Il modello previsionale LIFE ASTI

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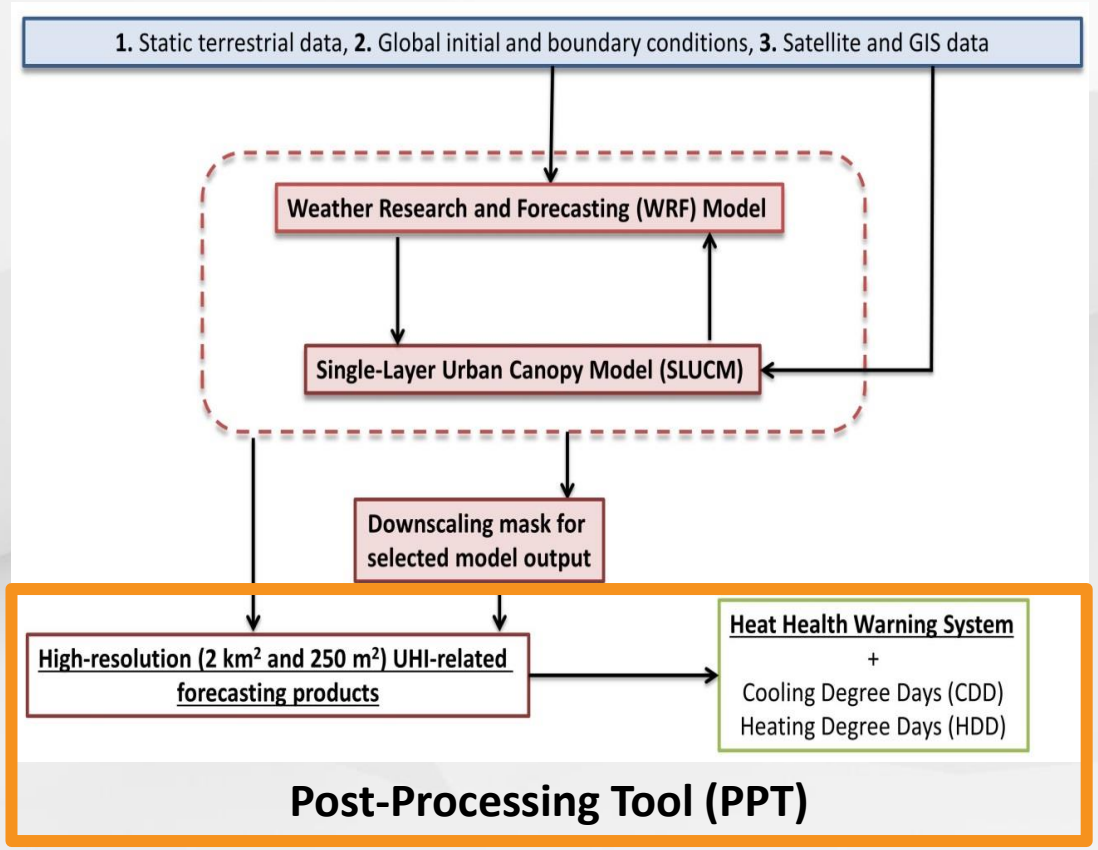
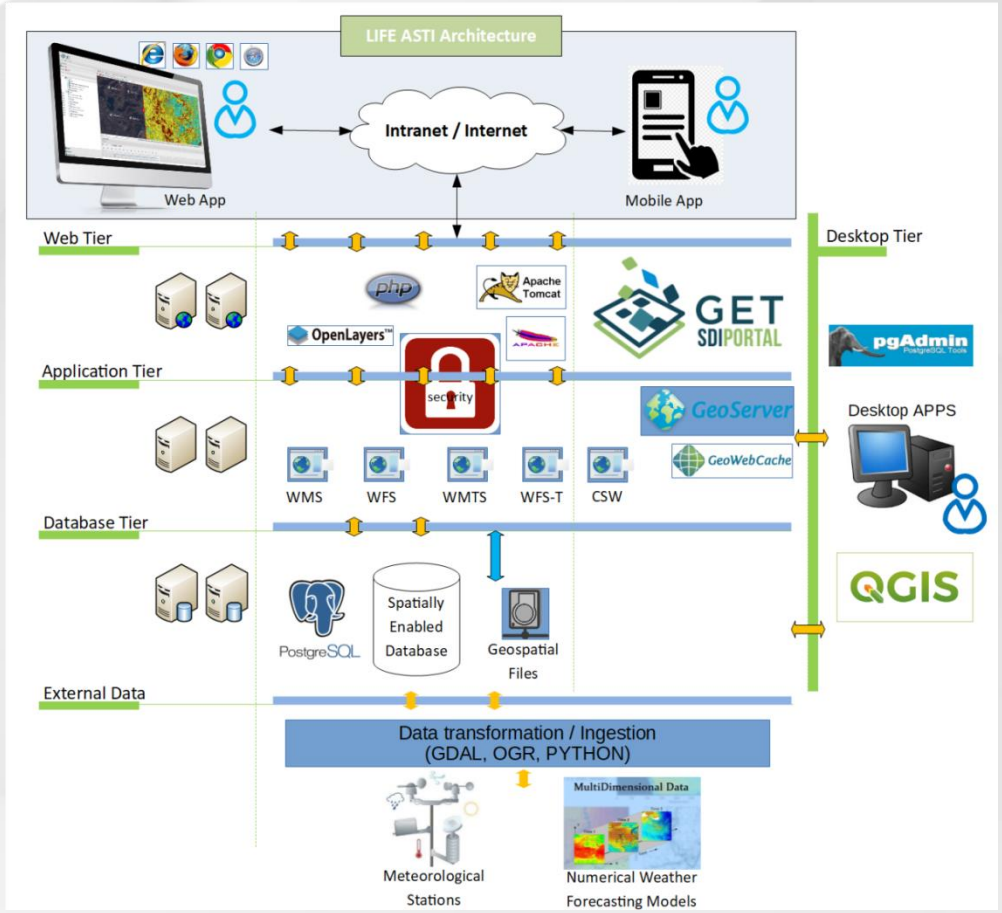
The project *Implementation of a forecAsting System for urban heaT Island effect for the development of urban adaptation strategies - LIFE ASTI* has received funding from the LIFE Programme of the European Union.

