

# TEA018 - Hidrologia Ambiental

Precipitação da base de dados CHIRPS

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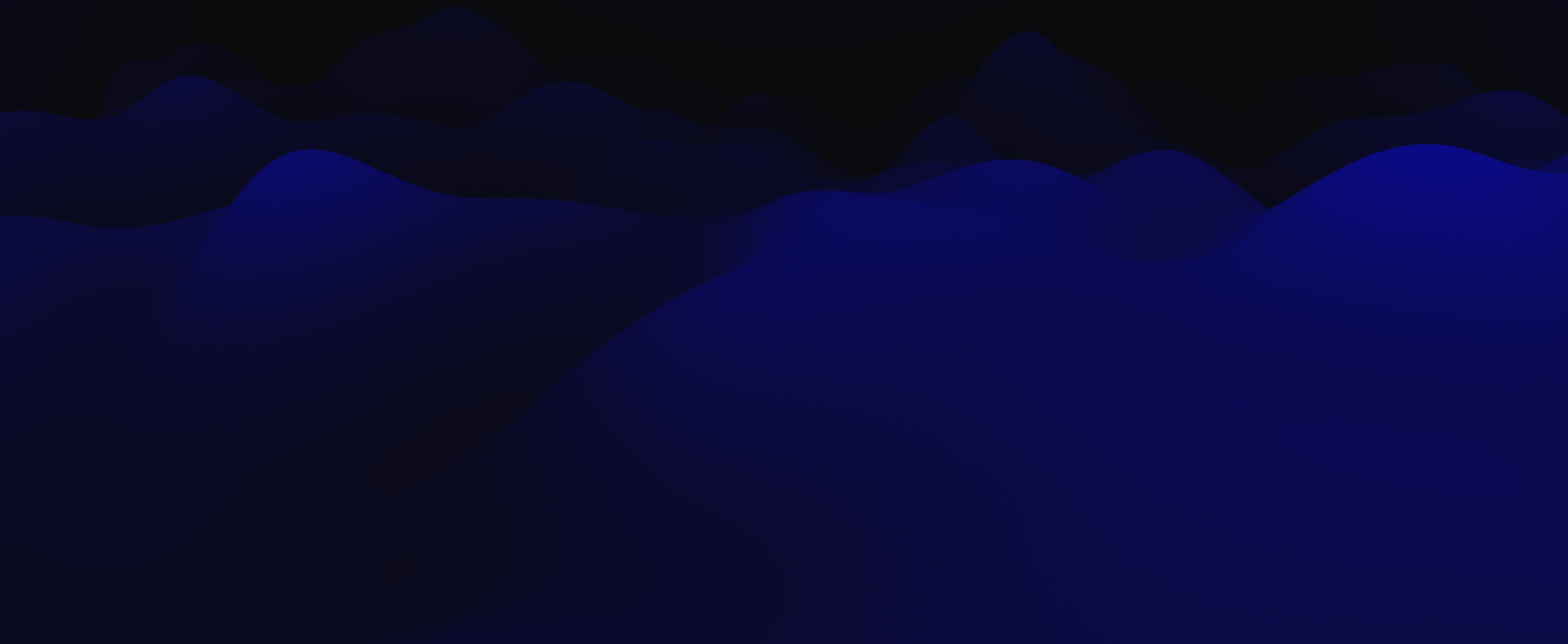
Universidade Federal do Paraná (UFPR)

# Outline

## Agenda de atividades

- O que é a base CHIRPS
- Baixar dados da bacia UVAIA (Alto Tibagi)
- Como extrair os dados de precipitação
  - Correção do Shapefile
  - Google Earth Engine (<https://code.earthengine.google.com/>)
  - Climate Engine (<https://app.climateengine.org/>)
- Leitura em um notebook do Google Colab
- Comparação com dados de pluviômetro

# O que é a base CHIRPS?



# O que é a base CHIRPS?

**Climate Hazards Group InfraRed Precipitation with Station Data**

**CHIRPS: Rainfall Estimates from Rain Gauge and Satellite Observations**

Satellite based precipitation data calibrated with ground data

<https://www.chc.ucsb.edu/data/chirps>

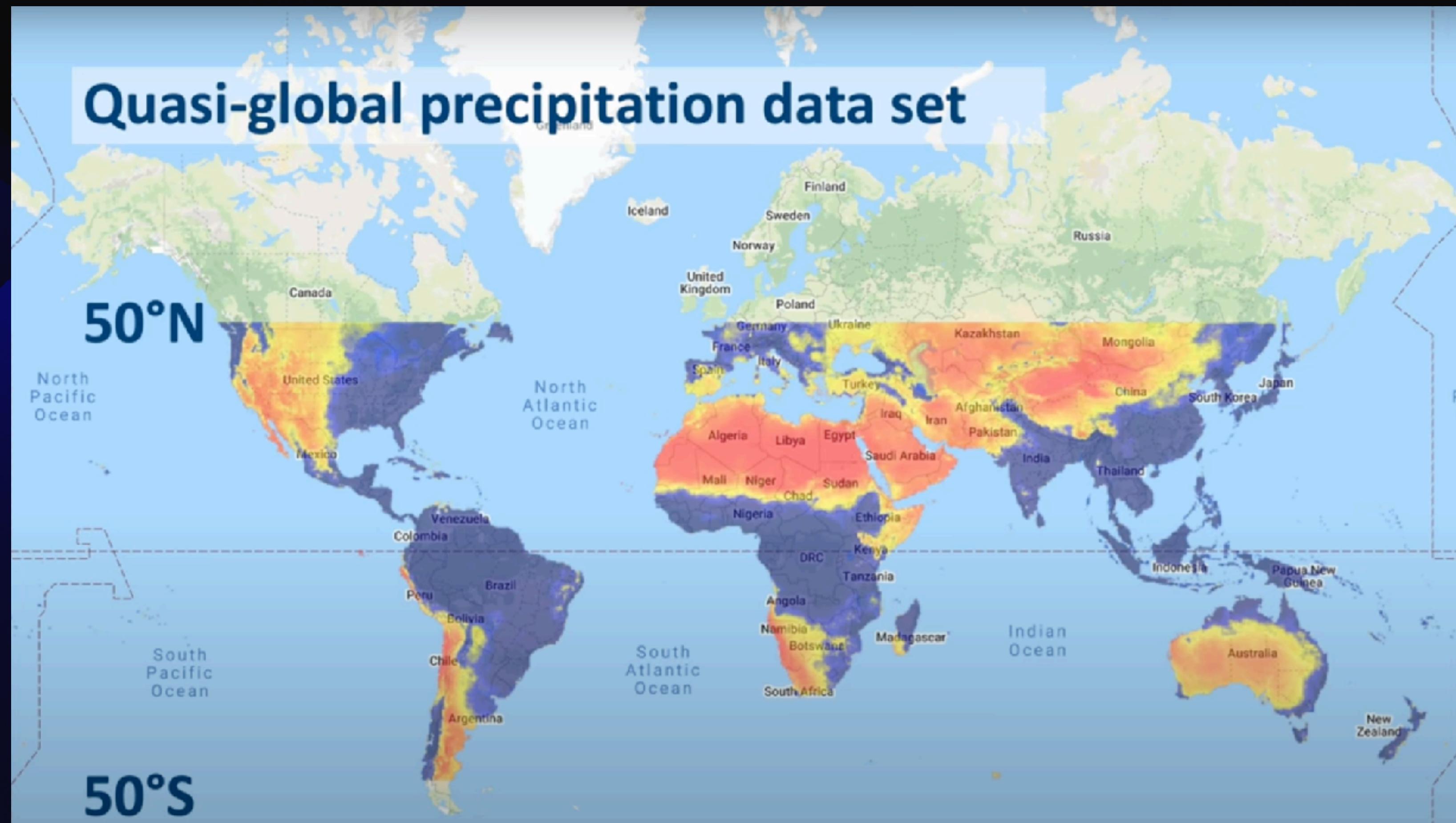
Developed by the Climate Hazards Center – UC Santa Barbara

