TEA018 - Hidrologia Ambiental

Precipitação da base de dados CHIRPS

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Outline

Agenda de atividades

- O que é a base CHIRPS
- Baixar dados da bacia Purus (Amazonas)
- 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

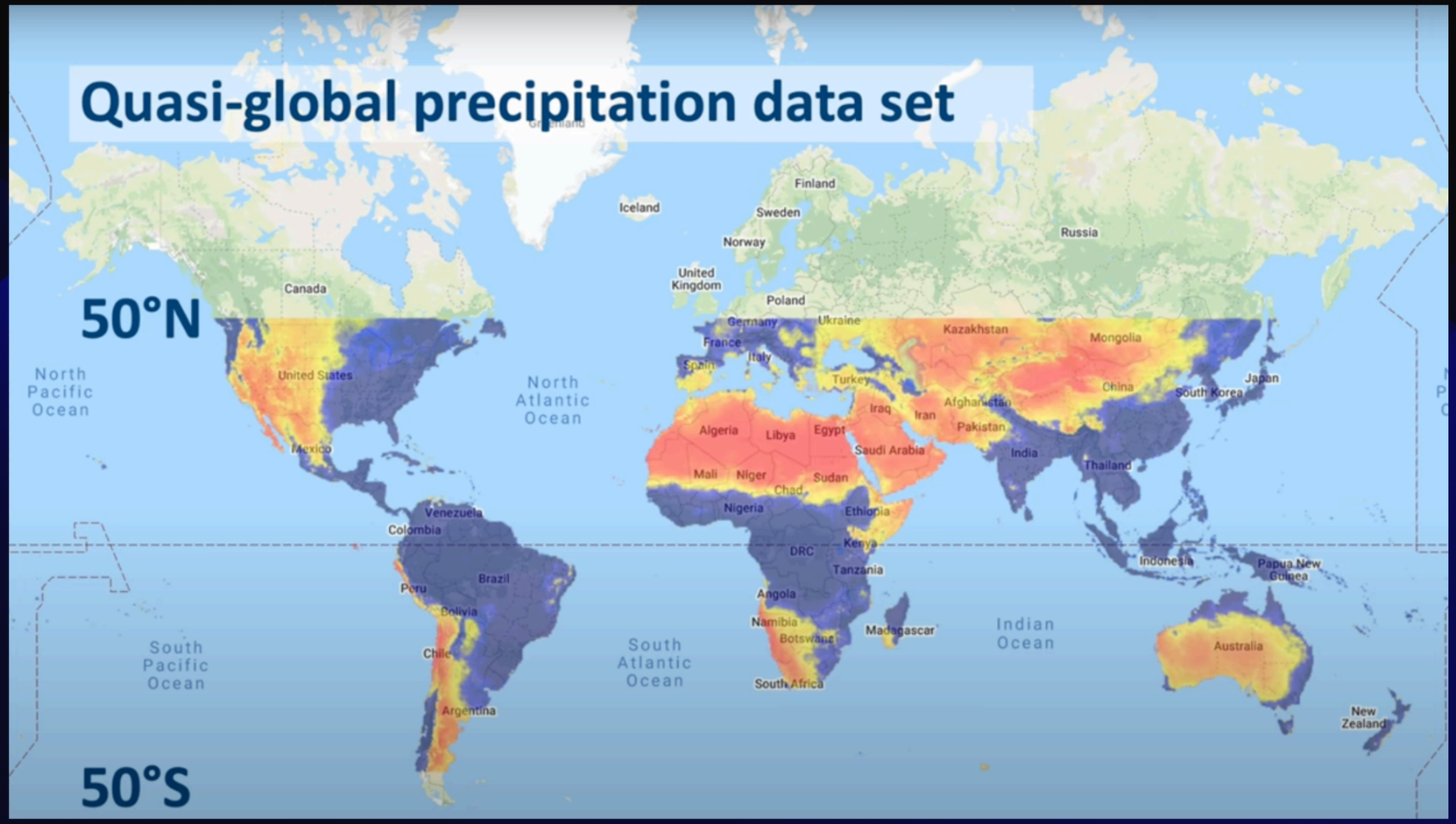
Developed by the Climate Hazards Center – UC Santa Barbara

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:



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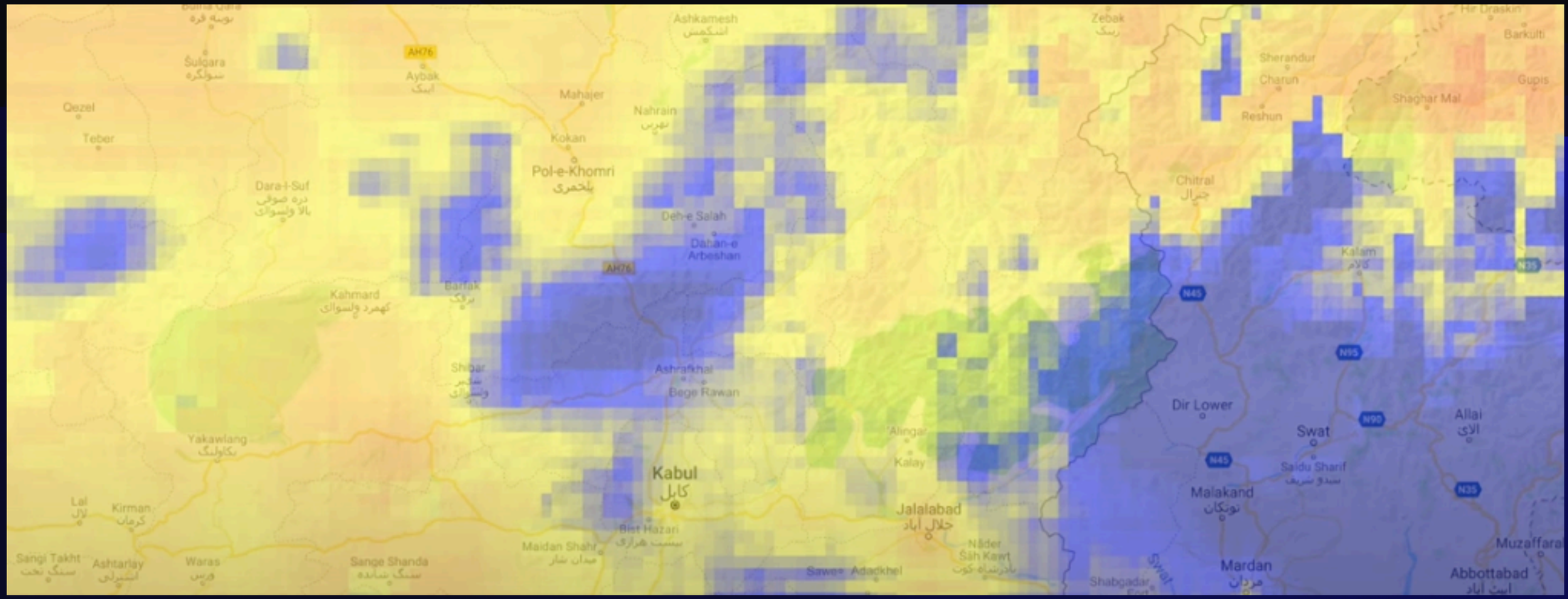
- Resolução espacial de: 0.05 x 0.05 deg (~6km no Equador)



