

RECENT UAH RESEARCH: URBAN HEAT ISLAND EFFECTS



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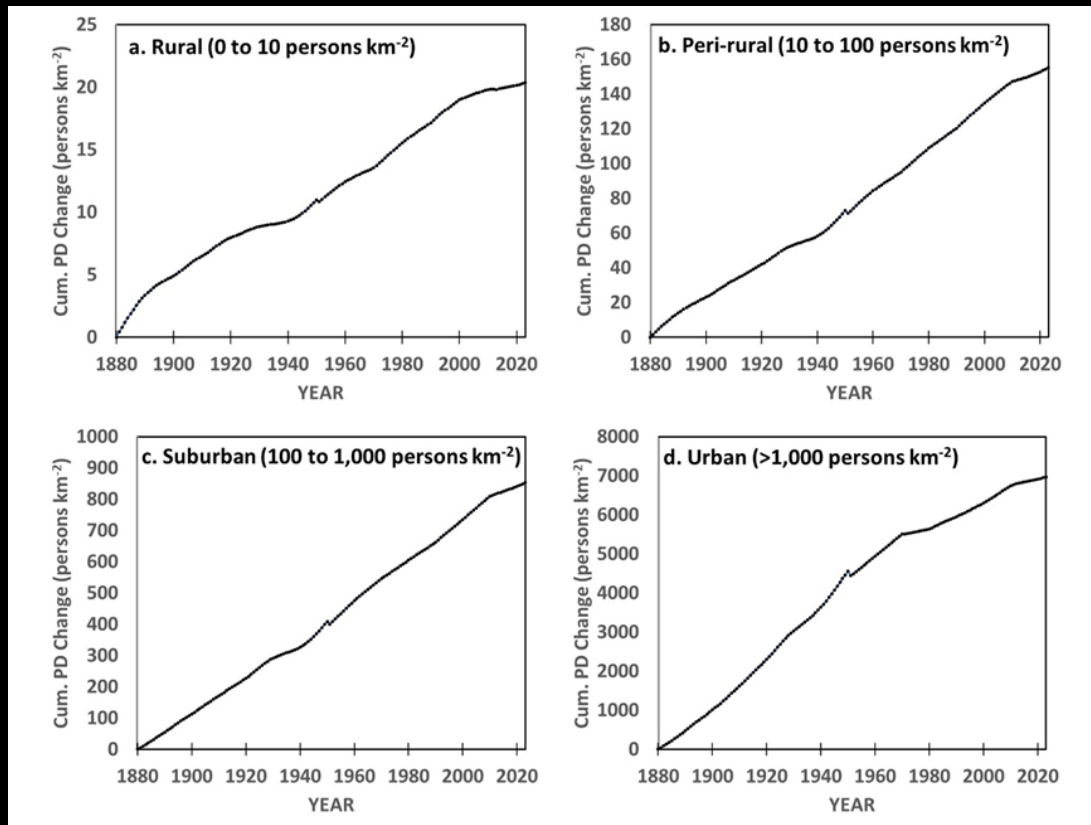
U.S. URBAN HEAT ISLAND EFFECTS ARE LARGE

“Urban Heat Island Effects in U.S. Summer Surface Temperature Data”, 1895-2023

Roy W. Spencer, John R. Christy, William D. Braswell

Journal of Applied Meteorology & Climatology (conditionally accepted)

U.S. population density growth in 4 classes of population density.



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Compute average ΔT (average of T_{max} and T_{min}) vs. ΔPD over thousands of closely-spaced GHCN stations

- ⇒ In different years (1880 to 2022)
- ⇒ In different regions (mostly U.S.)
- ⇒ In different seasons (mostly summer)



