# From ground to orbit : Integrating radar and satellite-derived rainfall fields in French Guiana

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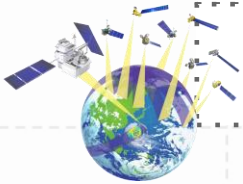
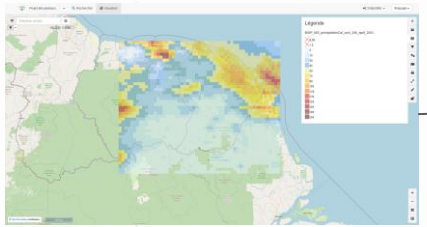
# Spatial Components of the BIO-PLATEAUX Project

## WP1 – Satellite-Derived Rainfall

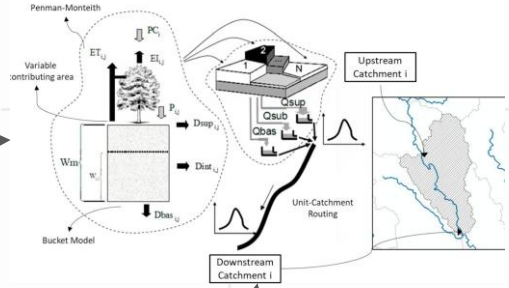


Automatic production and sharing of corrected satellite-derived rainfall estimates

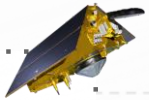


Input

## WP2 - The MGB Hydrological Model




Assimilation

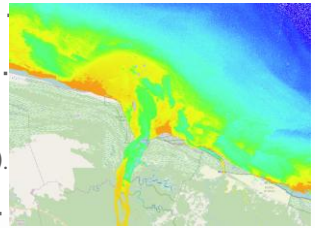


## WP3 – Satellite Altimetry

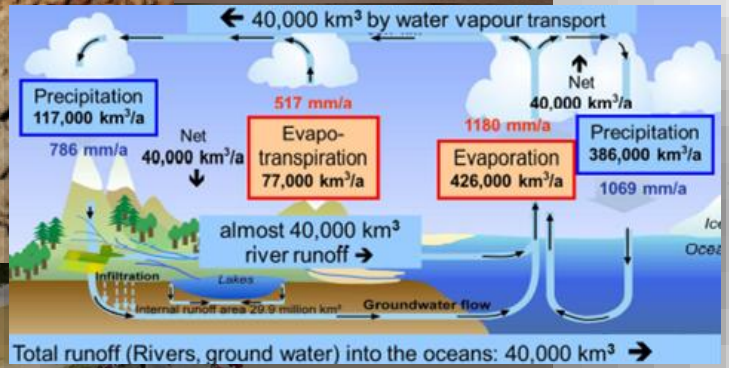
Following water height with satellite-derived measurements

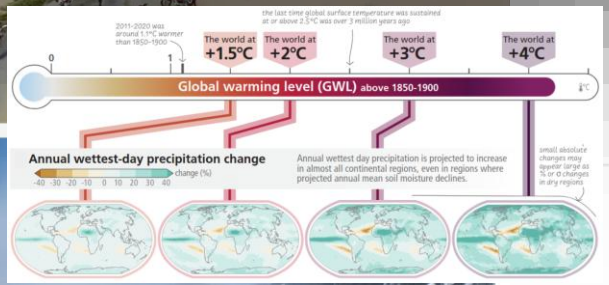
## WP4 – Water Color

Analysis of Sentinel-2 imagery to map water quality (turbidity, chlorophyll, etc.).

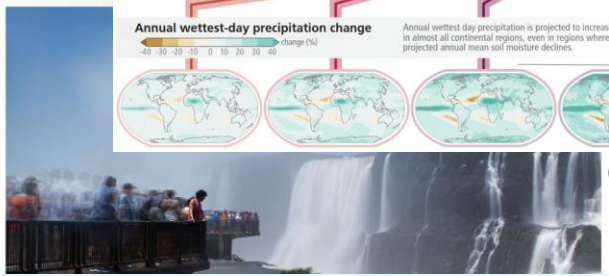


# Rainfall: An Essential Climate Variable




(Calvin et al. 2023)



