



Comparison of WRF and AERMET for Planetary Boundary Layer Estimation in Brazil



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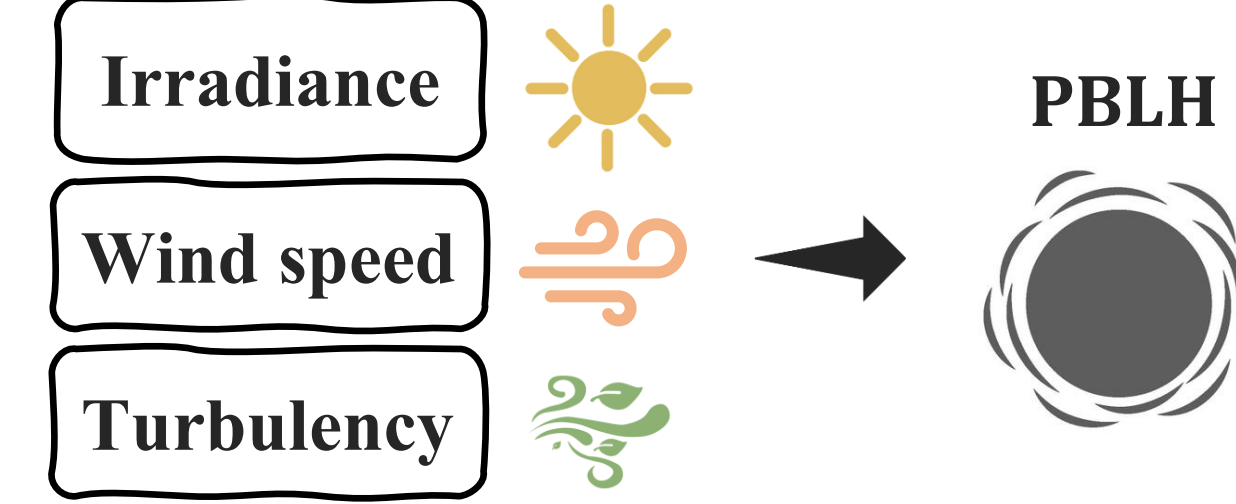
BACKGROUND

PBLH The part closest to the ground of the troposphere is known as the planetary boundary layer. It is in this region of the atmosphere that we will have the Earth's surface interfering significantly in temperature, humidity and wind speed.¹

Dependencies

- Land cover
- temperature
- Wind speed
- Average vertical gradient

Change in solar irradiation, temperature, wind speed, generate change in the **Planetary boundary layer height**



In Brazil, refined meteorological data is scarce and rarely fulfills the requirements for air quality modeling. To fill this gap and generate meteorological data for these areas, the community has extensively used the **Weather Research and Forecasting (WRF)** model. However, further evaluations of the **model's performance** in predicting the planetary boundary layer (PBL) are required.

RESEARCH QUESTIONS

- 1 Does the available **planetary boundary layer height** data meet the researchers' need ?
- 2 The **WRF model** overestimates or underestimates the data measured at airports ?

