

# Comparative Analysis of Temperature and Humidity Variability in Northeastern Brazil: A Case Study of July 2023 and 2024

## Motivation

Northeastern Brazil is a region vulnerable to climate variability, particularly in terms of temperature and humidity [6]. Studying these variables is important to predict extreme events, such as droughts, which negatively affect the population [5], agriculture, and land use [1].

## Objective

Analyze the variation in temperature and humidity during July of 2023 and 2024 in Northeastern Brazil using remote sensing and geoinformatics.

## Methodology

**0.1 Data Collection:** Temperature and humidity data were obtained via EUMETSAT [4] and NOAA [5] satellites.

**0.2 Data Processing** Python libraries, such as xarray, rasterio, and matplotlib, were used for data processing and visualization. Time series were analyzed, and spatial maps were created to identify climate variations.

**0.3 Statistical Analysis** Statistical analysis of the variables was performed, calculating averages, standard deviations, and daily maxima for each month.

## Results

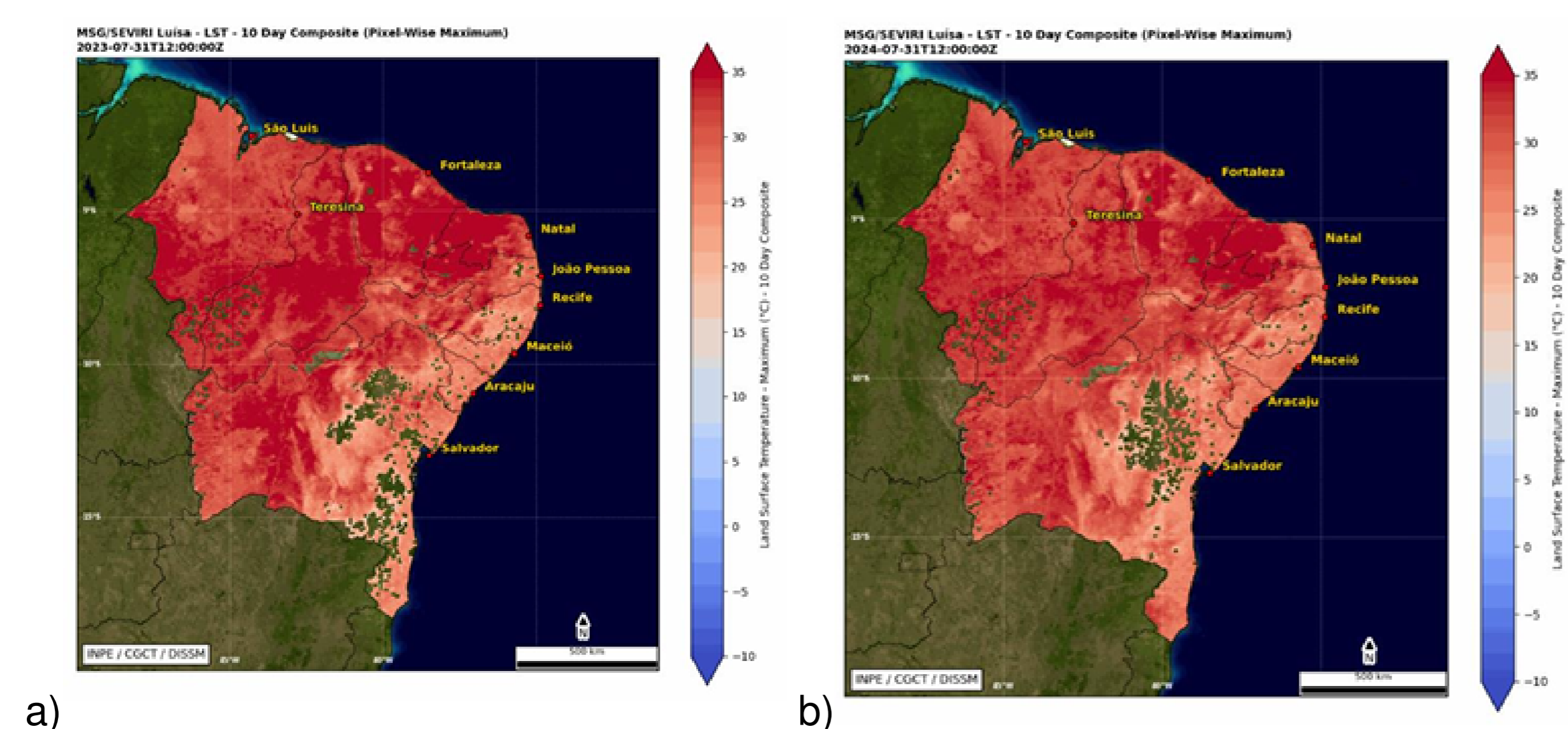


Figure 1: Temperatura de 21 de Julho de 2023 e 2024 - EUMETSAT.

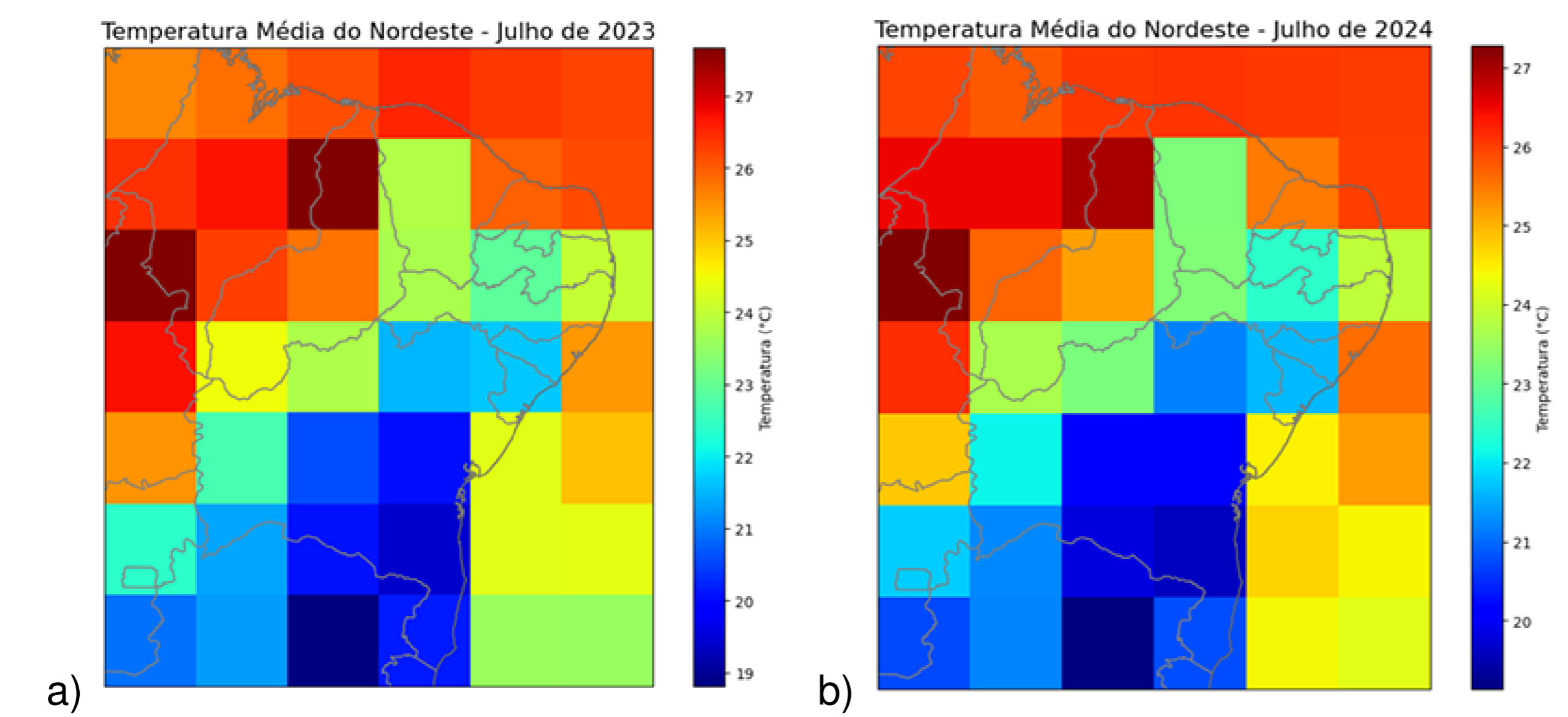


Figure 2: Temperatura Média em Julho de 2023 e 2024 - NOAA.

