



**Politecnico  
di Torino**



# **PP CITTA' meeting**

## **update on the Urban Canopy Parameters & tests of the ECOCLIMAP-SG dataset for ISA and AHF**

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# SET-UP COSMO 6.0

- Case study: week 16–22 March 2020, domain centered over Turin

Tested configurations:

- **Initial** and **boundary** conditions from:
  1. *Integrated Forecast System* (IFS), 9 km
  2. analyses from COSMO-2I, 2.2 km (from ArpaE)
- **Resolution**:
  1. 1 km
  2. 500 m
- External parameters → **dataset** used for **ISA** and **AHF**
  1. **GLC**: ISA and AHF from ExtPar
  2. **WUDAPT**: ISA and AHF computed through wudapt-to-cosmo (M. Demuzere) → LCZs from WUDAPT
  3. **ECO**: ISA and AHF computed through a new R script, «eco2cosmo» → LCZs from ECOCLIMAP Second Generation 2018

# Look-up tables

BUILDING TYPES	Local climate zone (LCZ)	Impervious surface fraction <sup>d</sup>	Anthropogenic heat output <sup>e</sup>
1 	LCZ 1 <i>Compact high-rise</i>	40–60	50–300
2 	LCZ 2 <i>Compact midrise</i>	30–50	<75
3 	LCZ 3 <i>Compact low-rise</i>	20–50	<75
4 	LCZ 4 <i>Open high-rise</i>	30–40	<50
5 	LCZ 5 <i>Open midrise</i>	30–50	<25
6 	LCZ 6 <i>Open low-rise</i>	20–50	<25
7 	LCZ 7 <i>Lightweight low-rise</i>	< 20	<35
8 	LCZ 8 <i>Large low-rise</i>	40–50	<50
9 	LCZ 9 <i>Sparsely built</i>	< 20	<10
10 	LCZ 10 <i>Heavy industry</i>	20–40	>300

from Stewart&Oke (2012)

