Lucas Lima
IG/UFPA
lucas.raiol@ig.ufpa.br

Dayla Rodrigues
IG/UFPA

Maria Nascimiento
IG/UFPA

João da Silva
UFRA

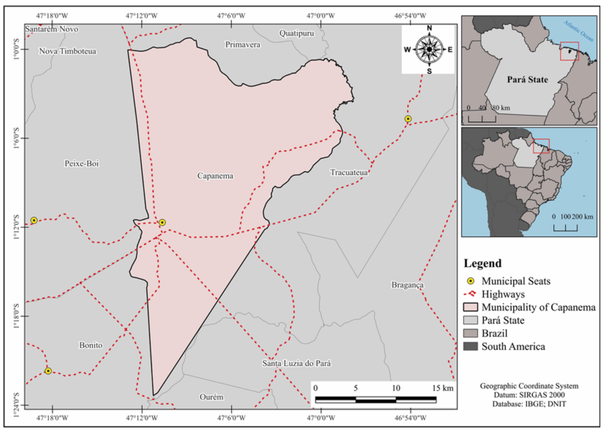
Nelton Cavalcante
INPE

Andrés Velástegui
FICT/ESPOL
dvelaste@espol.edu.ec

Thermal Remote Sensing: A Case Study on Detecting and Analyzing Surface Temperature Variations in Response to Land Use and Land Cover Changes

PROBLEM

In the Amazon basin, the impacts of unprecedented droughts were experienced in the austral summer of 2022–2023 and extending into 2024, with **heat waves** reported in the Amazon, causing **changes** to aquatic habitats an **increase** in the incidence of **fire**, and a **decrease in river levels**.



GENERAL OBJECTIVE

This study analyzed variations in Land Surface Temperature (LST) and its relationship with changes in Land Use and Land Cover (LULC) in the municipality of Capanema, Eastern Amazon.

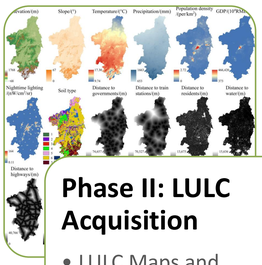
PROPOSAL

The research utilized thermal imagery from Landsat satellites (TM and OLI/TIRS) to extract LST and Normalized Difference Vegetation Index (NDVI) values from 1985 to 2023. LULC classification was obtained from MapBiomas data, enabling the identification of landscape changes over time.

Phase I: Data Processing

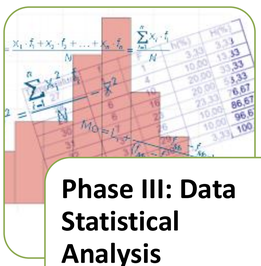
- Acquisition &Retrieval of LST
- Calculation of NDVI

Google Earth Engine



Phase II: LULC Acquisition

- LULC Maps and classification
- Obtaining Land use Land Cover Data

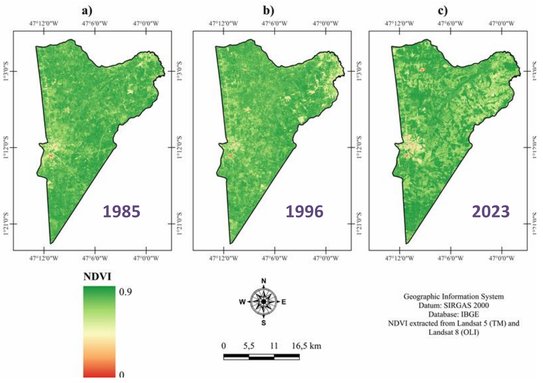


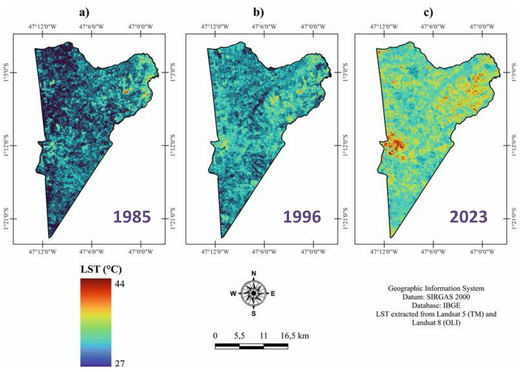
Phase III: Data Statistical Analysis

- Perfoming Statistical Analysis
- Correlation & trend analysis

RESULTS

- The maximum values varied between 0.85, 0.86, and 0.89 for 1985, 1996, and 2023, respectively.
- **This increase** in maximum values may be related to the **expansion of pastures and agriculture**.
- The greater variability in **2023 reflects** the diversity of LULC, with **urban, agricultural, and forest areas coexisting** in the municipality of Capanema.





- Exist a significant **increase in temperature** over the urban area due to the densification and impermeability of the soil of the urban conglomerates.
- The **reduction of green areas** and the increase of agricultural and pasture areas, which consequently **affects the increase of LST**

CONCLUSIONS

- The conversion of forested areas into pastures and urban zones, led to a significant upward trend in Land Surface Temperature (LST), including a **4.7 °C increase** between 1985 and 2023.
- Statistical analysis revealed a significant **negative correlation** between NDVI and LST, proving that the **reduction of natural vegetation** directly intensifies the heat island effect, with urban areas and pastures exhibiting the highest temperatures.
- The findings highlight the urgent **need for sustainable urban planning** and environmental restoration to mitigate rising temperatures.

Read the article!