

AOMSUC-15 FYSUC-2025

FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE
THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE



Comparative Study of Satellite Precipitation and Synoptic Observations in the Republic of Guinea

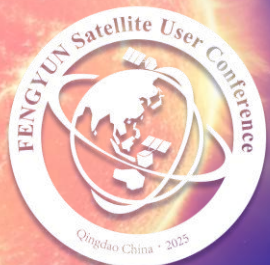
Mamadou Salioù Diallo^{1,3}, Ibrahima Kalil Kanté^{2,3}, Amadou Lamarana Bah³, Fatoumata Sylla⁴,

¹Higher Institute of Distance Learning, Technical Department, BP 1961, Conakry, Republic of Guinea

²Air Navigation and Aerodrome Safety Department, Guinean Civil Aviation Authority, BP 95, Conakry, Guinea

³Applied Energy Teaching and Research Laboratory, University Gamal Abdel Nasser of Conakry, BP 1147, Conakry, Guinea

⁴Director General of Research at the Ministry of Higher Education, Scientific Research and Innovation (MERSI), BP 2201, Conakry, Guinea



AOMSUC-15 FYSUC-2025

FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE
THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE



1

I- Introduction

1. Context and Problematics
2. Objectifs
3. Study area



Work-Plan

2

II- Data and methods

1. Data set
2. Methods

3

III- Results and Discussions

1. Results
2. Discussions

4

IV- Conclusion and Suggetions



AOMSUC-15 FYSUC-2025

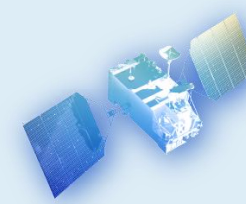
FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE
THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE

1

I- Introduction (1/2)

1.1 Context and Problematics (1/2)

- ❑ The precipitation plays an important role in global energy and water cycle. Accurate knowledge of its quantity reaching the earth's surface is of particular importance for freshwater assessment and management related to land use, agriculture and hydrology among others.
- ❑ On a global scale, 60% of precipitation occurs in tropical regions (*Delahaye et al., 2013; Ringard et al., 2017*), where the Republic of Guinea is located.
- ❑ Atmospheric and oceanic dynamics, which redistribute the excess energy received in these regions towards mid-latitudes, explain the high spatiotemporal variability of rainfall in the tropics (*Delahaye et al., 2013*).
- ❑ Precipitation is one of the most important meteorological and hydrological parameters, but it is difficult to measure, not least because of its great spatio-temporal variability and the conditions under which instruments are installed and maintained.
- ❑ Given the need for reliable precipitation data, national and international organizations such as the WMO (World Meteorological Organization) have launched and supported numerous research and environmental monitoring programs.
- ❑ In recent years, meteorologists, climatologists and hydrologists (*Maia-Bresson et al., 1996*) have shared a common interest in the undeniable need to estimate rainfall effectively from a practical point of view. It is with this in mind that projects to place meteorological observation satellites into orbit have emerged.



1

I- Introduction (2/2)

1.1 Context and Problematics (2/2)

It is with this in mind that projects to place meteorological observation satellites into orbit have emerged. At present, the importance of using satellite data to estimate cumulative rainfall, particularly in regions lacking adequate “conventional means” such as rain gauges, pluviometers or radar, is well recognized ([Maia-Bresson et al., 1996](#)).

1.2 Object

This work compares satellite rainfall with synoptic observations in the Republic of Guinea.

1.3 Study area

The Republic of Guinea is a West African country covering an estimated 245,857 km² and made up of four (4) natural regions with different microclimates.