Struttura generale

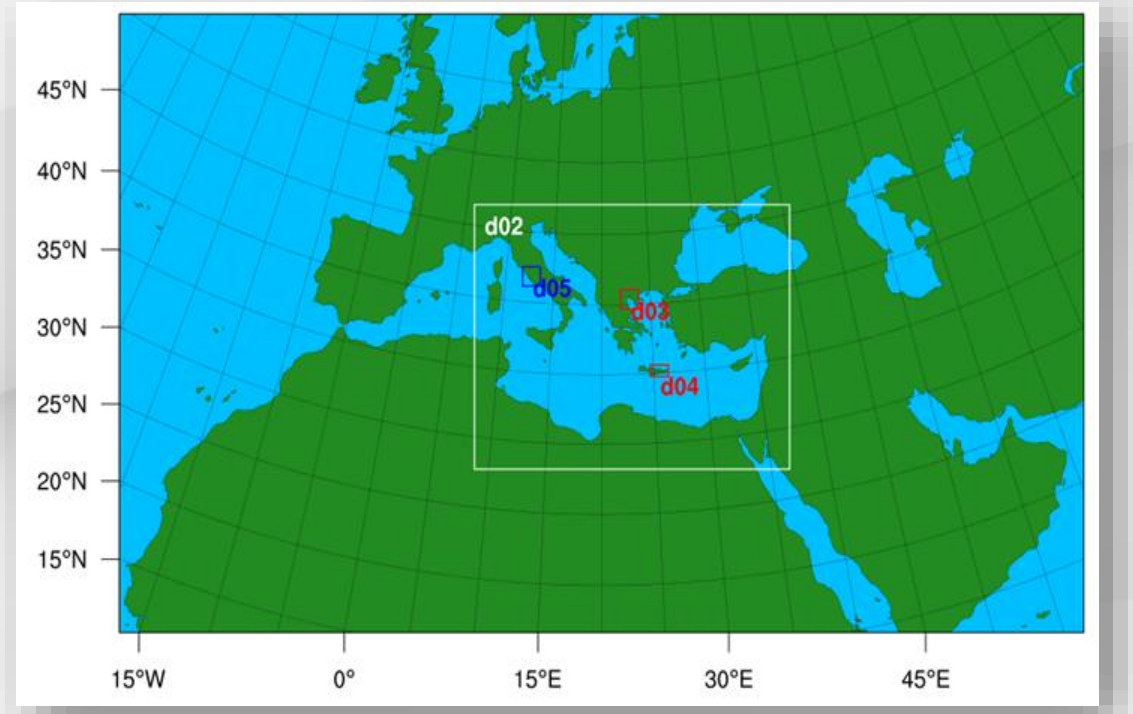
Weather Research and Forecasting Model (WRF) accoppiato con il Single-Layer Canopy Model (SLUCM)