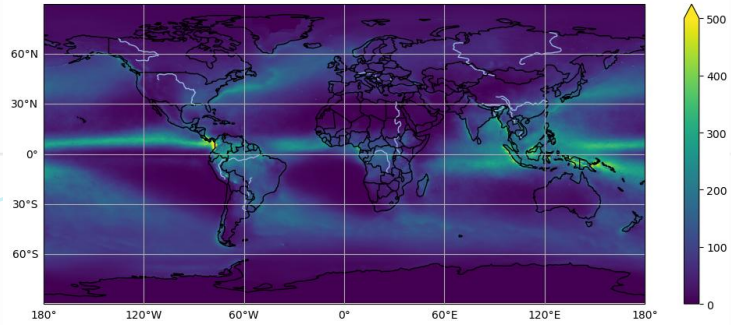
- **Key driver** in decision-making
- **Large-scale processes:** resources, water cycle, ecosystems
- **Local-scale processes:** early warning systems, short-term forecasting
- A phenomenon with **increasing variability** across all spatial and temporal scales with climate change

# Uneven precipitation distribution and monitoring

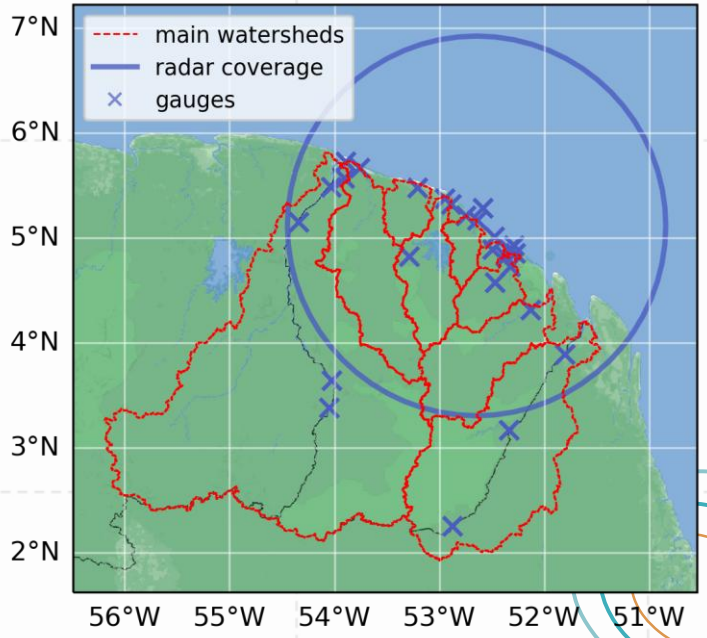
## RADAR coverage around the world

(Saltikoff et al. 2019)