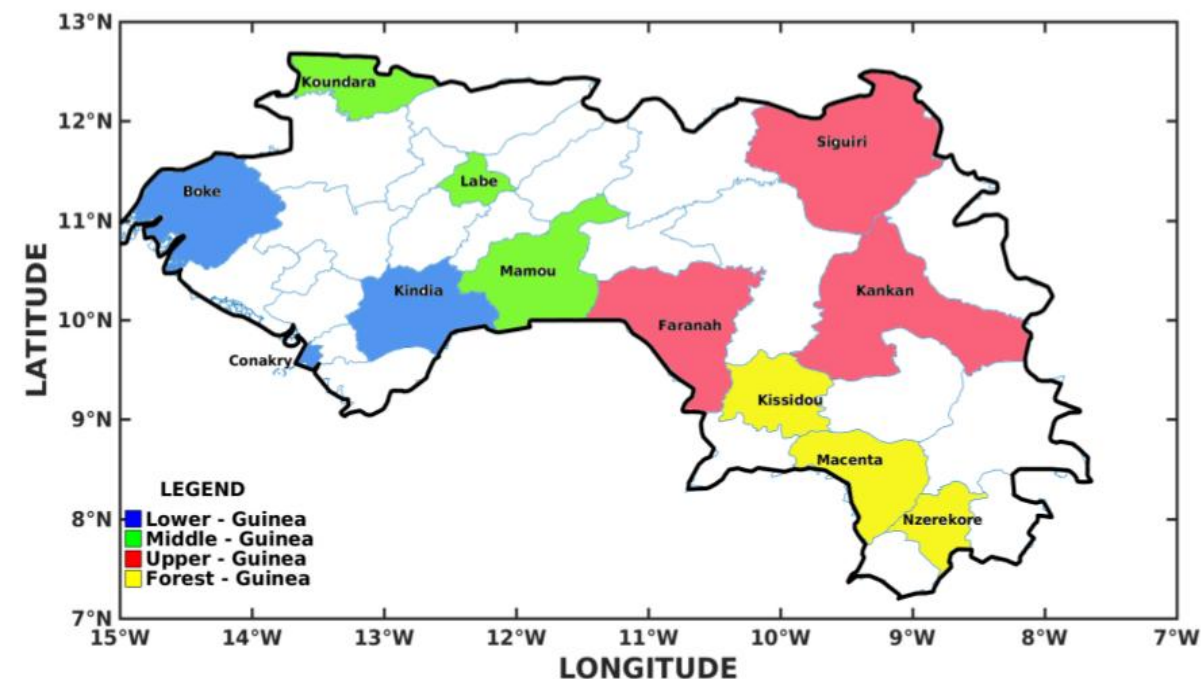
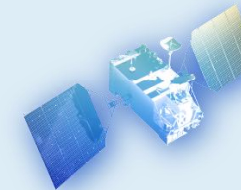


Figure 1: Guinea' s twelve (12) synoptic stations and its four (4) natural regions ([Kante et al., 2020](#))



AOMSUC-15 FYSUC-2025

FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE
THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE



2

II- Data and methods (1/2)

2.1 Data sets

Two types of data were used in this work: synoptic observations and satellite data.

2.1.1 Observation Data

- ❖ These data are provided by the National Directorate of Meteorology in Conakry, over a period of thirty years (30 years).
- ❖ To this end, twelve (12) synoptic stations have been selected for this study, with regular observations and reliable data [6], for an evaluation of satellite data. These are monthly point data over a 30-year period.

2.1.2 Satellite Data

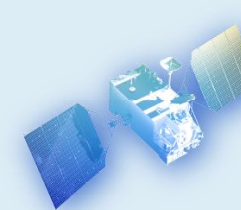
In this work, we used the following satellite products:

- ❖ GPCC (Global Precipitation Climatology Center), GPCP (Global Precipitation Climatology Project),
- ❖ CHIRPS (Climate Hazards Group InfraRed Precipitation with Station Data) and,
- ❖ CRU (Climatic Research Unit). These data are compared with observations from the twelve (12) synoptic stations in Guinea.