Configurazione

- Applicazione a 5 domini con risoluzione 18, 6 e 2 km, con 35 livelli
- Campi meteorologici fonrniti dal Global Forecast System (GFS)
- Schema della Yosei University per la parametrizzazione urbana
- Temperatura superficiale del mare ad alta risoluzione (NCEP/GFS)
- Categorie CORINE per l'utilizzo del suolo



Launch operational script-7 a.m. local time every day

Download data

Download GFS meteorological data-00 UTC forecasting hour	Download SST data-00 UTC of the previous day

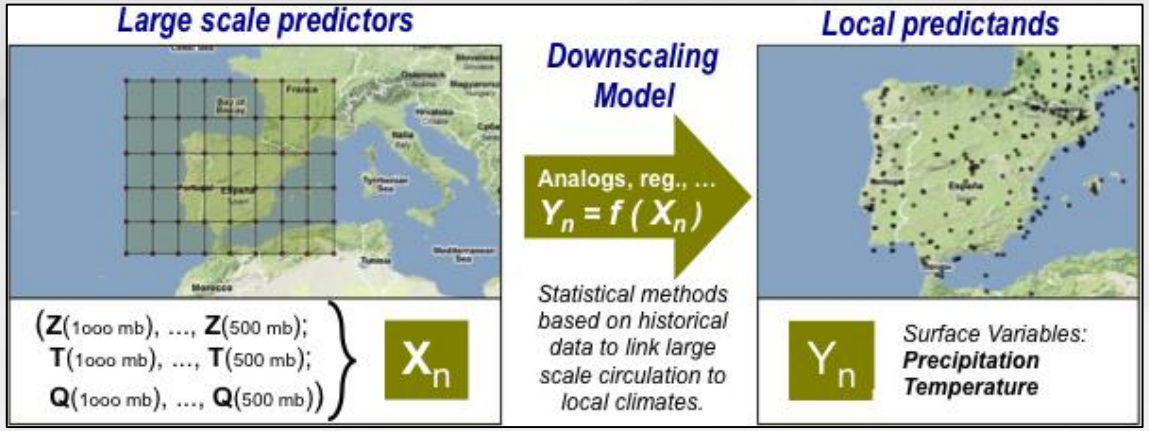
Run WRF+SLUCM system
(11 hours,2 Intel Xeon Gold 6125)

Output temporary saved in netcdf Format

Post-processing

Downscaling statistico – catturare variazioni intra-urbane ad una scala rilevante per gli esseri umani

- Applicazione di metodi statistici non lineari: support vector regression con tecniche di machine learning
- **Dati di input**: simulazioni a 2 km, topografia, ora del giorno, utilizzo del suolo



- **Addestramento e test**: dati acquisiti sperimentalmente dalla rete di stazioni nelle tre città con risoluzione oraria
- **Prodotto finale:** temperatura e umidità relativa a 2 m dal suolo
- **Risoluzione finale:** 250 m

La procedura riguarda solo temperatura e umidità.

Prodotti

A che serve tutto questo?