Monitoramento de secas no mundo e cooperação com World Food Programme (WFP).

The Climate Hazards Center is a 19-year-old alliance of multidisciplinary scientists and food security analysts from the UC Santa Barbara Geography Department, Africa, and Latin America working alongside partners in the US Geological Survey (USGS), the National Aeronautics and Space Administration (NASA), the Famine Early Warning Systems Network (FEWS NET), the National Oceanic and Atmospheric Administration (NOAA), and the United States Department of Agriculture (USDA).

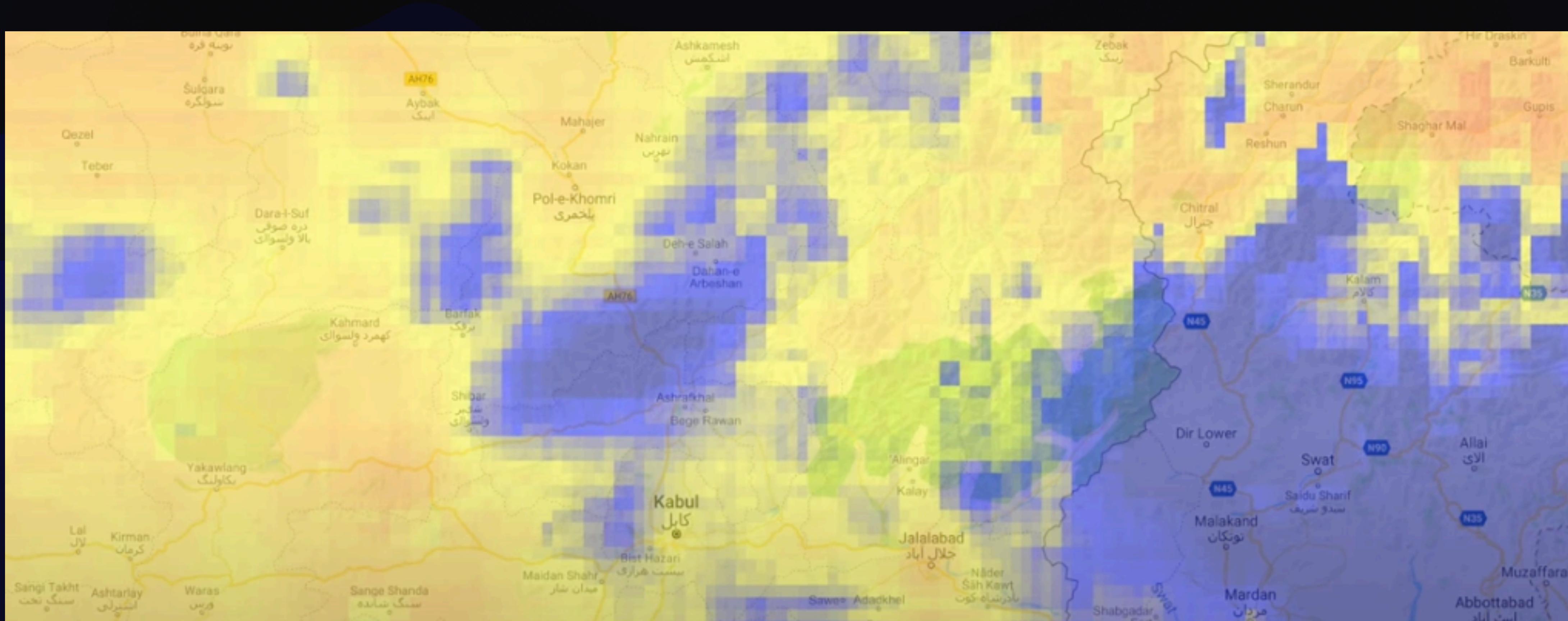
# CHIRPS = Climate Hazards Group InfraRed Precipitation with Station Data

- Extensão dos dados:



