



Time Series Topsoil Moisture Modeling from Sentinel-1, Sentinel-2 and Field Data Supporting Pedological Management

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Material and Methods

Sampling

Ten rounds of 40 undisturbed samples in triplicate collected synchronously with Sentinel-1 passage Brazilian Federal District (Midwest Brazil) during a rainfall cycle.

Analysis

Gravimetric soil moisture measurements using volumetric rings weighed before and after oven drying.

Modeling – Random Forest in R environment

Sentinel-1 → Backscattering VV, VH and Incidence Angle;
Sentinel-2 → NDVI Normalized Difference Vegetation Index);
SRTM → Terrain Attributes

Metrics

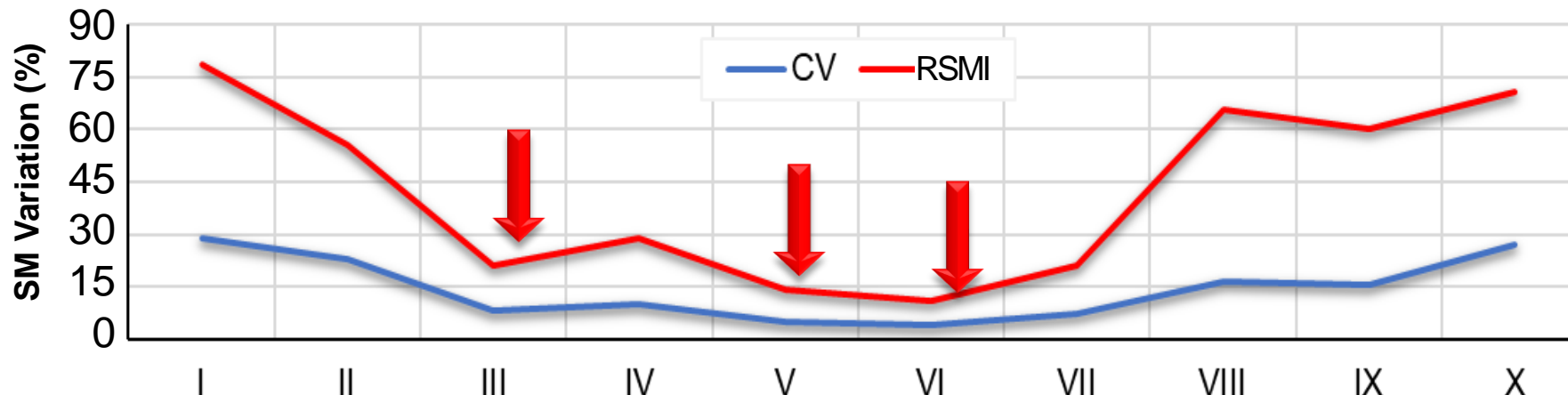
Coefficient of Determination and Root Mean Square Error