A determinare, con risoluzione di 250 m

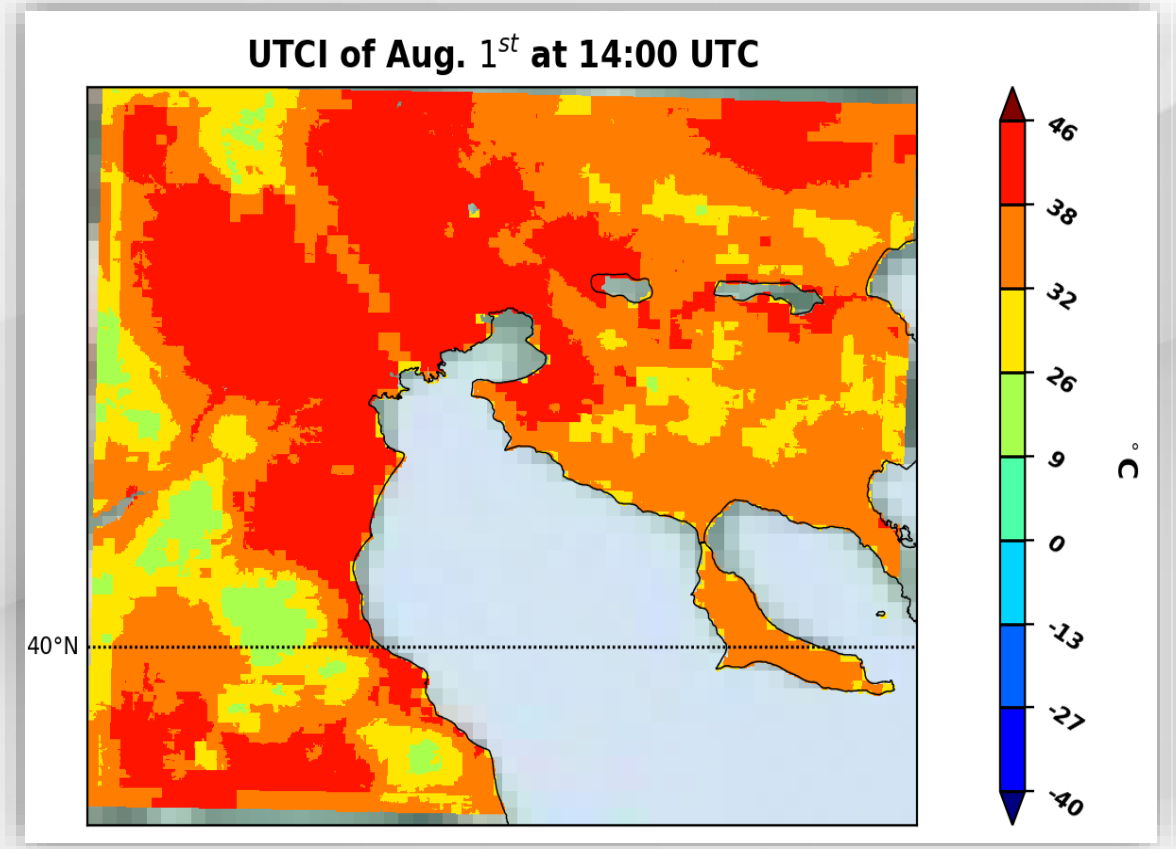
- Temperatura apparente
- Discomfort Index (DI)
- Urban Heat Island Intensity (UHII)
- Universal Thermal Climate Index (UTCI)

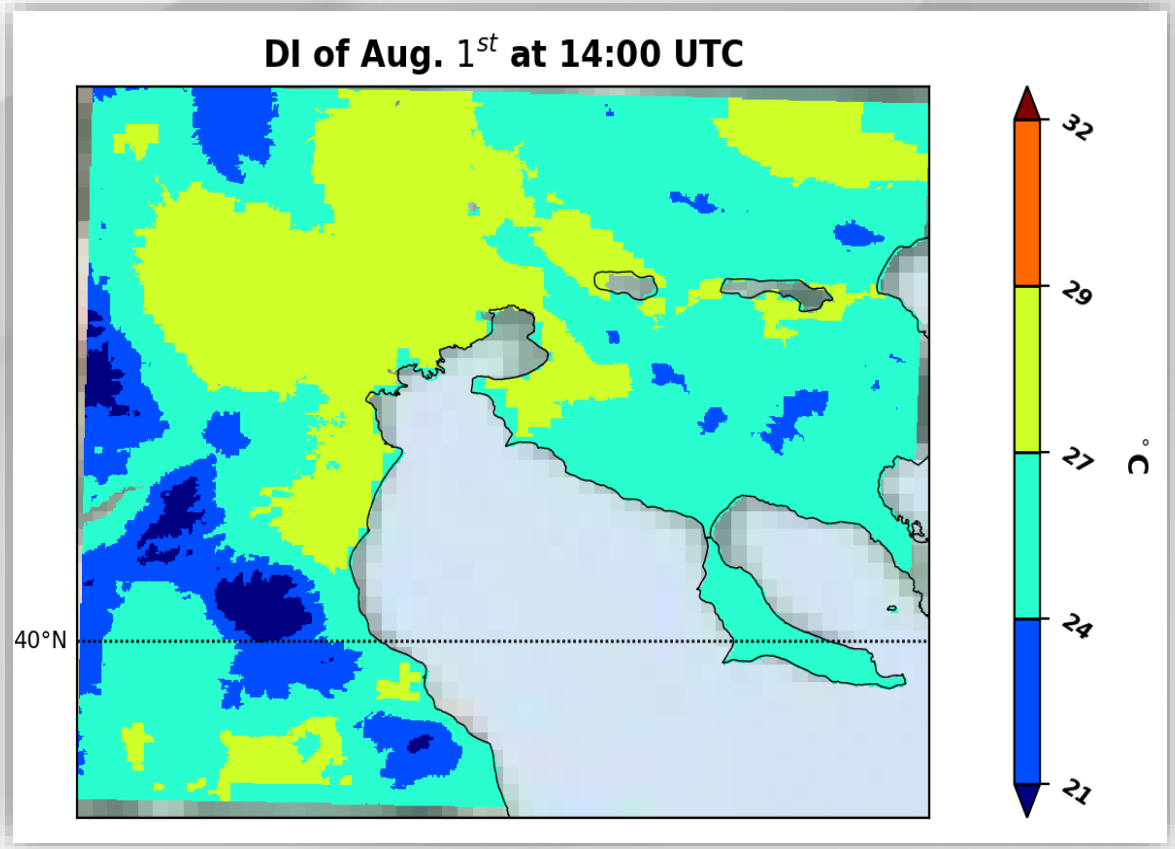
DI value	Discomfort conditions
DI ≤ 21 °C	No discomfort
21 °C < DI ≤ 24 °C	Under 50 % of the population feels discomfort
24 °C < DI ≤ 27 °C	Above 50 % of the population feels discomfort
27 °C < DI ≤ 29 °C	Most of the population feels discomfort
29 °C < DI ≤ 32 °C	The entire population feels discomfort
DI > 32 °C	Sanitary emergency conditions