METHODOLOGY

Compares

WRF model

20 km x 20 km
36 hours
E_vert = 33
Pbl_physics = 1
Mp_physics = 10



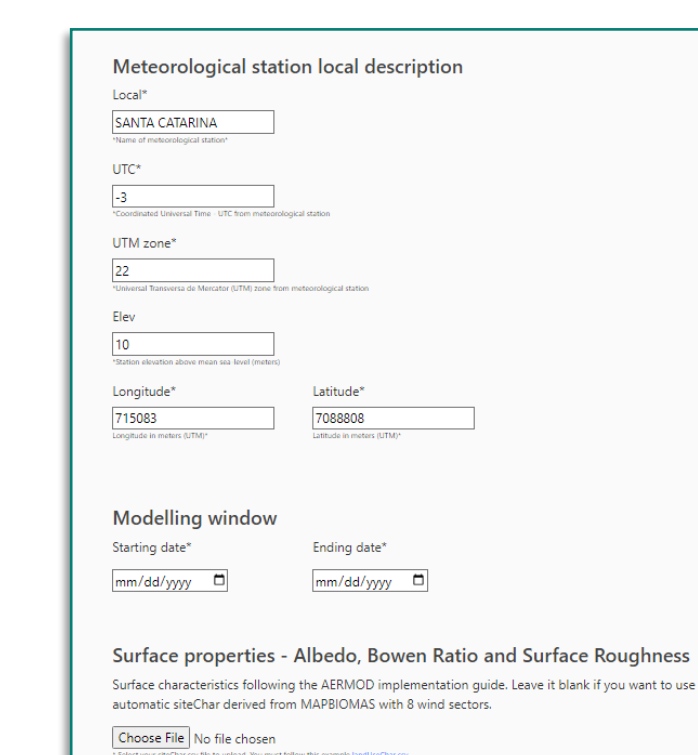
PRELIMINARY ANALYSIS

BIAS
RSME
SPEARMAN
SCATTER

