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

Rodrigo ZAMBRANA PRADO

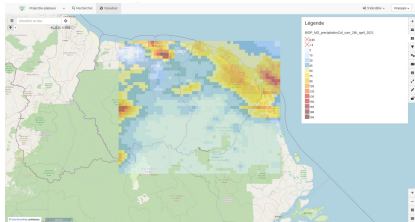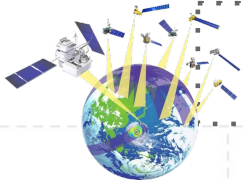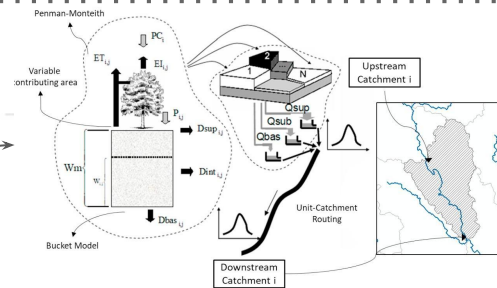# Spatial Components of the BIO-PLATEAUX Project

WP1 – Satellite-Derived Rainfall

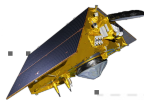Automatic production and sharing of corrected satellite-derived rainfall estimates

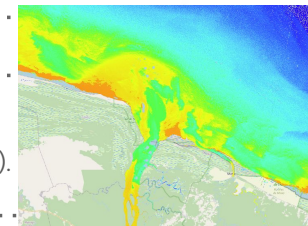**WP2 - The MGB Hydrological Model**

Input

Assimilation

WP3 – Satellite Altimetry

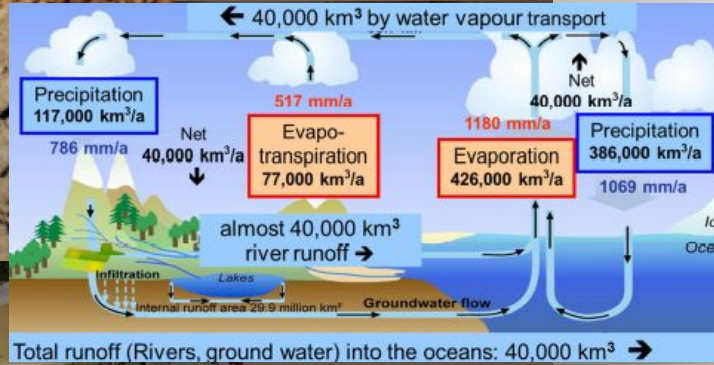Following water height with satellite-derived measurements

WP4 – Water Color

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

Rainfall: An Essential Climate Variable

(Calvin et al. 2023)
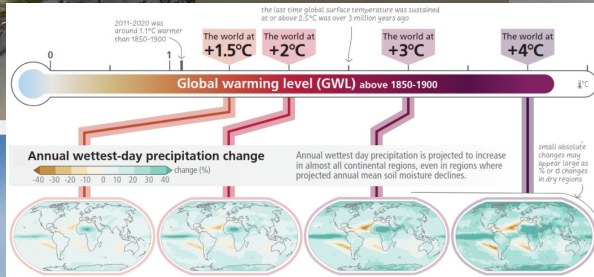
Key driver in decision-making

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
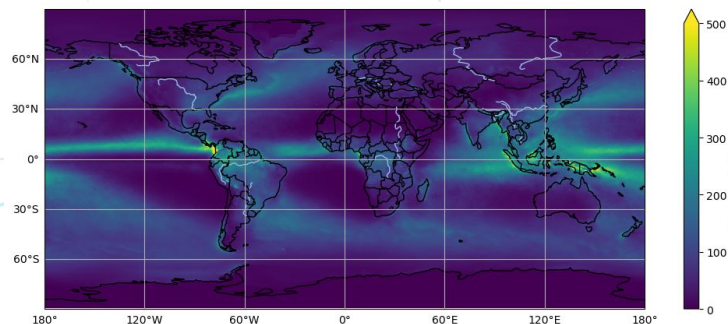
Uneven precipitation distribution and monitoring