Temperatures During July 2023, certain regions in Northeastern Brazil experienced higher temperatures, with peaks around 39°C on July 21 at noon. This aligns with global data indicating that July 31, 2023, reached an average temperature of 20.96°C, marking the hottest day in recent history [2].

The overall average temperature for July 2023 was 23.94°C, with a standard deviation of 0.66°C, while in 2024, the average was slightly lower at 23.77°C with a standard deviation of 0.45°C. This small difference suggests that 2024 had more stable and less variable temperature patterns [3].

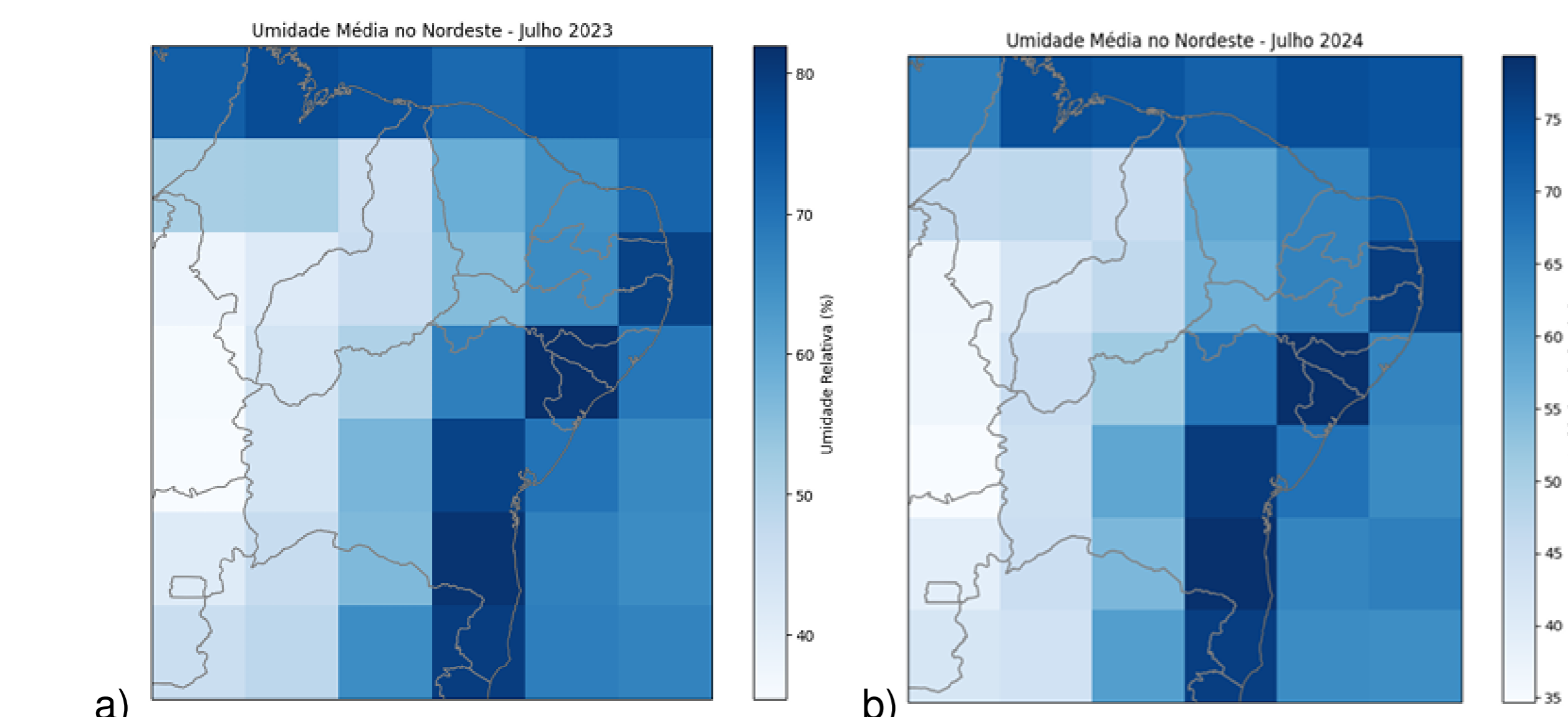
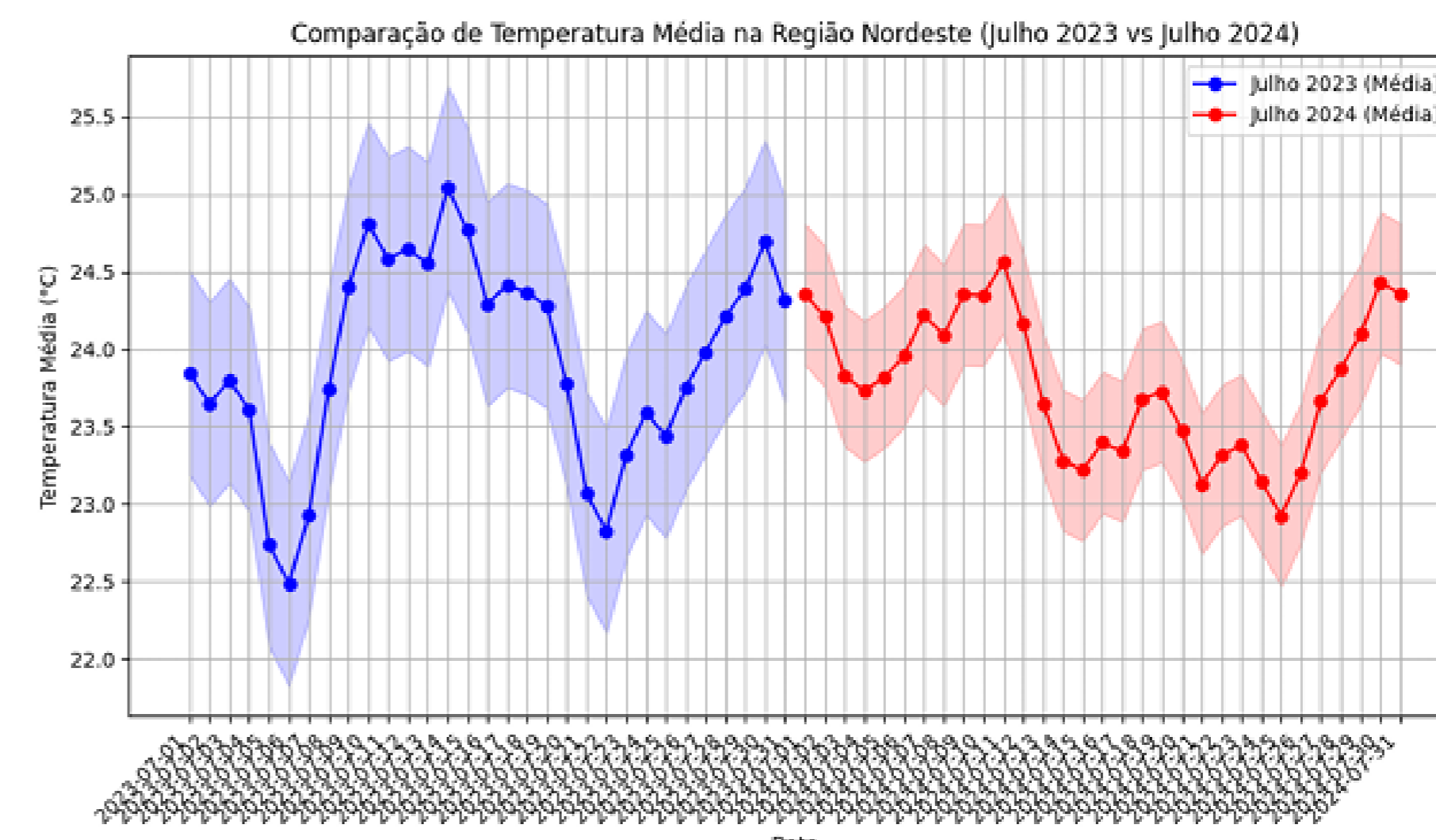
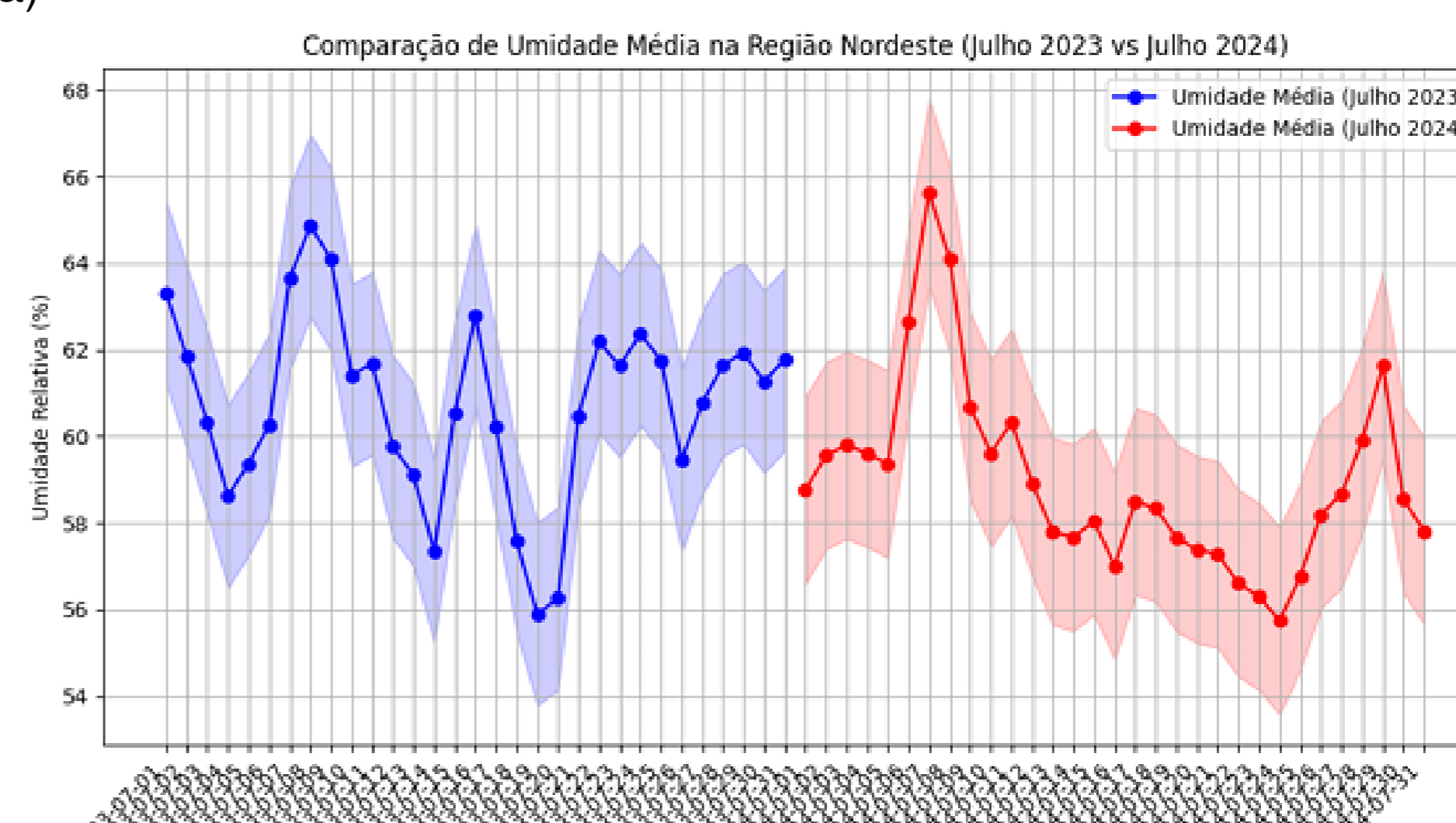