## Average monthly accumulation over the last 10 years



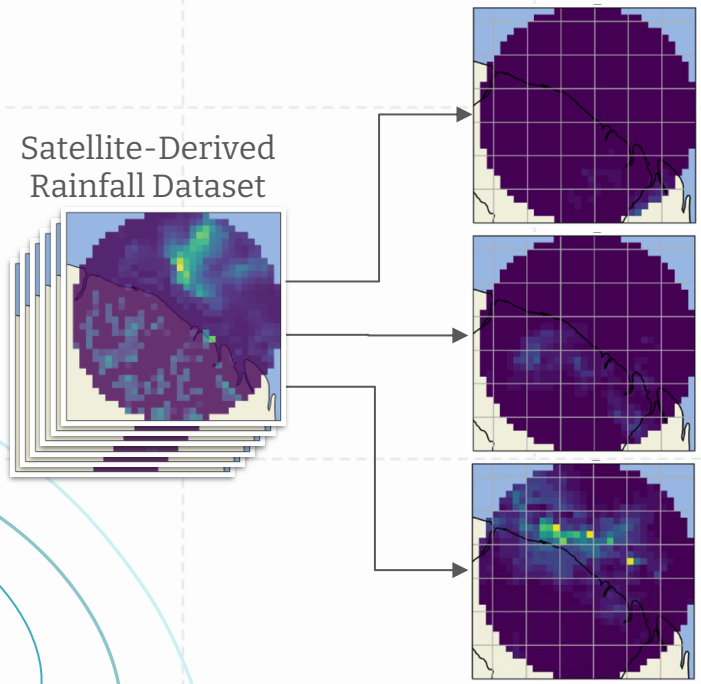

## Observation Network in French Guiana



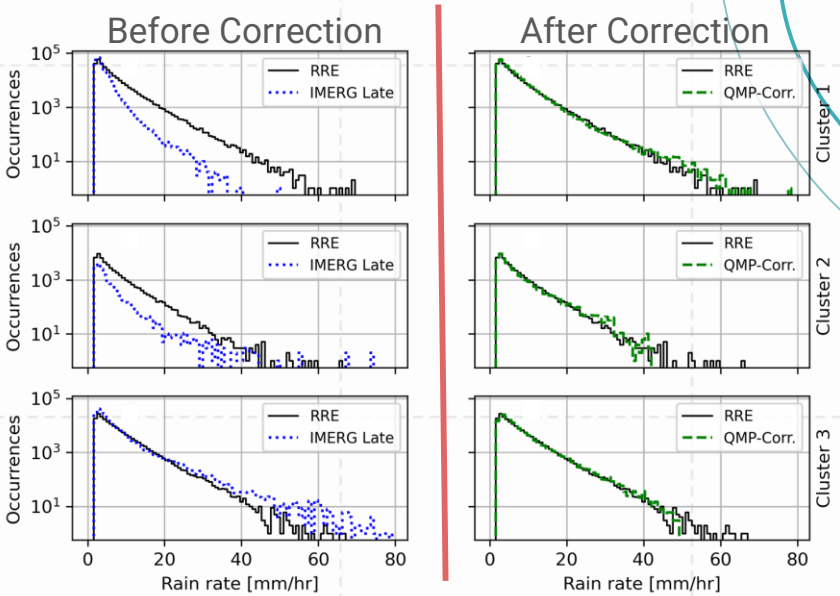
# Correction Scheme: Classification and PDF-Matching

**AI-driven classification into 3 distinct clusters**

Satellite-Derived Rainfall Dataset



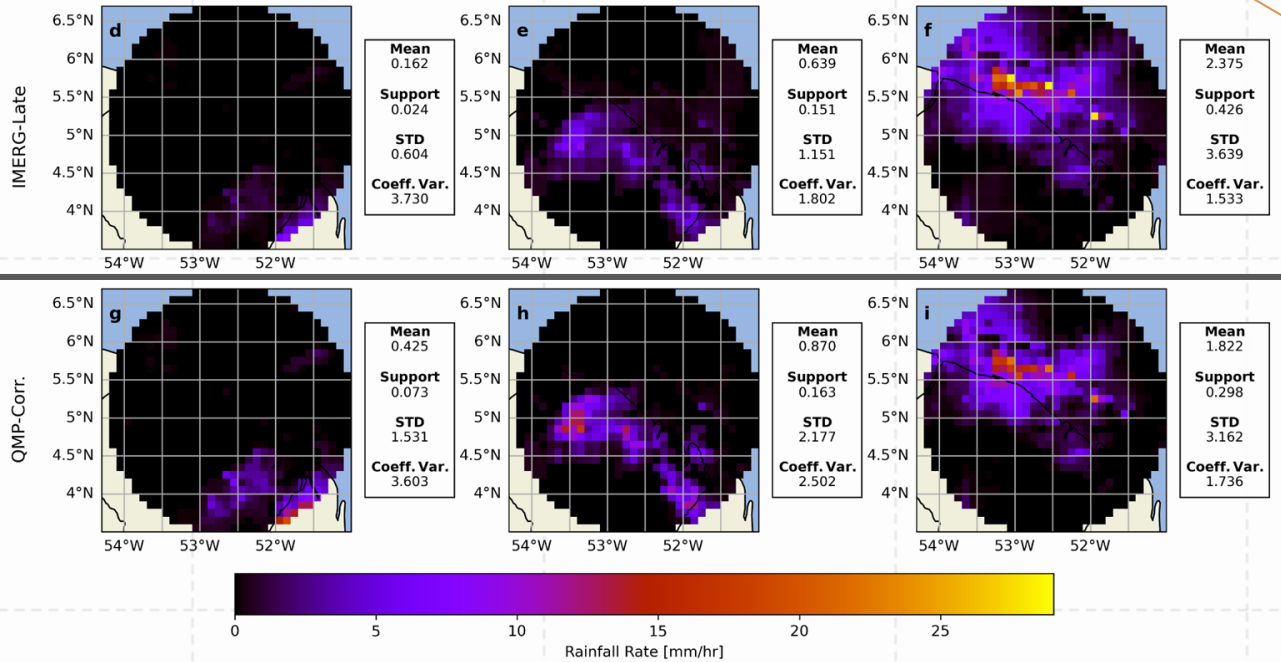
**Matching radar-derived intensity distributions by cluster**



