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Intercomparison of Reanalysis Products during Extreme Flood and Drought Events: Evaluation over the Major River Basins of Africa

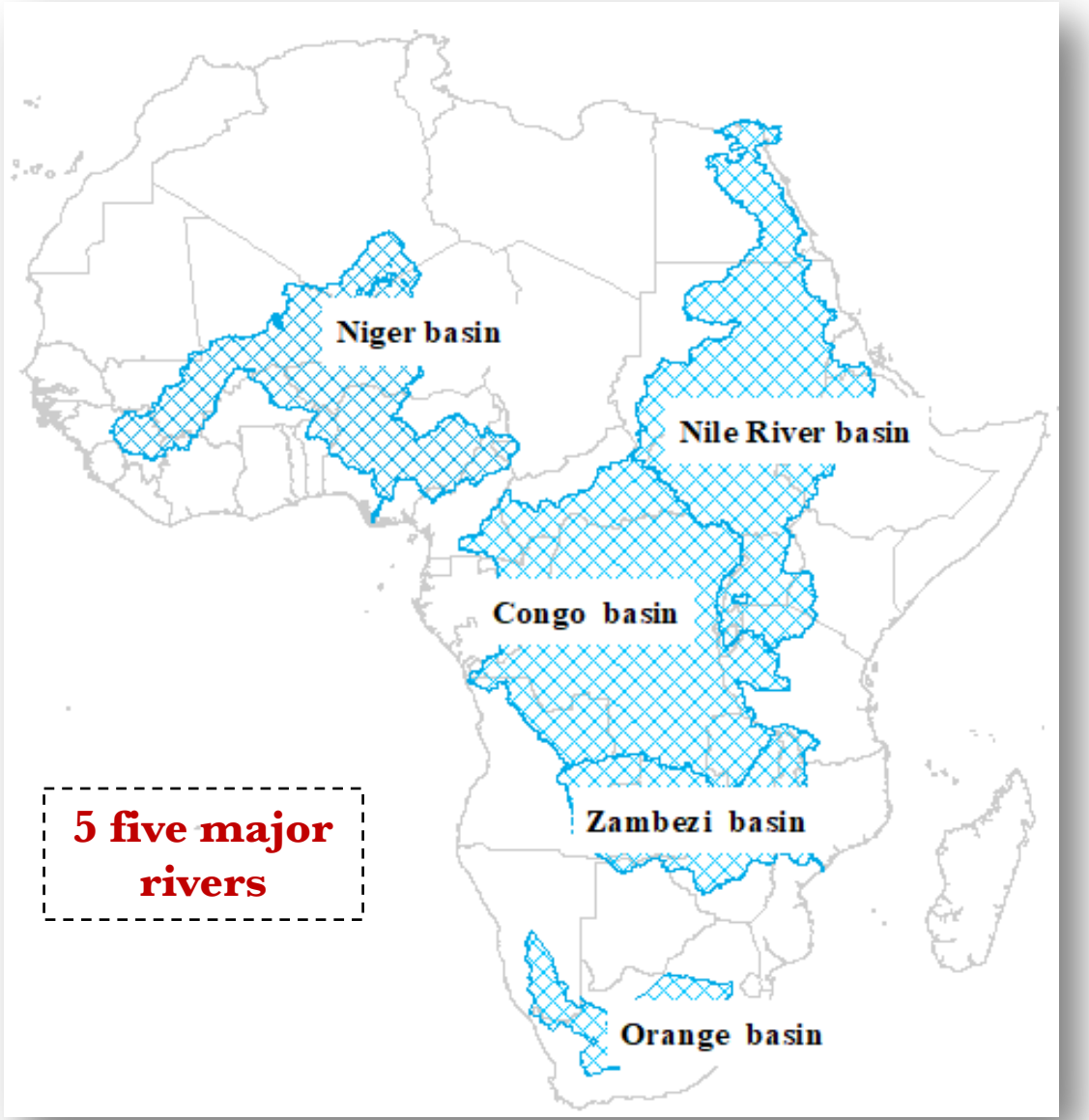
Hadir Abdelmoneim* *and Hisham Eldardiry*