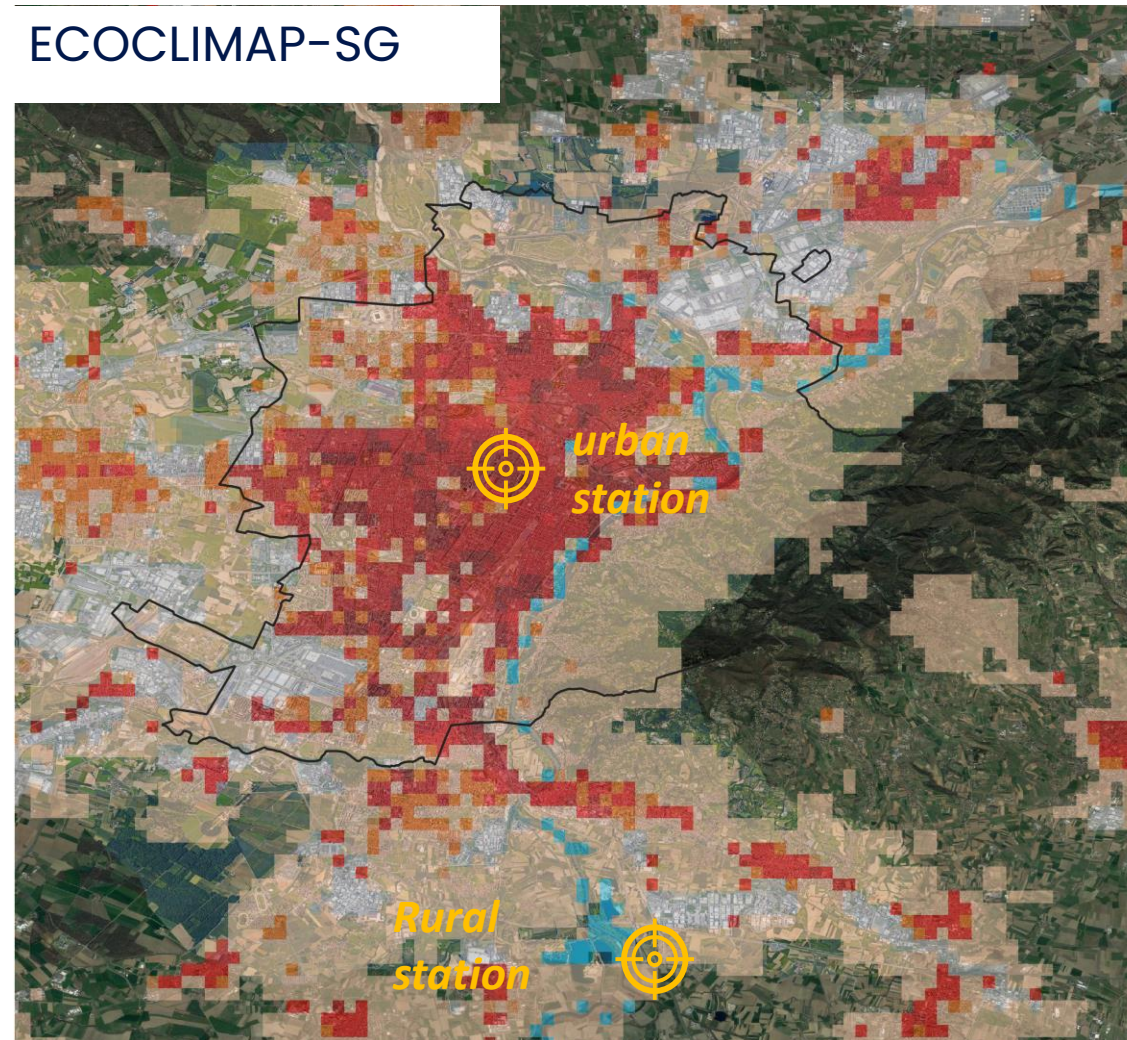
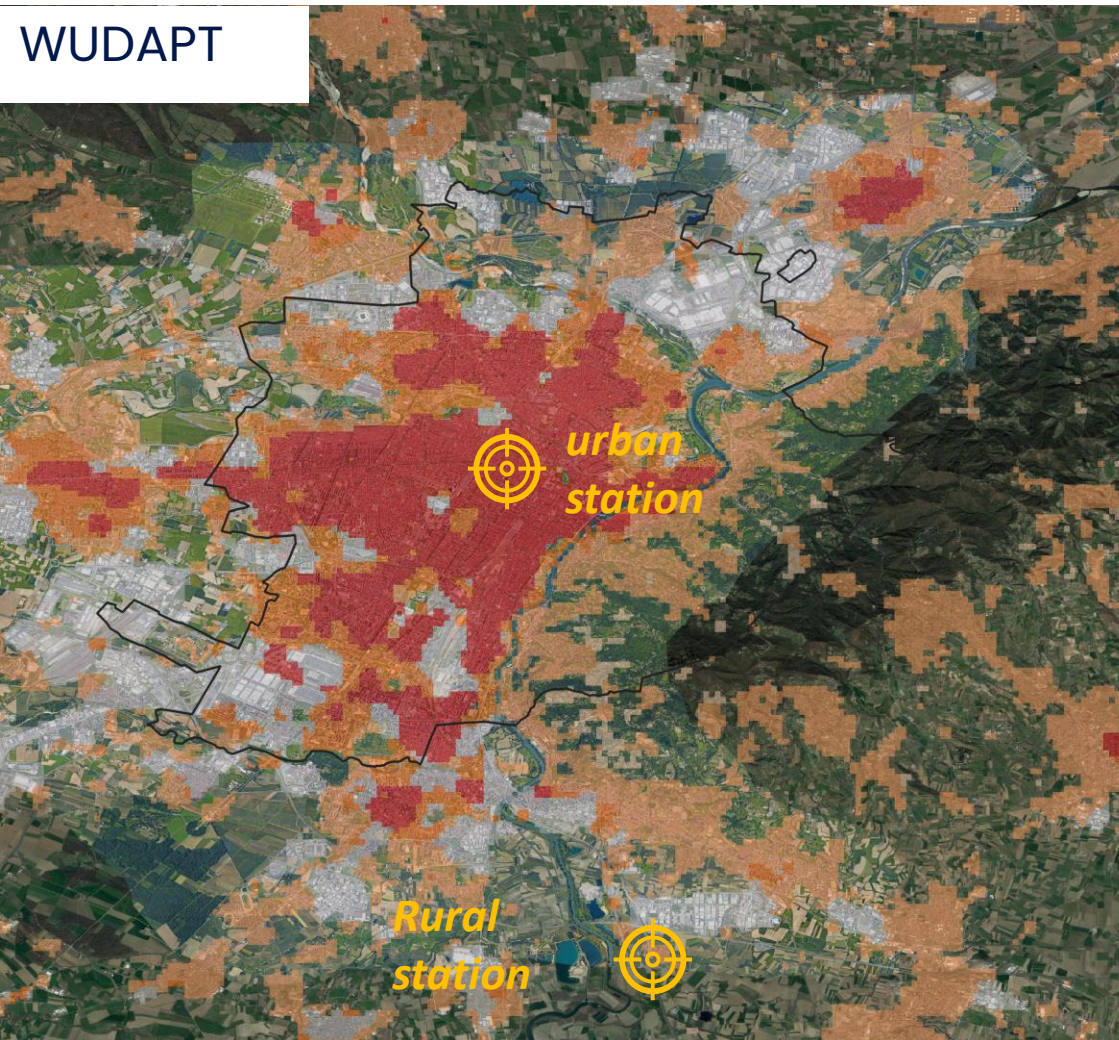
classes	ISA	AHF
1	0.95	100
2	0.9	35
3	0.85	30
4	0.65	30
5	0.7	15
6	0.6	10
7	0.85	30
8	0.85	40
9	0.3	5
10	0.55	300
11	0	0
12	0	0
13	0	0
14	0	0
15	0	0
16	0	0
17	0	0