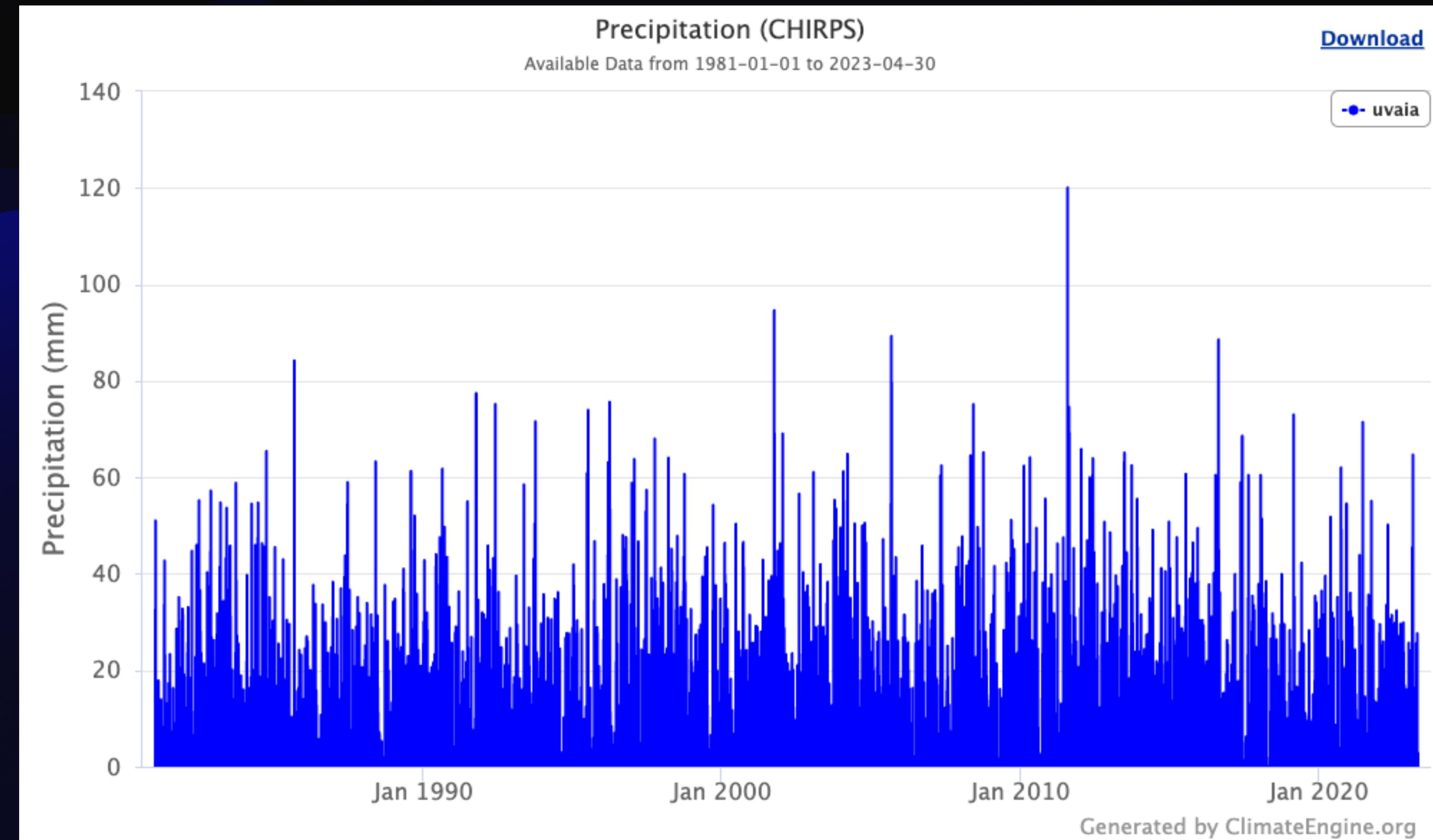
# CHIRPS = Climate Hazards Group InfraRed Precipitation with Station Data

- Resolução espacial de:  $0.05 \times 0.05$  deg (~6km no Equador)



# CHIRPS = Climate Hazards Group InfraRed Precipitation with Station Data

- Time series since 01 de Janeiro de 1981 (+40 anos)



# CHIRPS = Climate Hazards Group InfraRed Precipitation with Station Data

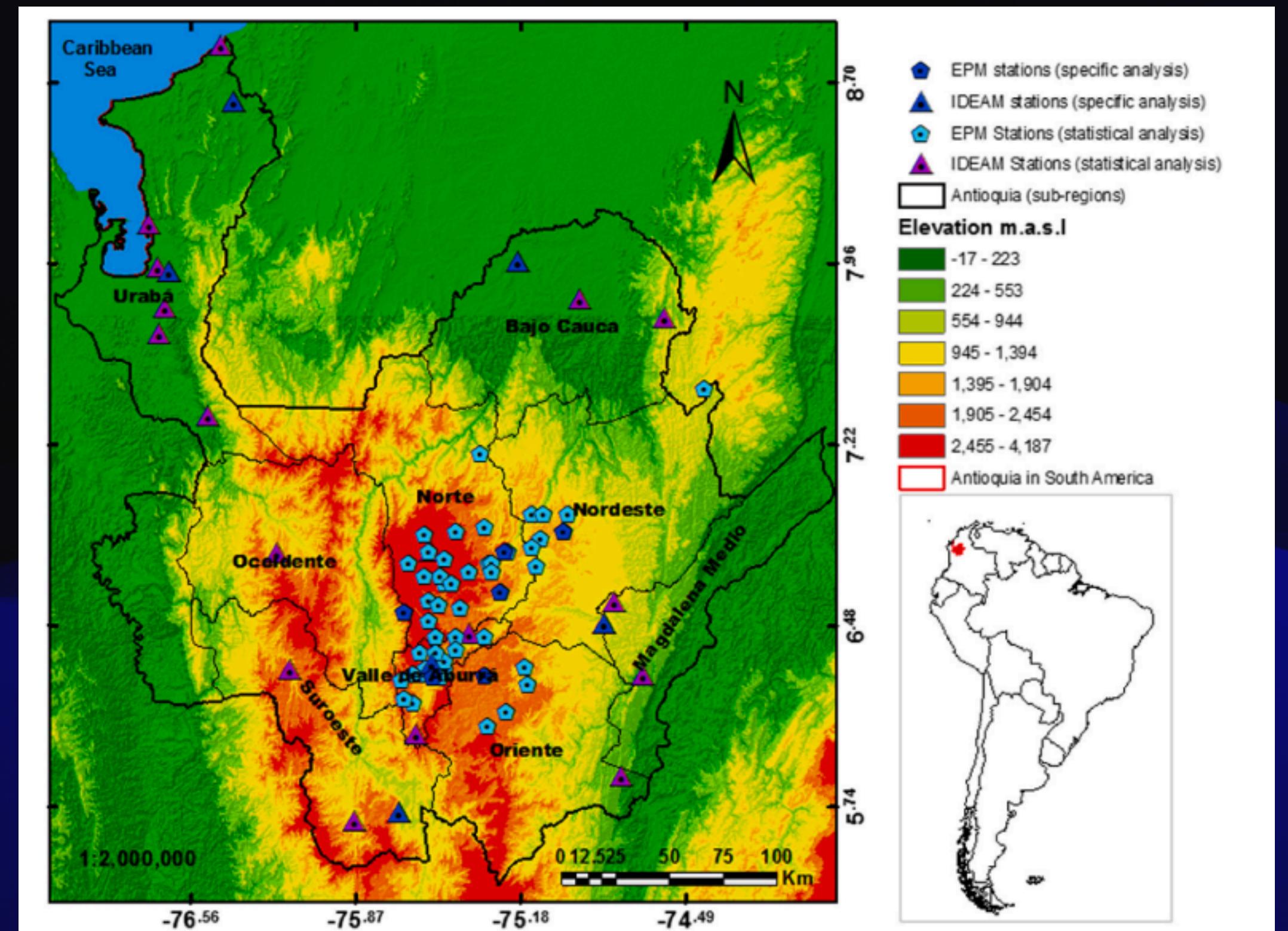
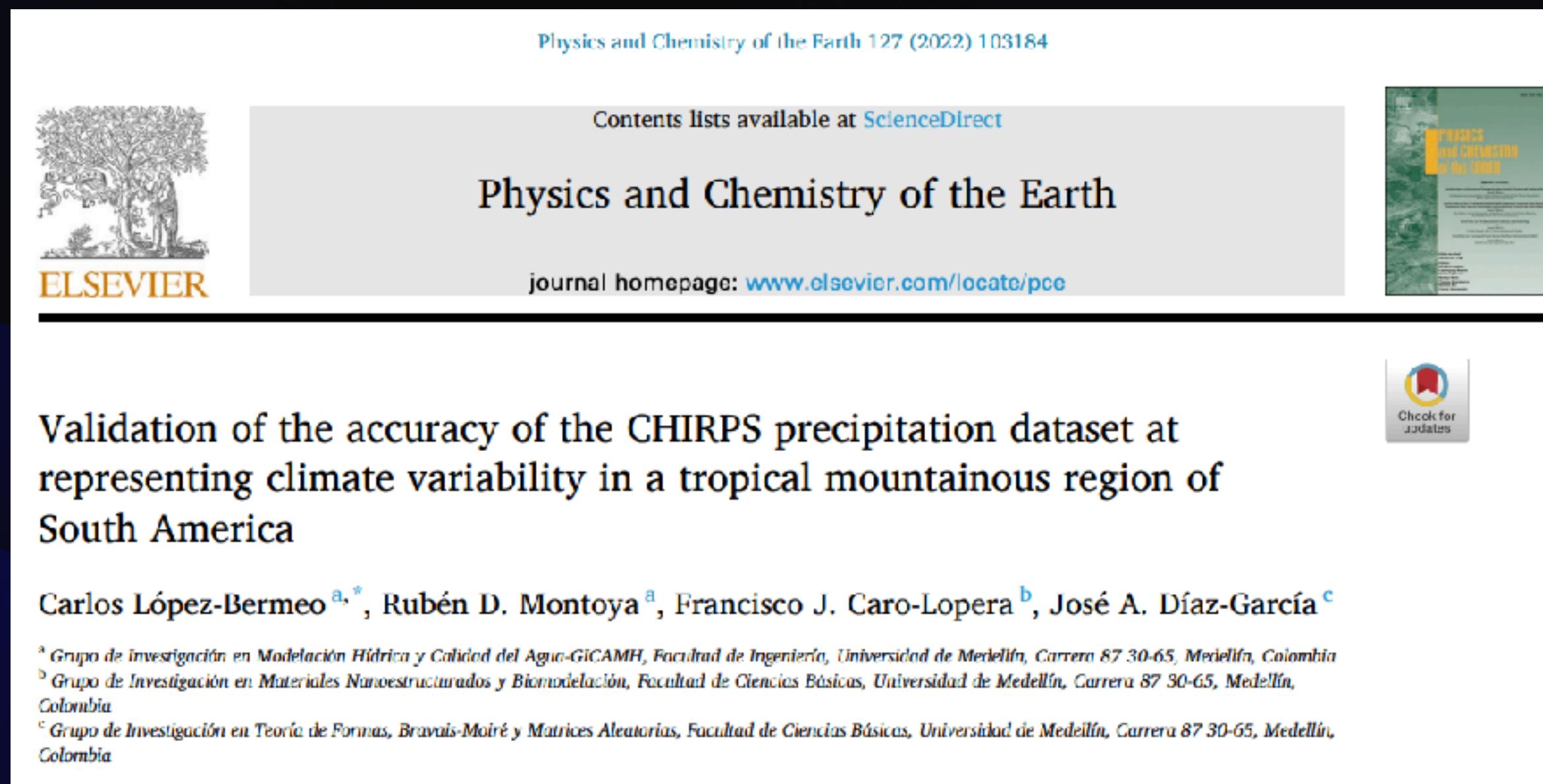
- Time steps: pentad, day, month, year