# Merging radar and satellite: Results

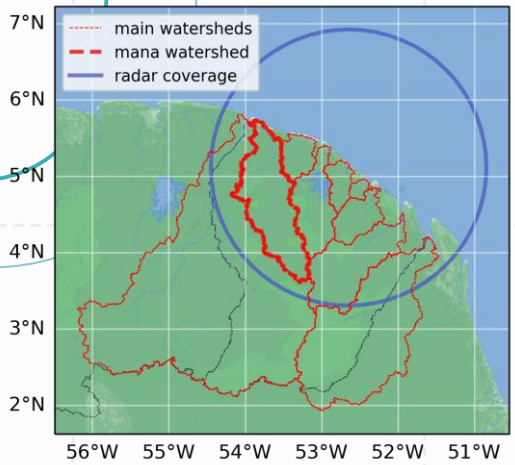
**Before Correction**

**After Correction**

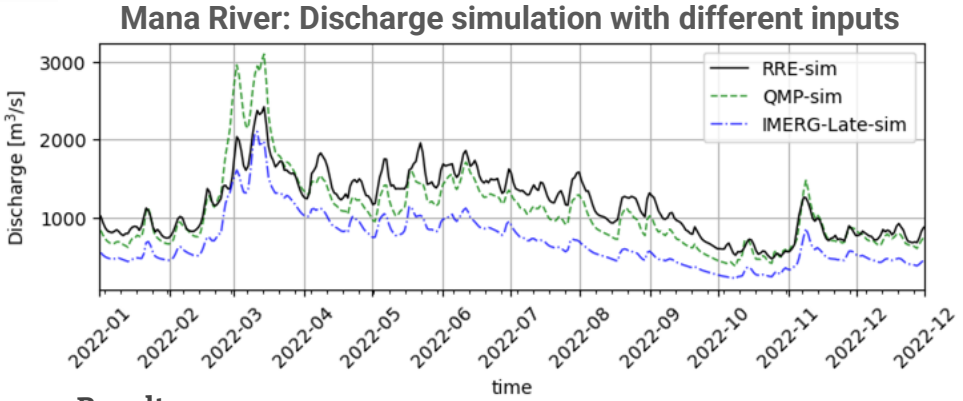



The **correction method** significantly **improves IMERG Late** by **reducing biases** and **better capturing variability**, making it a **reliable solution** for precipitation estimates that are more suitable for hydrological applications.

# Merging radar and satellite: Hydrological modeling




With collaborators at **Hydro Matters**, the **MGB Model** (Modelo de Grandes Bacias, Collischonn et al. 2007) was used simulating the **Mana River discharge**