Figure 3: Umidade Média em Julho de 2023 e 2024 - NOAA.

Humidity Relative humidity ranged from 40% to 80%, with greater variability in 2023. In 2024, the more homogeneous distribution indicated a stable climate pattern [1].

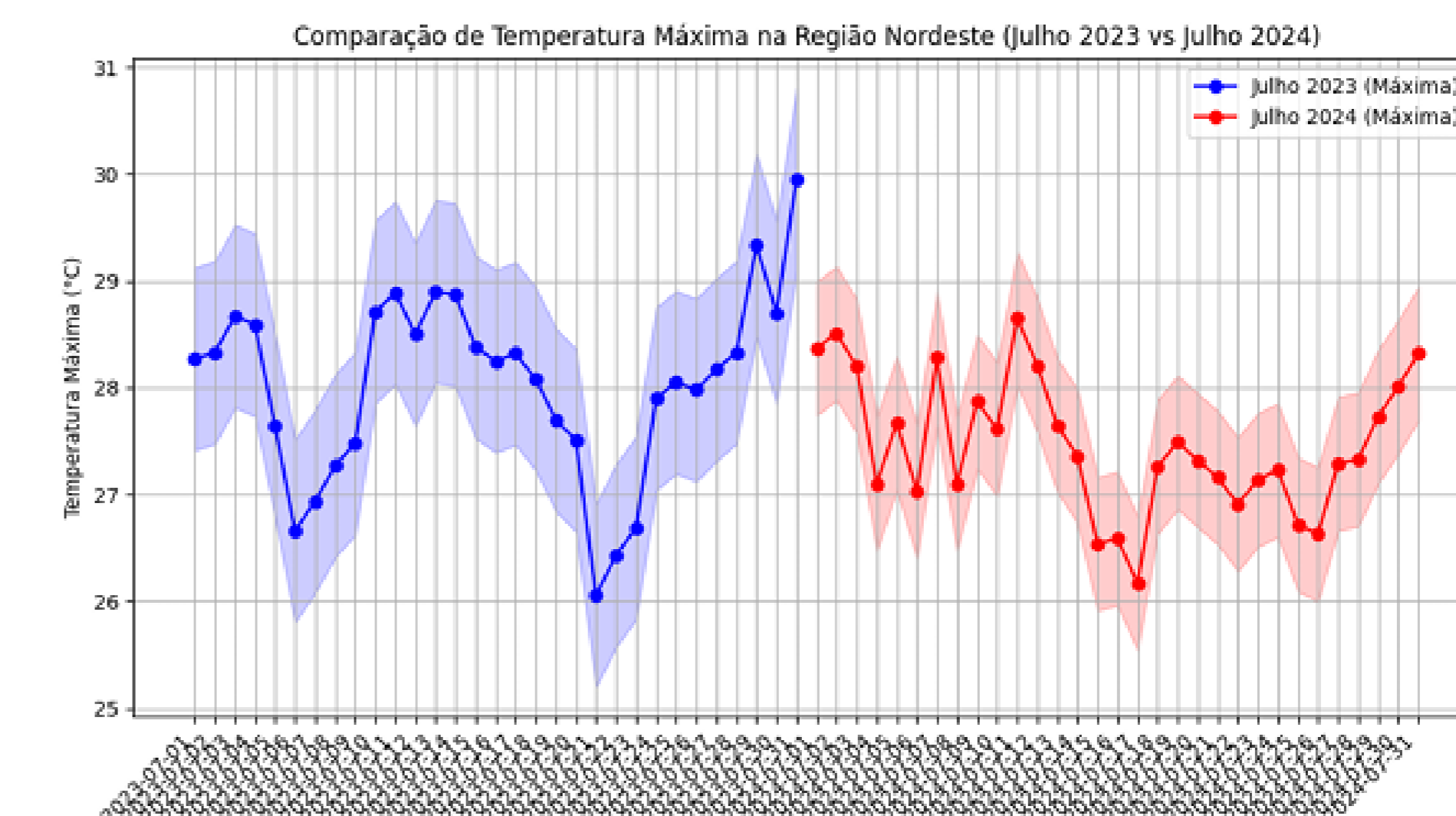


a)

