First tests with Zonda for ECOCLIMAP-SG in ICON

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ECOCLIMAP-SG

A land cover dataset with **Local Climate Zones (LCZs)**

- Designed for high-resolution urban applications
- *Looks very promising for the aims of PP CITTA'*
  (Apreda et al., 2023)
- Requires proper **Impervious Surface Area (ISA)** values implementation

Dataset/*Producer*	Classes*
ECOCLIMAP-SG/*CNRM*	 24. LCZ1: compact high-rise
	 25. LCZ2: compact midrise
	 26. LCZ3: compact low-rise
	 27. LCZ4: open high-rise
	 28. LCZ5: open midrise
	 29. LCZ6: open low-rise
	 30. LCZ7: lightweight low-rise
	 31. LCZ8: large low-rise
	 32. LCZ9: sparsely built
	 33. LCZ10: heavy industry

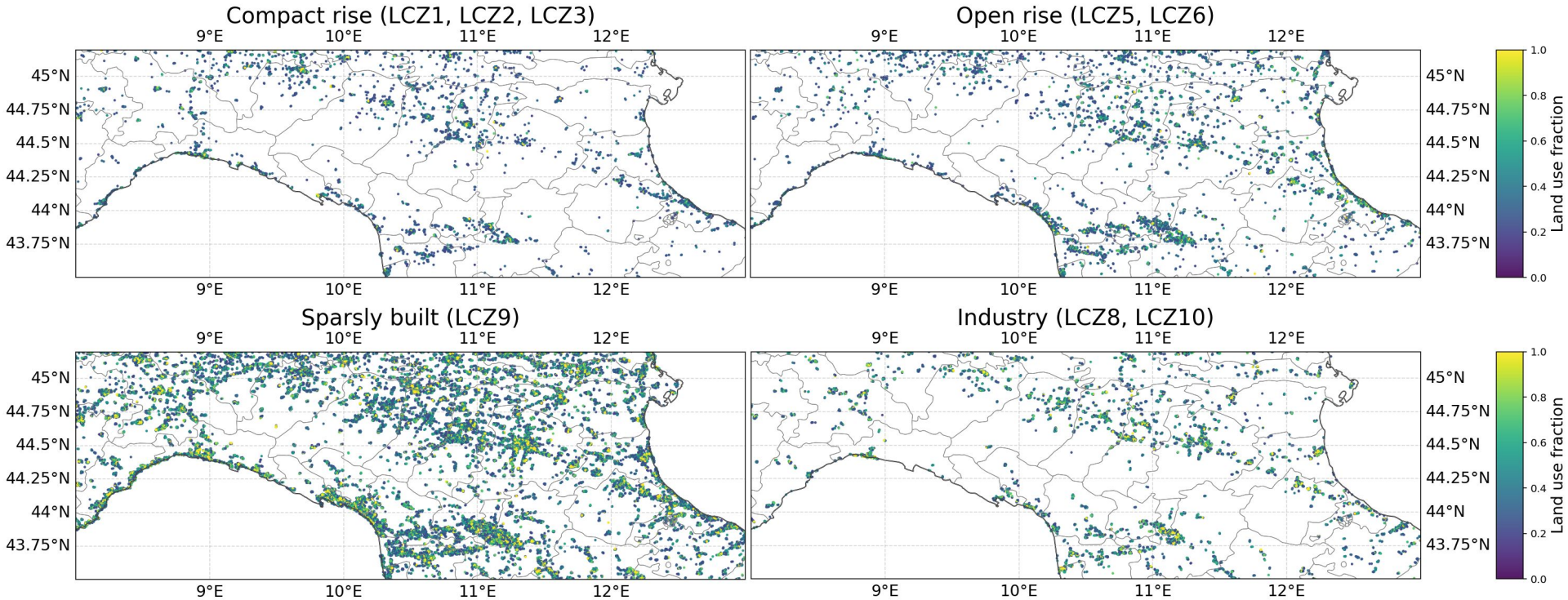
**Stewart & Oke, 2012*

Getting ECOCLIMAP-SG from Zonda

- **Zonda**: a web interface for the generation of EXTPAR data on ICON grid in a easy way
- Different land use dataset available: **GLC2000, Globcover2009 and Ecoclimap-SG**

