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Université d'Abomey-Calavi



# Earth observation for water, agriculture and forestry applications.

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# Outline

- I. Introduction
- II. Earth observation
- III. Applications in water, agriculture and forestry
- IV. Satellite data / research in Laboratoire de Physique de l'Atmosphère (UAC)
- V. Conclusion and perspectives

# I- Introduction

- Earth observation provides important decision-making bases for environmental protection, climate, land use, coastal monitoring, disaster management and sustainable development.
- Components of Earth observation
- Major Earth observation missions
- Satellite data
- Satellite data offer crucial tools for tackling specific water, agriculture, forestry and air quality challenges around the world, and particularly in Africa.

# III- Earth observation (Satellite for water applications)

## **Water Resources Management**

- \* Reservoir and river monitoring
- \* Flood zone mapping
- \* Water quality monitoring

MetOp satellites ; The Jason series ; SWOT ; Meteosat satellites ; .....

# III- Earth observation (Satellite for agriculture applications)

## **Optimization of farming practices**

- \* Crop monitoring
- \* Irrigation Management
- \* Crop Forecasting

Sentinel-2 ; Sentinel-3 ; Landsat ; ....

# III- Earth observation (Satellite for forestry applications)

## **Sustainable Forest Management**

- \* Deforestation Monitoring
- \* Forest Fire Monitoring
- \* Habitat Mapping

MetOp satellites ; Sentinel-2 ; Sentinel-3; .....

## Climatology of coastal wind regimes in Benin

FRANÇOIS K. GUEDJE<sup>1\*</sup>, ARNAUD V.V. HOUETO<sup>1</sup>, ETIENNE B. HOUNGNINOU<sup>1</sup>, ANDREAS H. FINK<sup>2</sup> and PETER KNIPPERTZ<sup>2</sup>

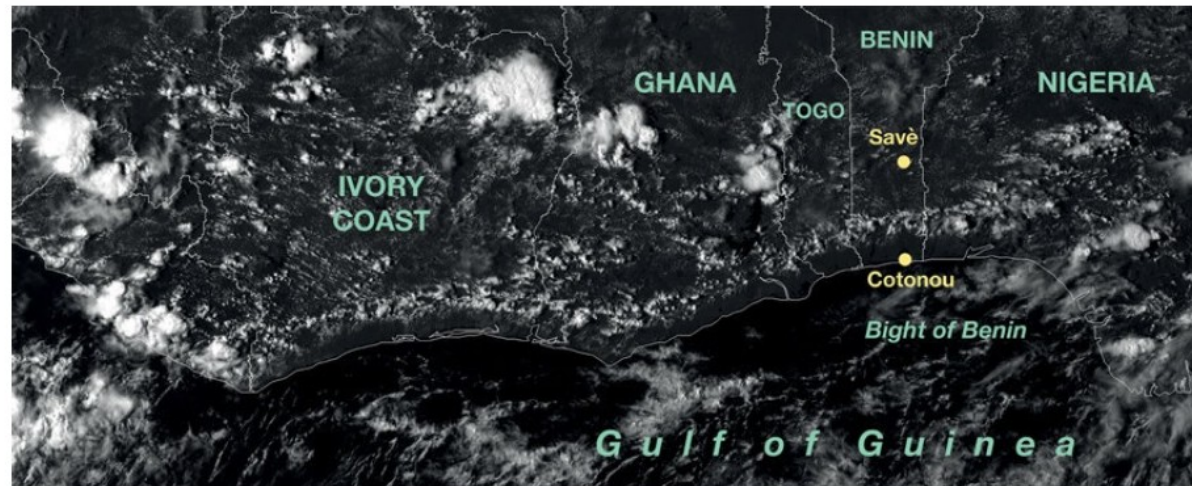
<sup>1</sup>Laboratoire de Physique de l'Atmosphère, Université d'Abomey-Calavi, Bénin.

<sup>2</sup>Karlsruhe Institute of Technology, Institute of Meteorology and Climate Research, Germany.