Time steps: Pentad (5 days) → day, month, year

No.	Datetime	Precipitation (mm)	Year	Season
1	01/01/1981	2.38	1981	JFM
2	02/01/1981	12.83	1981	JFM
3	03/01/1981	3.05	1981	JFM
4	04/01/1981	4.09	1981	JFM
5	05/01/1981	0.00	1981	JFM
6	06/01/1981	0.00	1981	JFM
7	07/01/1981	0.00	1981	JFM
8	08/01/1981	0.00	1981	JFM
9	09/01/1981	0.00	1981	JFM

# CHIRPS = Climate Hazards Group InfraRed Precipitation with Station Data

- Acurácia, viés, erros..



**Table 1**

Statistical metrics used in this study. Notation:  $P_o$  stands for the observed rain-gauge station;  $P_e$  stands for the precipitation estimates from CHIRPS;  $n$  refers to the sample size.

Statistical metrics	Formula	Value range	Classification
Pearson correlation factor ( $r$ )	$r = \frac{\sum_{i=1}^n (P_e - \bar{P}_e)(P_o - \bar{P}_o)}{\sqrt{\sum_{i=1}^n (P_e - \bar{P}_e)^2} \sqrt{\sum_{i=1}^n (P_o - \bar{P}_o)^2}}$	-1 ≤ to ≤ 1	1 indicates a strong positive relationship -1 indicates a strong negative relationship 0 indicates no relationship at all
Index of Agreement (Willmott 1982)	$d = 1 - \frac{\sum_{i=1}^n (P_o - P_e)^2}{\sum_{i=1}^n ( P_e - \bar{P}_o  +  P_o - \bar{P}_o )^2}$	0 ≤ to ≤ 1	1 indicates perfect agreement 0 indicates no agreement at all
Relative Mean Bias Error (bias)	$bias = \frac{\sum_{i=1}^n P_e - P_o}{\sum_{i=1}^n P_o} \times 100$	< -20 -20-20 >20 0 ≤ to ≤ ∞	Underestimate Good Overestimate 0 indicates a perfect fit
Root-Mean-Square Error (RMSE)	$RMSE = \sqrt{\frac{1}{n} \sum_{i=1}^n (P_e - P_o)^2}$		

