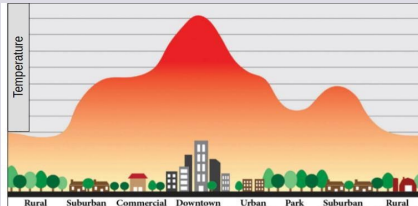


# URBAN REPRESENTATION IN HIGH RESOLUTION WRF SIMULATIONS OVER THE REGION OF EASTERN MEDITERRANEAN AND THE MIDDLE EAST

K. Constantinidou, P. Hadjinicolaou, G. Zittis, A. Tzyrkalli and J. Lelieveld

## Urban Heat Island effect



<https://climatekids.nasa.gov/heat-islands/>  
<https://bayareamonitor.org/article/summer-in-the-city-seeking-relief-from-urban-heat-islands/>

**Aim:** To simulate the effect of urbanization on the climate over the region of eastern Mediterranean and the Middle East.

## Simulation information:

Weather Research and Forecasting (WRF) model

Nested simulation  
16 km → 4 km

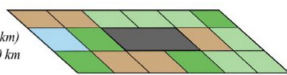
NoahMP Land Surface Scheme  
bulk urban parametrization

June-July-August  
JJA 2000

### Horizontal scales

i. Global / regional  
domain size 0(1000 to 100 km)  
model resolution ~100 to 10 km

### Detail of city representation

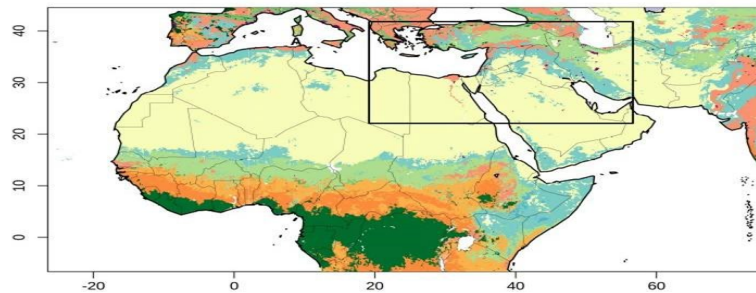


### Modelling & simulation approaches

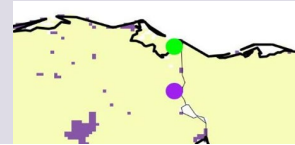
modified vegetation canopy  
bulk processes  
slab models



### LU\_INDEX MENA-CORDEX domain

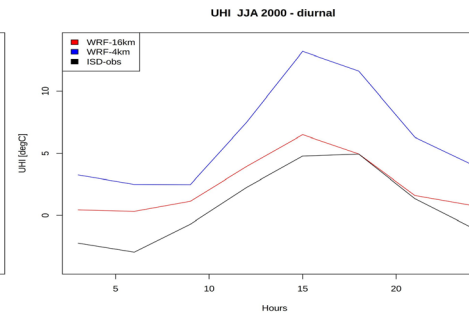
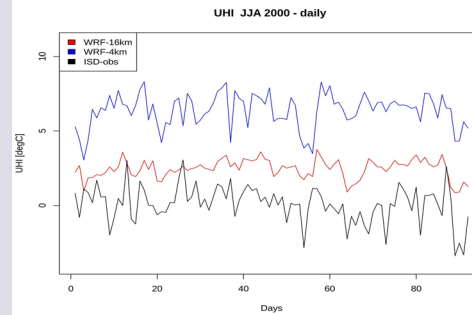
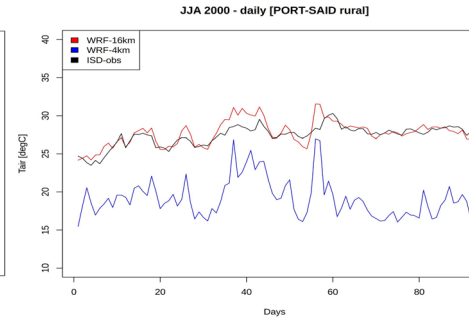
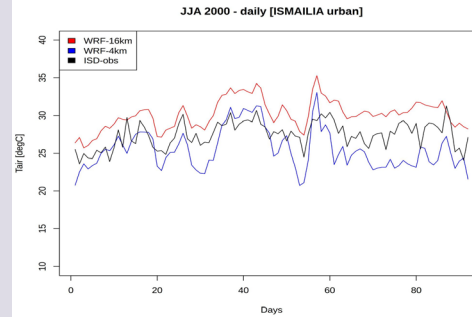


## Preliminary results:



Ismailia – Port-Said  
(urban) (rural)

Distance between stations ~ 85 km



WRF – 16km    WRF – 4km    Observations – Integrated Surface Dataset (ISD)

	mean(Tair) – JJA 2000 [°C]		mean(UHI) – JJA 2000 [°C]
	urban	rural	UHI = Turban - Trural
WRF 16km	30.2	27.7	2.5
WRF 4km	25.5	19.1	6.4
Obs.-ISD	27.5	27.4	0.1

## Main points:

- Finer resolution improves the spatial representation of the urban areas
- Temperature bias over ISMAILIA (urban) is  $\pm 2$  °C  
WRF\_16km – positive | WRF\_4km – negative
- Temperature bias over PORT-SAID (rural) is + 0.3 °C WRF\_16km & -8.3 °C WRF\_4km
- For ISMAILIA-PORT-SAID the model simulates an UHI of 3-7 °C, while the observed UHI = 0.1 °C

## Further work:

- More pairs of stations to be considered in order to evaluate model output for the domain of interest.
- Change properties of bulk urban parametrization to better represent the area.
- Use more elaborated urban parametrization schemes for the simulations.

## Acknowledgements:

This work was co-funded by the European Regional Development Fund and the Republic of Cyprus through the Research Innovation Foundation CELSIUS Project EXCELLENCE/1216/0039. It was also supported by the EMME-CARE project that has received funding from the European Union's Horizon 2020 Research and Innovation Programme, under grant agreement no. 856612, as well as matching co-funding by the Government of the Republic of Cyprus.

Contact information: [k.constantinidou@cyi.ac.cy](mailto:k.constantinidou@cyi.ac.cy)



CARE-C

