Urban Climate Simulation in the Metropolitan Area of Buenos Aires (SUrAMBA)
Sensitivity study on urban parameters and LCZ reclassification

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INTRODUCTION

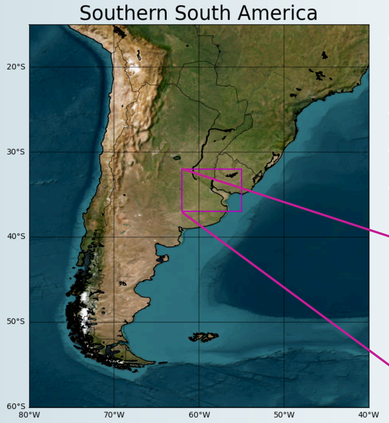
More than 50% of the world's population lives in urban areas. It is projected to reach 61% by 2030. In Argentina, this percentage currently exceeds 90% [1], [2].

Urban structures influence local and regional climate and atmospheric composition due to some main characteristics [3], [4]:

- Three-dimensional morphology
- Surface permeability
- Anthropogenic heat release

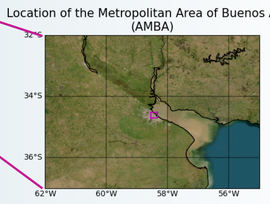
STUDY AREA AND WUDAPT DATABASE

Southern South America

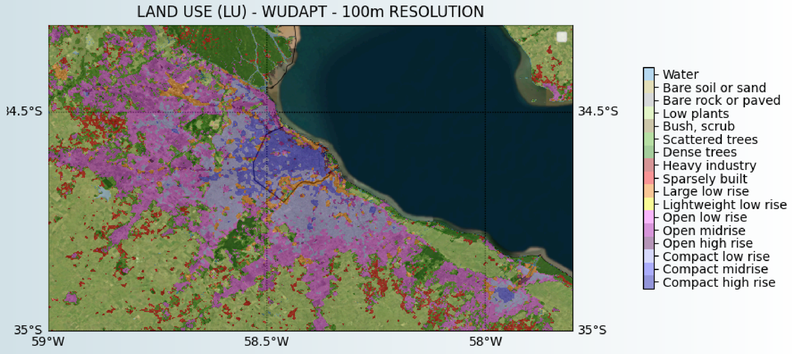


- 10 urban categories: Local Climate Zones (LCZs)
- Landsat data
- 100m resolution
- Global coverage [5]

Location of the Metropolitan Area of Buenos Aires (AMBA)



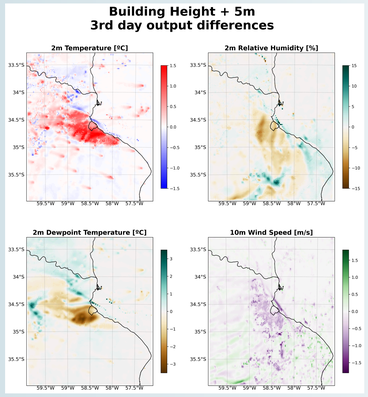
LAND USE (LU) - WUDAPT - 100m RESOLUTION

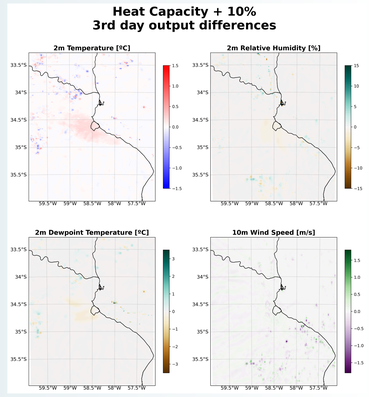


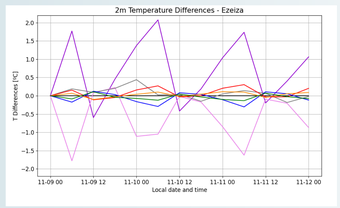
SUrAMBA EXPERIMENTAL DESIGN

WRF 4.5.1 - Urban canopy scheme (BEP+BEM)
Refinement LCZ/WUDAPT classification using local data
Climate simulations **1 km resolution**: current and future climate conditions, and no urban.
Lateral Boundary Conditions from 4 km WRF South America Affinity Group (SAAG) simulations [6].