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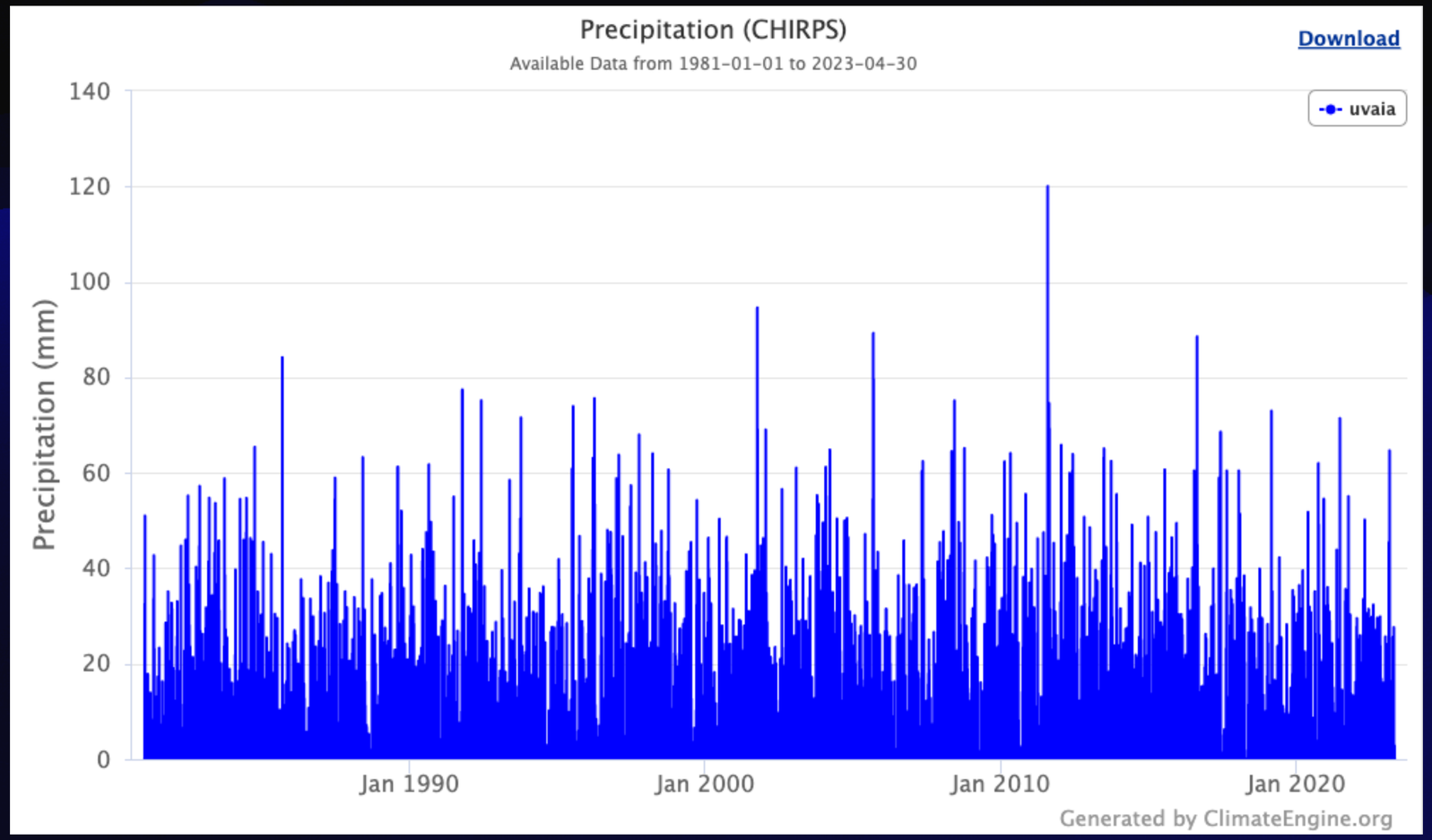
- Time series since 01 de Janeiro de 1981 (+40 anos)