PRELIMINARY ANALYSIS

Meteorologic data + AERMET

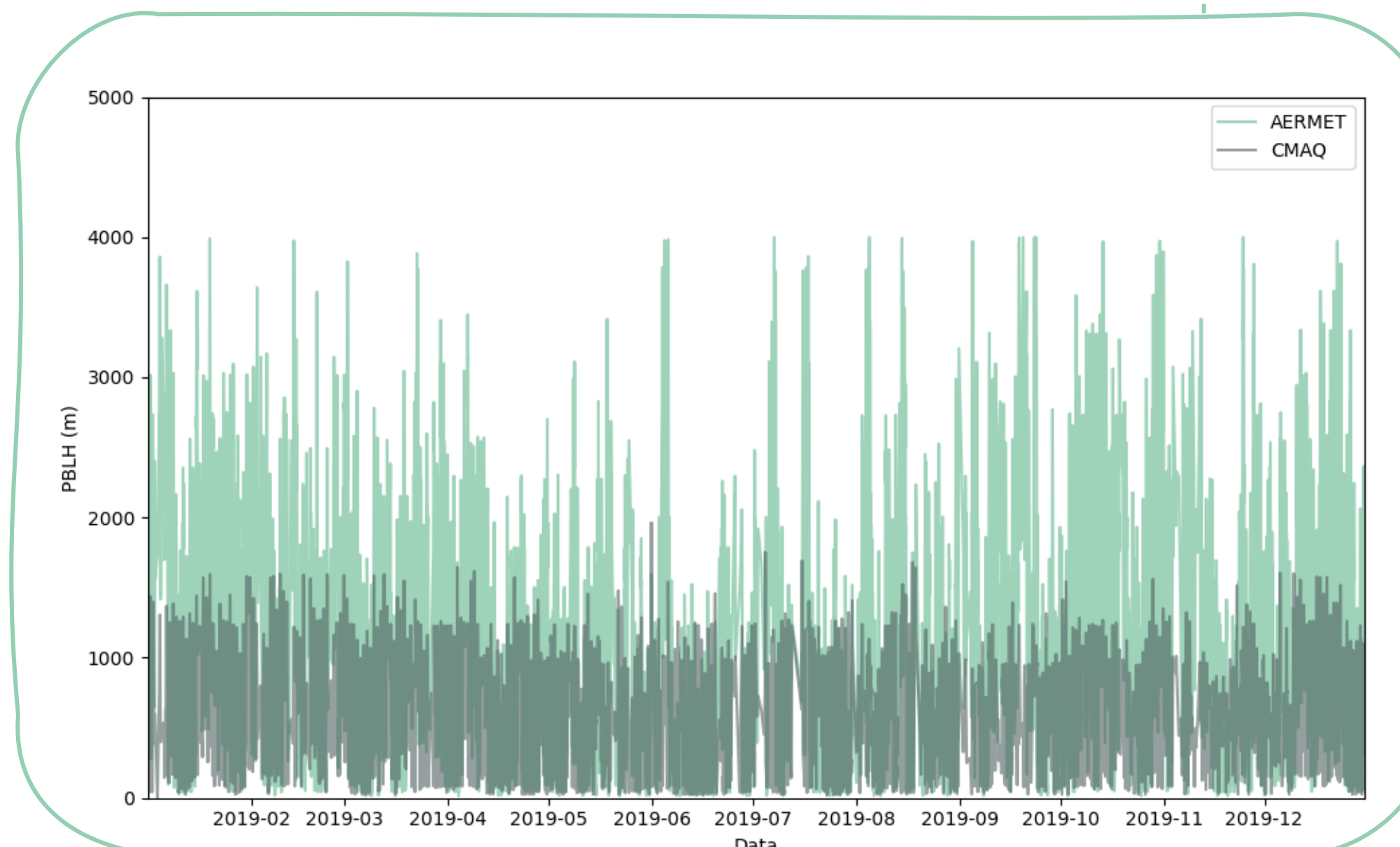
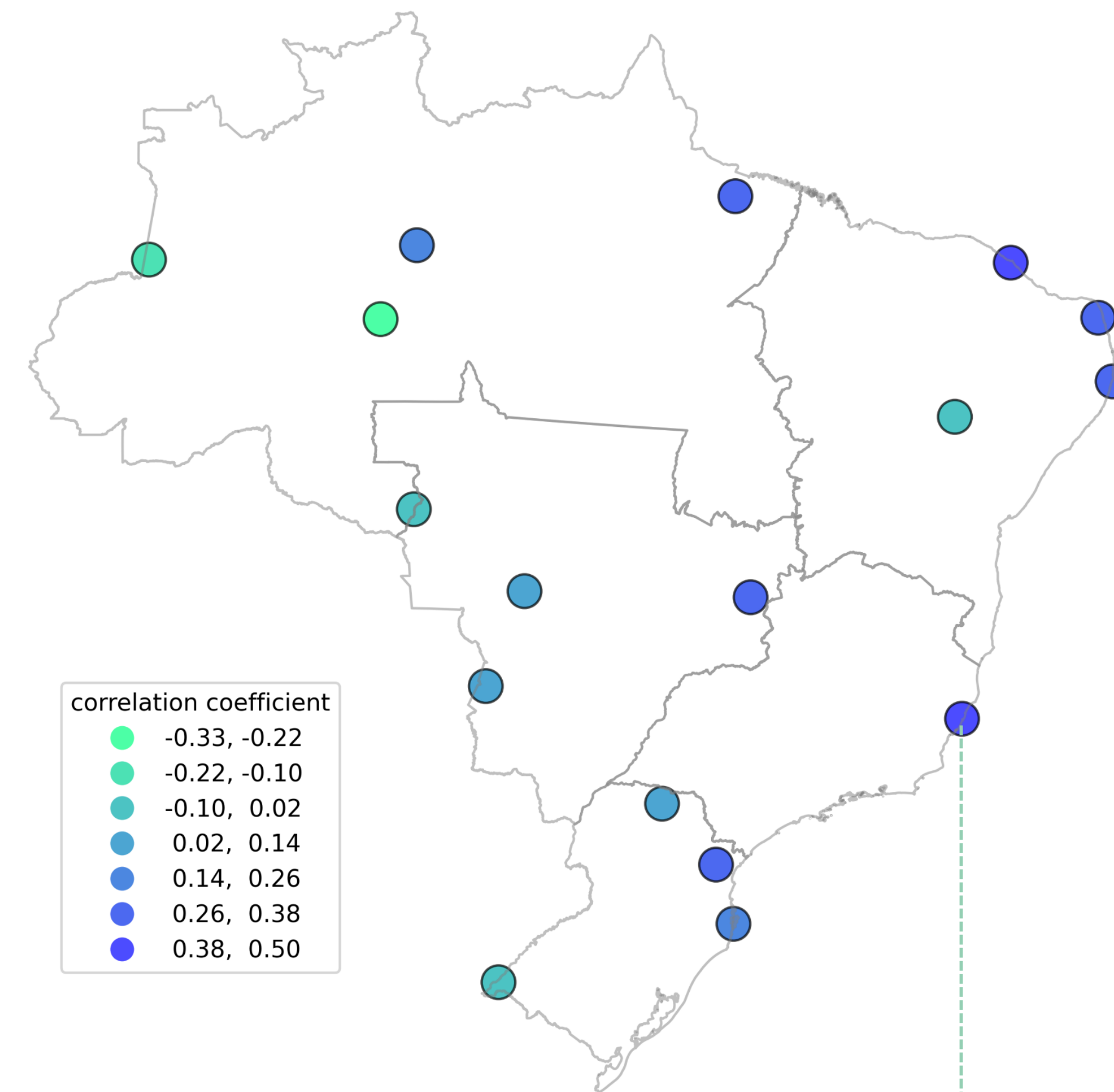
36 airports
Metar files
Upper air sounding
Mapbiomas
Bowen ratio
Albedo