# CHIRPS = Climate Hazards Group InfraRed Precipitation with Station Data

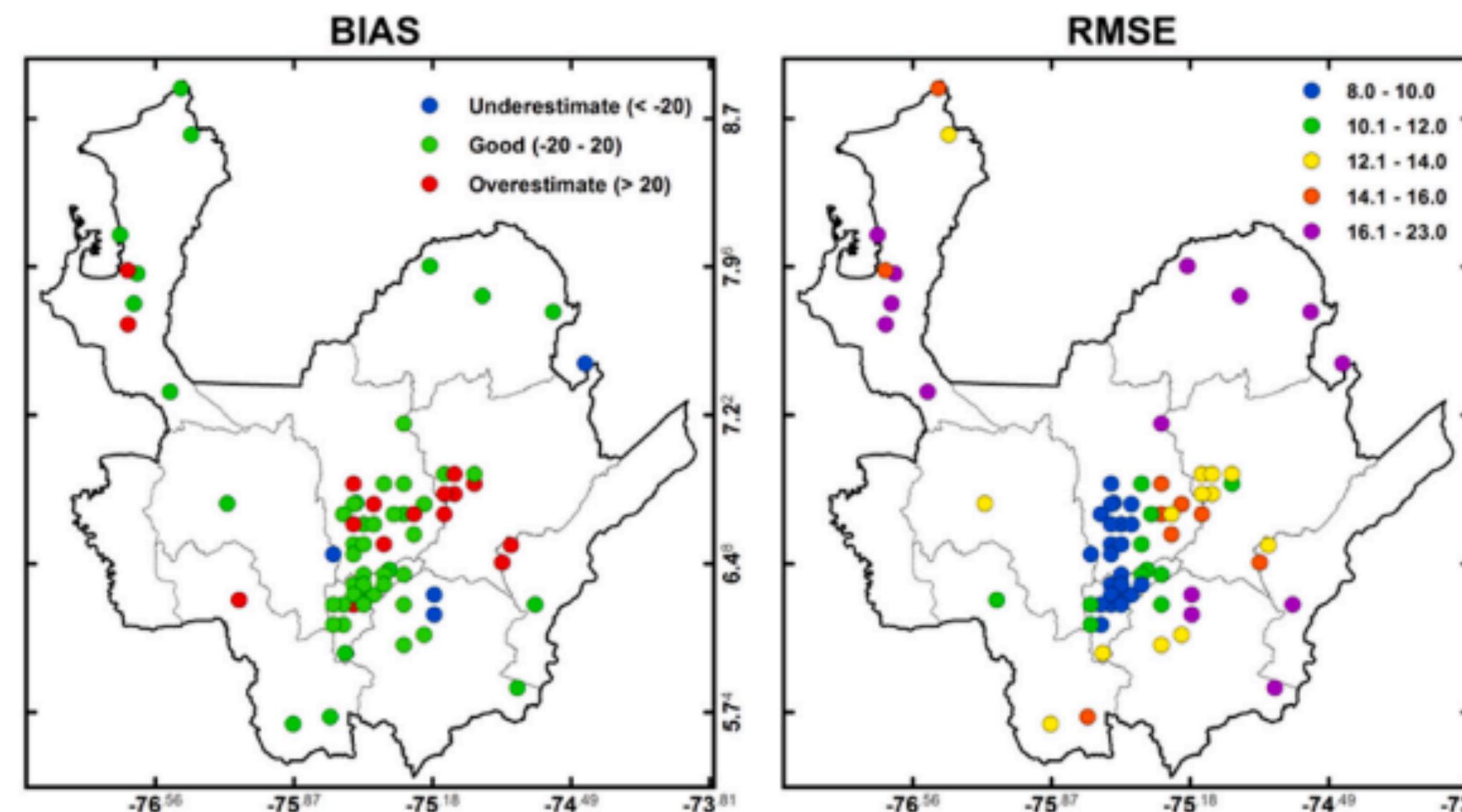
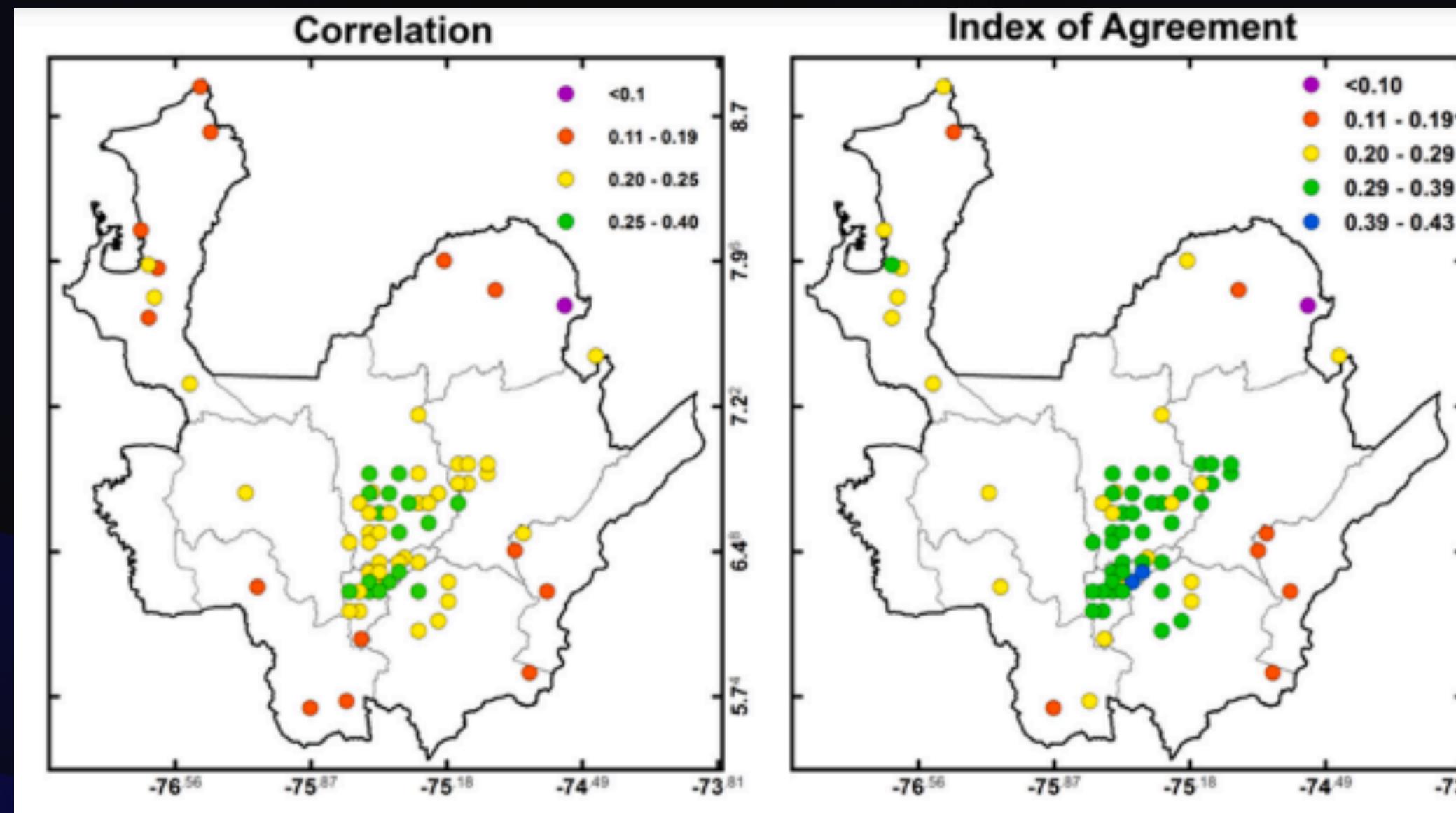


Fig. 2. Results of r, d, bias, and RMSE for CHIRPS daily precipitation data compared to rain gauge observations.