Relative Soil Moisture Index Calculation

$$RSMI_t = \frac{SM_{min} - SM_{max}}{SM_{max} + SM_{max}} .100$$

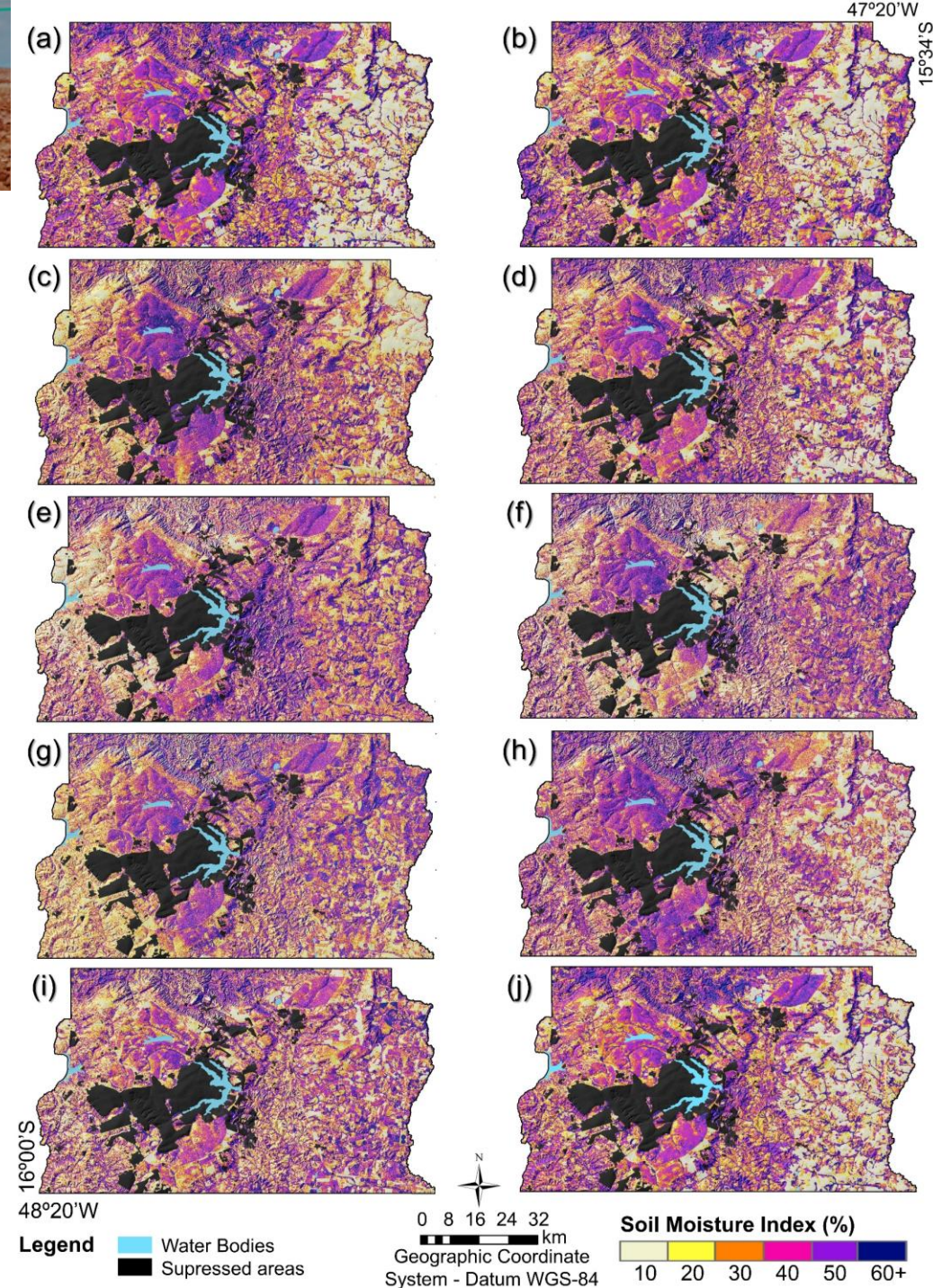
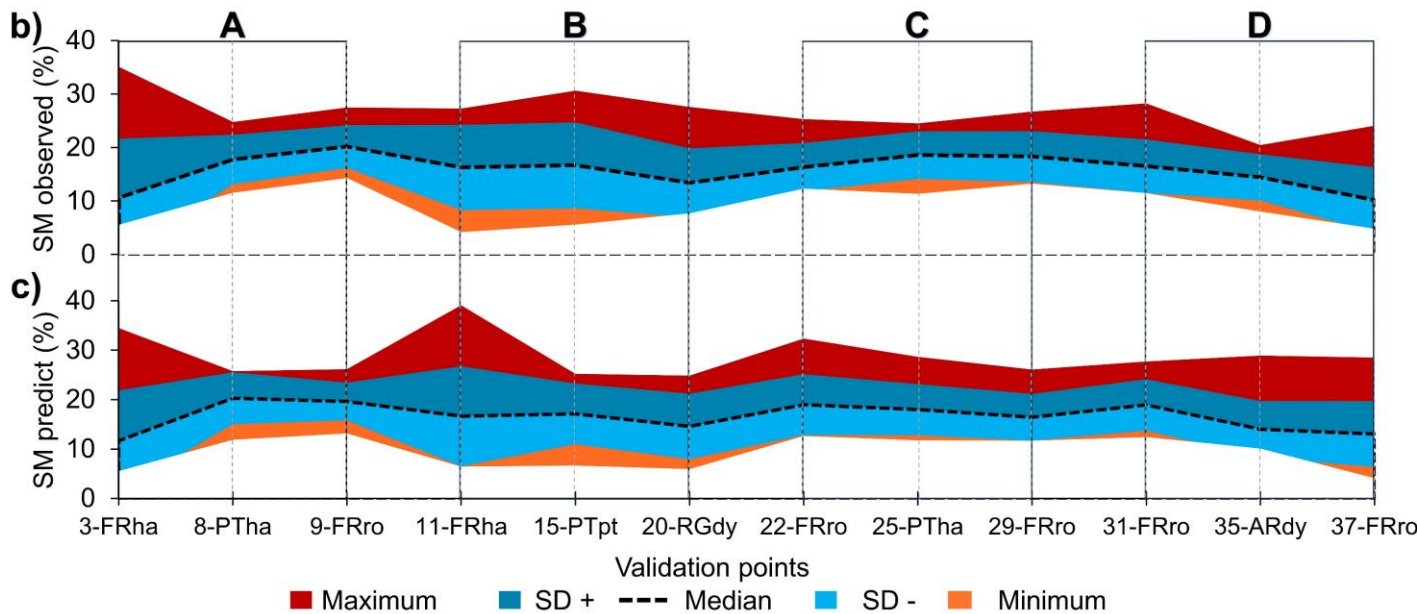
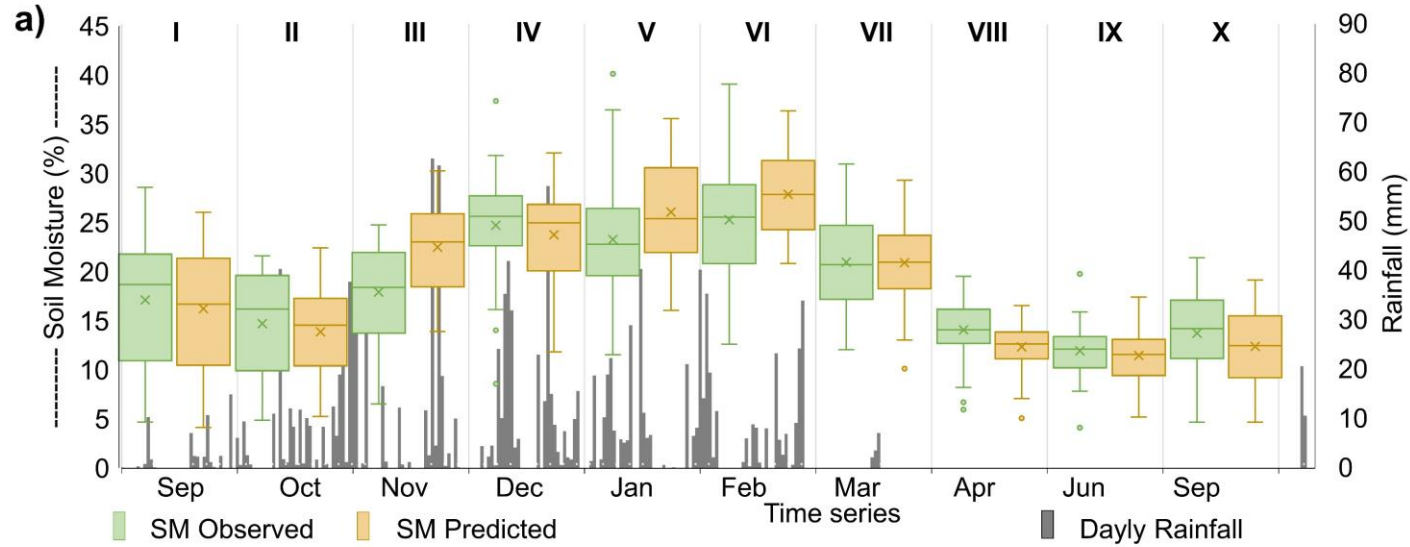
Validation

