Supplementary Information File

Urbanization amplifies nighttime heat stress on warmer days over the US

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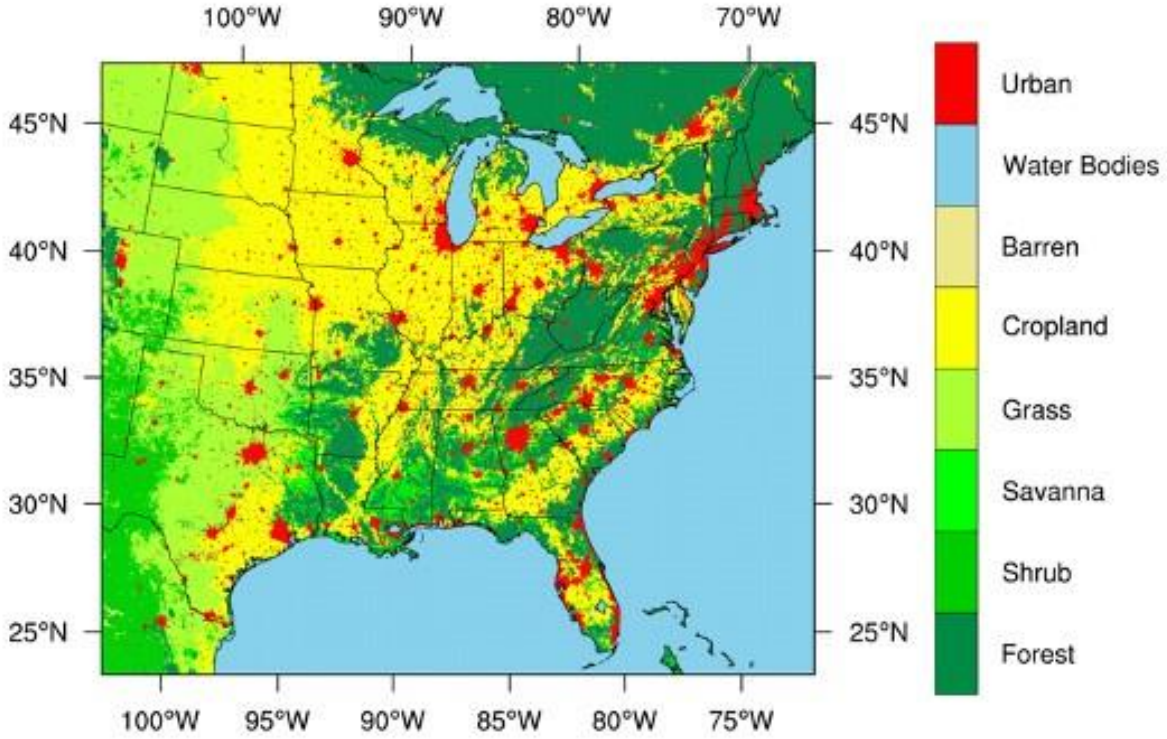
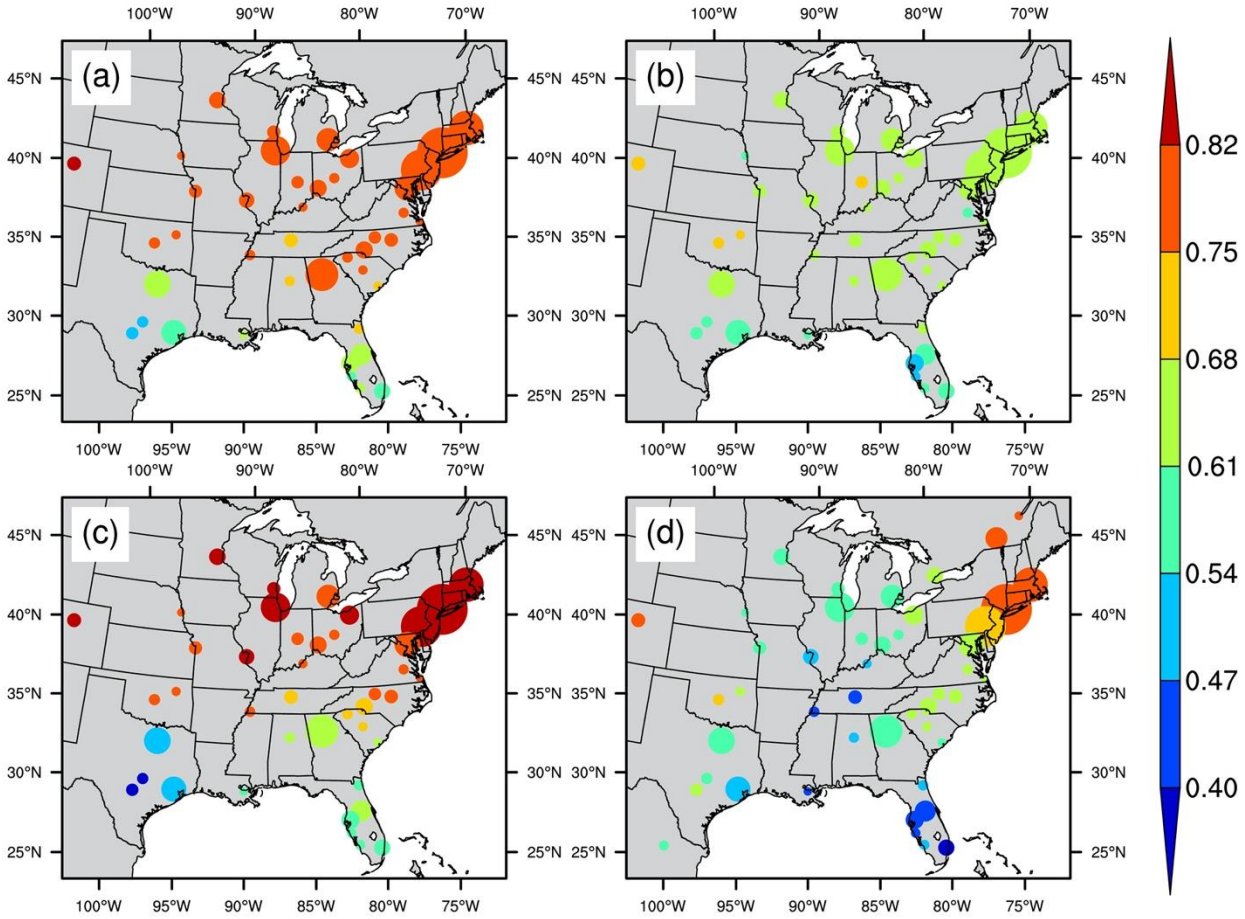
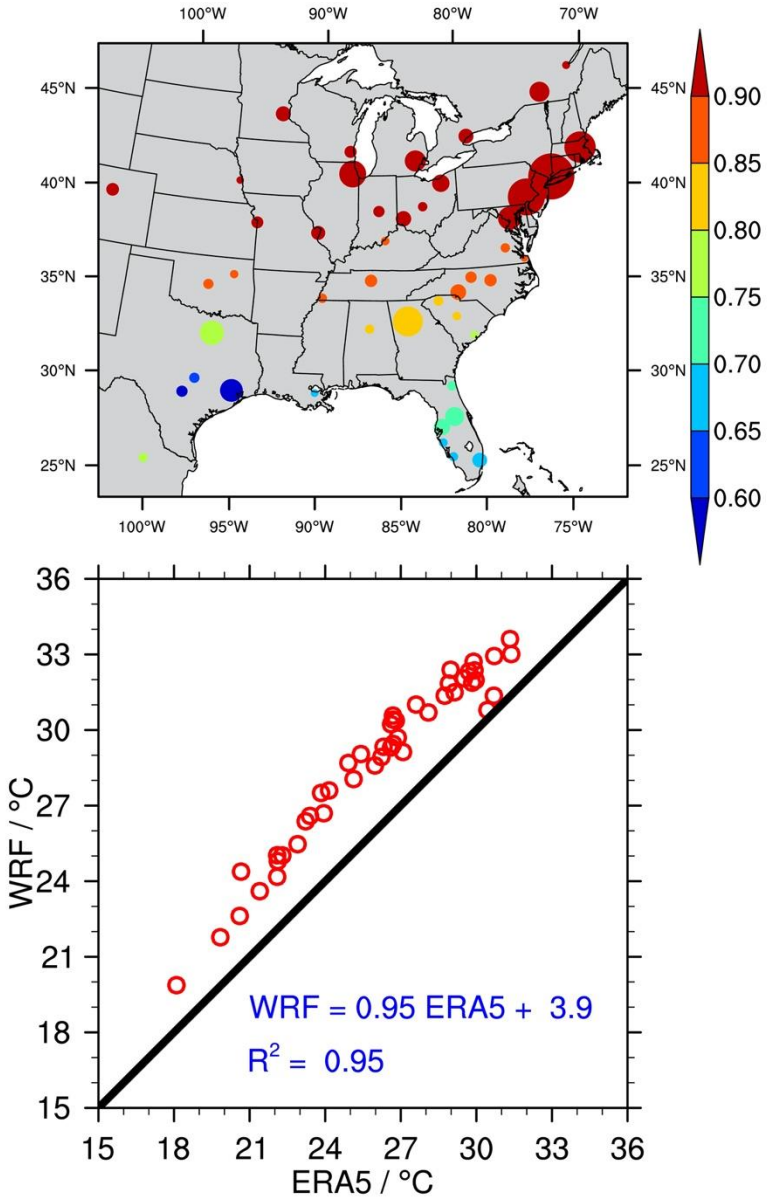


