

Supplementary Information for “Trees halve urban heat island effect globally but unequal benefits only modestly mitigate climate-change warming”

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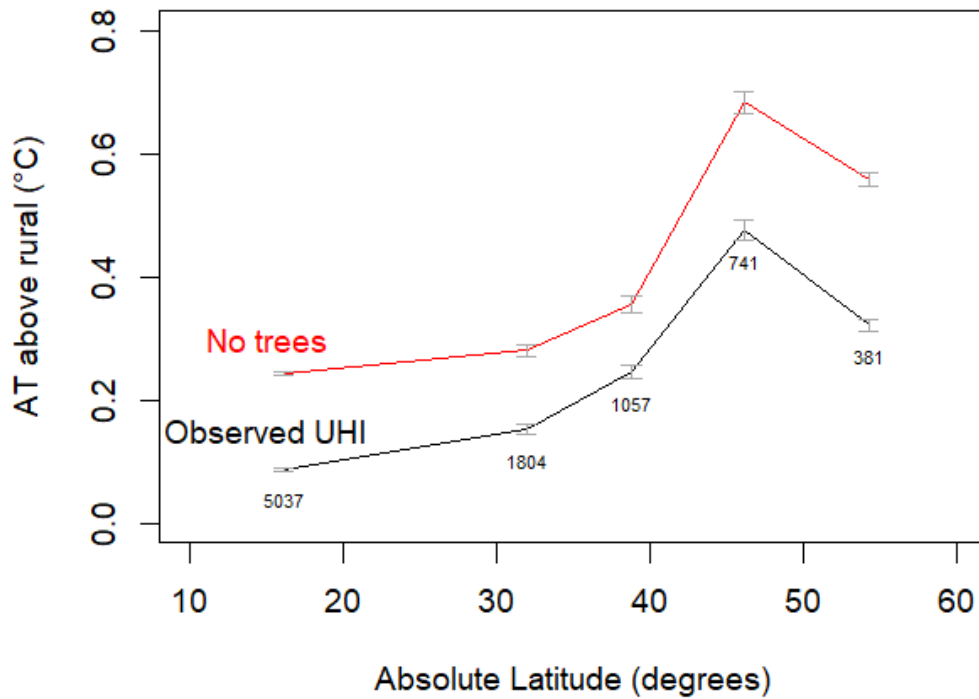
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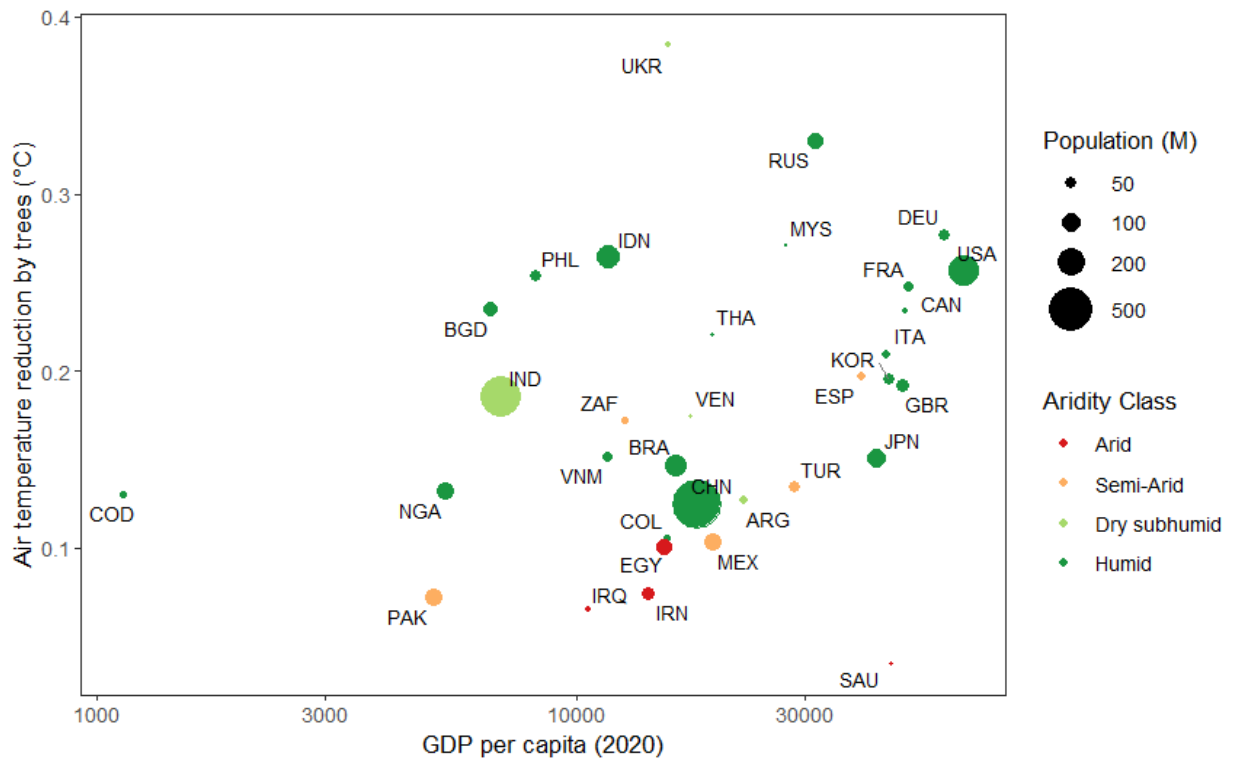
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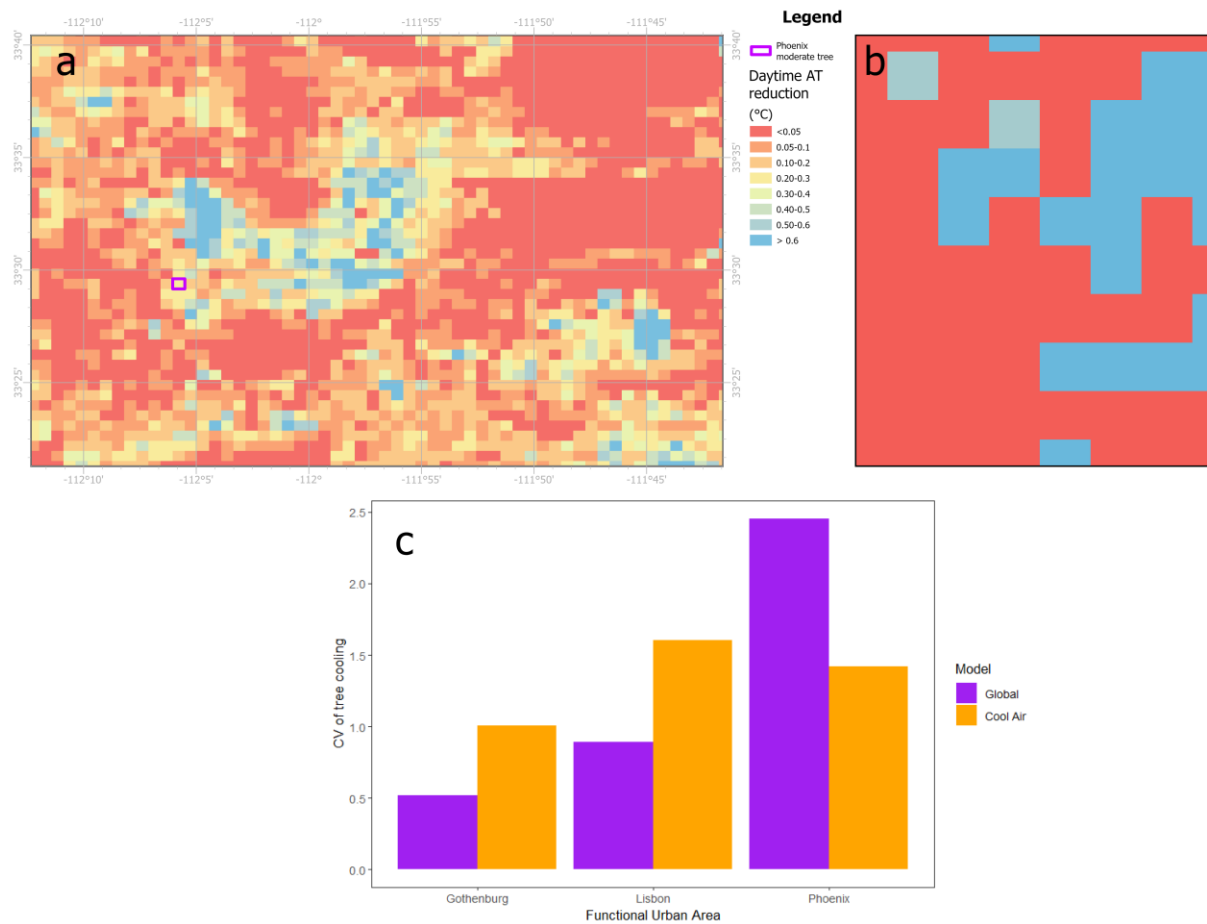
Supplementary Figure 1: Relationship between latitude and the urban heat island (UHI). The world's Functional Urban Areas (FUAs) are divided into quintiles based upon absolute latitude, and the average observed UHI calculated, based on the Simplified Urban Extent (SUE) algorithm. Also shown is the maximum potential UHI that would occur if there were no tree cover, calculated using our global regression model. Error bars are standard errors of the mean. The number of FUAs in each latitude category is also shown.