**wudapt-to-cosmo**  
WUDAPT database (100 m)  
for LCZs: 1-10 = urban

classes	ISA	AHF
1	0	0
2	0	0
3	0	0
4	0	0
...	0	0
...	0	0
23	0	0
24 (LCZ 1)	0.95	100
25 (LCZ 2)	0.9	35
26 (LCZ 3)	0.85	30
27 (LCZ 4)	0.65	30
28 (LCZ 5)	0.7	15
29 (LCZ 6)	0.6	10
30 (LCZ 7)	0.85	30
31 (LCZ 8)	0.85	40
32 (LCZ 9)	0.3	5
33 (LCZ 10)	0.55	300

**eco2cosmo**  
ECOCLIMAP-SG database (300 m)  
for LCZs: 24-33 = urban

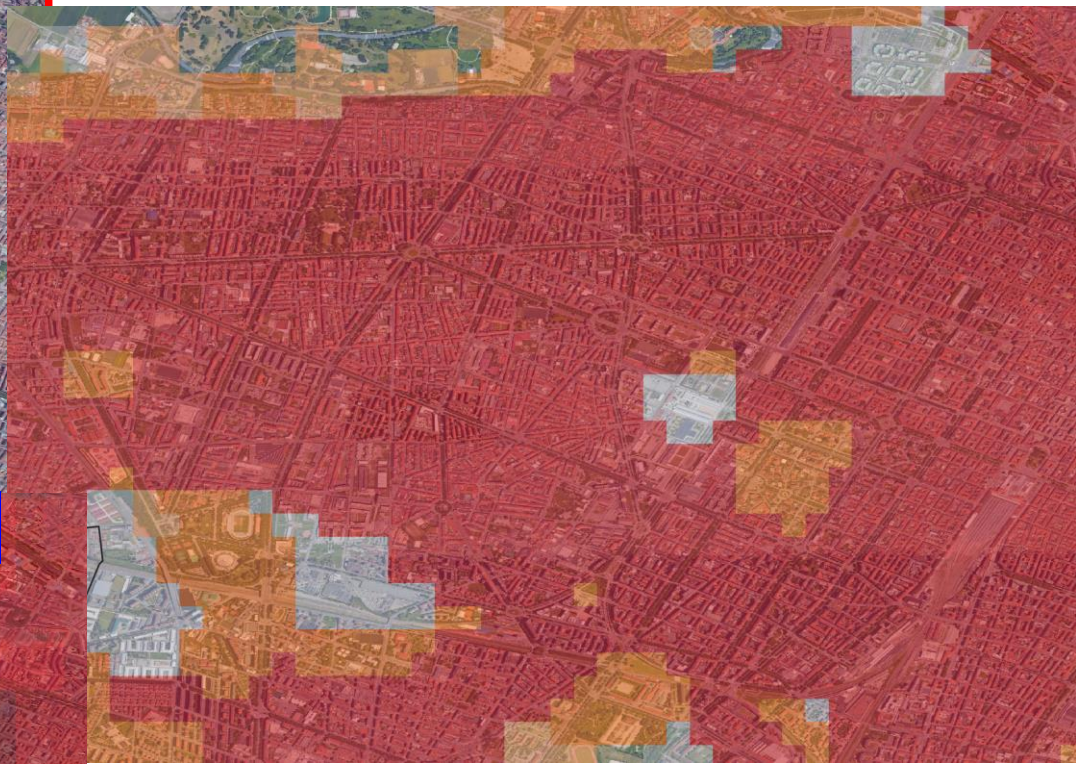
# WUDAPT vs ECOCLIMAP (Turin)