Sensitivity to urban parameters







Physical Parameters

- Higher sensitivity, accessible information.
- Building Height BH ± 5m
- Street Direction SD + 45º

Thermal Parameters

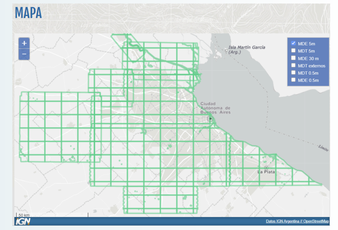
- Lower sensitivity, scarce information.
- Heat Capacity HC ± 10%
- Thermal Conductivity TC ± 10%

LCZ RECLASSIFICATION

Urban morphology data

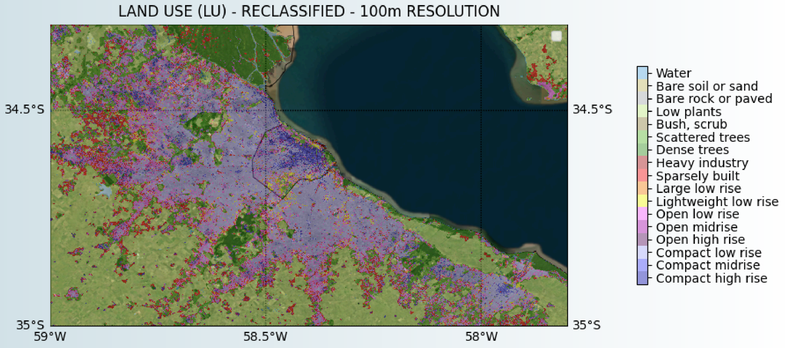
- Free access
- Shapefile of polygons
- Capital city (CABA)
- No influence of topography

- Free access
- 5m resolution raster
- Metropolitan Area (AMBA)
- Influenced by topography

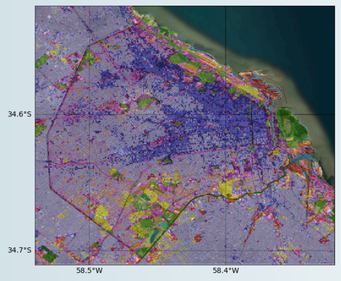


Results

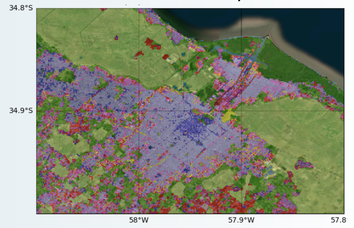
LAND USE (LU) - RECLASSIFIED - 100m RESOLUTION



Buenos Aires city



La Plata city



NEXT STEPS

- Evaluate the sensitivity of parameters related to urban life in the context of extreme events.
- Make reclassification codes public.
- Evaluate the outputs of the first months of the long simulations.

SCAN ME

Poster Wiki

REFERENCES

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[2] Dirección Nacional de Población, "Población urbana en Argentina Evolución y distribución espacial a partir de datos censales." Accessed: Feb. 12, 2024. [Online]. Available: https://www.argentina.gob.ar/sites/default/files/poblacion_urbana_dnp.pptx_.pdf
[3] R. Hamdi et al., "The State-of-the-Art of Urban Climate Change Modeling and Observations," Earth Systems and Environment, vol. 4, no. 4, pp. 631–646, Dec. 2020, doi: 10.1007/s41748-020-00193-3.
[4] V. Masson, A. Lemonsu, J. Hidalgo, and J. Voogt, "Urban Climates and Climate Change," Annu Rev Environ Resour, vol. 45, no. 1, pp. 411–444, Oct. 2020, doi: 10.1146/annurev-environ-012320-083623.
[5] J. Ching et al., "WUDAPT: An Urban Weather, Climate, and Environmental Modeling Infrastructure for the Anthropocene," Bull Am Meteorol Soc, vol. 99, no. 9, pp. 1907–1924, Sep. 2018, doi: 10.1175/BAMS-D-16-0236.1.
[6] F. Dominguez et al., "Advancing South American Water and Climate Science through Multidecadal Convection-Permitting Modeling," Bull Am Meteorol Soc, vol. 105, no. 1, pp. E32–E44, Jan. 2024, doi: 10.1175/BAMS-D-22-0226.1.