**Faculty of Engineering, Alexandria University, Egypt.*

Personal Website

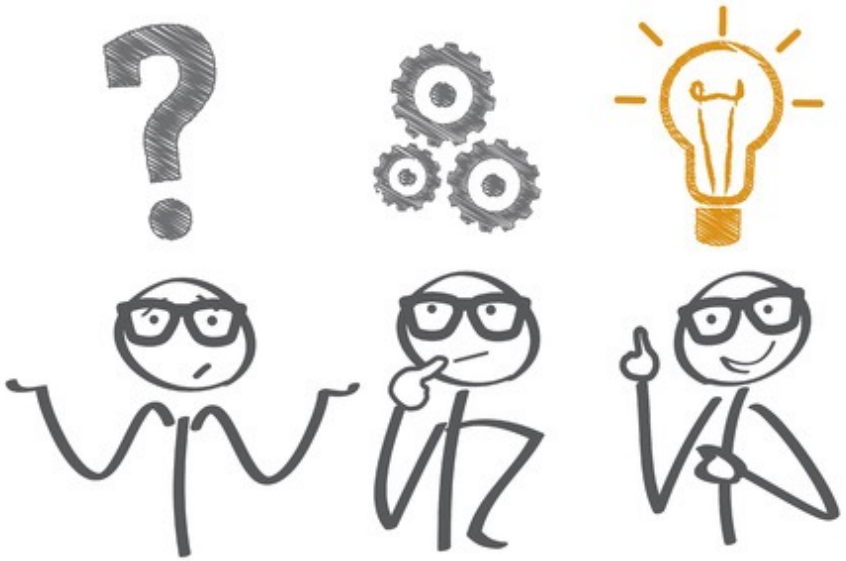
Introduction

- Africa is most vulnerable to weather and climate variability.
- **Motivation:** Precipitation is the key drive for any hydrological applications. (e.g., hydrological modeling, water management ..).
- **Challenge:** Data availability, accessibility and accuracy is predominantly an issue for building hydrological applications, particularly in data-scare regions, like Africa.