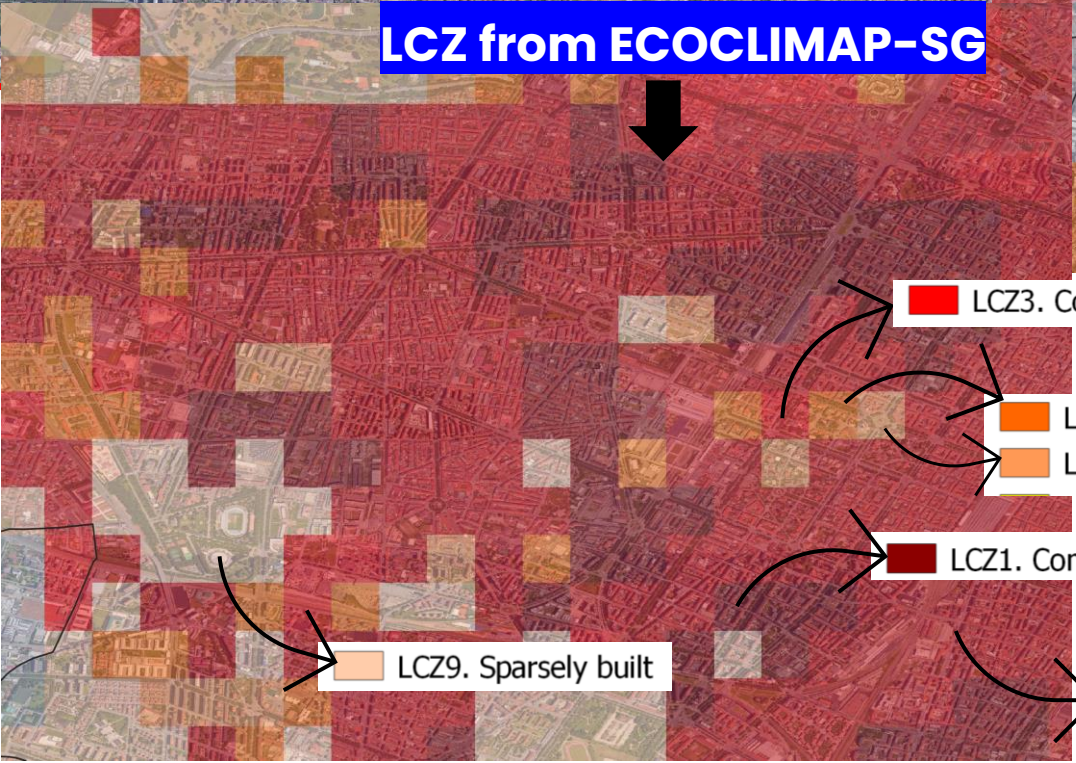
- Torino
- LCZ
- 1. Compact high-rise
  - 2. Compact midrise
  - 3. Compact low-rise
  - 4. Open high-rise
  - 5. Open midrise
  - 6. Open low-rise
  - 7. Lightweight low-rise
  - 8. Large low-rise
  - 9. Sparsely built
  - 10. Heavy industry
  - G. Water

