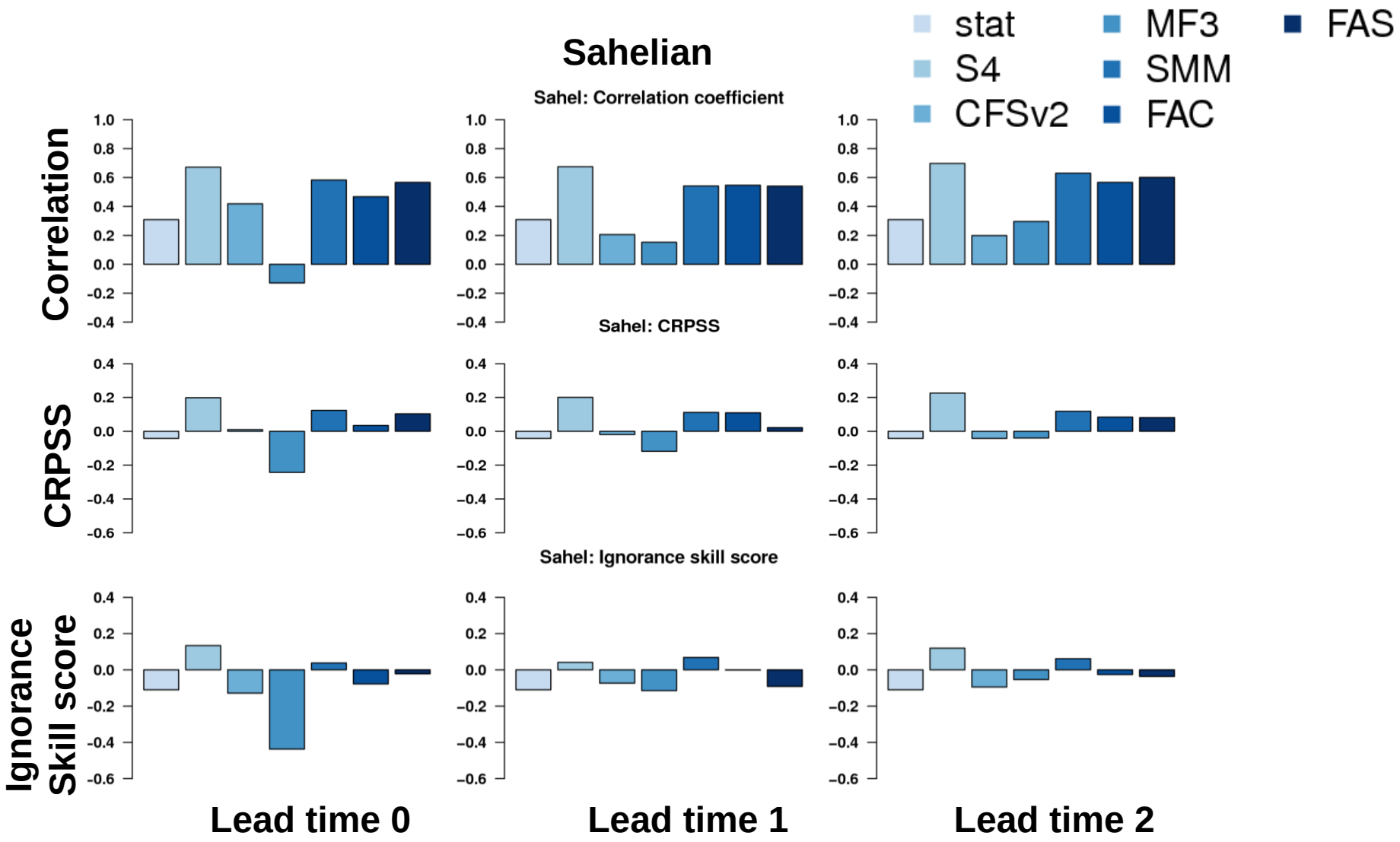


# West African Monsoon: predicted principal components

First PC (Guinean regime) of the predicted intraseasonal evolution diagram by single forecast systems and their combinations for lead 0