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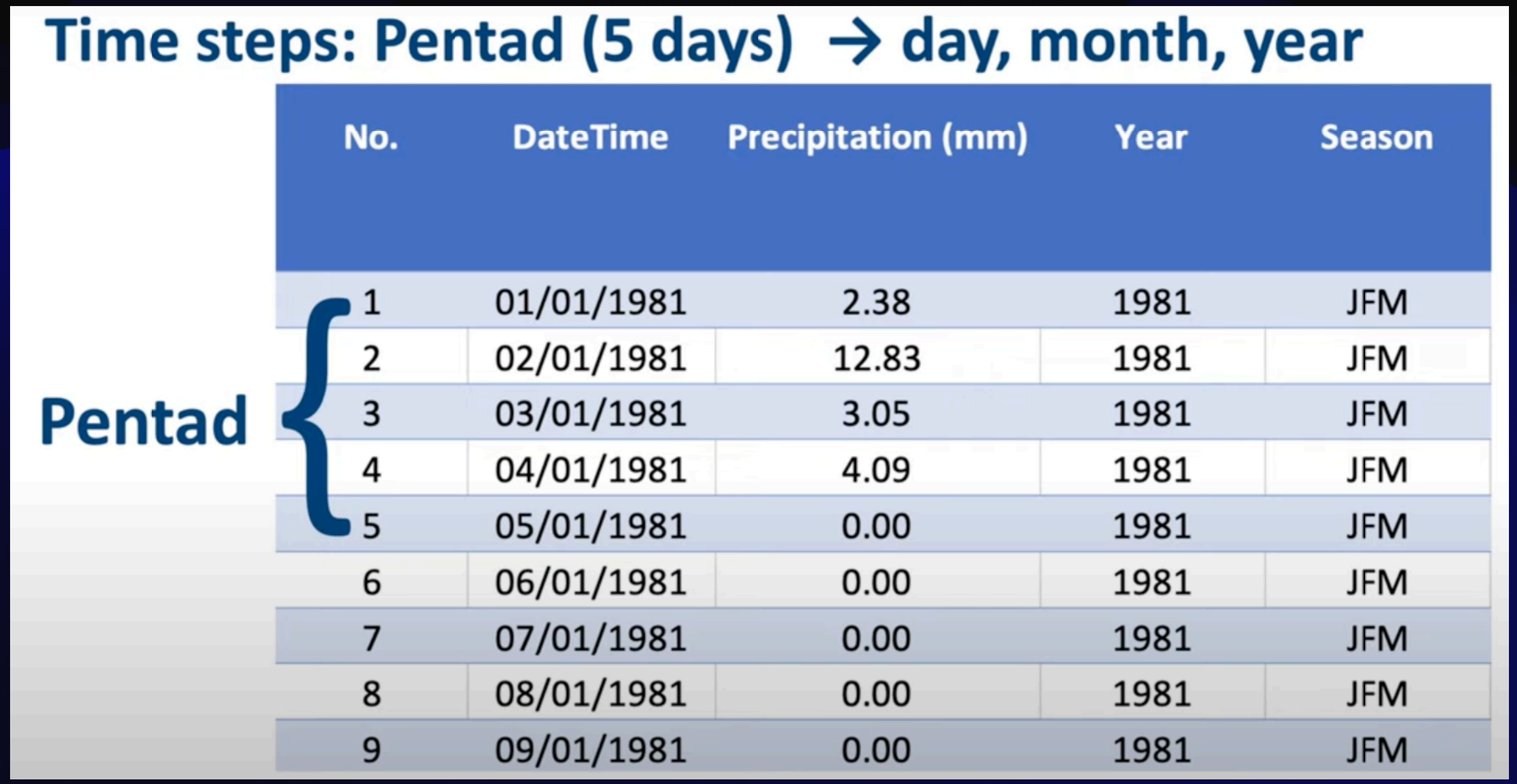
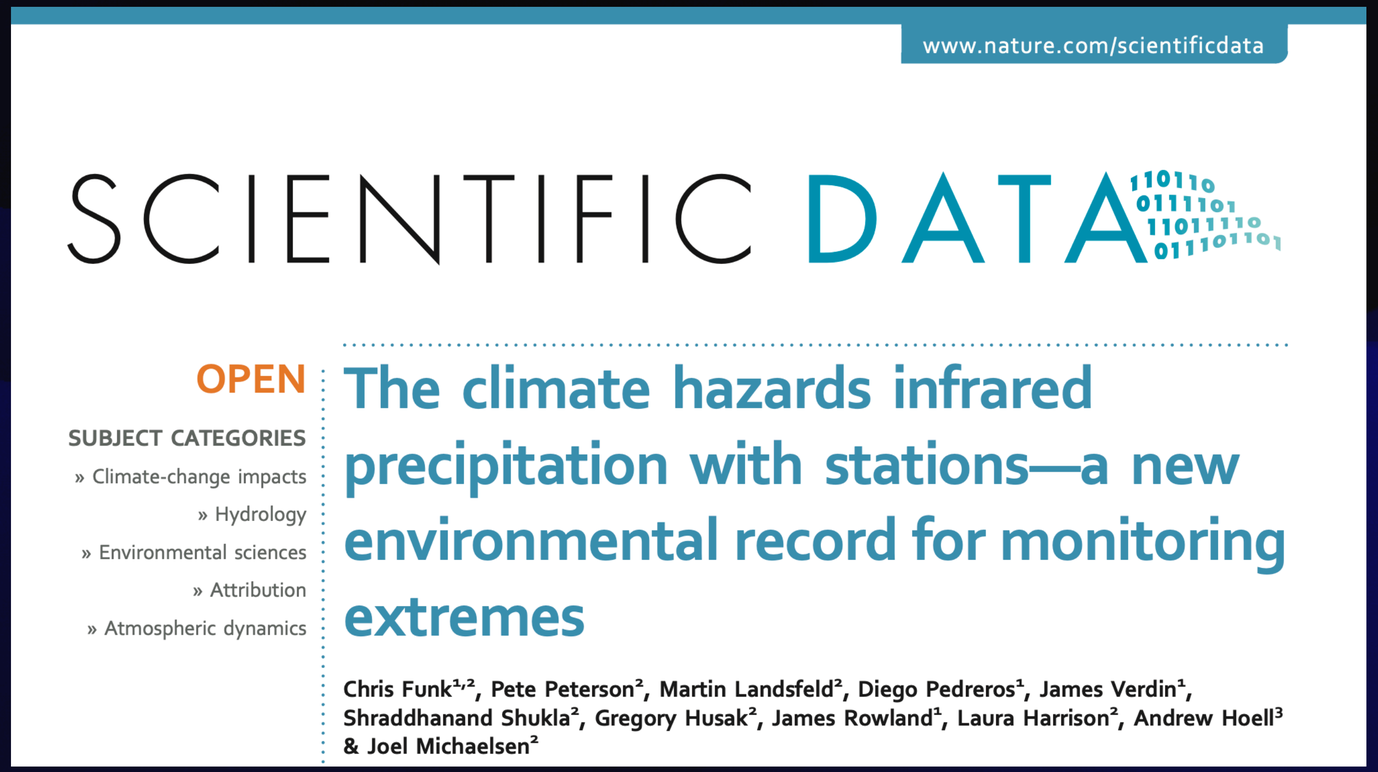
- Time steps: pentad, day, month, year