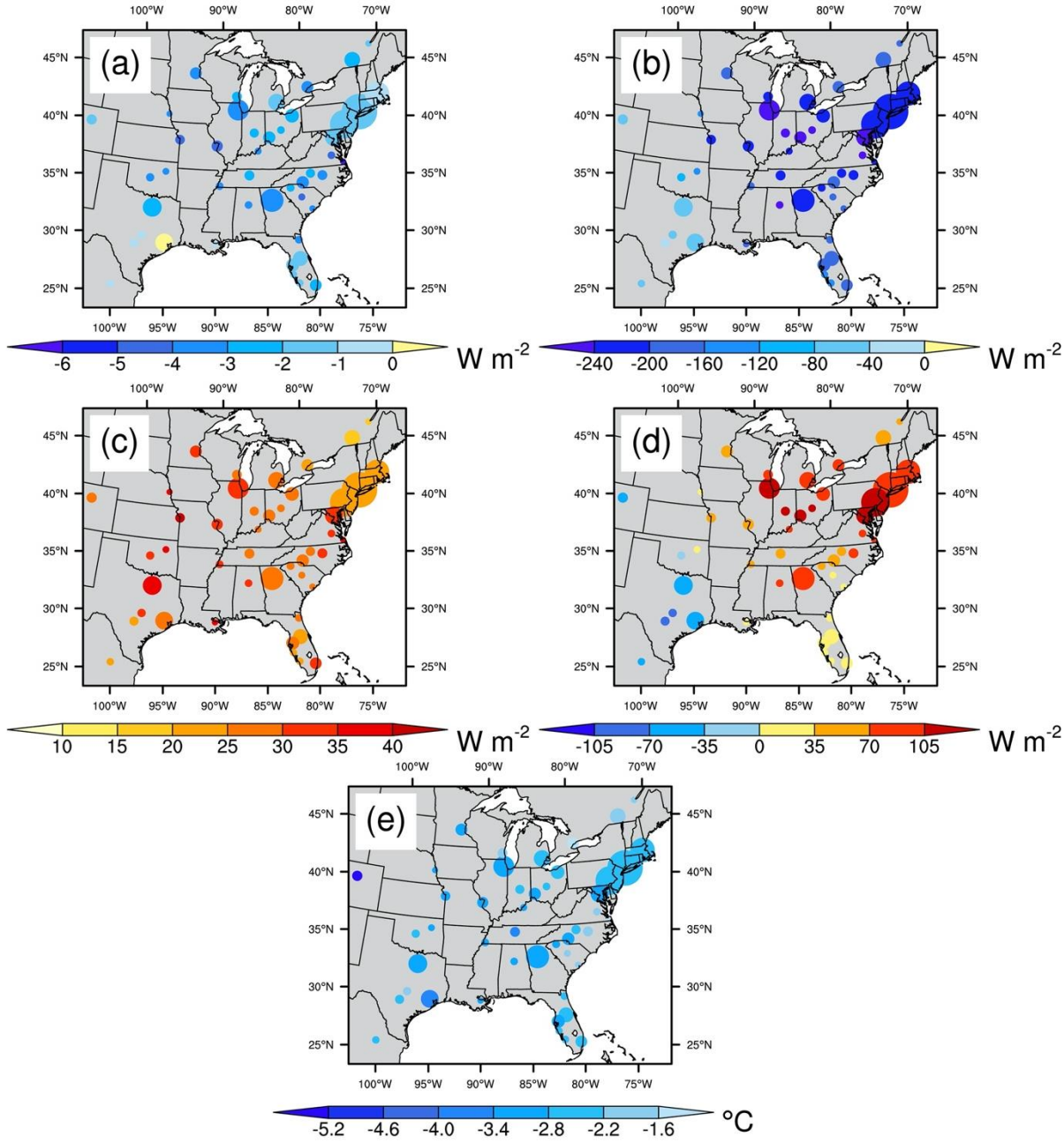
Supplementary Figure 1: WRF simulation domain with background land use and land cover map.