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F.K. Guedje et al.: Climatology of coastal wind regimes in Benin

*Meteorol. Z. (Contrib. Atm. Sci.)*

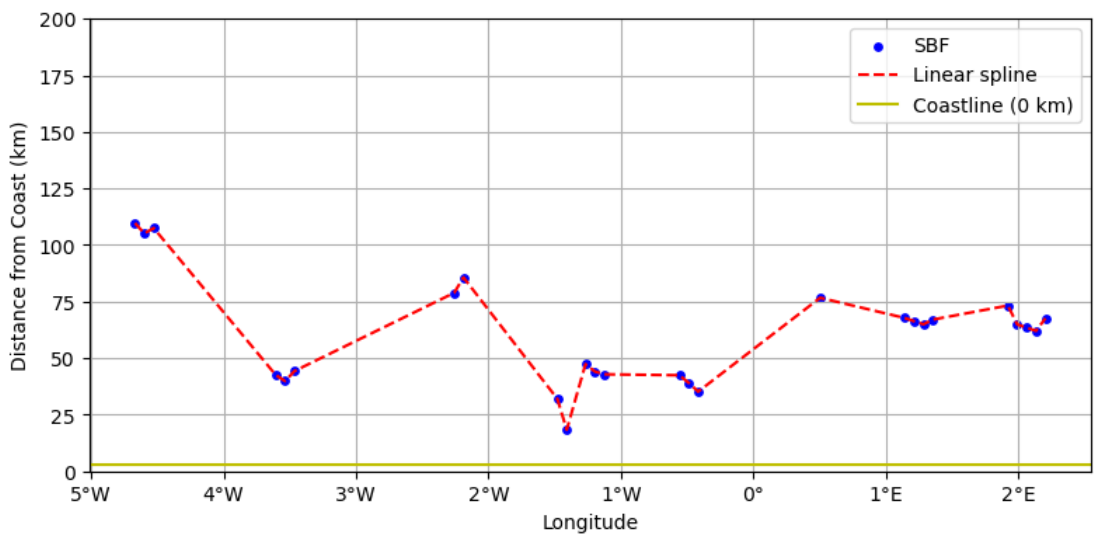
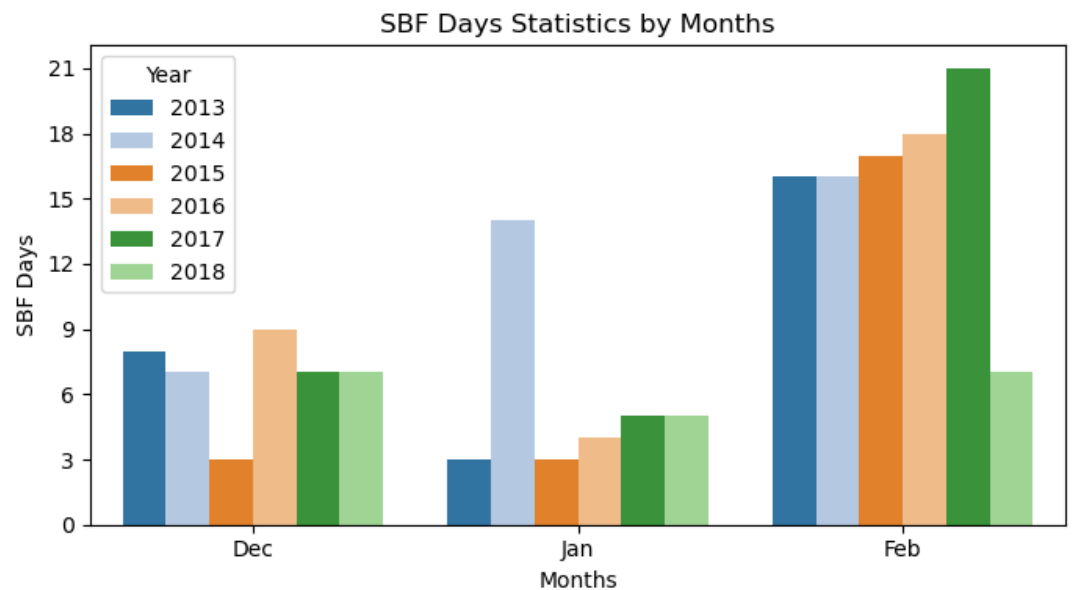
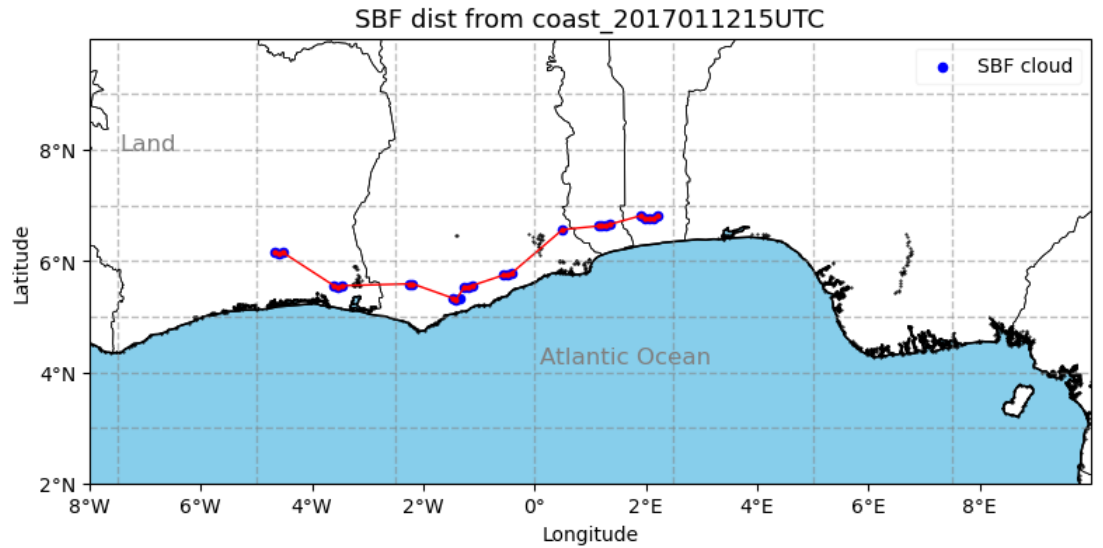