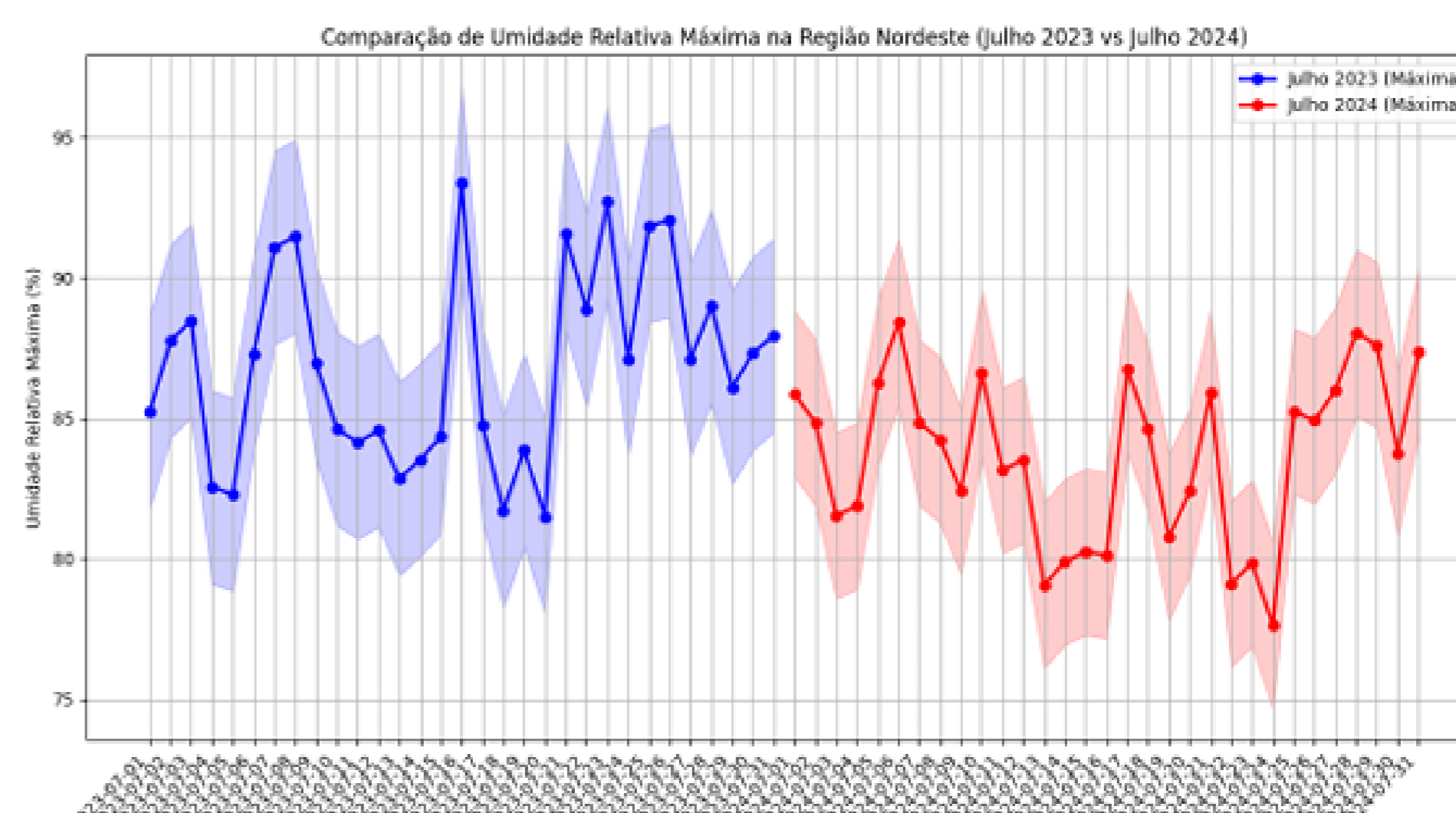


b)

Figure 4: Temperatura e Umidade Média e Desvio Padrão em Julho de 2023 e 2024.



a)



b)

Figure 5: Temperatura e Umidade Máxima e Desvio Padrão em Julho de 2023 e 2024.

## Conclusion

The study highlights the importance of using remote sensing data to monitor climate variables in Northeastern Brazil. The significant variations observed between 2023 and 2024 reinforce the need for climate mitigation policies.

## Acknowledgements

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## References

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