AOMSUC-15 FYSUC-2025

FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE
THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE

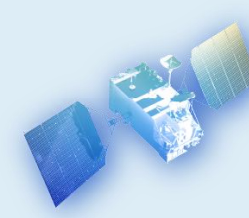


2

II- Data and methods (2/2)

2.2 Methods used

- We considered synoptic and satellite observation data for a 30-year period from 1981 to 2010.
- First, using these observation data, we calculate the mean seasonal precipitation cycle for each station, then compare them with satellite data. This first part of the methodology concerns the amount of precipitation and its variability over the period under consideration, compared with satellite products.
- We evaluate rainfall trends over the study period in the four (4) natural regions of Guinea, using time averages from the 3 stations located in each region. This enables us to determine the start and end of rainy seasons in Guinea, and to identify satellite products that reproduce observations well.
- Secondly, we calculate the correlations between observational and satellite data.
- The correlation coefficient allows us to determine the link between the observational and satellite data associated with the level of significance.

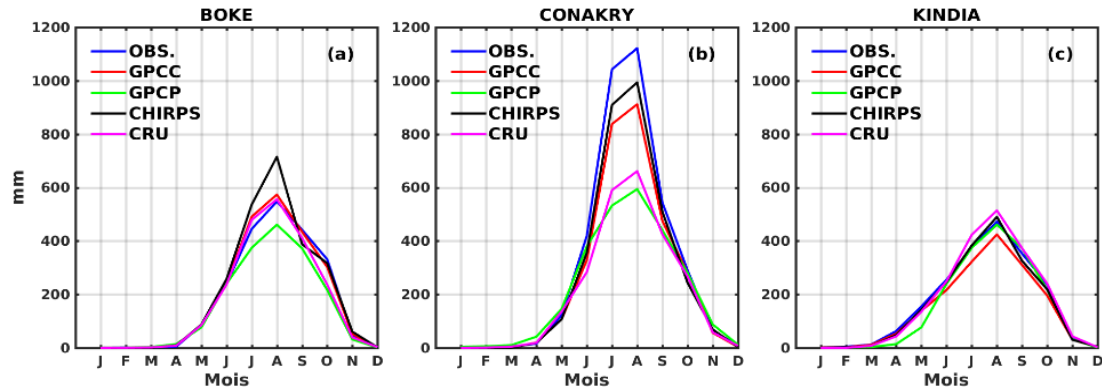


3

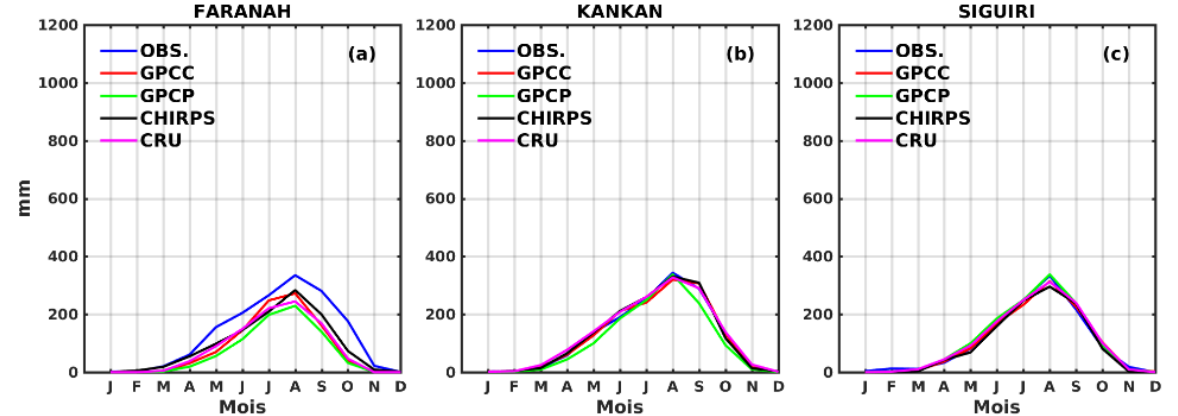
III- Results and Discussions (1/3)