# West African Monsoon: forecast quality assessment



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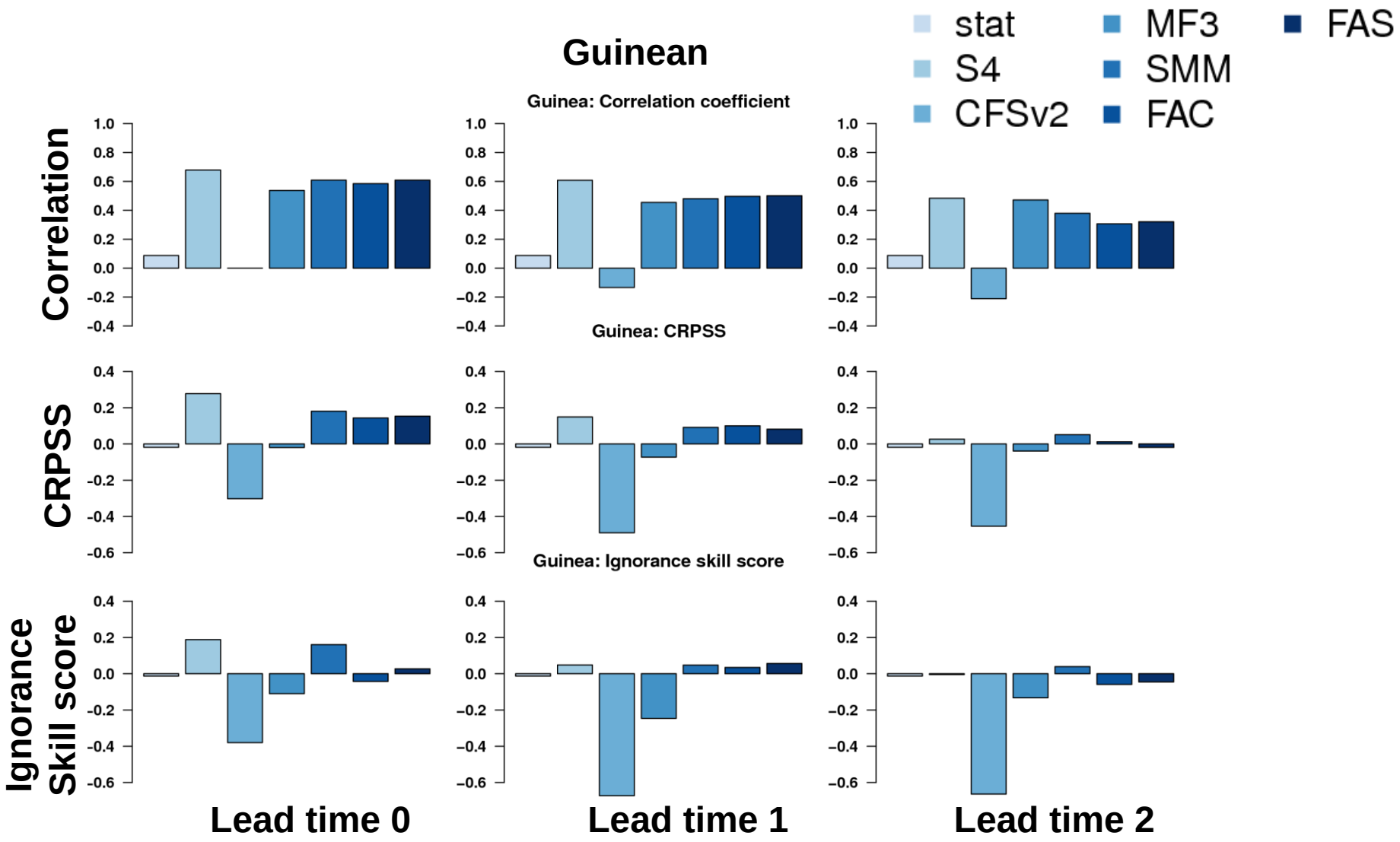

# Conclusion

- S4, CFSv2 and MF3 are able to capture the main features associated with the two leading modes of WAM rainfall variability
- However, all these operational dynamical forecast systems have substantial systematic error
- S4 has relatively high correlation when predicting the two leading modes of WAM rainfall variability and MF3 when predicting the Guinean regime. On the other hand, CFSv2 has low correlation when predicting the Guinean and Sahelian regimes
- All probabilistic scores show a similar conclusion: only S4 consistently beats the probabilistic climatological forecast
- S4 outperforms all single forecast systems and combinations

# Thank you