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..



www.nature.com/scientificdata

SCIENTIFIC DATA

OPEN

SUBJECT CATEGORIES

» Climate-change impacts
» Hydrology
» Environmental sciences
» Attribution
» Atmospheric dynamics

The climate hazards infrared precipitation with stations—a new environmental record for monitoring extremes

Chris Funk[1,2], Pete Peterson[2], Martin Landsfeld[2], Diego Pedreros[1], James Verdin[1], Shraddhanand Shukla[2], Gregory Husak[2], James Rowland[1], Laura Harrison[2], Andrew Hoell[3] & Joel Michaelsen[2]

The Climate Hazards group Infrared Precipitation with Stations (CHIRPS) dataset builds on previous approaches to 'smart' interpolation techniques and high resolution, long period of record precipitation estimates based on infrared Cold Cloud Duration (CCD) observations.

Funk, Chris, et al. "The climate hazards infrared precipitation with stations—a new environmental record for monitoring extremes." *Scientific data* 2.1 (2015): 1-21.

CHIRPS = Climate Hazards Group InfraRed Precipitation with Station Data

- Acurácia, viés, erros..

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journal homepage: www.elsevier.com/locate/pce

Validation of the accuracy of the CHIRPS precipitation dataset at representing climate variability in a tropical mountainous region of South America

Carlos López-Bermeo [a,*], Rubén D. Montoya [a], Francisco J. Caro-Lopera [b], José A. Díaz-García [c]

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[b] Grupo de Investigación en Materiales Nanoestructurados y Biomodelación, Facultad de Ciencias Básicas, Universidad de Medellín, Carrera 87 30-65, Medellín, Colombia
[c] Grupo de Investigación en Teoría de Formas, Bravais-Moiré y Matrices Aleatorias, Facultad de Ciencias Básicas, Universidad de Medellín, Carrera 87 30-65, Medellín, Colombia

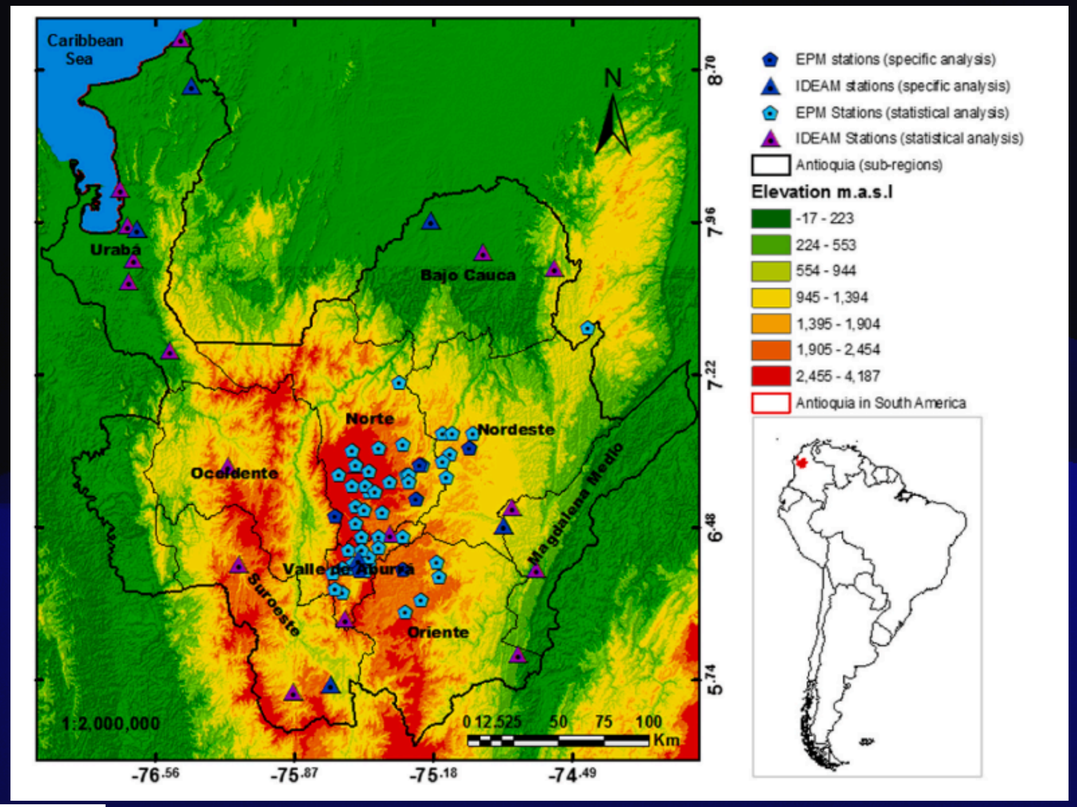

Table 1
Statistical metrics used in this study. Notation: P_o stands for the observed rain-gauge station; P_e stands for the precipitation estimates from CHIRPS; n refers to the sample size.