UTCI value	Thermal sensation
UTCI ≤ – 40 °C	Extreme cold stress
– 40 °C < UTCI ≤ – 27 °C	Very strong cold stress
– 27 °C < UTCI ≤ – 13 °C	Strong cold stress
– 13 °C < UTCI ≤ 0 °C	Moderate cold stress
0 °C < UTCI ≤ 9 °C	Slight cold stress
9 °C < UTCI ≤ 26 °C	No thermal stress (comfort)
26 °C < UTCI ≤ 32 °C	Moderate heat stress
32 °C < UTCI ≤ 38 °C	Strong heat stress
38 °C < UTCI ≤ 46 °C	Very strong heat stress
UTCI > 46 °C	Extreme heat stress

Risultati di esempio

1 Agosto 2019, 14:00 UTC (17 LST)





Validazione - Roma

Dataset di umidità e temperatura orari

- Anno 2015
  8 stazioni, intero anno
- Anno 2019
  24 stazioni, estate (luglio-settembre)

Metodi

- Serie temporali orarie di umidità e temperatura
- Serie stagionali
- Scatter plots
- Q–Q (quantile-quantile) plot
- 13 indicatori statistici

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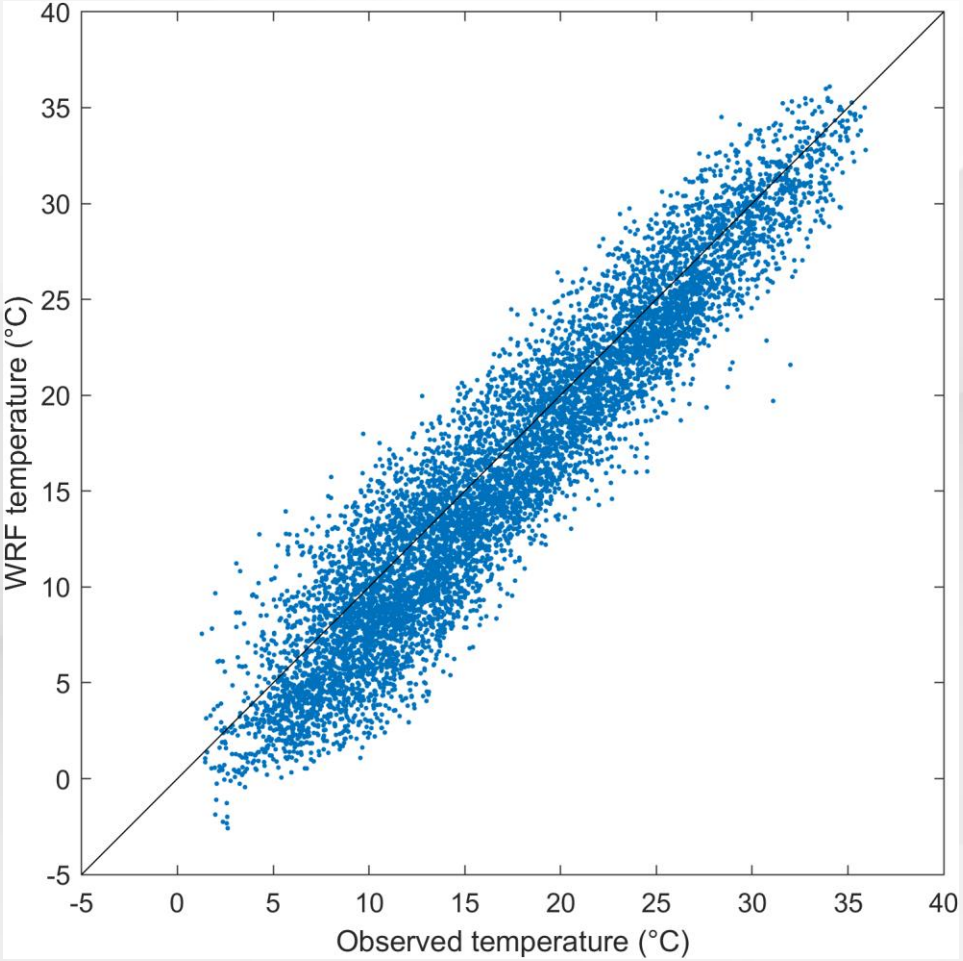
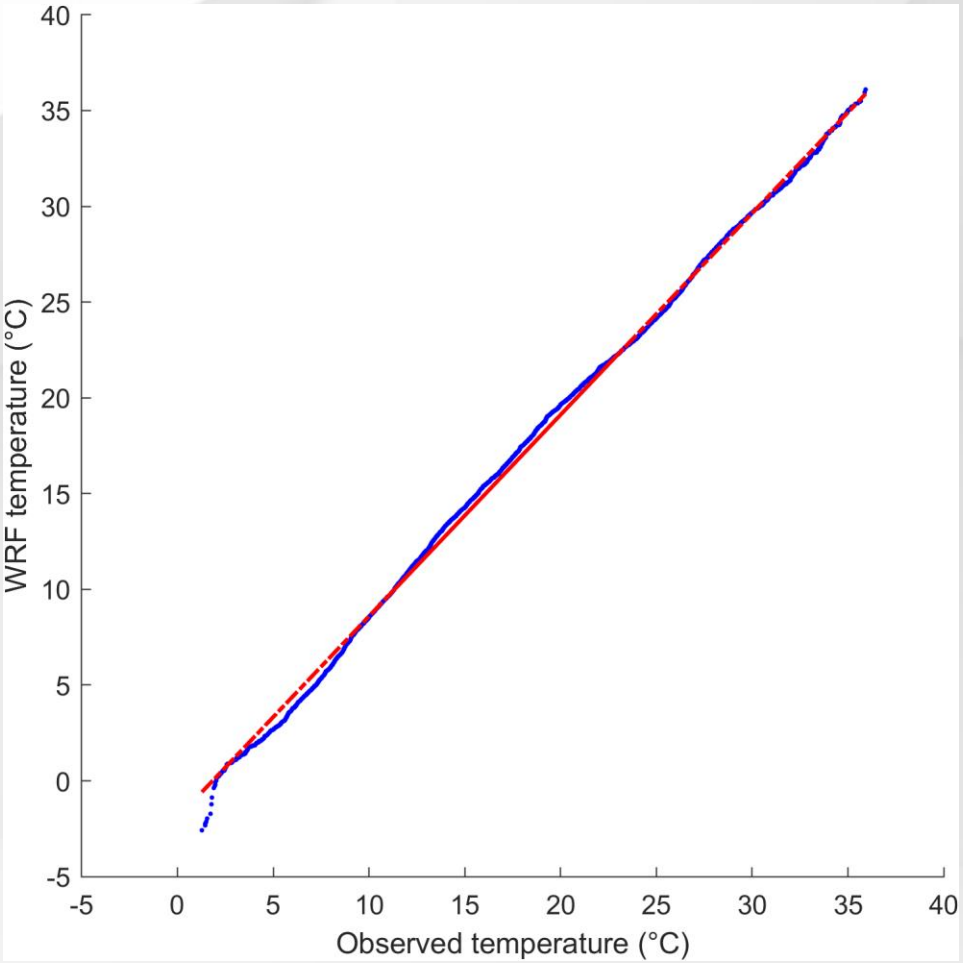
Temperatura