**Figure 1:** Visible image of the Guinea Coast from Meteosat Second Generation 2 for 18 September 2016 at 1500 UTC. Country names, ocean areas and names of surface stations used are indicated.

# IV- Satellite data / research in Laboratoire de Physique de l'Atmosphère (UAC)

Automatic detection of the sea breeze fronts along the Gulf of Guinea (West Africa) and its inland penetration,

Thomas D'Aquin Allagbe<sup>1,3</sup>, François K. Guedje<sup>1,3</sup>, Marlon Maranan<sup>2</sup>, Arnaud Houeto<sup>1,3</sup>, Andreas H. Fink<sup>2</sup>, P. Knippertz<sup>2</sup>  
<sup>1</sup>Laboratoire de Sciences des Matériaux et Modélisation (LaSMMo)/ University of Abomey-Calavi, UAC-Benin  
<sup>2</sup>Karlsruhe Institute for Technology (KIT), Institute of Meteorology and Climate Research (IMK), Troposphere Research (IMK-TRO), Karlsruhe(Germany)  
<sup>3</sup>International Chair in Mathematical Physics and Applications/ University of Abomey-Calavi, UAC-Benin



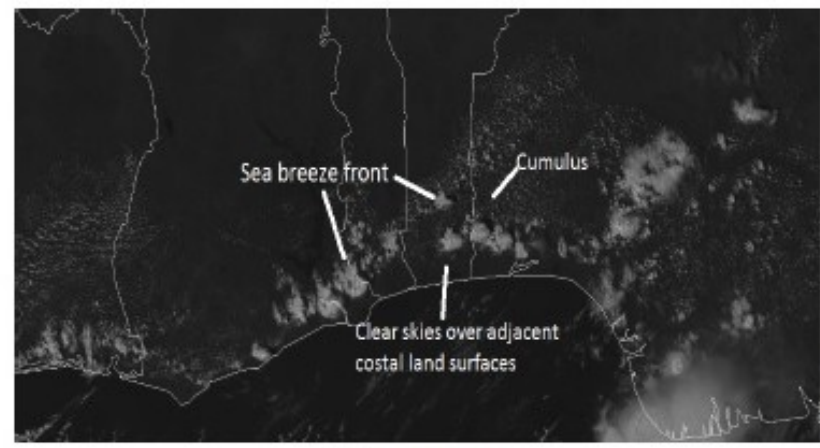


# IV- Satellite data / research in Laboratoire de Physique de l'Atmosphère (UAC)

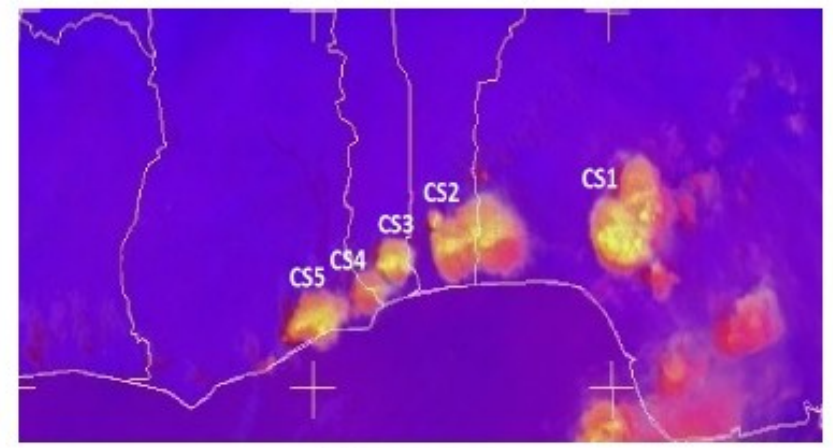
*Numerical simulations of sea breeze circulation and induced convection along the West Africa coastal areas*