Statistical metrics	Formula	Value range	Classification
Pearson correlation factor (r)	$r = \frac{\sum_{i=1}^{n}(P_e - \overline{P}_e)(P_o - \overline{P}_o)}{\sqrt{\sum_{i=1}^{n}(P_e - \overline{P}_e)^2}\sqrt{\sum_{i=1}^{n}(P_o - \overline{P}_o)^2}}$	$-1 \leq$ 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)	$d = 1 - \frac{\sum_{i=1}^{n}(P_o - P_e)^2}{\sum_{i=1}^{n}(\lvert P_e - \overline{P}_o\rvert + \lvert P_o - \overline{P}_o\rvert)^2}$	$0 \leq$ 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	Underestimate Good Overestimate
Root-Mean-Square Error (RMSE)	$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(P_e - P_o)^2}$	$0 \leq$ to $\leq \infty$	0 indicates a perfect fit

López-Bermeo, C., Montoya, R. D., Caro-Lopera, F. J., & Díaz-García, J. A. (2022). Validation of the accuracy of the CHIRPS precipitation dataset at representing climate variability in a tropical mountainous region of South America. *Physics and Chemistry of the Earth, Parts A/B/C*, *127*, 103184.

López-Bermeo, C., Montoya, R. D., Caro-Lopera, F. J., & Díaz-García, J. A. (2022). Validation of the accuracy of the CHIRPS precipitation dataset at representing climate variability in a tropical mountainous region of South America. *Physics and Chemistry of the Earth, Parts A/B/C*, *127*, 103184.

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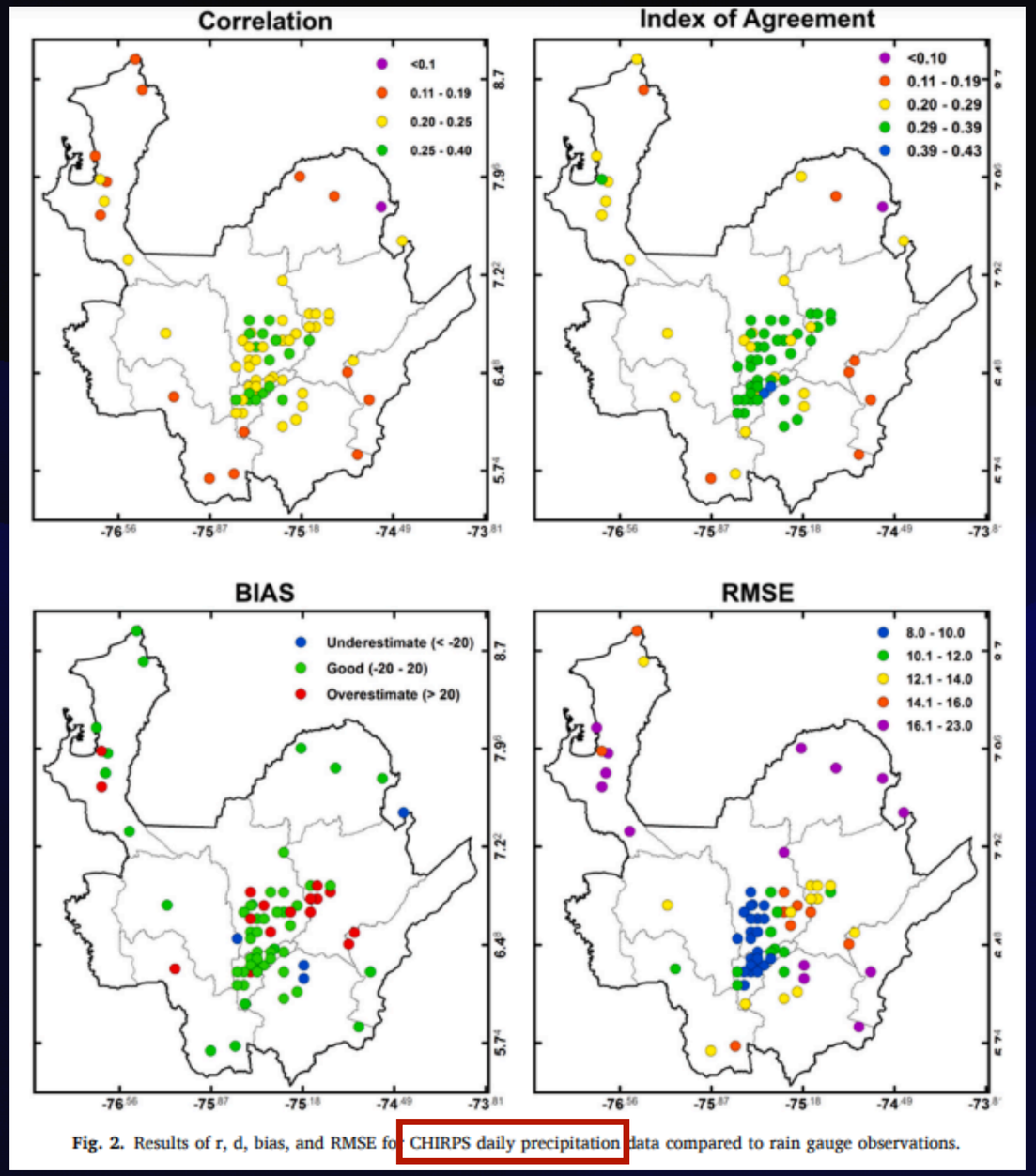


Fig. 2. Results of r, d, bias, and RMSE for CHIRPS daily precipitation data compared to rain gauge observations.