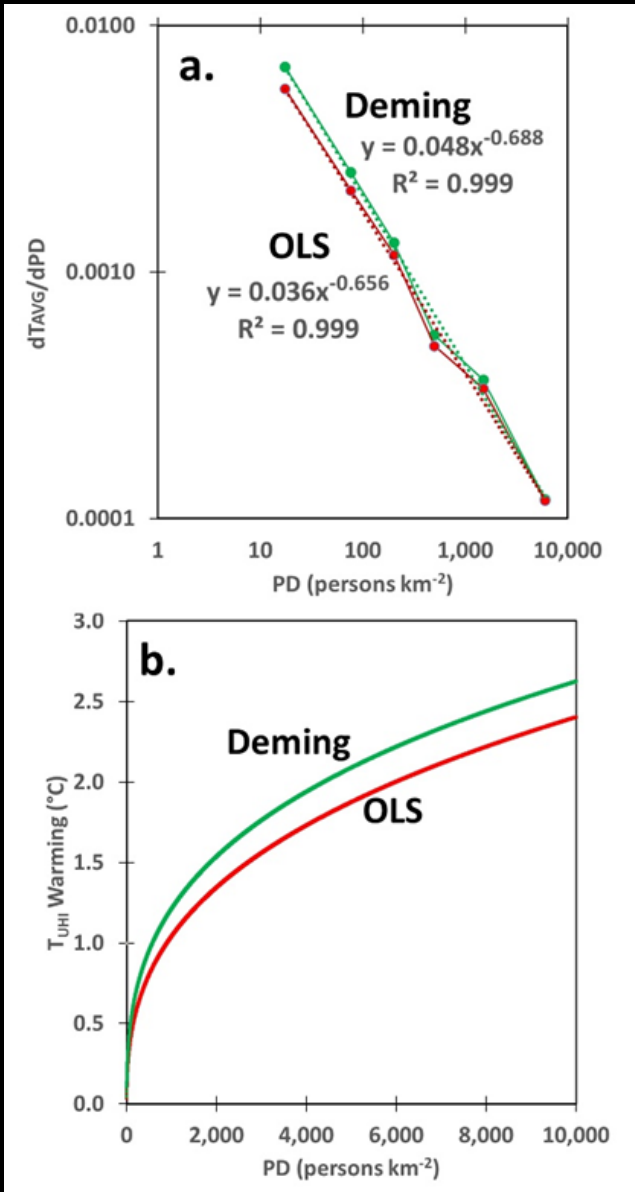
Temperature (T) difference



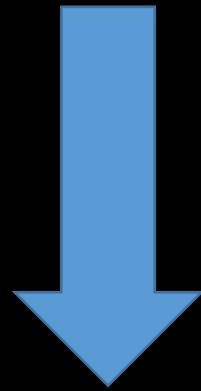
Population density (PD) difference



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Regression results
(dT/dPD)

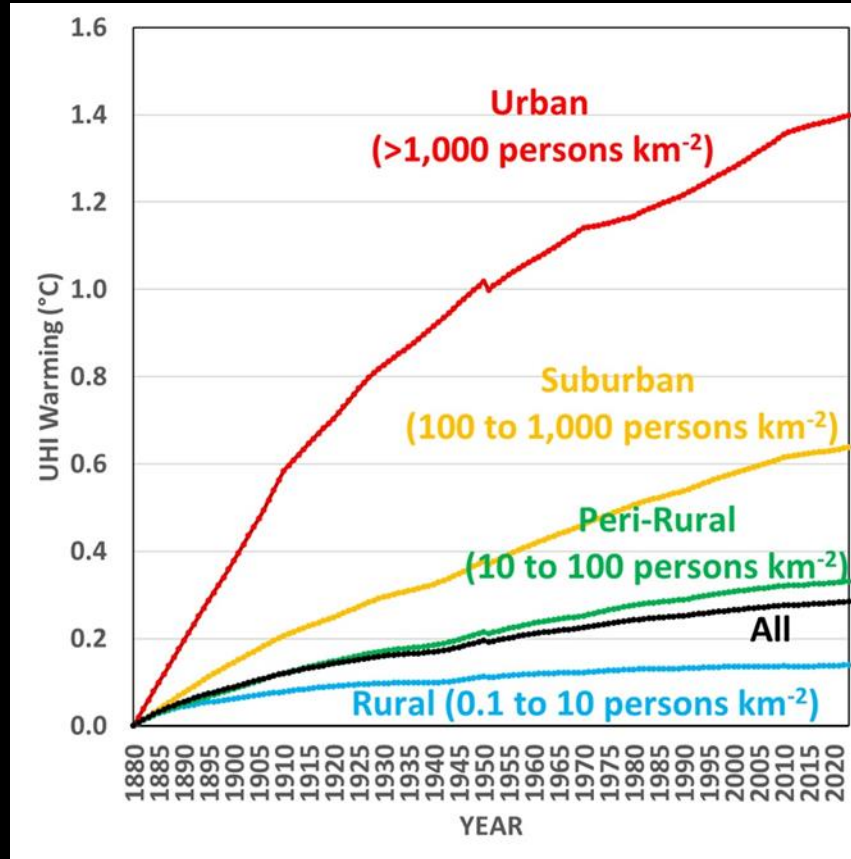


UHI warming vs population
density from integrating dT/dPD
across PD



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U.S. average warming since 1880
from the UHI effect in 4 classes
of population density