3.1 Results (1/3)

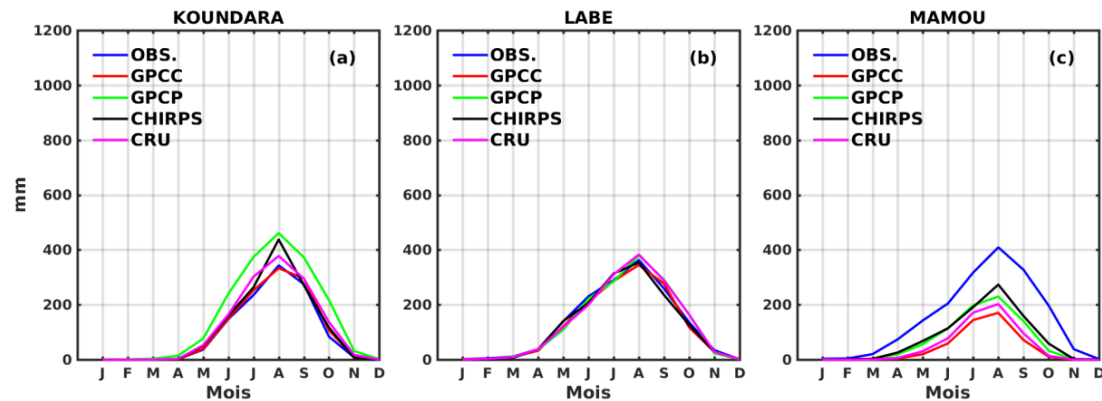
1- Lower Guinea



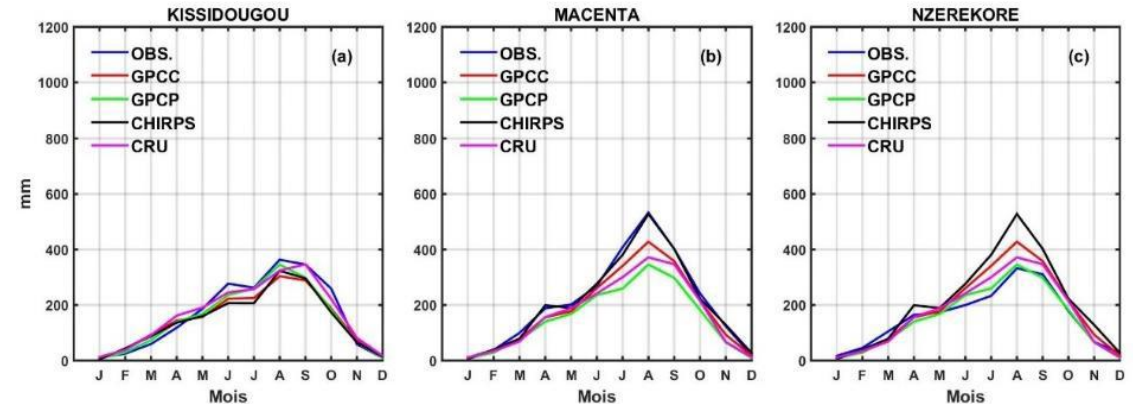
3- Upper Guinea

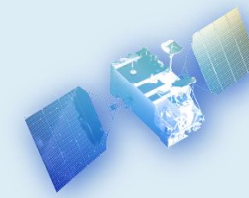


2- Middle Guinea