# LCZ from WUDAPT

- 2. Compact midrise
- 5. Open midrise
- 8. Large low-rise



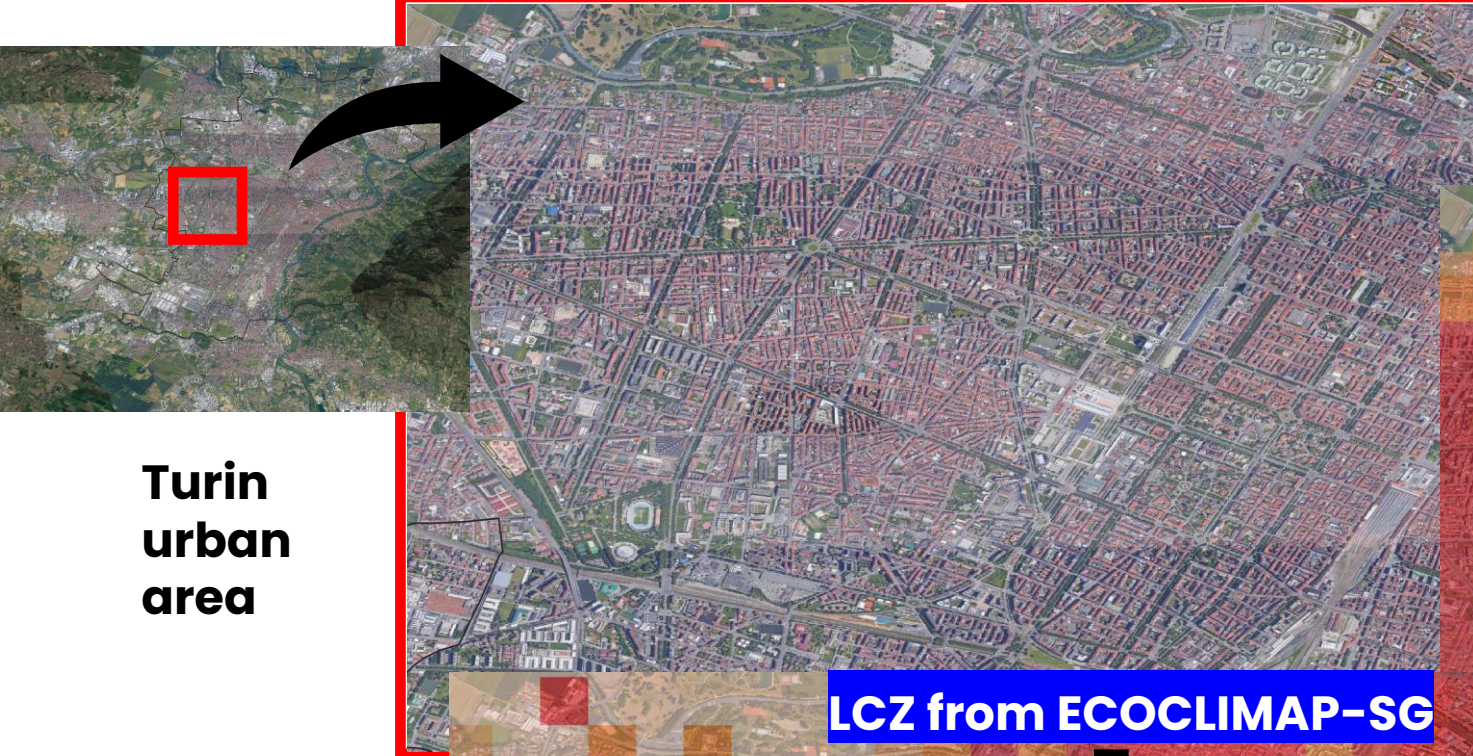
# LCZ from ECOCLIMAP-SG








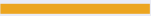
- LCZ3. Compact low-rise
- LCZ5. Open midrise
- LCZ6. Open low-rise
- LCZ1. Compact high-rise
- LCZ9. Sparsely built
- LCZ2. Compact midrise