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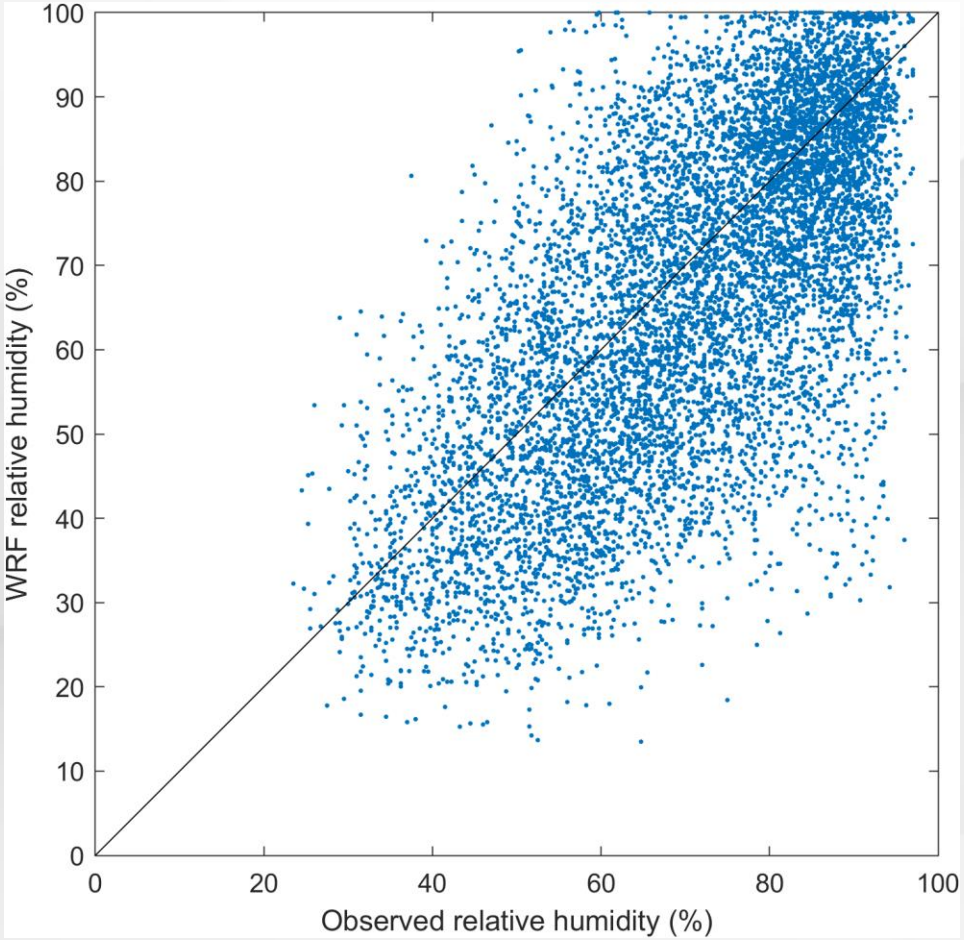
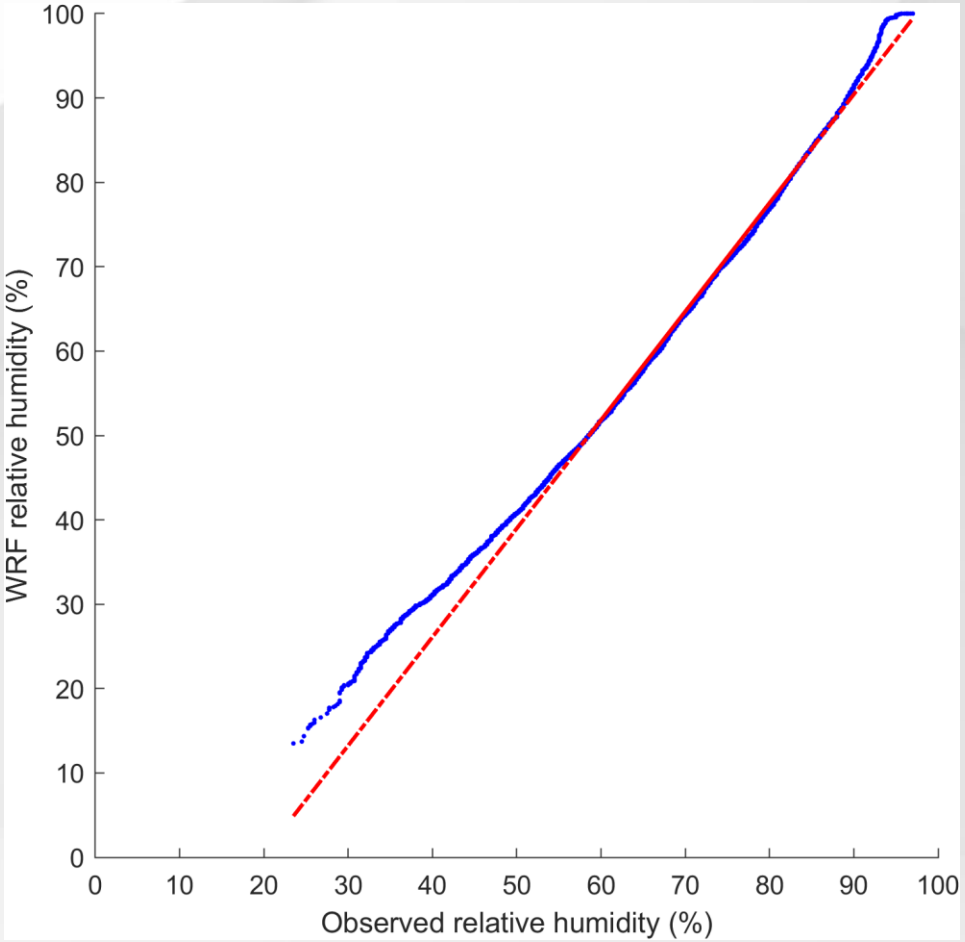
Umidità