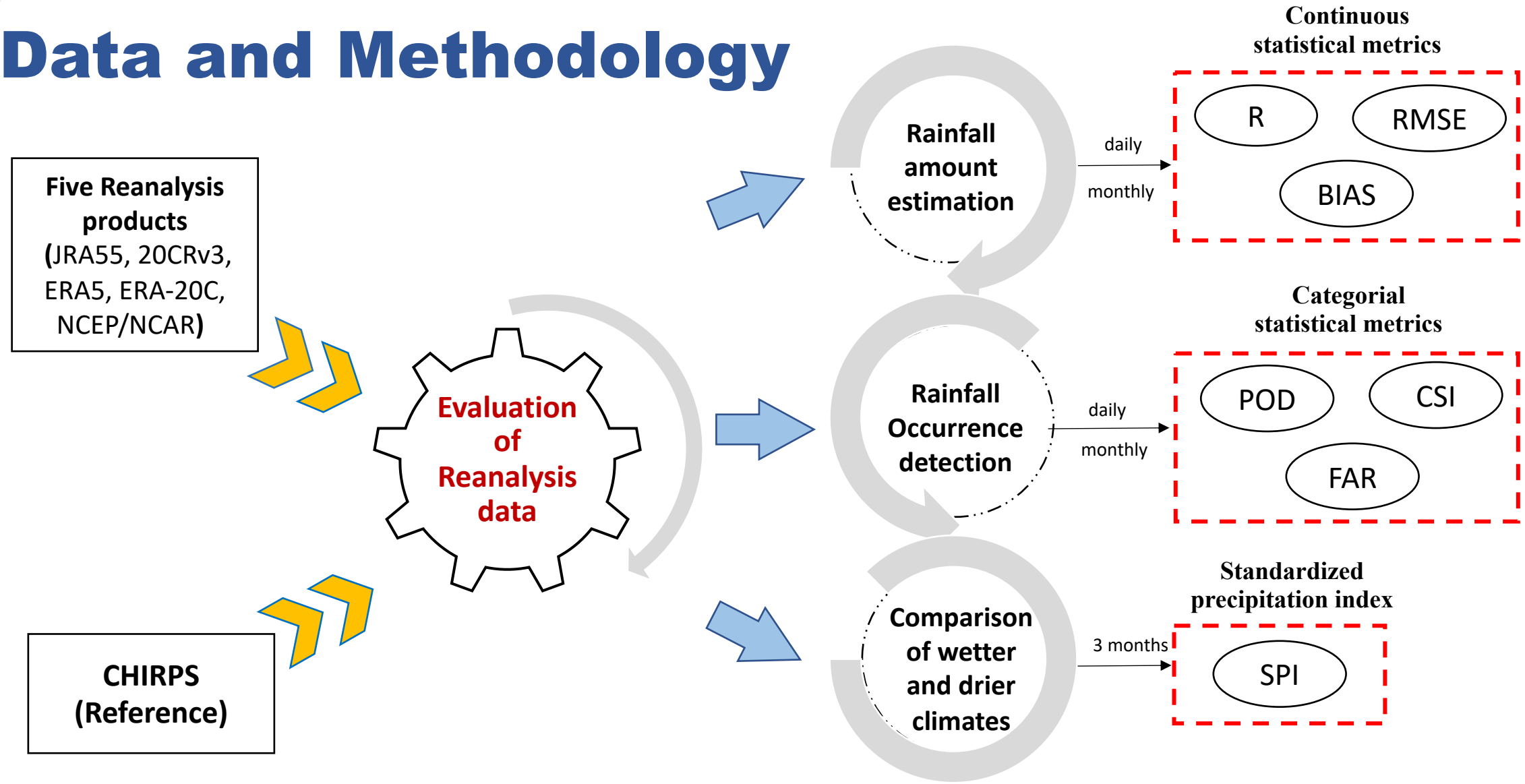


OBJECTIVES

The overarching goal is to assess the meteorological forcing from different reanalysis products during extreme events for the period (2000-2015)