Turin urban area

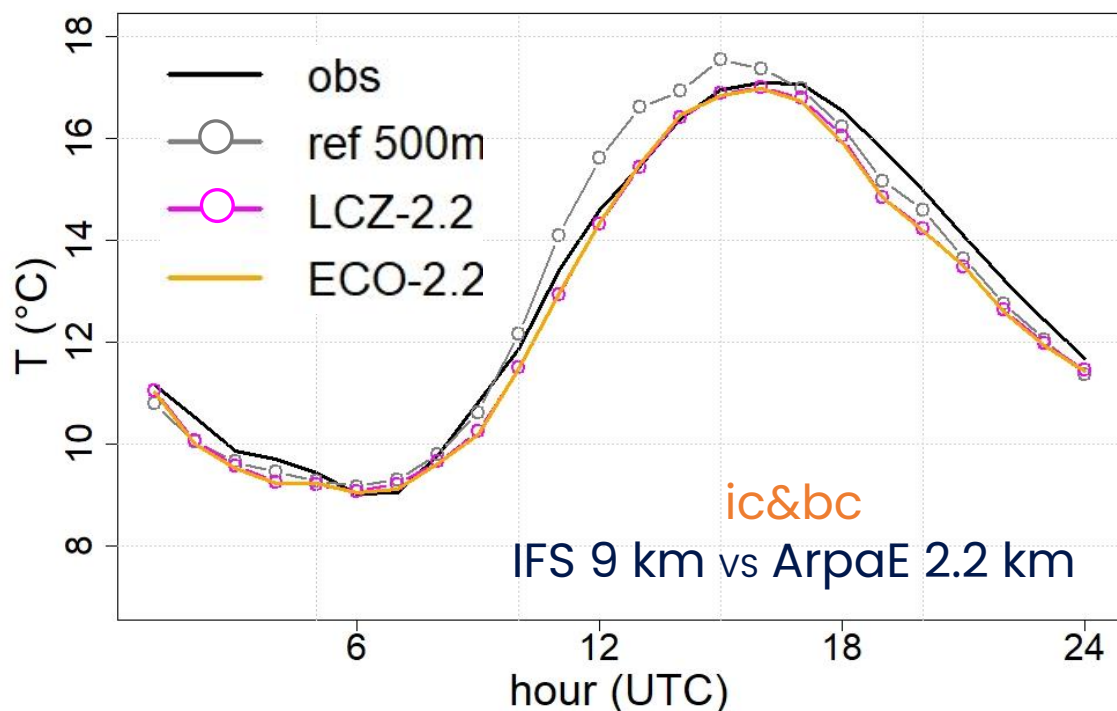
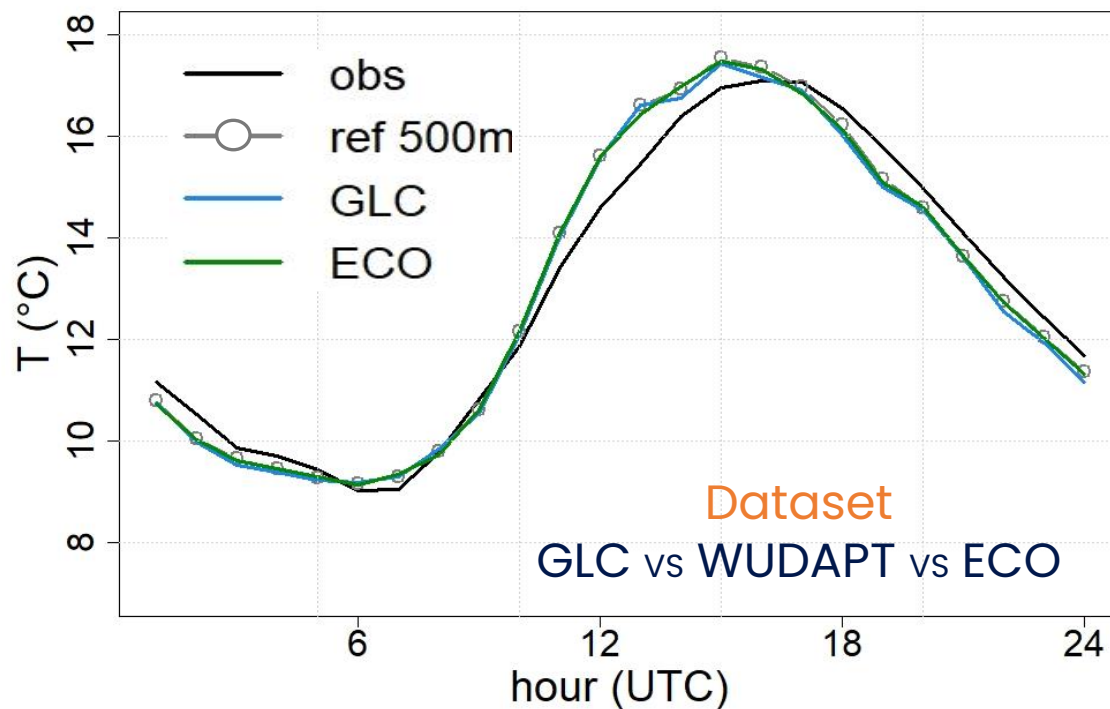
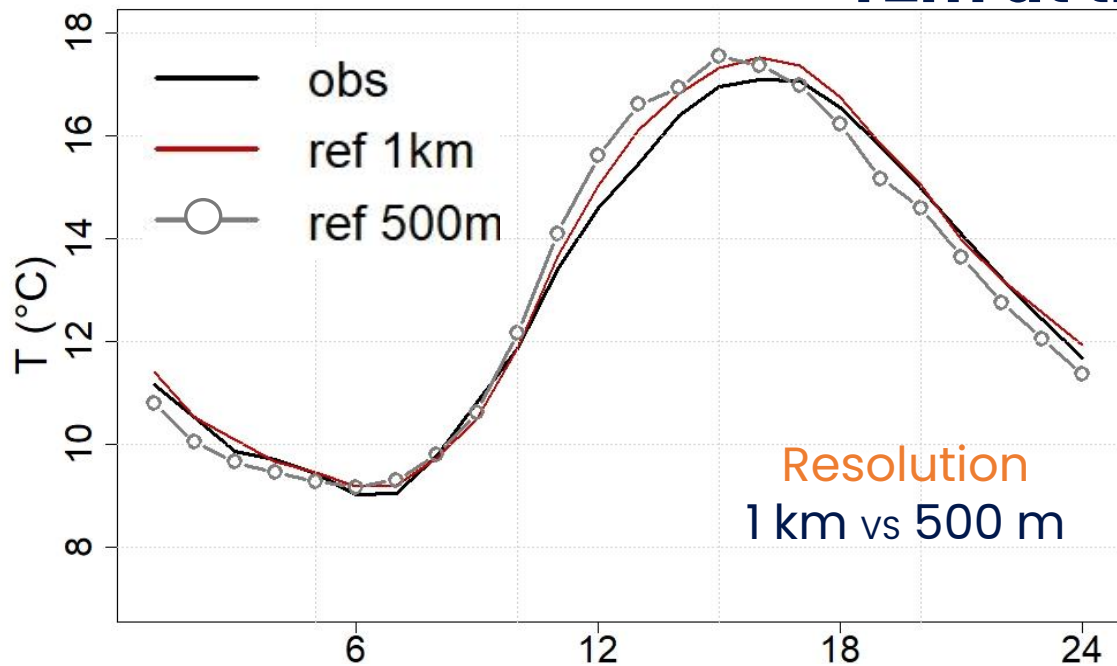
ECOCLIMAP-SG 2018 is more detailed for Turin!