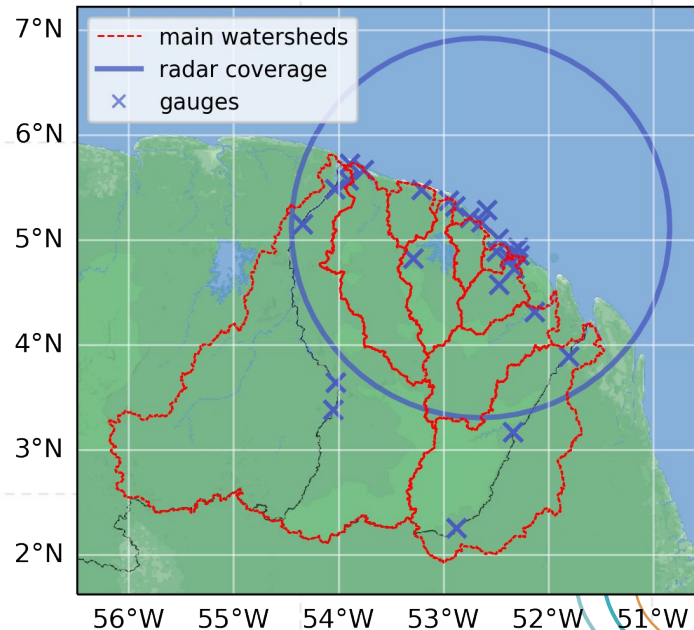### RADAR coverage around the world

(Saltikoff et al. 2019)

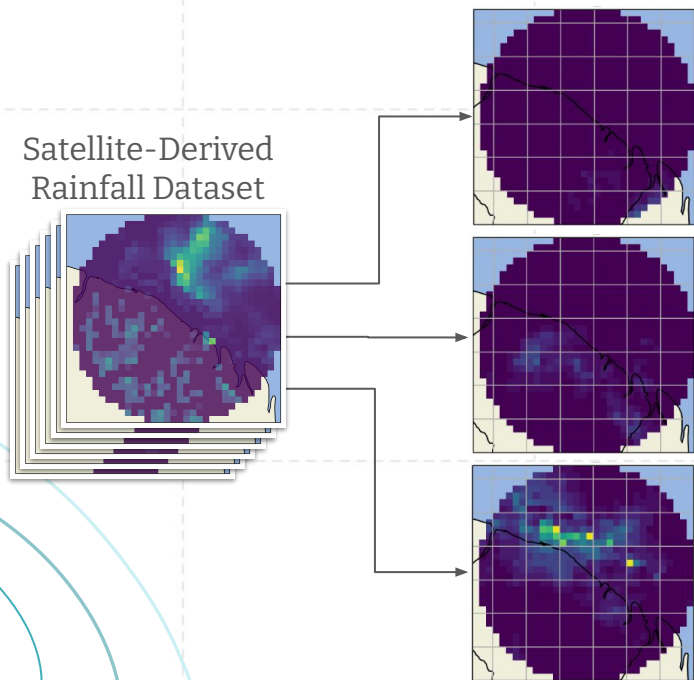### Average monthly accumulation over the last 10 years