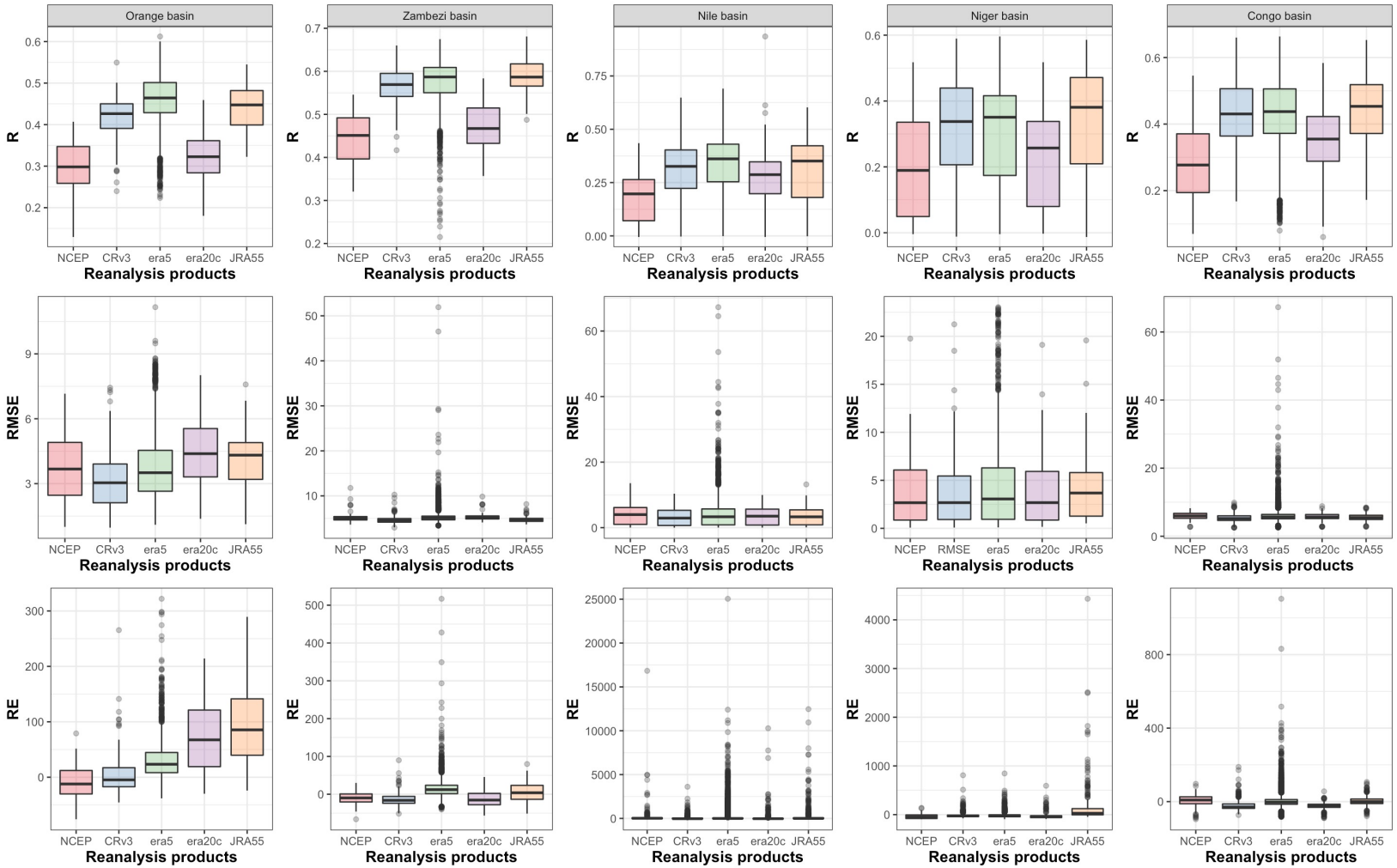
Data and Methodology



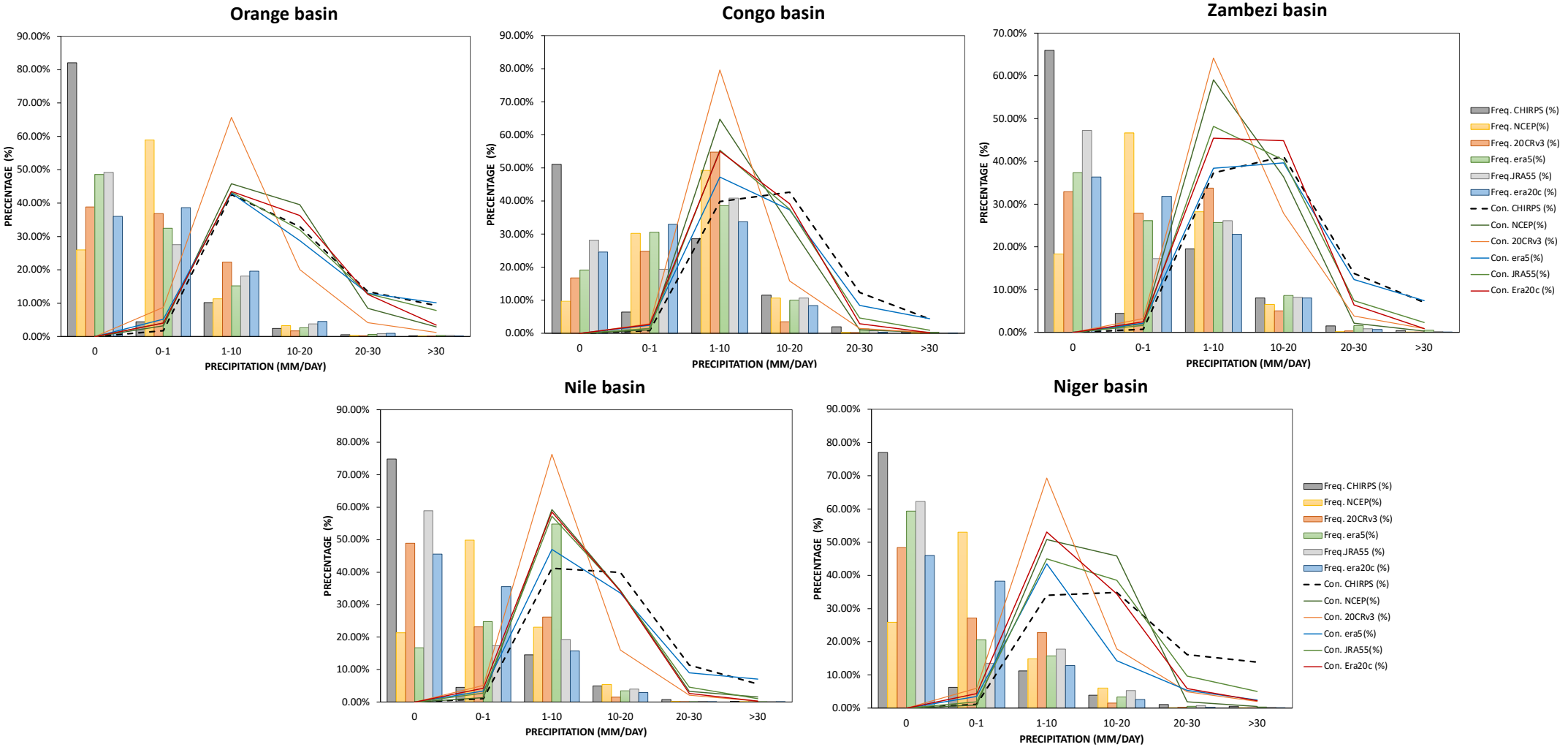
Results: (a) Rainfall amount estimation

Daily Scale

- ERA5 and JRA55 show a relatively reasonable correlation against CHIRPS, however, NCEP illustrates the weakness correlation.
- All products demonstrate a similarity in RSME values with a slight difference and outliers in such basins.
- All Reanalysis Products appear a large bias values that increase by the increasing of basins areas