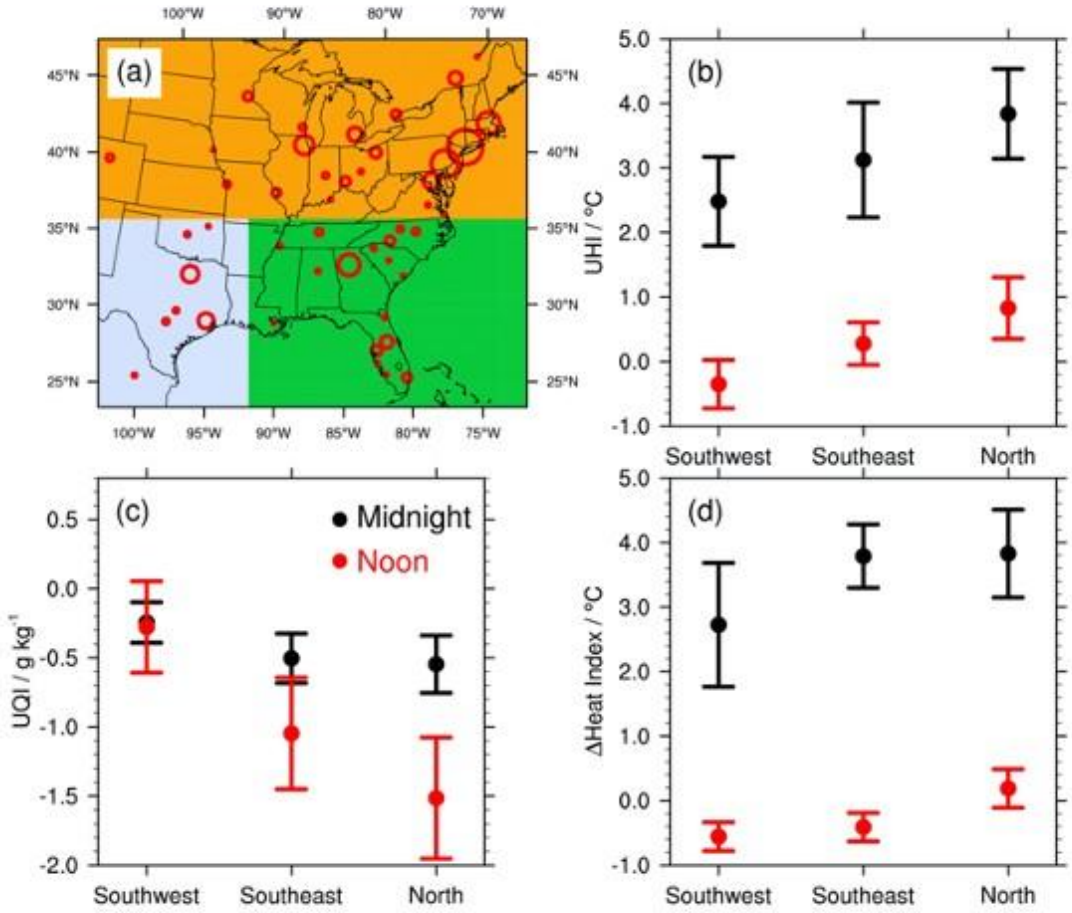
Supplementary Figure 2: Spatiotemporal distribution of correlation coefficients between PRISM data and WRF simulated a)daily mean temperature, b) daily maximum temperature, c) daily minimum temperature and d) Relative humidity from ERA reanalysis data.