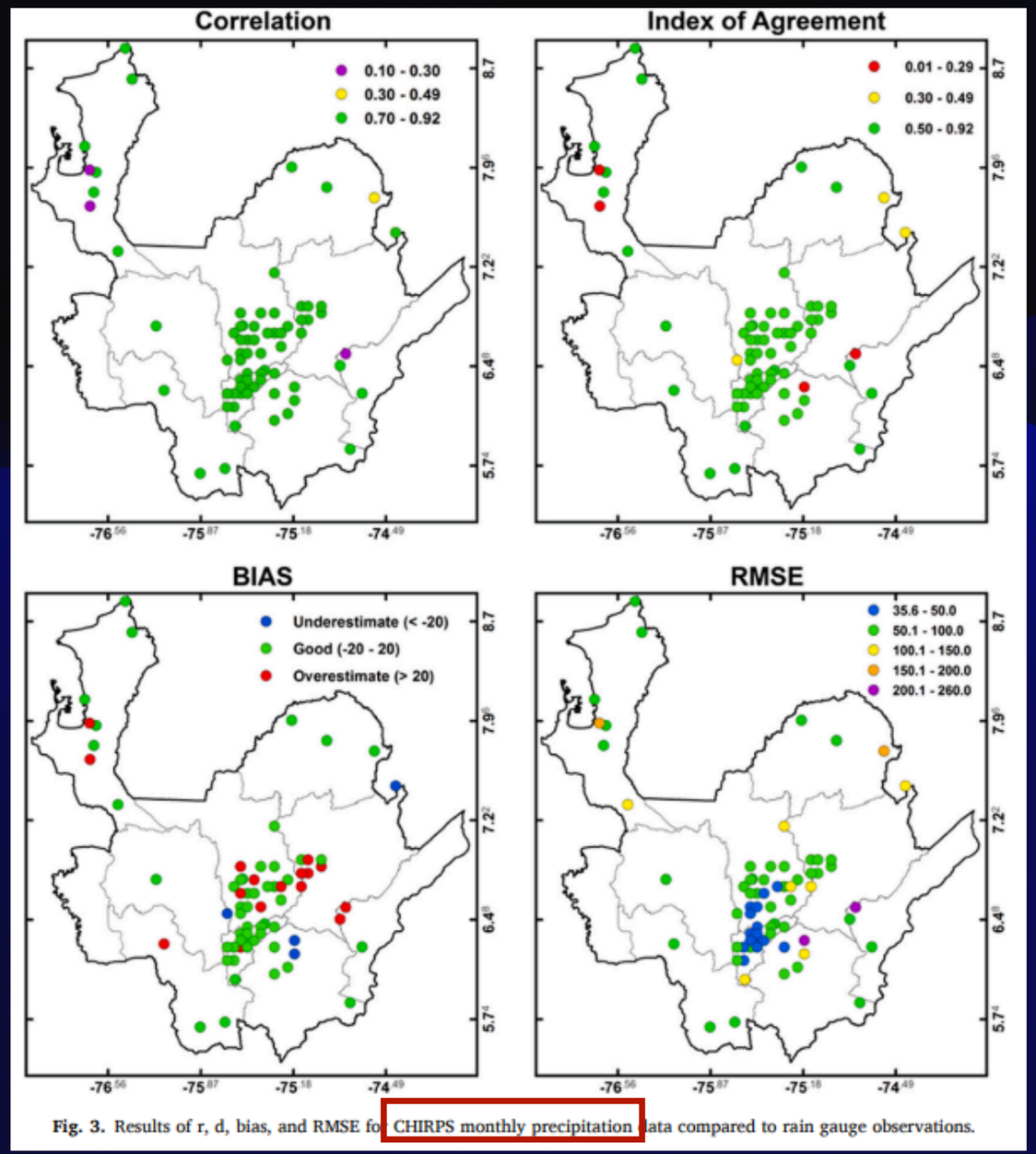
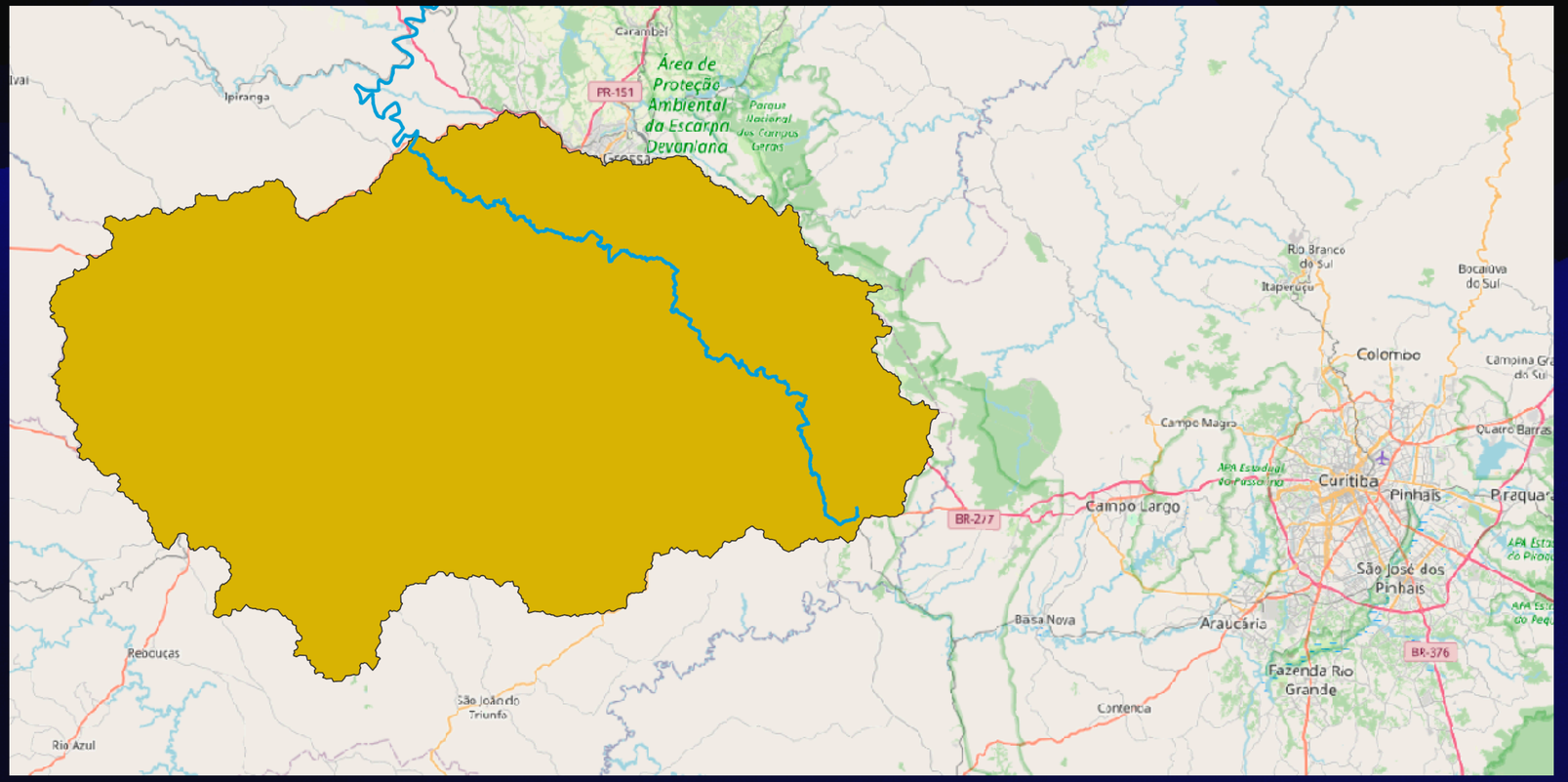