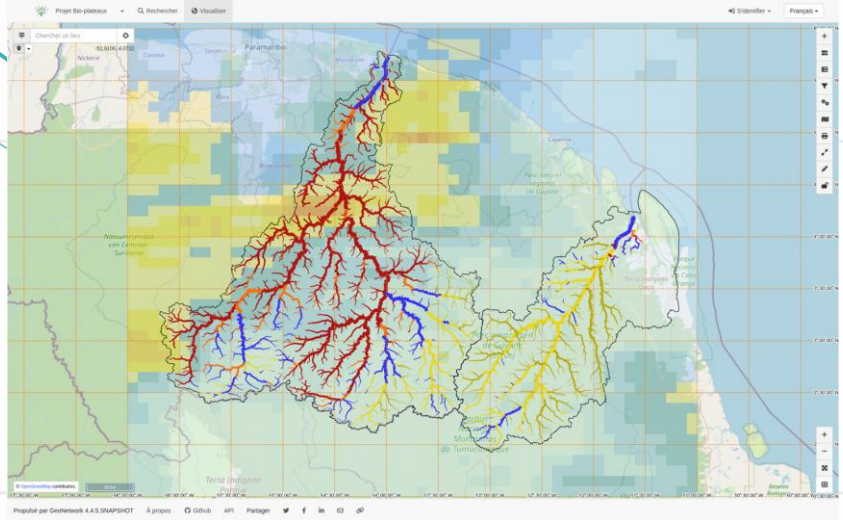

**Results :**

- **KGE improves** from **0.36** (without correction) to **0.83** (corrected)
- **QMP correction aligns closer to radar benchmark**

- The **hydrological simulation validates** the correction method, showing a **closer alignment** with reference rainfall in the region
- This can be **furthered into the regional scale**, in the **Oyapock** and **Maroni** basins

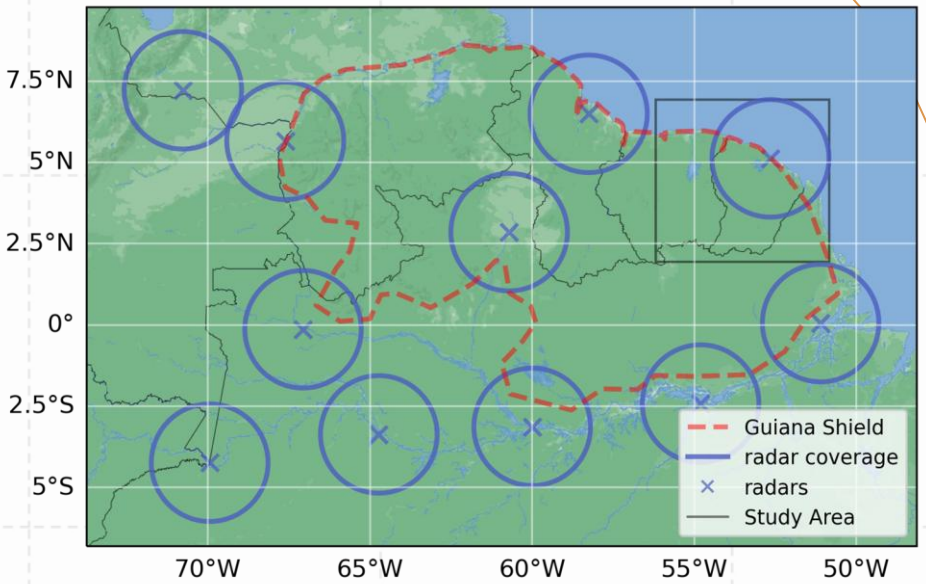
# Turning Knowledge into Action for Water and Agriculture

**Precipitation and hydrological monitoring in transboundary Oyapock and Maroni basins**



BIO-PLATEAUX platform currently under development

**RADAR coverage around the Guiana Shield in the Amazon**




**Sufficient observation networks exist, we are lacking integration and sharing rainfall and hydrological information across borders**

# From Innovation to Action: Key Takeaways

## Measure better to manage better

- **Reliable** rainfall **data** is vital for farming and water management.
- **Merging radar and satellite** improves **accuracy**, even in **remote areas.**

## Integrate and share

- The data exist — what's missing is **integration and exchange**.
- **BIO-PLATEAUX** builds a shared platform for rainfall and river monitoring across borders.

## Science serving the field

- **Satellites know no borders**
- **Corrected rainfall products** help **plan irrigation**, **anticipate floods and droughts**, and **guide decisions.**

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# Thank you for your attention

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# Merging radar and satellite: Numerical Results

| Comparison | Product | rBias | ρ (Corr.) |
|---|---|---|---|
| Daily vs Gauges | IMERG Late | -0.41 | 0.65 |
| | QMP-Corr. | **-0.20** | 0.65 |
| 30-min vs Gauges | IMERG Late | -0.41 | **0.32** |
| | QMP-Corr. | **-0.21** | 0.31 |
| 30-min vs RRE | IMERG Late | -0.21 | **0.51** |
| | QMP-Corr. | **0.04** | 0.48 |