Results: (a) Rainfall amount estimation



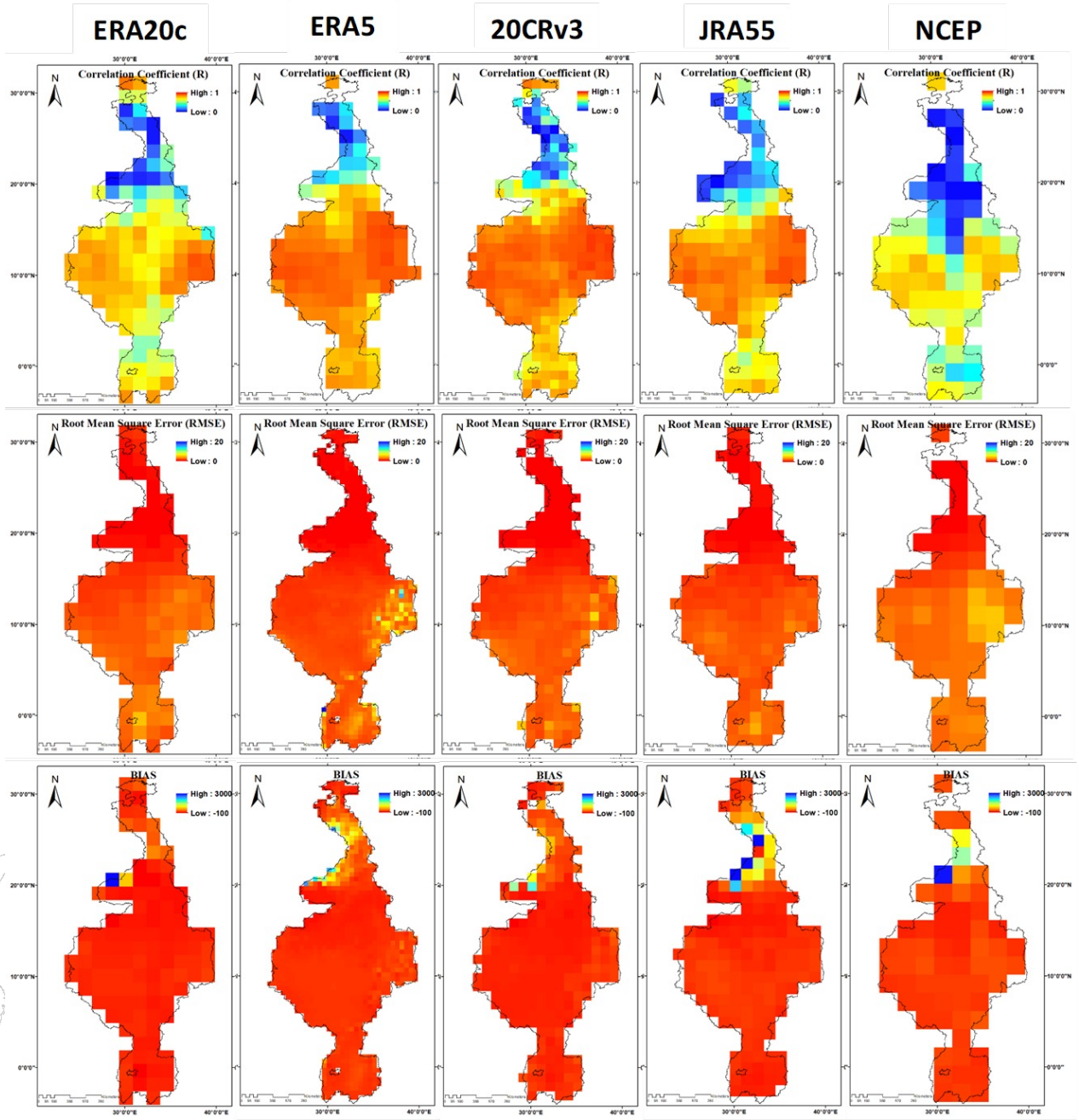
- All products failed to detect for no rainfall events, however, (era5, era20c and JRA55) show a good agreement for high moderate events (20-30 mm/day).

Results: (a) Rainfall amount estimation

Monthly Scale

- Good performance -- > the Ethiopian highlands
- Poor performance -- > North part of the basin
- Reasonable performance -- > remain parts of basin
- Sigficant improvement -- > RSME and BIAS values
- NCEP -- > less performance
- ERA5, JRA55 -- > good performance
- 20CRv3 -- > less Bias values

Nile basin



Results: (a) Rainfall amount estimation

	ERA20C	ERA5	20CRv3	JRA55	NCEP
Nile basin	O	√	O	√	×
Orange basin	O	O	×	O	√
Congo basin	√	×	×	√	O
Niger basin	O	×	√	×	O
Zambezi basin	√	×	O	×	√