4- Forest Guinea



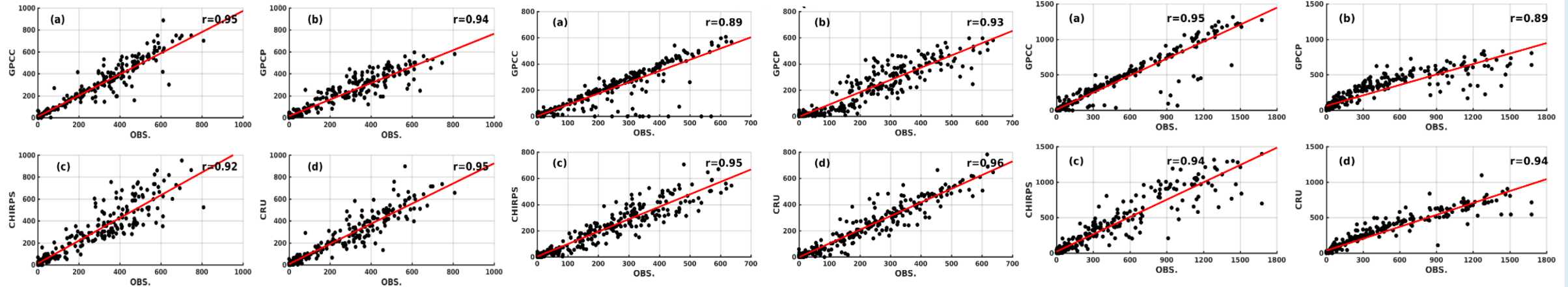


3

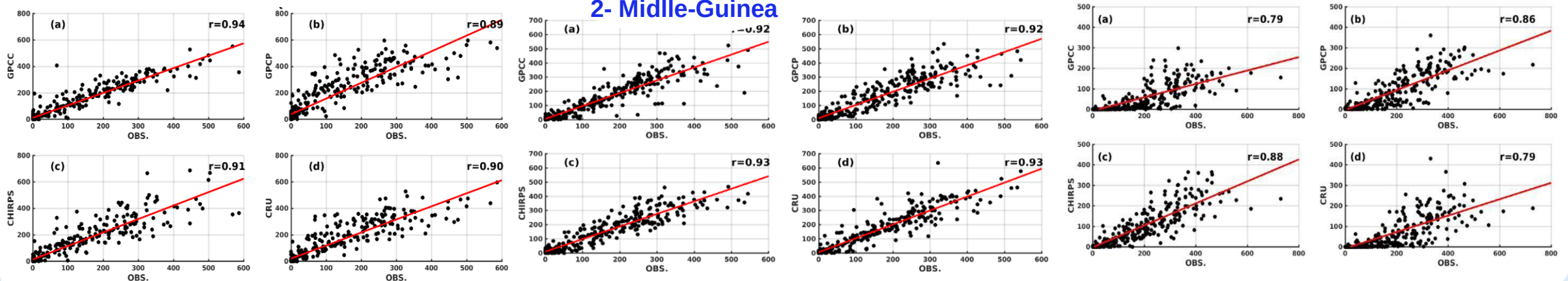
III- Results and Discussions (2/3)

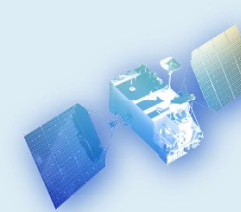
3.2 Results (2/3)