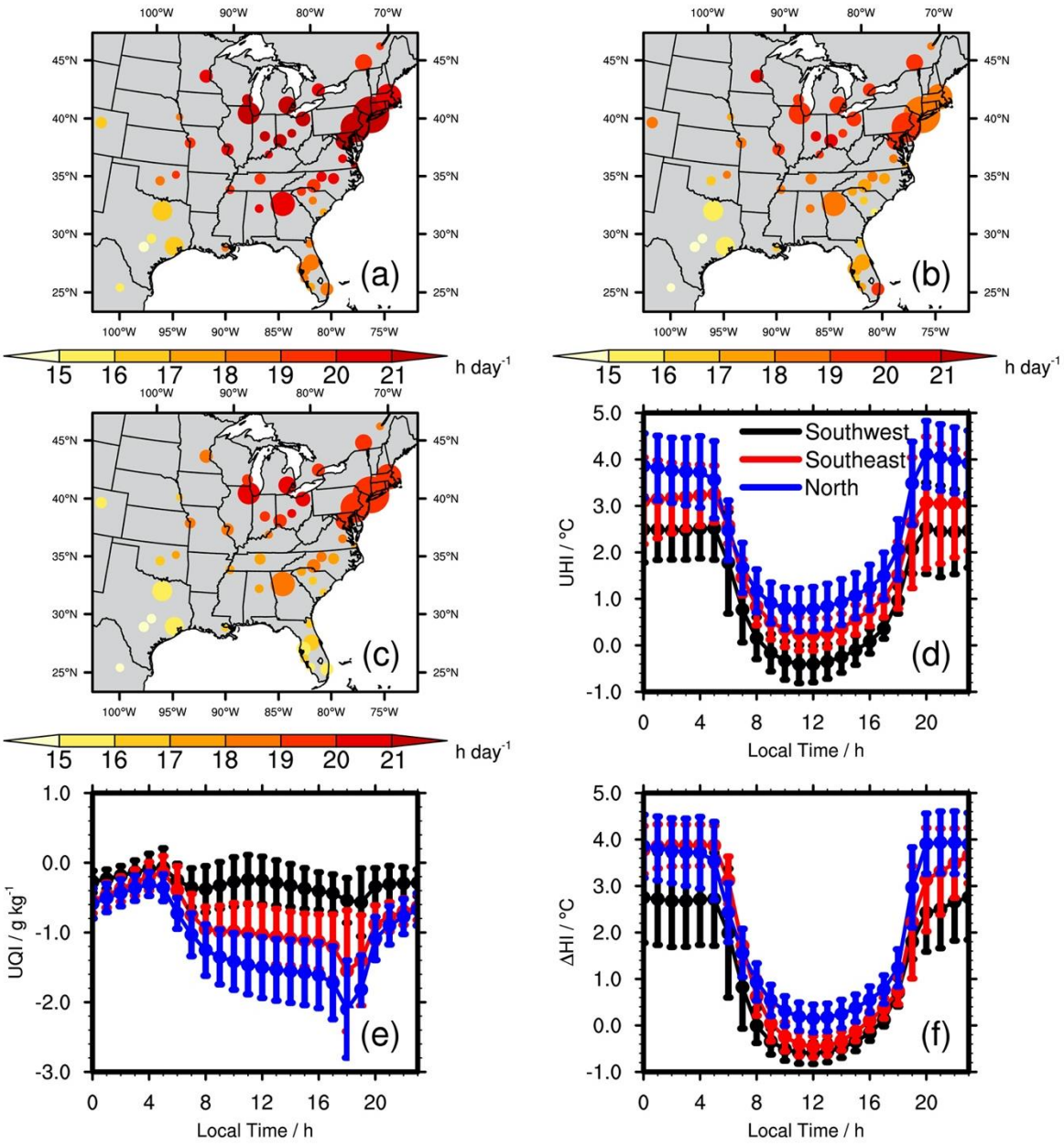
Supplementary Figure 3: Evaluation of WRF (CTRL) simulated heat index by using ERA5-land hourly data (0.1°×0.1°) in the summer (June – August) of 2008-2013. Hourly heat index is calculated by using T2 and RH2, and for the ERA5-land dataset, we calculate RH2 by using T2 and 2-m dew point temperature. Daily mean heat index is derived from hourly heat index for each city by averaging the heat index values of all grid cells belonging to that city. Based on the city daily mean heat index values in the summer of 2008-2013, we calculate the Pearson correlation coefficient (R) between WRF-CTRL and ERA5-land for each city, as shown in the top panel. In the bottom panel, we show the scatterplot for the average daily mean heat index during the summer of 2008-2013 from WRF-CTRL and ERA5-land.