Supplementary Figure 2: Percentage of urban dwellers in different aridity categories in the world's large Functional Urban Areas (FUAs), as a function of country-level income category as defined by the World Bank using per-capita income (Low < USD 1,145, Middle USD 1,145-14,005, Upper > 14,005 USD). The Y-axis shows the cumulative percentage, see main text for details. Note the different total urban populations in large FUAs in each income category: Low (138 million); Middle (2,491 million); and Upper (918 million)



Supplementary Figure 3: Relationship between income and air temperature reduction. Income as measured by gross domestic product (GDP) per capita in 2020, measured in current international dollars. The average population-weighted air temperature reduction by trees in °C for each country is shown on the Y-axis. Colors indicate the average aridity index class of each country, while the size of the dot is proportional to the total urban population in the country. Only countries with an urban population greater than 20 million (M) are shown. Country labels are 3-digit ISO codes (e.g., IND = India).



Supplementary Figure 4: Reduction in daytime summer air temperatures (AT) by trees varies by scale. (a) Phoenix, US, estimates from the global 1 km empirical model of AT reductions by trees for each grid cell (mean reduction = 0.06°C, standard deviation=0.14°C). (b) For one location in Phoenix, the i-Tree Cool Air model estimates of AT reductions by trees at a 30 m resolution. This location is the medium tree cover landscape outlined in purple in (a) (mean reduction for this landscape = 0.35°C, standard deviation=0.72°C). While more than 75% of 30 m cells have little to no tree cover and hence little cooling, a small fraction of cells has relatively large reductions in AT due to trees. (c) The coefficient of variation (CV) of tree cooling estimated by the global and Cool Air models, for three FUAs (Gothenburg, Sweden; Lisbon, Portugal; and Phoenix, US). Cool Air was run for three sample landscapes in each FUA, see main text for details.

Supplementary Table 1. Average cooling by trees expressed in air temperature (AT) and wet bulb globe temperature (WBGT). Analysis was conducted at 30m resolution using the i-Tree Cool Air model, for three study sites (1 km cells) at three tree cover levels, for three cities that span an aridity gradient. Average shown is the simple arithmetic mean.

Variable	City	Tree cover level		
		Low	Medium	High
AT cooling by trees (°C)	Gothenburg	0.02	0.05	0.08
	Lisbon	0.00	0.01	0.02
	Phoenix	0.09	0.16	0.82
WBGT cooling by trees (°C)	Gothenburg	0.21	0.46	0.90
	Lisbon	0.15	0.29	1.18
	Phoenix	0.31	0.54	2.91