First step: inspect LCZ representation through data generated from Zonda

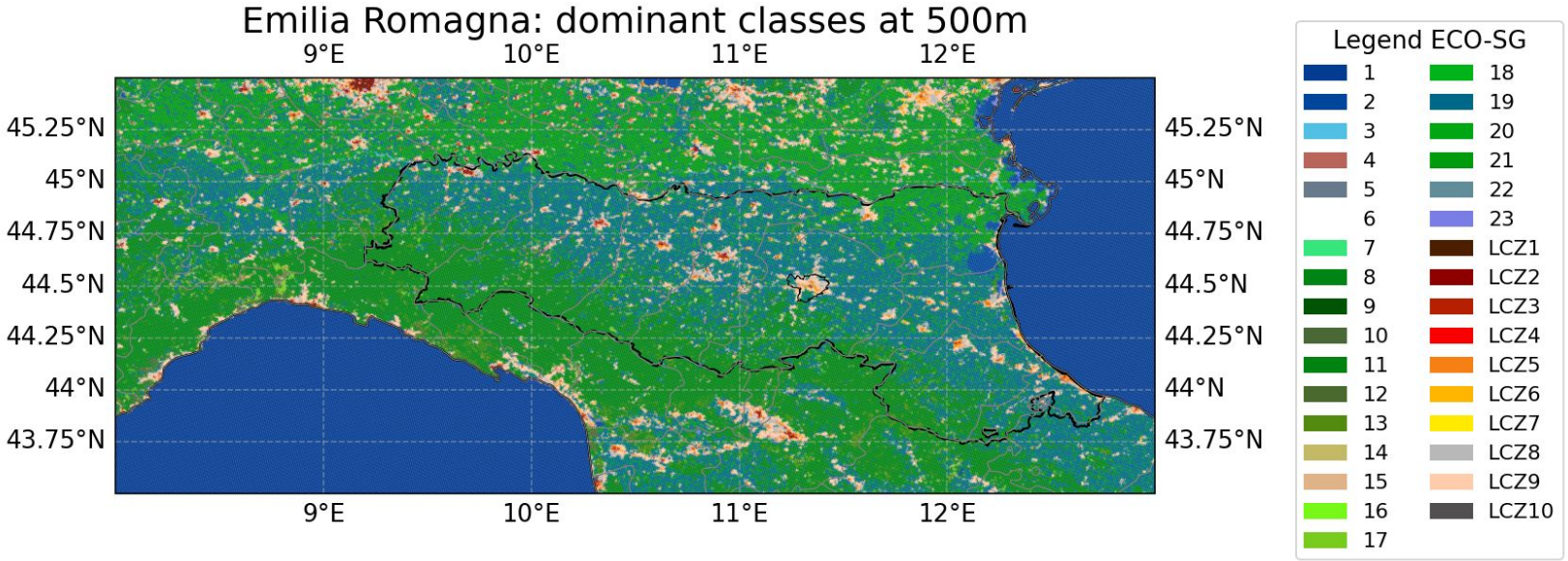
LCZ in Emilia Romagna



The most common LCZ in Emilia Romagna **at 500m**: sparsly built

No LCZ4 or LCZ7 were found within this domain

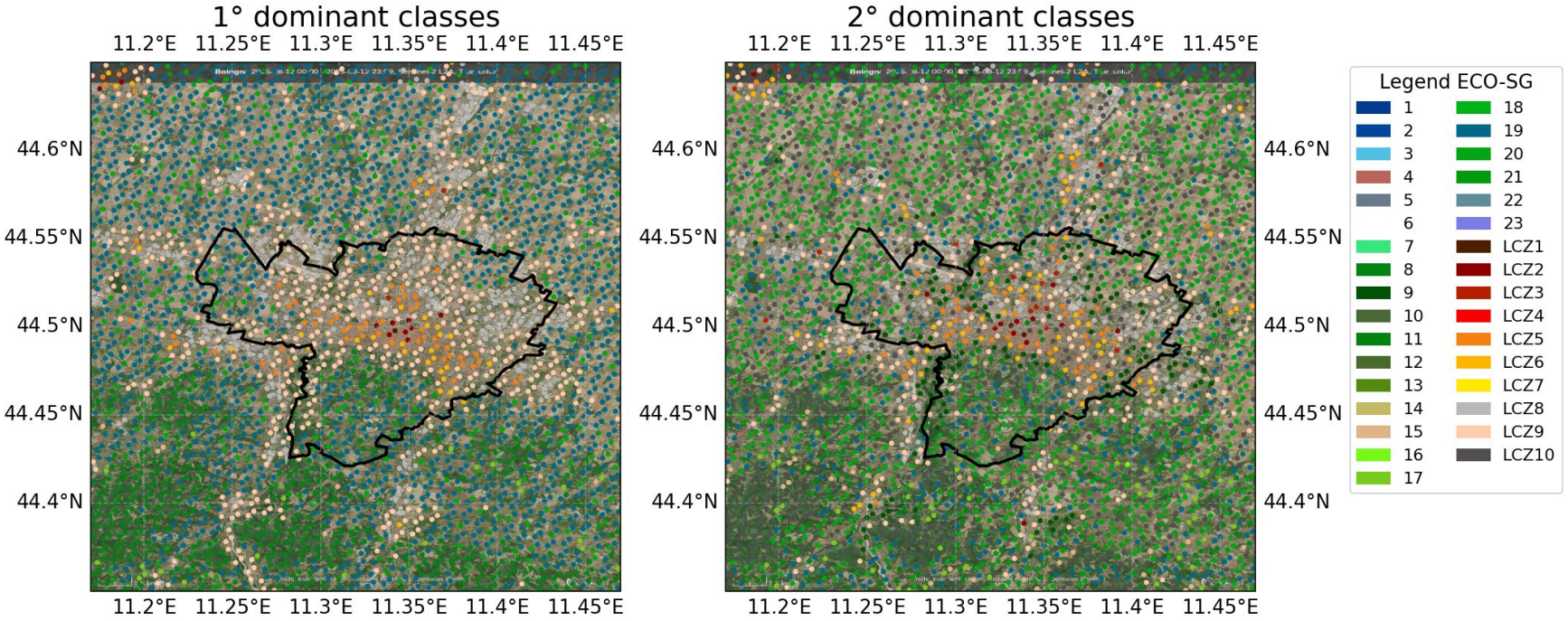
LCZ in Emilia Romagna



Urban centers clearly identified

Relying only on the dominant class may not be sufficient for geospatial classification

LCZ in Bologna



When model resolution is higher than Ecoclimap-SG, urban characteristics may be lost considering only the dominant class

First simulations with Ecoclimap-SG

Thanks to the work of J.-P. Schulz, Ecoclimap-SG can be tested on ICON

Second step: first test simulation with **ICON-LAM** over **Bologna** with different LCZ

Model setup:

Start time: 29 Jul 2024, 12 UTC

Run: 48h

Clear sky conditions

Boundary conditions: IFS(≈8.5km)