Supplementary Figure 4: Spatio-temporal distribution of simulated perturbation in a) midnight Latent heat, b) midday latent heat, c) midnight sensible heat, d) midday sensible heat and e) diurnal temperature range due to urbanization (CNTL-NO_URB).



Supplementary Figure 5: Analysis of spatial variability in UHI (panel b), UQI (panel c) and UHSI (panel d) over three subregions as defined by the geographical bounds shown in Panel a. The black marker indicates midnight and red marker indicates midday periods.



Supplementary Figure 6a-c: The (6-year summer mean) number of hours when the simulated urbanization induced UHI is positive, UQI is negative and UHSI is positive during the entire day over each city cluster in EUS. Panel 6d-f illustrates the diurnal distribution of UHI, UQI and UHSI over the three subregions in the domain.

Supplementary Table 1:

Summer mean and variability of urban climate variables simulated over EUS.

	EUS		**EUS_{North}**		**EUS_{SE}**		**EUS_{SW}**	
	Day	Night	Day	Night	Day	Night	Day	Night
UHI	0.4±0.6	3.4±0.9	0.8 ±0.5	3.8±0.7	0.3±0.3	3.1±0.9	-0.4±0.4	2.5±0.7
UQI*	-1.2±0.6	-0.5±0.2	-1.5±0.4	-0.5±0.2	-1.9	-0.5±0.2	-0.3±0.3	-0.2±0.1
UHSI	-0.1±0.4	3.6±0.8	0.2±0.3	3.8±0.7	-0.4±0.2	3.8±0.5	-0.6 ±0.2	2.7 ±1.0
UHI-T	0.04±0.05	0.15±0.09	0.06±0.04	0.09±0.03	0.05±0.04	0.19±0.07	0.04±0.02	0.23±0.11
UQI-T*	-0.05±0.05	-0.07±0.05	-0.07±0.04	-0.07±0.04	-0.06±0.04	-0.1±0.03	0.03±0.02	-0.03±0.07
UHSI-T	-0.02±0.03	0.22±0.20	-0.02±0.03	0.09±0.05	-0.02±0.05	0.37±0.23	-0.03±0.02	0.25±0.15

**Note that negative value of UQI means urban-induced dryness and vice versa. Similarly, negative slope of the UQI-T regression means larger urban-induced drying with increase in in temperature and vice versa.*