√ best performance

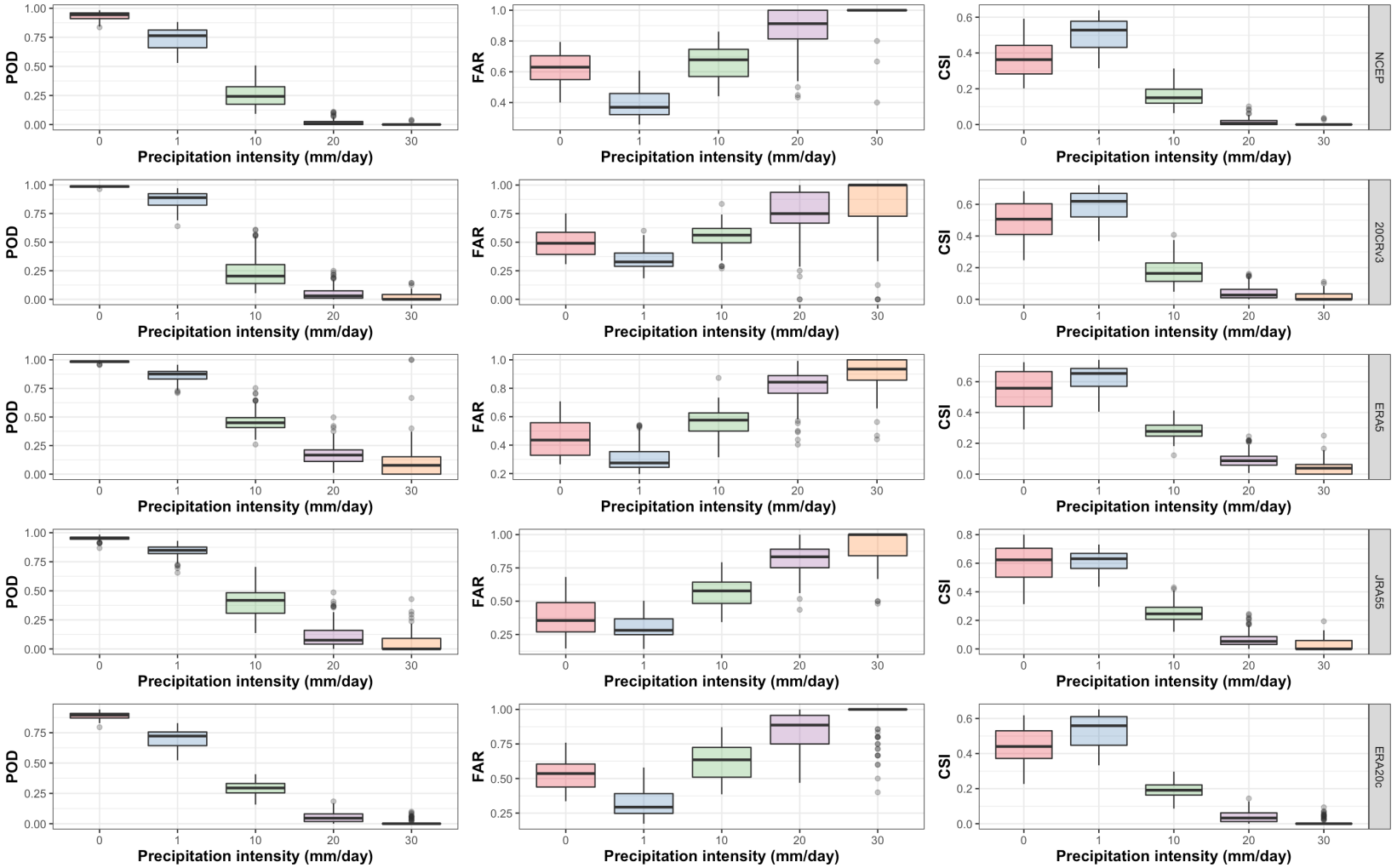
O reasonable performance

× weak performance

Results: (b) Rainfall Occurrence detection

Daily Scale

Zambezi basin



- The performance of all products decrease gradually by the increase of the precipitation intensity.
- In all rainfall events, ERA5 has the best performance, followed by JRA55.

Conclusion

- **ERA5** and **JRA55** have the best correlation over the majority of basins but they still have such discrepancy with a **significant bias**.
- **NCEP** demonstrate the weak performance in detection light rain events for most basins.
- All products reveals a **large bias** for both daily and monthly scales.
- **ERA5** is the best products in detection of extreme precipitation events.

Thank you!

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For any questions, please feel free to contact me at
hadir.abdelmoneim@alexu.edu.eg