https://hoinaski.prof.ufsc.br/AERMOD_online/AERMET_web

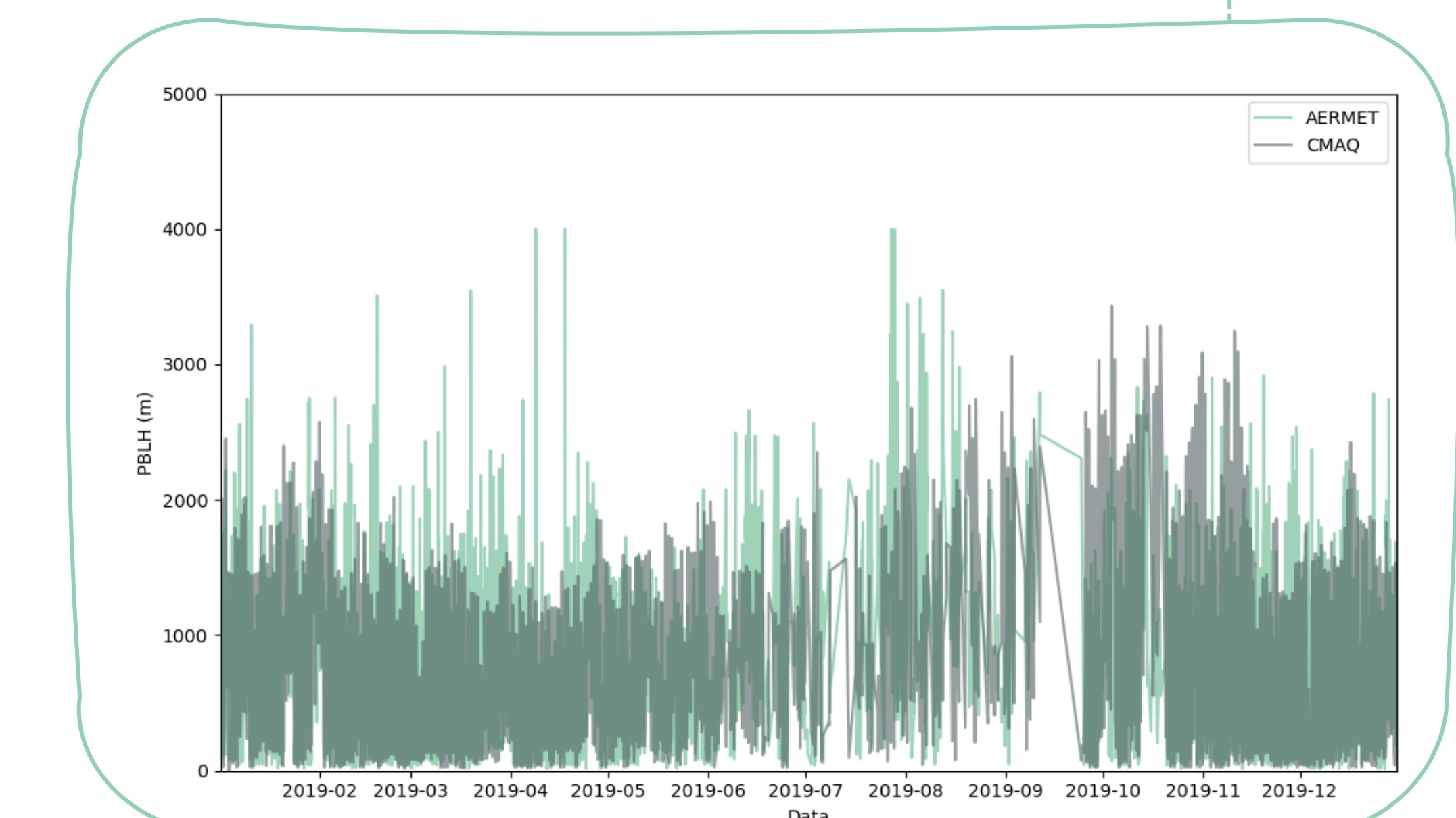
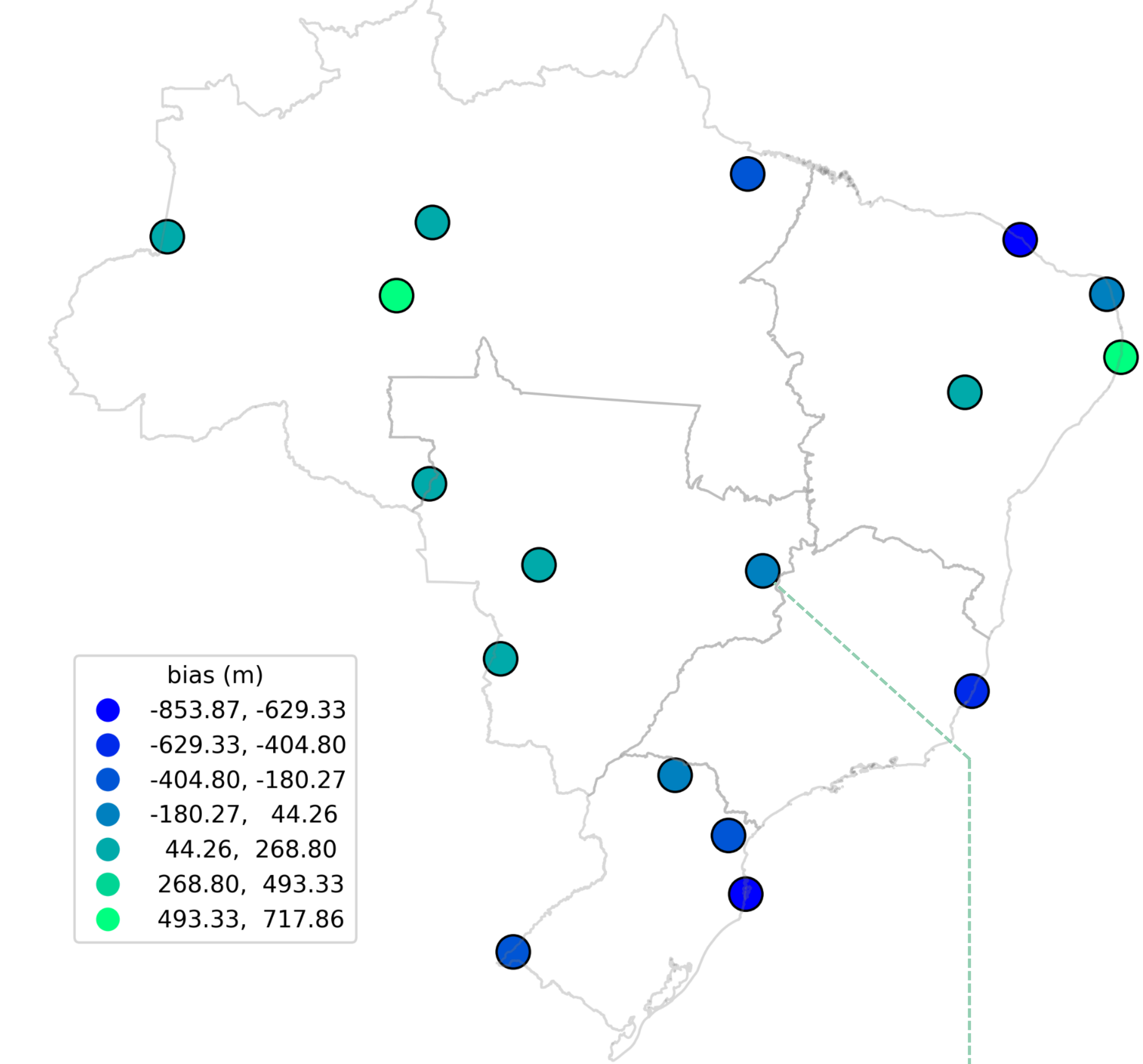
RESULTS

CMAQ X AERMET - correlation coefficient



correlation coefficient – CMAQ x AERMET – $\rho = 0.49$

CMAQ X AERMET- BIAS



bias – CMAQ x AERMET – bias = 16.4407

→ There was a great variation in the correlation indices, with the best results in general occurring in the coastal part

→ The best results presented are compatible with those found in the literature.^{2,3}

→ The model showed a yield to underestimate the height in the boundary layer in the South Portion and overestimate in the northern portion of the country.

→ The best results will occur in the central-western region of Brazil, the results are compatible with the literature.^{2,3}

CONCLUSIONS

- 1 The model presented some correlation indexes compatible with the bibliography, but also presented negative correlation indexes. The values of bias are compatible with the bibliography, in general the CMAQ subestimates the height of the boundary layer;
- 2 The difference between the regions indicates that large territorial spaces should be divided into smaller areas, with distinct WRF configurations for each of them;
- 3 More refined resolutions and other settings should be tested to find the best setting for modeling.

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