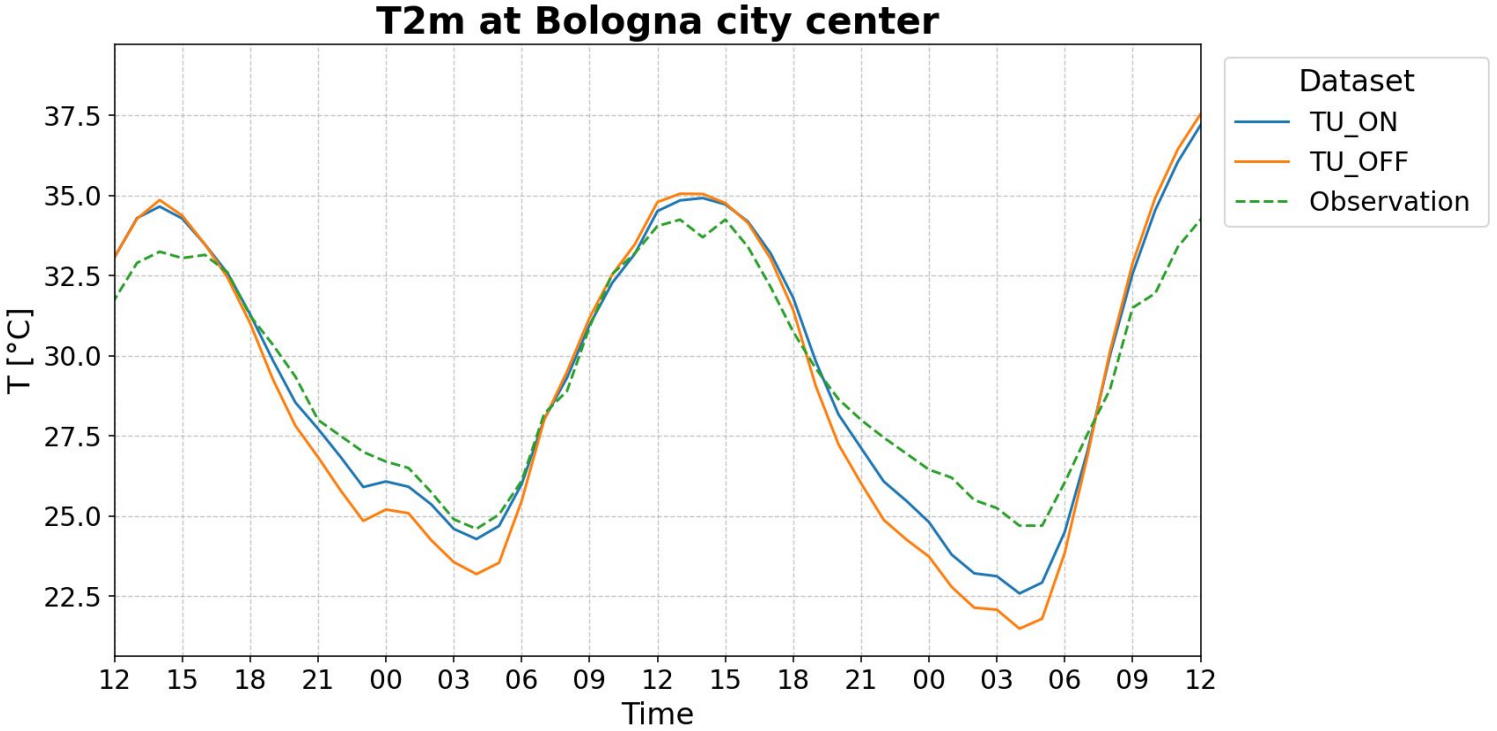
Model domain:

ICON(2.2km)