# Tested configurations

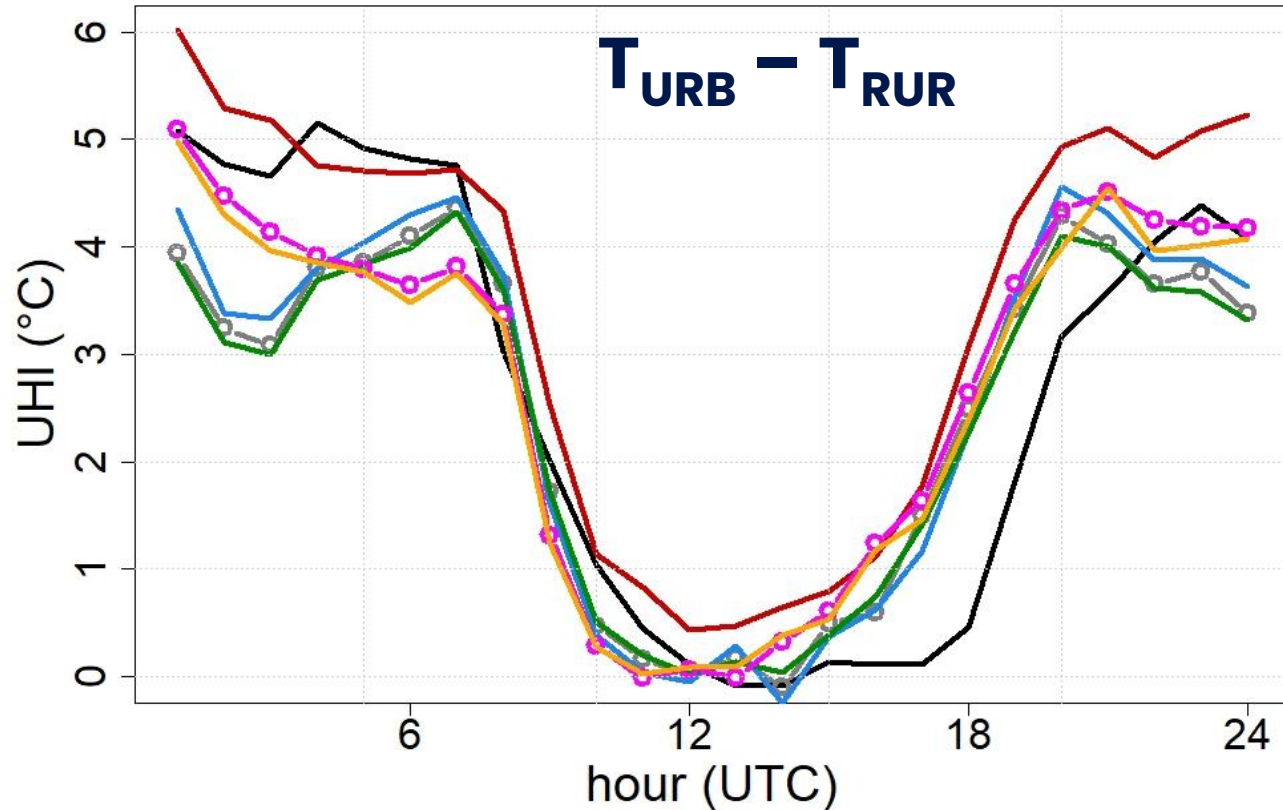
iC & BC from	Resolution (Piemonte domain)	ISA & AHF (dataset)	Name
IFS 9 km	1 km	WUDAPT	ref 1km 
IFS 9 km	500 m	WUDAPT	ref 500m 
IFS 9 km	500 m	GLC	GLC 
IFS 9 km	500 m	ECO	ECO 
ArpaE 2.2 km	500 m	WUDAPT	LCZ-2.2 
ArpaE 2.2 km	500 m	ECO	ECO-2.2 

# T2m at the urban station



ic & BC from	Resolution (Piemonte domain)	ISA & AHF (dataset)	Name
IFS 9 km	1 km	WUDAPT	ref 1km
IFS 9 km	500 m	WUDAPT	ref 500m
IFS 9 km	500 m	GLC	GLC
IFS 9 km	500 m	ECO	ECO
ArpaE 2.2 km	500 m	WUDAPT	LCZ-2.2
ArpaE 2.2 km	500 m	ECO	ECO-2.2

# Urban Heat Island (UHI)



iC & BC from	Resolution (Piemonte domain)	ISA & AHF (dataset)	Name
IFS 9 km	1 km	WUDAPT	ref 1km
IFS 9 km	500 m	WUDAPT	ref 500m
IFS 9 km	500 m	GLC	GLC
IFS 9 km	500 m	ECO	ECO
ArpaE 2.2 km	500 m	WUDAPT	LCZ-2.2
ArpaE 2.2 km	500 m	ECO	ECO-2.2

**Not significant improvements!**

- BUT:
- the urban parameters are the hard-coded ones
  - ECOCLIMAP is not coherent with all the external parameters deriving from ExtPar



- Future step: simulations with 2D urban and thermal parameters (not only ISA and AHF)
- Future needs: ECOCLIMAP to be implemented in ExtPar