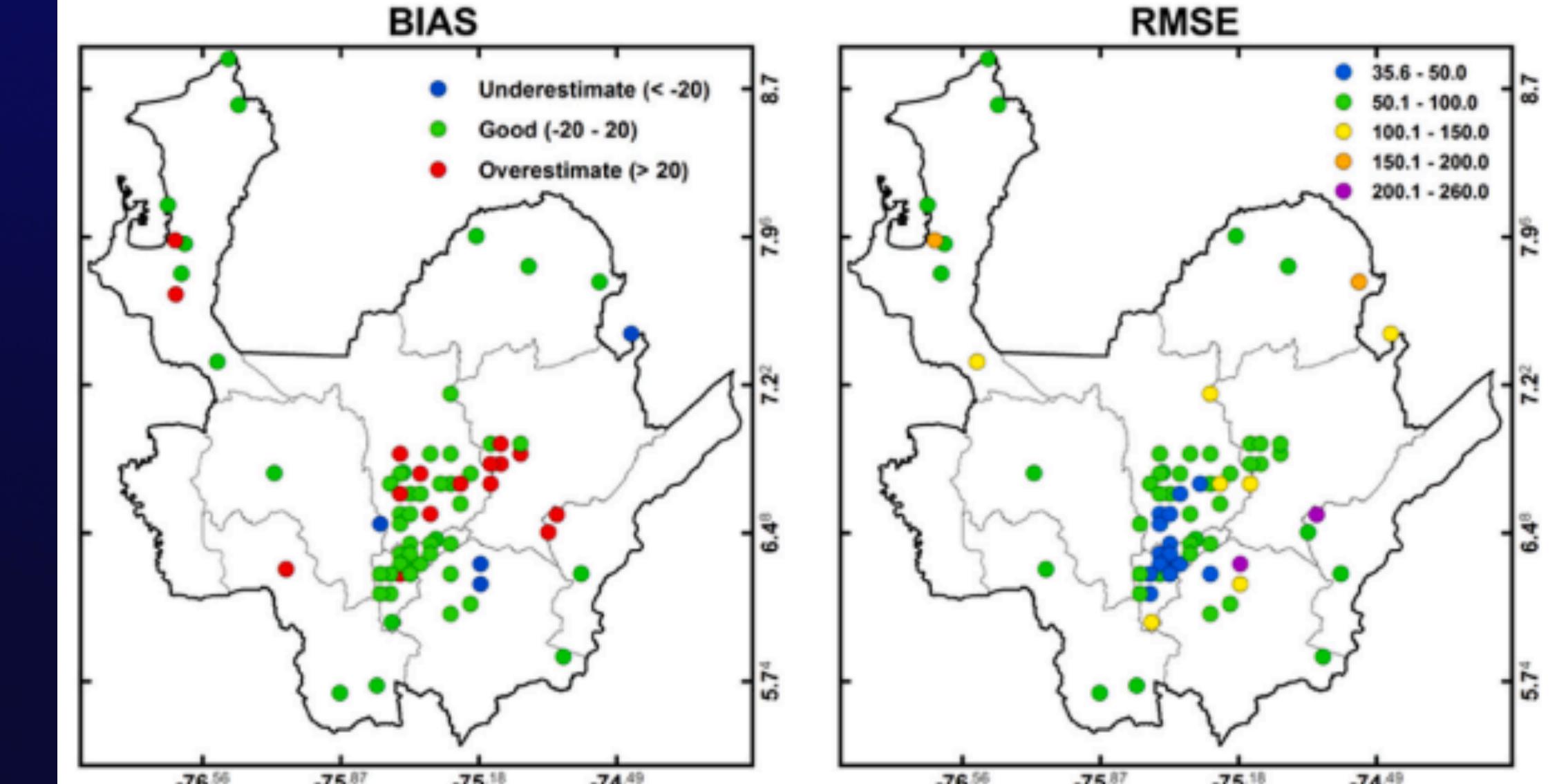
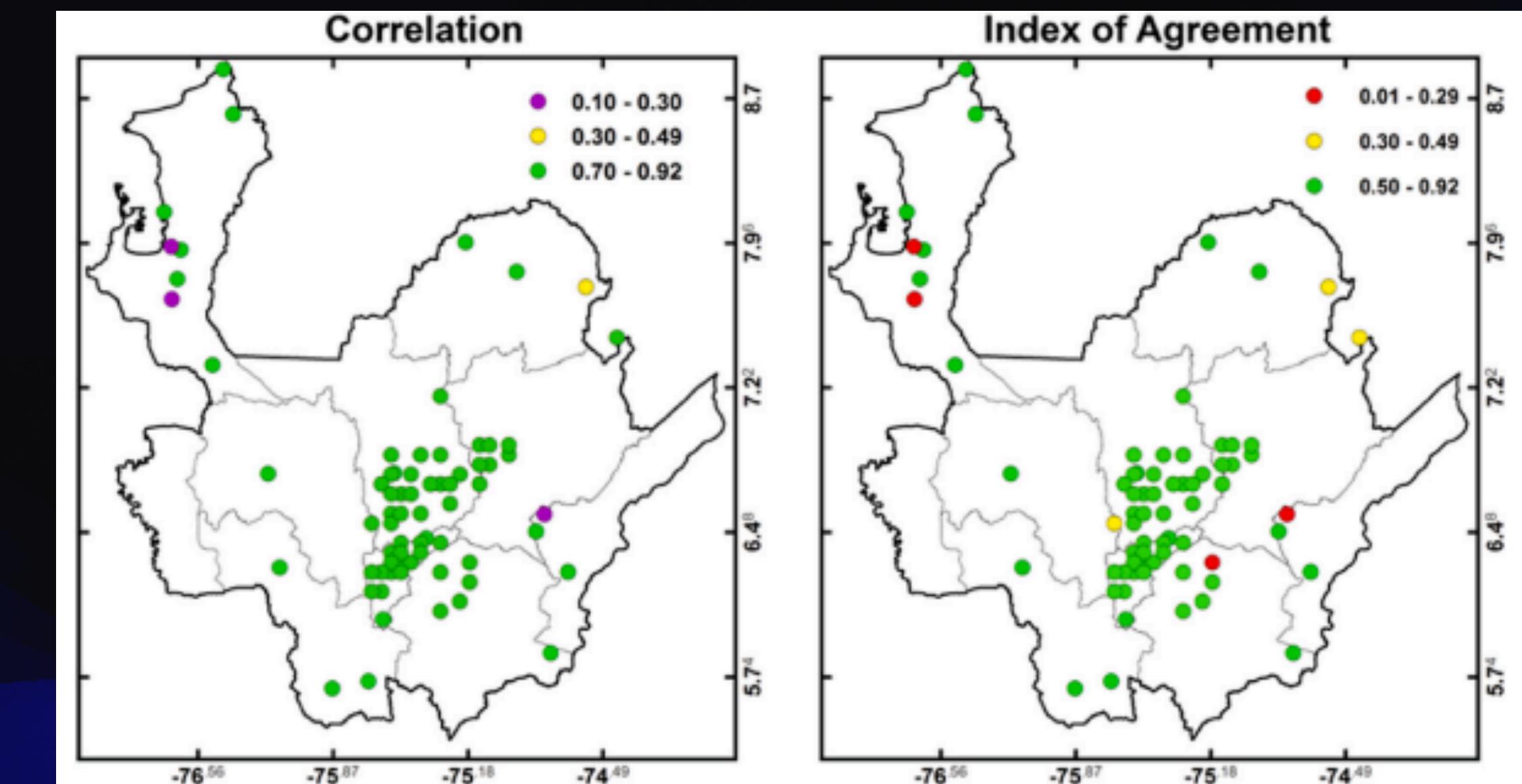


Fig. 3. Results of r, d, bias, and RMSE for CHIRPS monthly precipitation data compared to rain gauge observations.