First simulations with Ecoclimap-SG

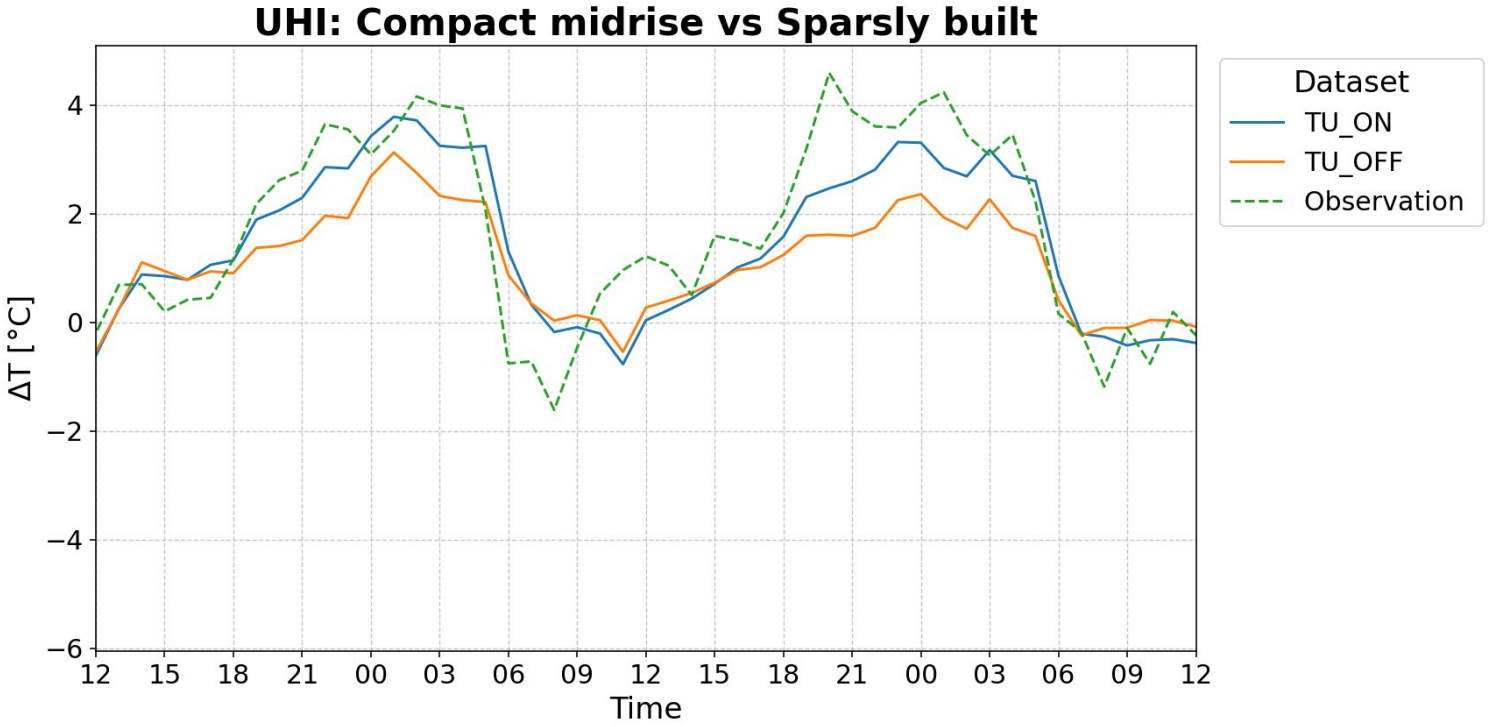
Effect of module **TERRA_URB** visible

- ISA values could be underestimated



First simulations with Ecoclimap-SG

T difference between areas with different urban classes (LCZ2 vs LCZ9)



Conclusions

- **Ecoclimap-SG** dataset successfully retrieved from **Zonda** and visualised at high resolution
- Preliminary analysis shows a **realistic representation of urban areas**, but the use of only dominant classes may be a limitation
- First **ICON simulation** with Ecoclimap-SG confirm the impact of **TERRA_URB**
- Comparisons across **different urban climate zones** are now possible with Ecoclimap-SG
- These are **preliminary tests**: future detailed analysis will be carried out

Proposed contribution to the follow-up of PP CITTA'

- Test ICON + TERRA_URB at the **hectometric scale** on an Italian sub-domain:
  - intense rainfall, thunderstorms
  - heat waves
- Verification using local data and crowd-sourced observations
- Evaluation on applications like heat waves and air quality applications (in the framework of the **VERA Digital Twin project** of the Emilia-Romagna Region); use the **GLORI framework**
- Quantification of the forecast uncertainties with an **ensemble approach**:
  - perturb parameters of the ICON model relevant for the urban areas
  - perturb parameters of the urban model
  - quantify the respective contribution
- Involved scientists: Ludovico Mattavelli, Enrico Minguzzi, Davide Cesari, Chiara Marsigli

Thank you for the attention

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