The regional-scale model WRF-ARW is applied to the Guinea coast for a SB convection study on 07 February 2018, to assess the atmospheric dynamics in the SB convergence zone (SBCZ).

V. V. A. Houeto et al.

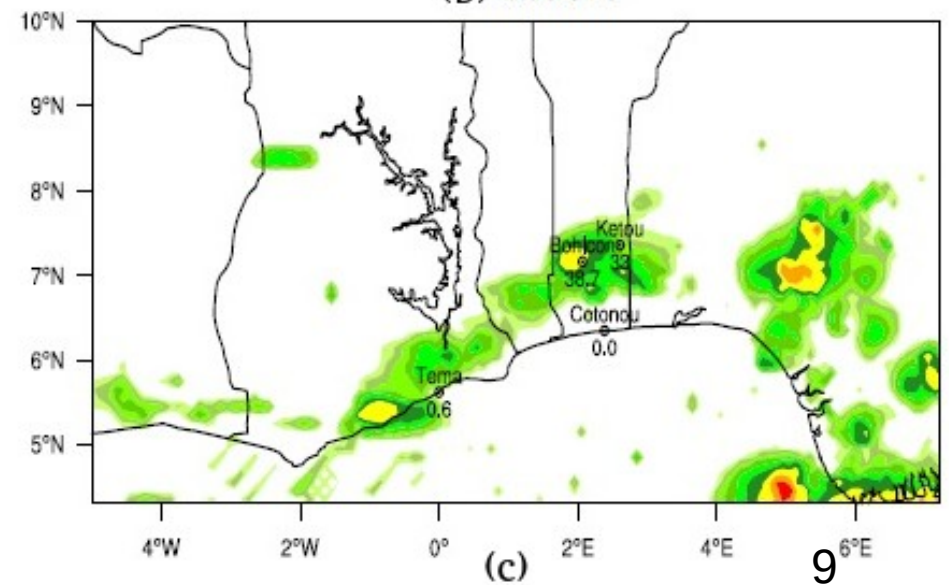


(a) 14:30 UTC



(b) 16:00 UTC

The model outputs are evaluated with reanalysis and observational data obtained respectively from ERA5 and two weather stations (Cotonou and Bohicon).



(c)

# IV- Satellite data / research in Laboratoire de Physique de l'Atmosphère (UAC)

A systematic evaluation of the performance of the WWLLN in northern Benin is carried out using data from the lightning detection network (LINET) data as ground truth.

The results show that the WWLLN is capable of locating both cloud-to-ground (CG) and inter-cloud (IC) lightning.

Bulletin of Atmospheric Science and Technology (2023) 4:7  
<https://doi.org/10.1007/s42865-023-00060-9>

RESEARCH



## Evaluation of the performance of the World Wide Lightning Location Network (WWLLN) using the lightning detection network (LINET) as a truth

Mamadou Waïdi Onah<sup>1</sup> · Joseph Adébiyi Adéchinan<sup>2</sup> · François Kossi Guédjé<sup>1</sup> · Hilaire Kougbéagbé<sup>1</sup> · Etienne Bodoun Houngninou<sup>1</sup>

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<https://rajpub.com/index.php/jap>

DOI: <https://doi.org/10.24297/jap.v19i.9102>

### Drop Size Distribution and Lightning Manifestations in AMMA-CATH Area

Adéchinan A. Joseph<sup>1</sup>, Moumouni Sounmaïla<sup>1</sup>, Guédjé K. François<sup>2</sup> and Houngninou B. Etienne<sup>2</sup>

<sup>1</sup>Laboratoire de Physique de l'Atmosphère, Université Nationale des Sciences Technologie Ingénierie et Mathématique, Bénin

<sup>2</sup>Laboratoire de Physique de l'Atmosphère, Université d'Abomey-Calavi, Bénin

## V- Conclusion and perspectives

The data provided by EUMETSAT satellites are extremely useful for Earth Observation

MTG to continue studies requiring upper air measurements: study underway on numerical simulation of sea breezes using the WRF model to further analyze SBF (to be compared with conditions simulated by the model)..