# Dados de precipitação da bacia UVAIA (Alto Tibagi)

- Bacia do delineamento



# Etapas para baixar da base CHIRPS

1. Importar arquivo do GitHub, pasta:

[https://github.com/emiliomercuri/hidrologia/precipitation\\_CHIRPS/shapefile\\_com\\_erros/](https://github.com/emiliomercuri/hidrologia/precipitation_CHIRPS/shapefile_com_erros/)

Arquivos: “alto\_tibagi.shp”

2. Converter de coordenadas Projetadas (p.ex. UTM) para coordenadas Geográficas (lat, lon)

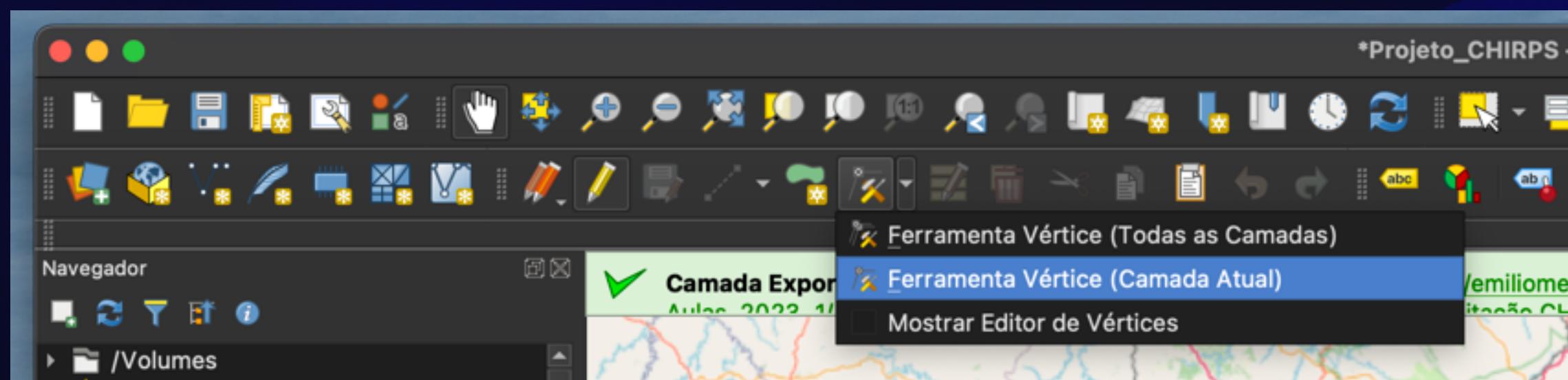
Clicar na camada → exportar → salvar camada vetorial como → UVAIA\_geo\_WGS84

Escolher: SRC Padrão: EPSG: 4326 - WGS 84

3. Verificar se o Shapefile tem erros:

QGIS → Vetor → Geometras → Verificar Validade

4. Editar camada: Editar → Ferramenta Vértice (ir até o erro e remover os “buracos”)



5. Ainda no modo edição: abrir tabela de atributos e renomear label para: UVAIA



# Etapas para baixar da base CHIRPS

6. Acessar <https://code.earthengine.google.com/>, criar conta
7. Assets → New → Shapefiles
8. Upload a new shape file asset (selecionar os arquivos abaixo)

Upload a new shapefile asset

Source files

**SELECT**

Please drag and drop or select files for this asset  
Allowed extensions: shp, zip, dbf, prj, shx, cpg, ftx, gpx, ebn or shp.xml.

- UVAIA.geo\_WGS84.dbf
- UVAIA\_geo\_WGS84.prj
- UVAIA\_geo\_WGS84.shp
- UVAIA\_geo\_WGS84.shx

Asset ID

Asset Name: UVAIA.geo\_WGS84

Properties

Metadata properties about the asset which can be edited during asset upload and after ingestion. The "system:time\_start" property is used as the primary date of the asset.

Add start time | Add end time | Add property

Advanced options

Character encoding

CANCEL UPLOAD

9. Em Tasks observar se "Ingest table" foi completado (em azul)

Inspector Console Tasks

Search or cancel multiple tasks in the Task Manager

SUBMITTED TASKS

↑ Ingest table: "projects/ee-emiliomercuri/assets/UVAIA_geo_WGS84"	✓ <1m
↑ Ingest table: "projects/ee-emiliomercuri/assets/UVAIA_WGS84_dissolved"	✓ <1m
↑ Ingest table: "projects/ee-emiliomercuri/assets/PR_dissolved"	⚠ <1m



10. Em Assets → Atualizar → clicar em Share it → Anyone can read → Copy link

# Etapas para baixar da base CHIRPS

11. Acessar <https://app.climateengine.org/>

12. Make Graph → Region → Custom Polygon from Table Asset

Colar o endereço do Asset (que foi criado no Earth Engine)

Vai aparecer o mapa ao lado →

Pick a region → UVAIA (nós renomeamos no QGIS o polígono!)