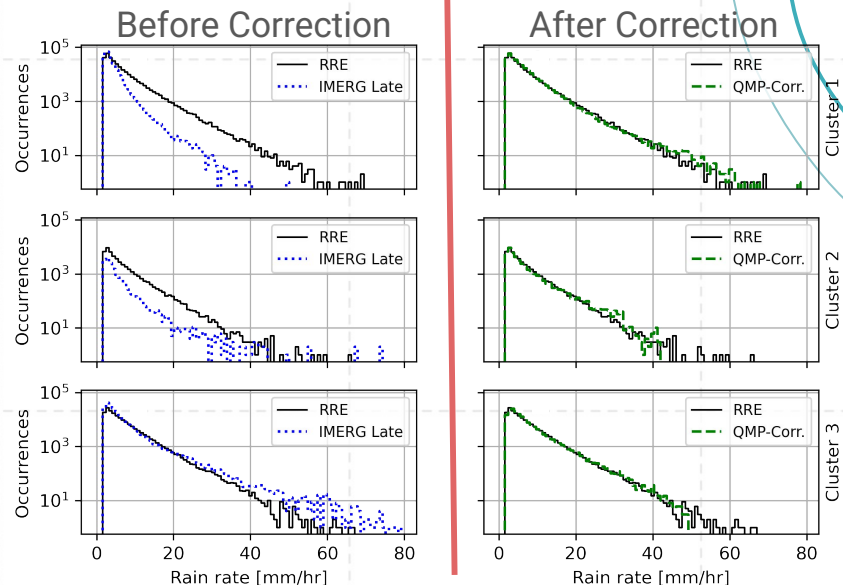## Observation Network in French Guiana

Correction Scheme: Classification and PDF-Matching

**AI-driven classification
into 3 distinct clusters**
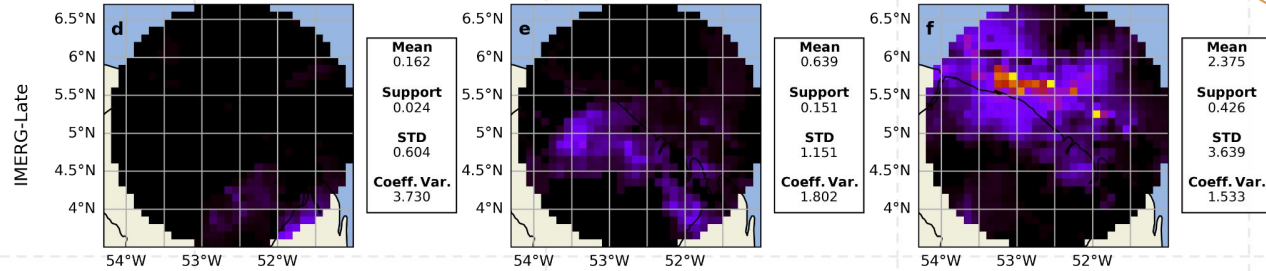
Satellite-Derived
Rainfall Dataset

**Matching <u>radar-derived</u>
intensity distributions by cluster**
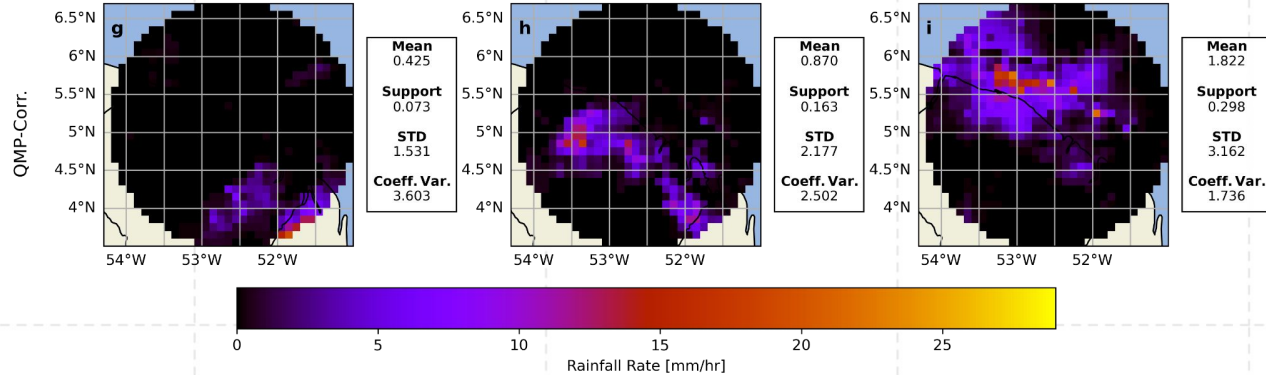
Merging radar and satellite: Results
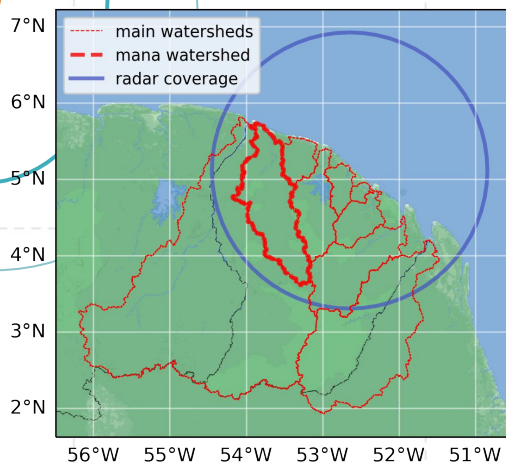

The **correction method** significantly **improves IMERG Late** by **reducing biases** and **better capturing variability**, making it a **reliable solution** for precipitation estimates that are more suitable for hydrological applications.