MTG to better study lightning and thunderstorms.

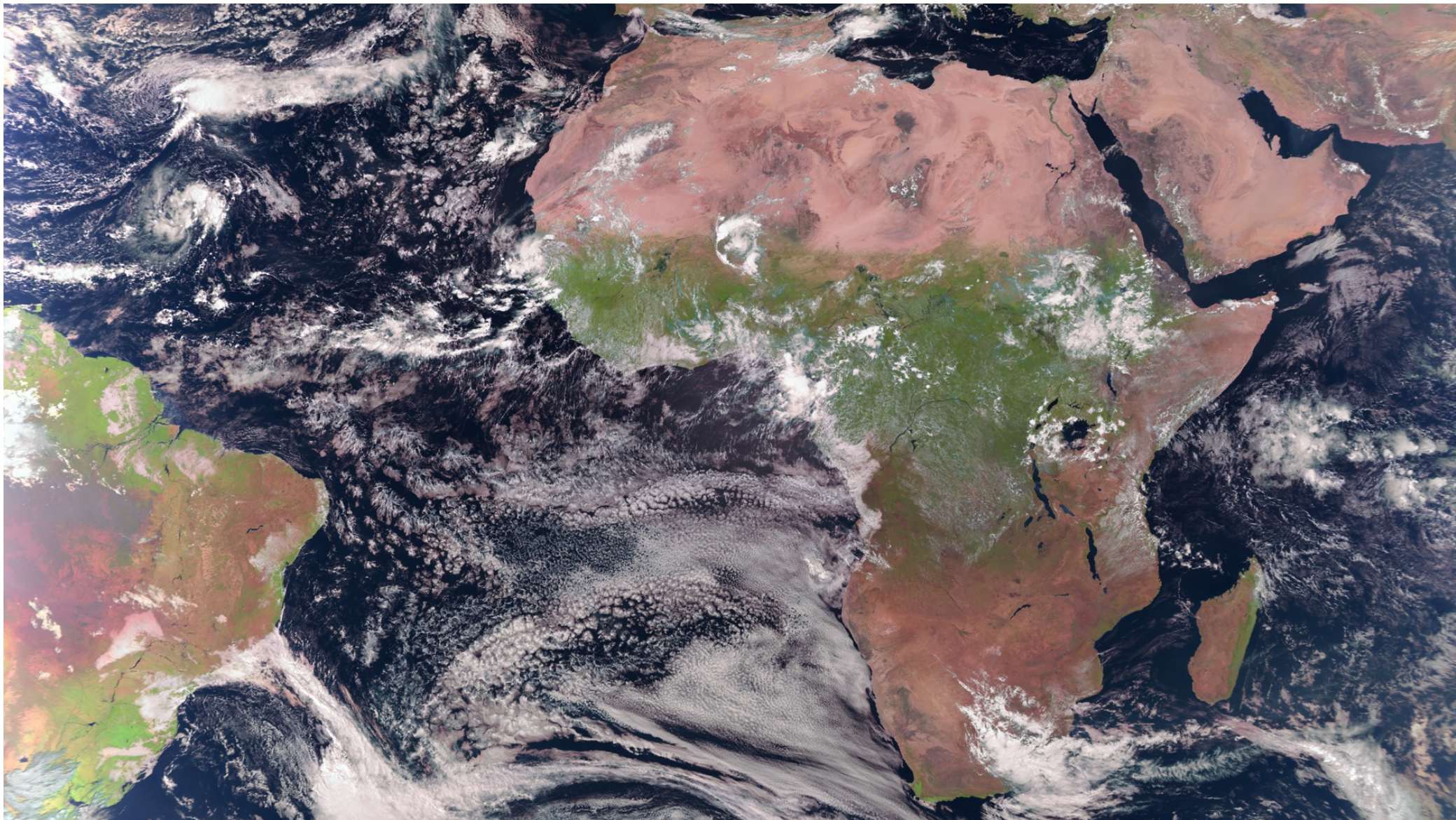
For the research laboratories of our universities, the main challenges are access to quality data and the need to focus our research on certain areas of expertise to exploit and better interpret the data in order to integrate them properly into our regional and national policies and practices.

# V- Conclusion and perspectives

Perspectives :

Capacity building: Training and development of local capacities in collaboration with universities to use data for scientific research.

International collaboration: Strengthening and promoting partnerships to share data, resources and best practices.



Meteosat-11 weather satellite on 17 September 2024.

**THANK YOU**