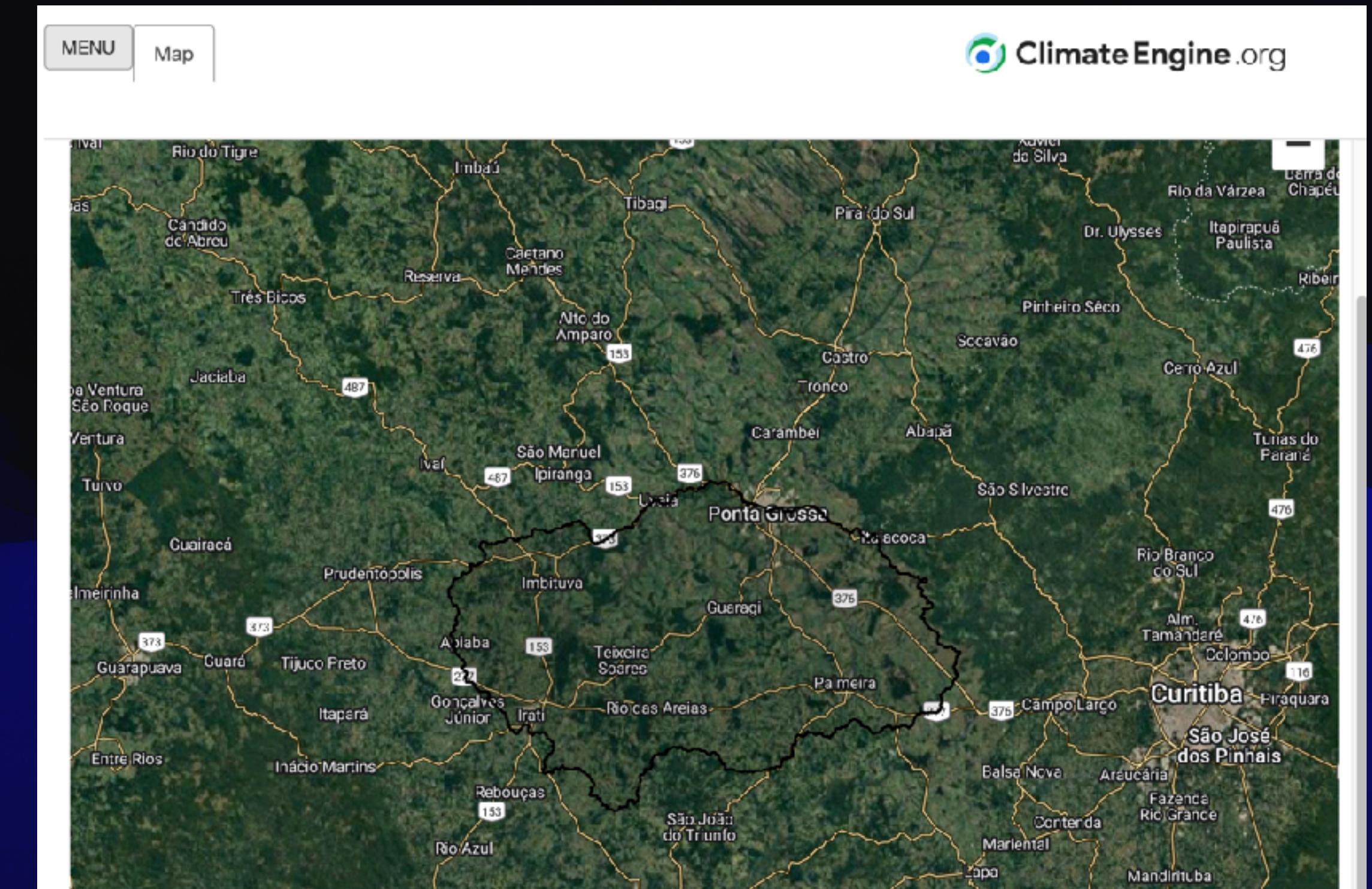
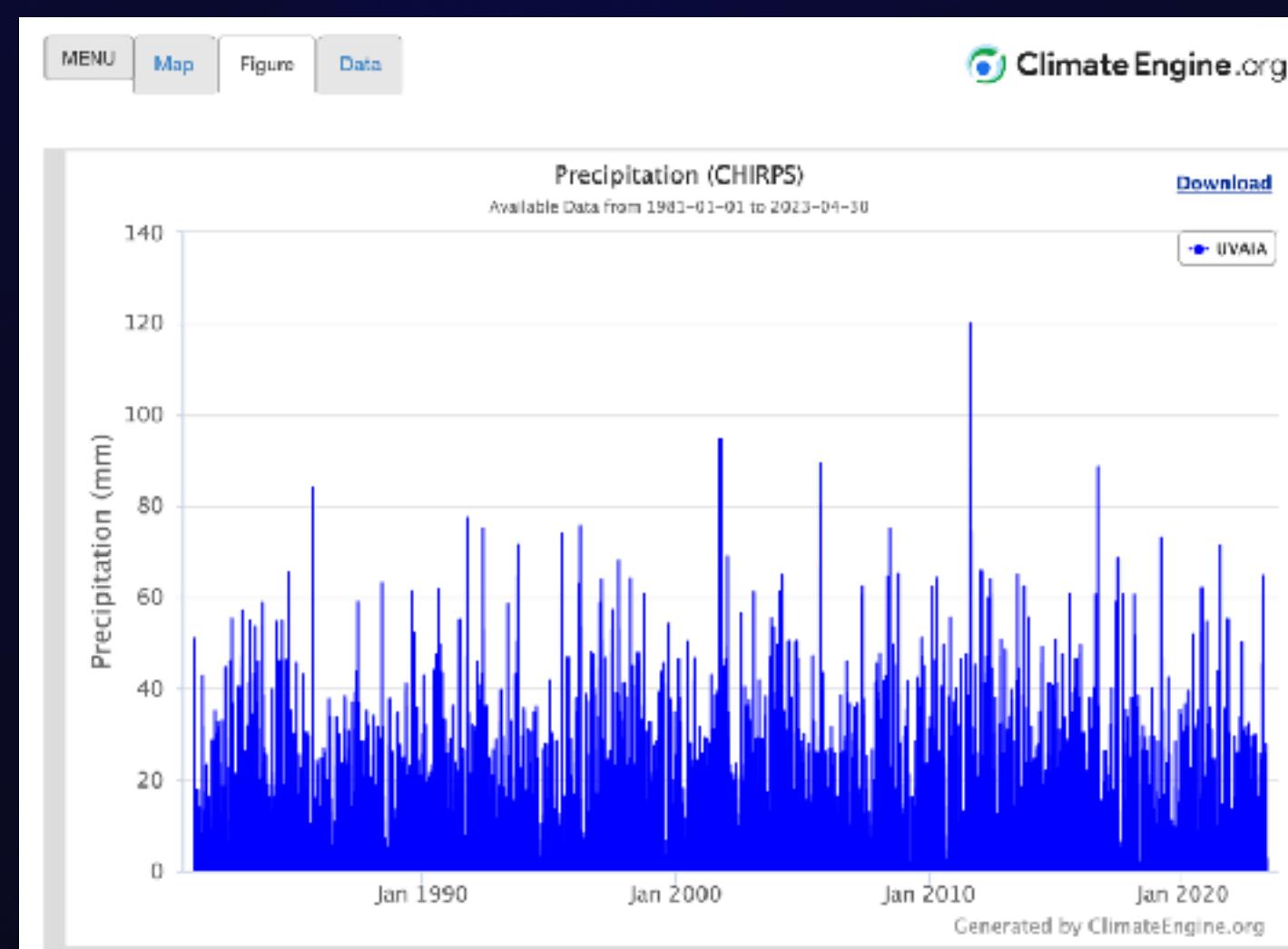
13. Variable 1 → Type → Climate & Hydrology

14. Dataset → CHIRPS - 4.8 km - Daily

15. Time Period → Entire Period of Record of Dataset

16. Get Time Series!

17. Fazer o download do CSV



# Comparação de dados de pluviômetros com a base CHIRPS

What we will do:

- Import the data into Google Colab
- Make a graph, regression