Indicatori statistici

Temperatura

Station	N	R	IoA	RMSE	FB
AL001	7722	0.93	0.96	2.83	-0.06
AL003	8604	0.93	0.96	3.15	-0.03
AL004	8520	0.91	0.95	3.11	-0.02
AL007	8643	0.95	0.98	2.38	-0.02
ML-01	8370	0.95	0.97	2.87	-0.06
ML-04	8760	0.94	0.96	2.86	-0.05
ML-11	8158	0.93	0.96	2.86	-0.01
ML-13	8738	0.95	0.98	2.40	-0.02
AVG	**-**	**0.94**	**0.96**	**2.81**	**-0.03**

Umidità

Station	N	R	IoA	RMSE	FB
AL001	7722	0.60	0.76	16.53	-0.08
AL003	8521	0.63	0.79	16.72	-0.06
AL004	8390	0.60	0.77	15.64	-0.03
AL007	8643	0.67	0.81	15.07	-0.03
ML-01	8347	0.67	0.80	15.49	-0.06
ML-04	8759	0.63	0.75	16.77	-0.10
ML-11	8158	0.62	0.75	17.22	-0.11
ML-13	8738	0.68	0.78	17.36	-0.14
AVG	**-**	**0.64**	**0.78**	**16.35**	**-0.08**

Risorse

Sito ufficiale

- https://lifeasti.eu/

Siti dei partner

- https://www.meteoregionelazio.it
- http://www.arpalazio.gov.it/ambiente/aria/

Thank you for your attention

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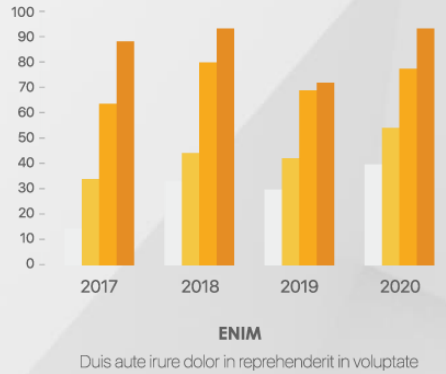

Key factors:

- Curabitur luctus mi vitae lacus malesuada ultrices
- Pellentesque eu libero quis velit cursus euismod sit amet
- Donec dictum risus imperdiet justo viverra molestie
- Sed nec nibh in lectus venenatis posuere eget id ex
- Curabitur luctus mi vitae lacus malesuada ultrices