1- Lower-Guinea



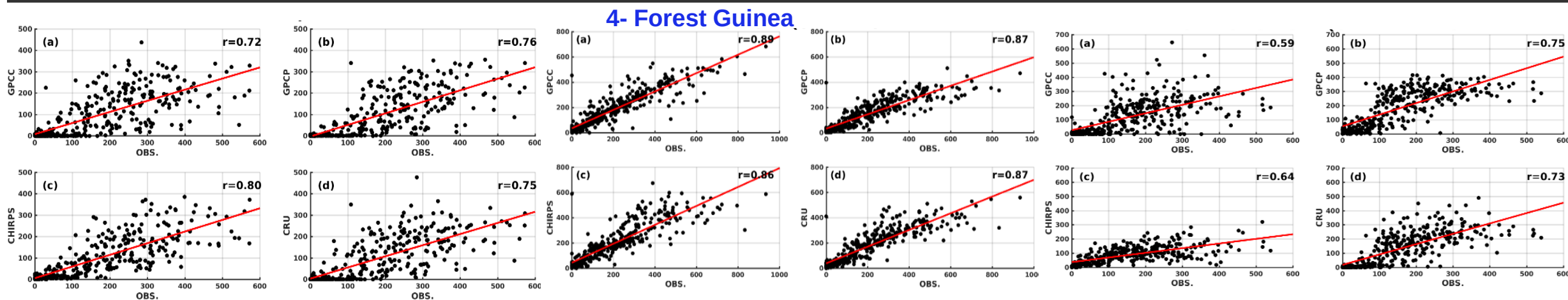
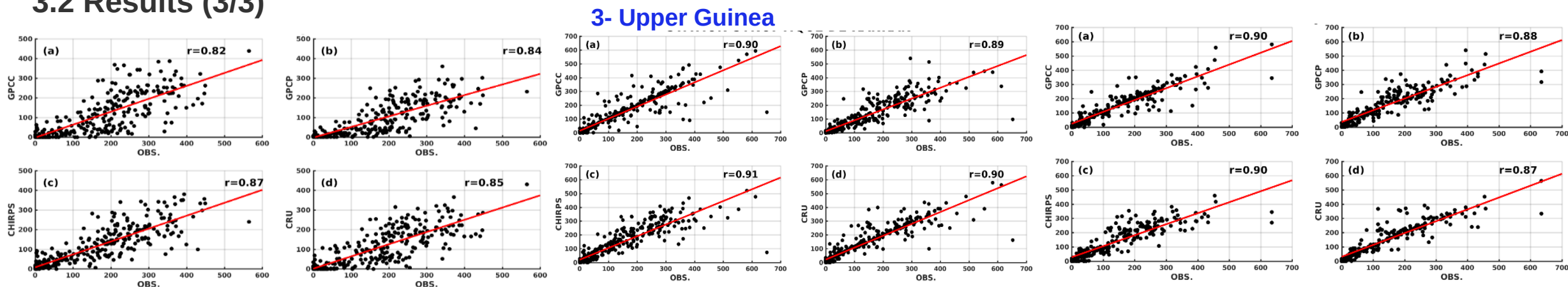
2- Middle-Guinea





3 III- Results (3/3)

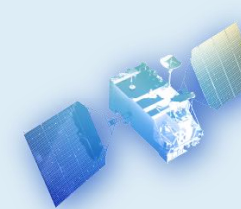
3.2 Results (3/3)





AOMSUC-15 FYSUC-2025

FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE
THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE



4

IV- Conclusion and suggestions

4.1 Conclusion

A study of the correlations between satellite products and observed precipitation at the 12 synoptic stations in Guinea, with correlation coefficients ranging from 0.59 to 0.96, and with scatter plots closely spaced on either side of the regression line, shows that satellite precipitation (GPCC, GPCP, CHIRPS and CRU) correlates well with synoptic observations in Guinea.

4.2 Suggestions

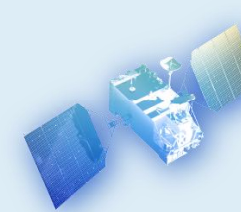
Finally, we would like to continue this work as part of an in-depth study, with other data such as ACR2, TRMM and Era5, so that we can take this research further, also taking into account other statistical calculation methods:

- ✓ Bias,
- ✓ RMSE (root mean square error),
- ✓ CHA (ascending hierarchical classification),
- ✓ EOFs (empiric orthogonal function),
- ✓ PCAs (principal component analysis).



AOMSUC-15 FYSUC-2025

FIFTEENTH ASIA-OCEANIA METEOROLOGICAL SATELLITE USERS' CONFERENCE
THE JOINT 2025 FENGYUN SATELLITE USER CONFERENCE



THANK YOU FOR YOUR ATTENTION

ACKNOWLEDGEMENT TO



Hosted by



Co-Sponsorship

IC-FYMS