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**

Mana River: Discharge simulation with different inputs
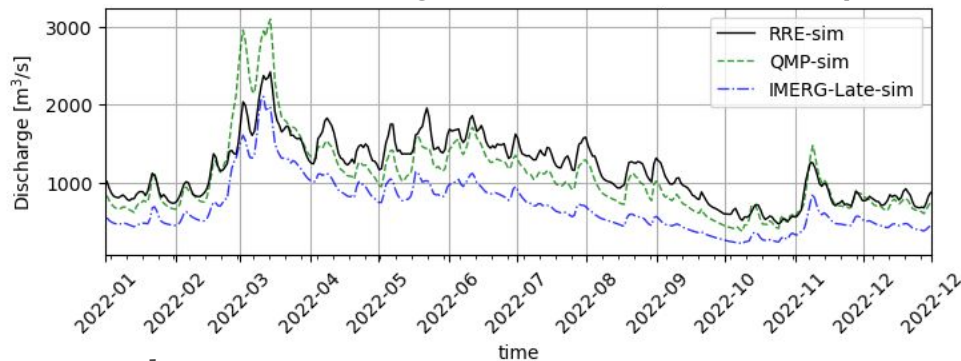
**Results :**

- **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

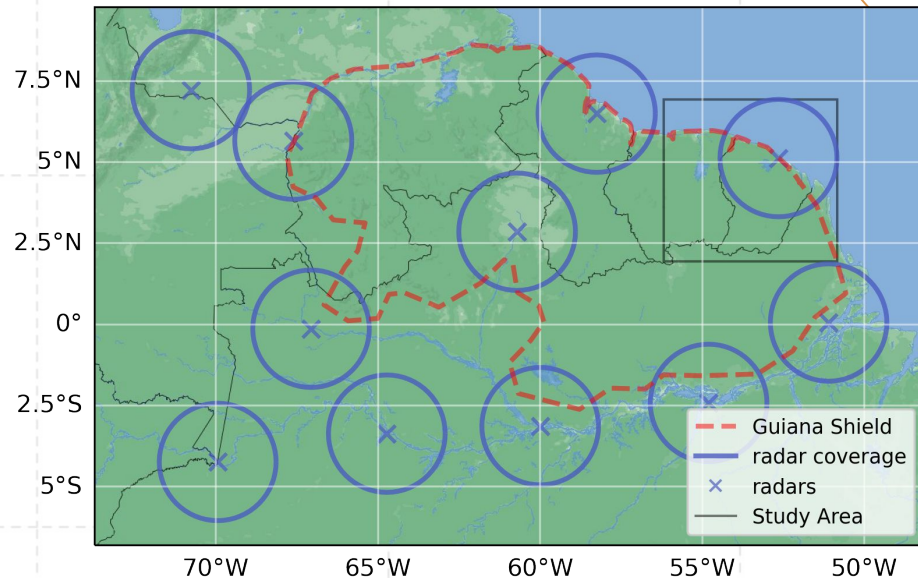# Turning Knowledge into Action for Water and Agriculture

Precipitation and hydrological monitoring in transboundary Oyapock and Maroni basins
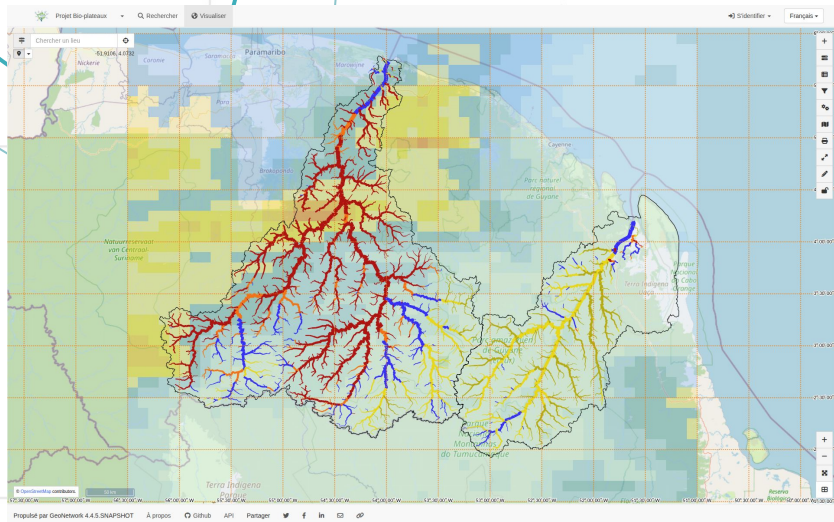
BIO-PLATEAUX platform currently under development

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.**

Thank you for your attention

For further inquiries: rodrigo.zambrana@ird.fr

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

CV Boxplots, before and after correction