Coefficient of Variation and LULC



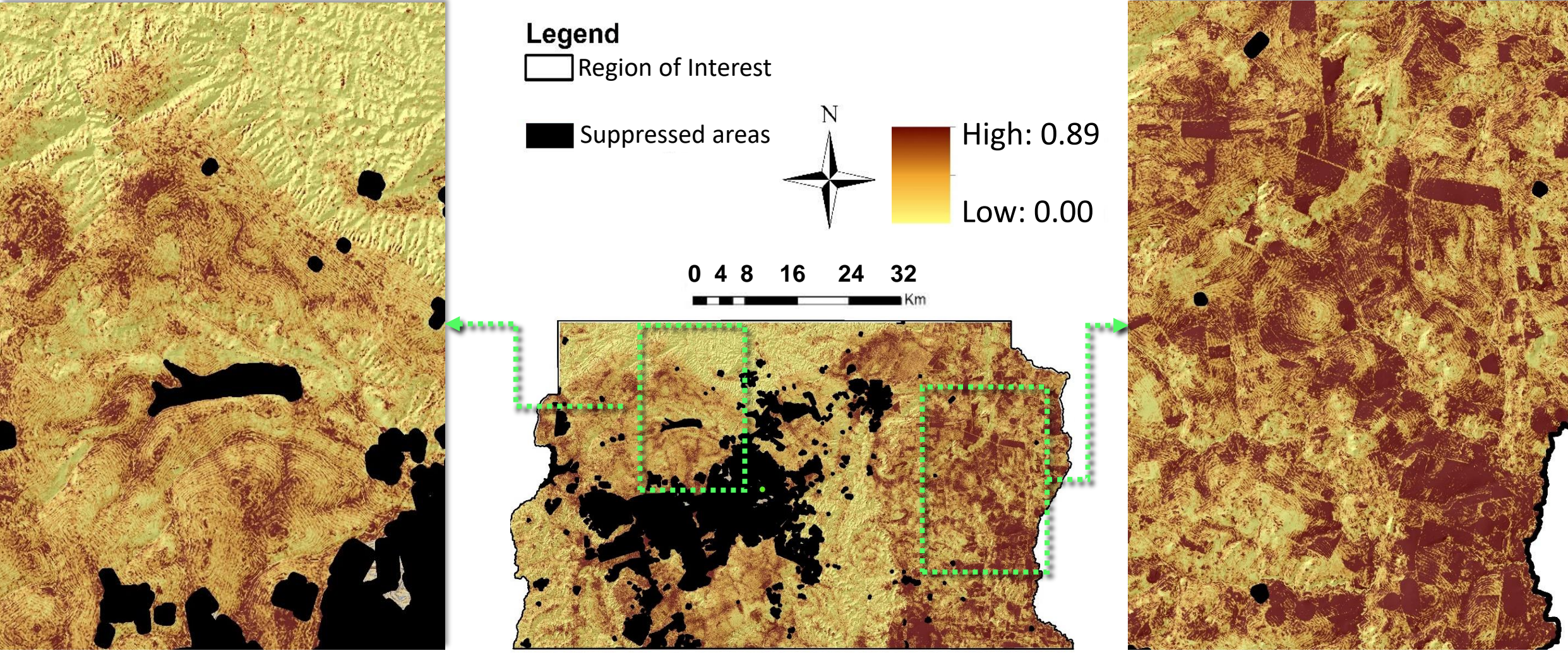
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Results and Discussion



Results and Discussion

Under which LULC does soil moisture vary the most and least?



Conclusion

- Soil moisture variation was higher during drought in agricultural areas than native vegetation areas;
- Soil moisture variation was low in wet seasons for both areas;
- RSMI map can be useful in irrigation scheduling, agriculture, drought and flood monitoring, and water resources management.



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