Fig. 3. Results of r, d, bias, and RMSE for CHIRPS monthly precipitation data compared to rain gauge observations.

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/

   Arquivos: “alto_tibagi.shp”

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

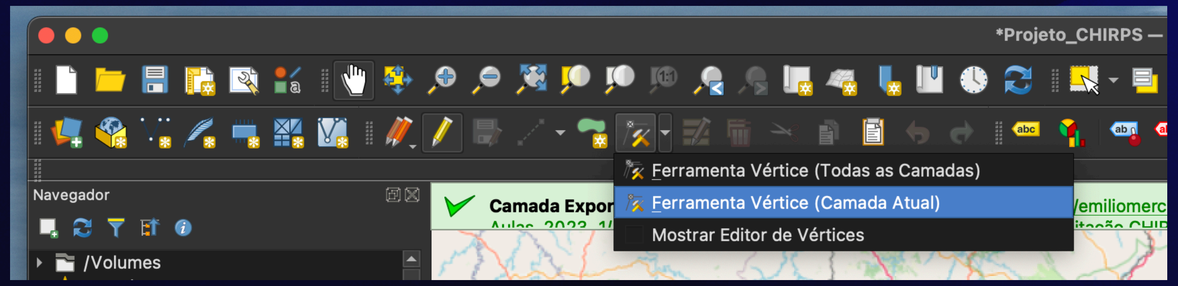
   Clicar na camada → exportar → salvar camada vetorial como → UVAIA_geo_WGS84

   Escolher: SRC Padrão: EPSG: 4326 - WGS 84

3. Verificar se o Shapefile tem erros:

   QGIS → Vetor → Geometras → Verificar Validade

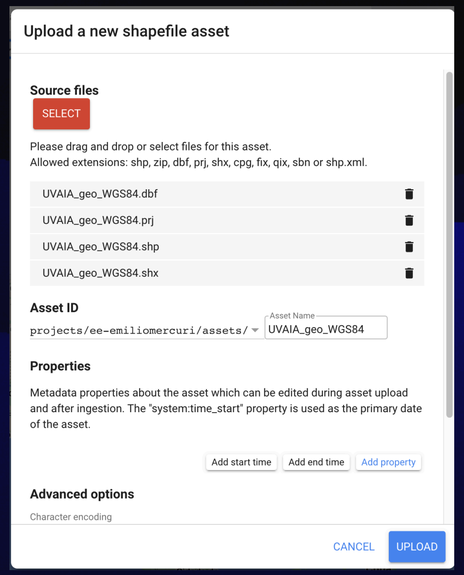
4. Editar camada: Editar → Ferramenta Vértice (ir até o erro e remover os “buracos")



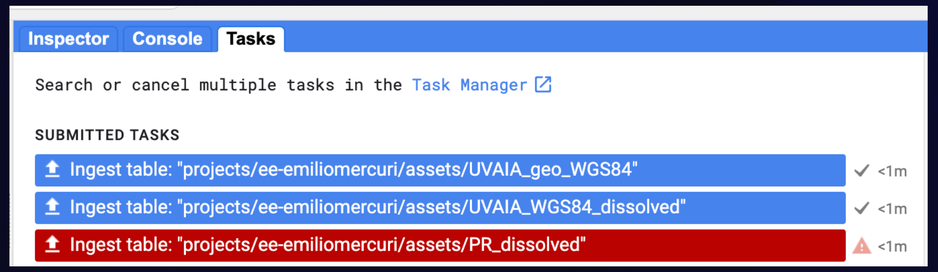
5. Ainda no modo edição: abrir tabela de atributos e renomear label para: UVAIA

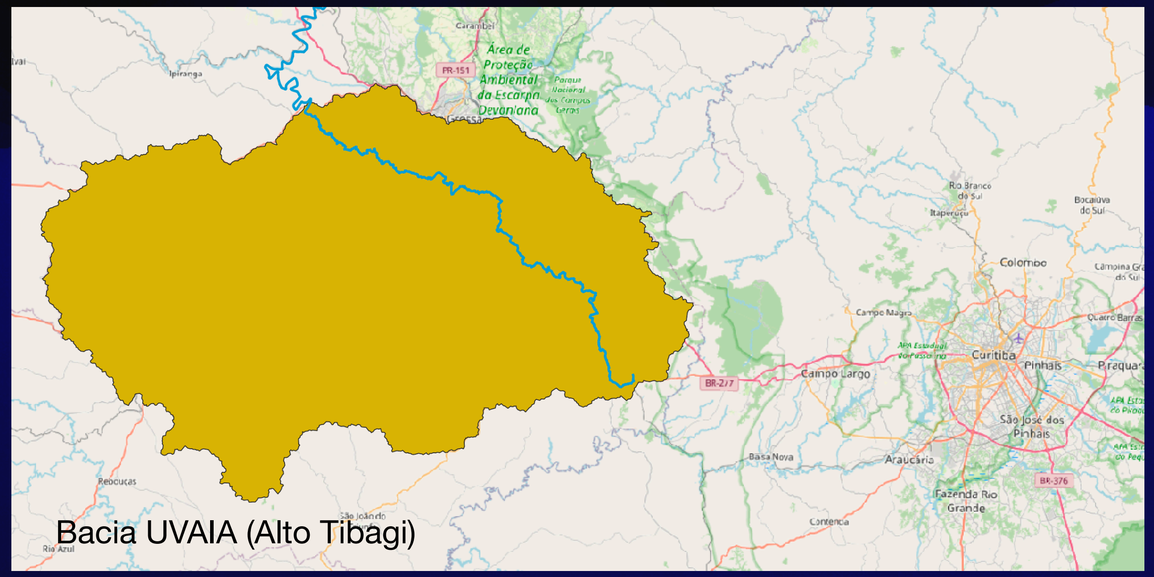
Etapas para baixar da base CHIRPS

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



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





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

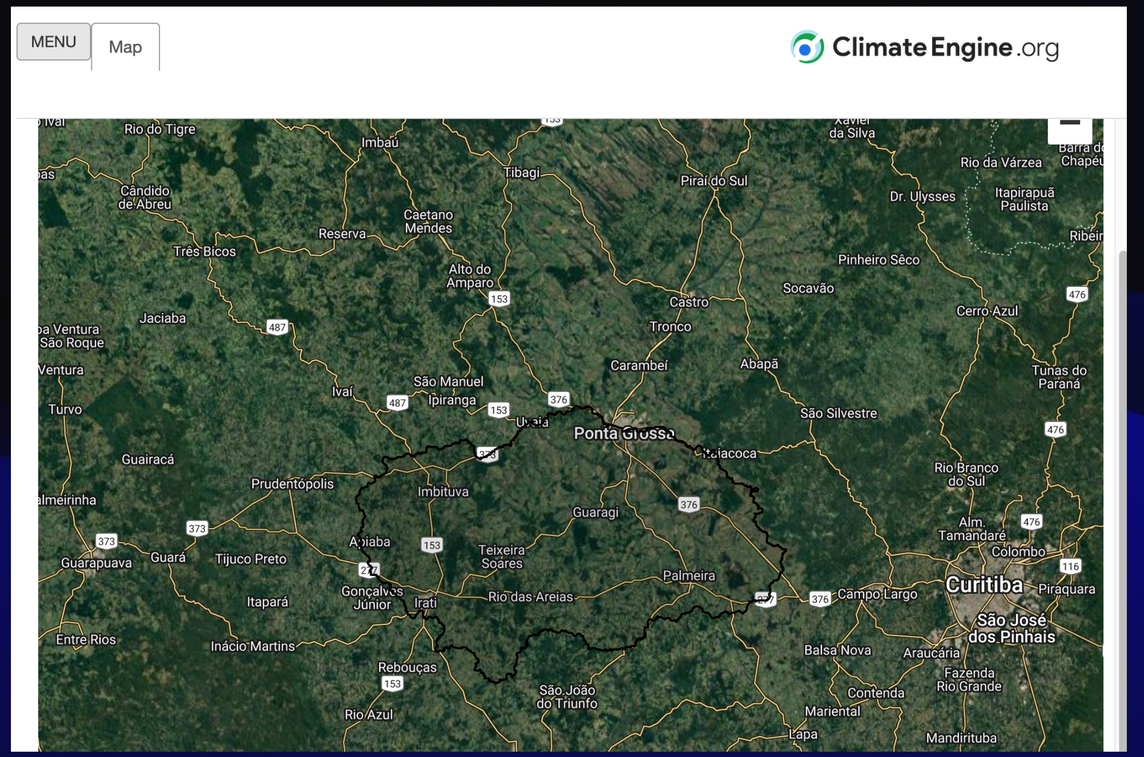
Etapas para baixar da base CHIRPS

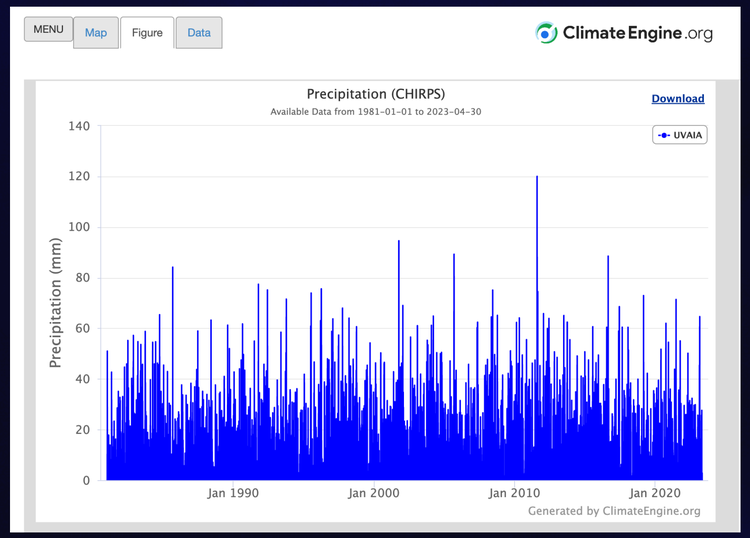
11. Acessar https://app.climateengine.org/ (fazer o login com a conta Google)
12. Make Graph → Region → Custom Polygon from Table Asset

    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





Let’s Code! Google Colaboratory

Comparação de dados de pluviômetros com a base CHIRPS

What we will do:

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