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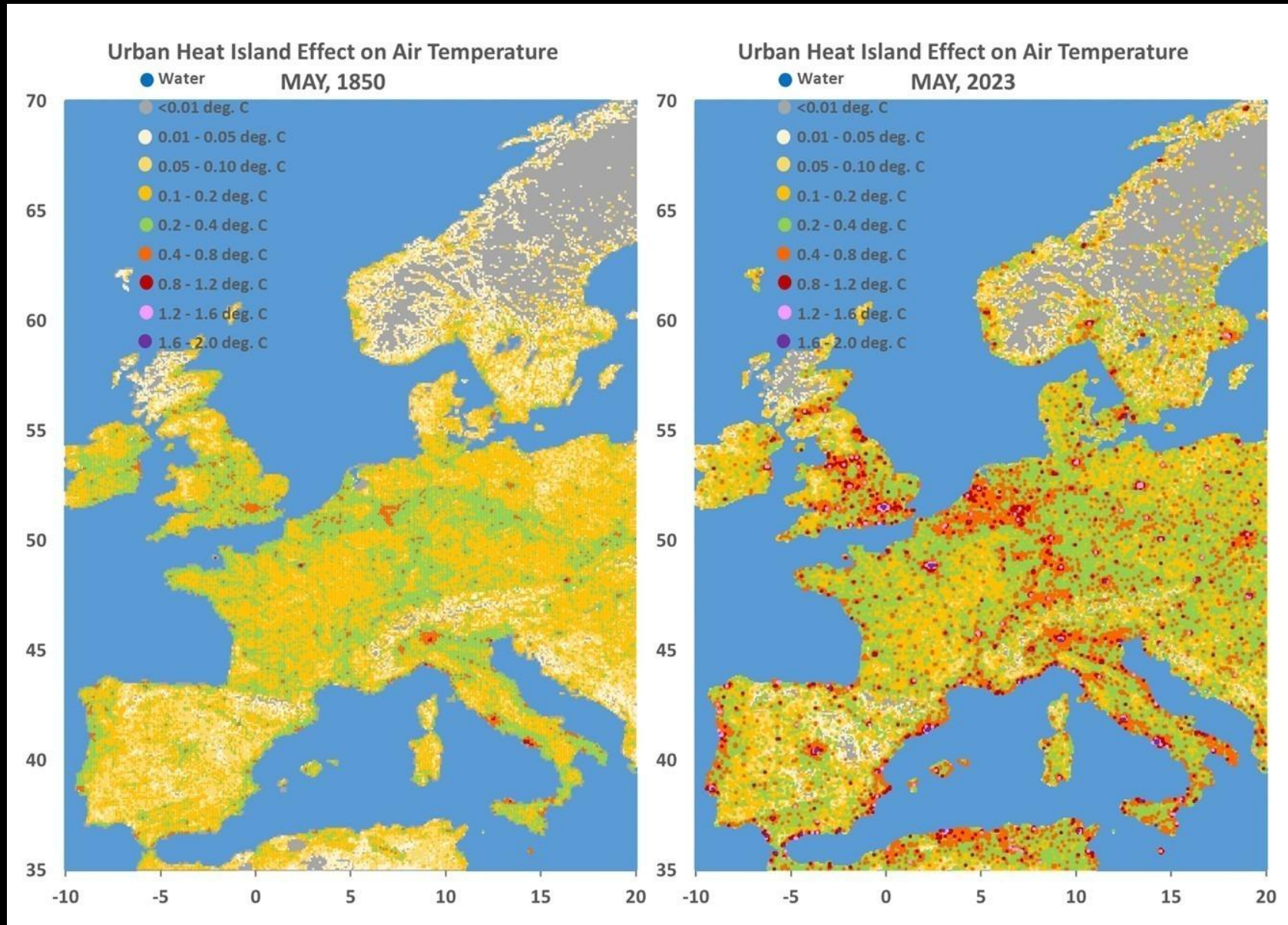
Final % Impact of **UHI warming** on U.S. Temperature Trends, 1895-2023

PD (persons km ⁻²)	1895-2023 T _{AVG} trend (°C decade ⁻¹) Raw (Adjusted)	1895-2023 T _{UHI} trend (°C decade ⁻¹)	[T _{UHI} trend]/[T _{AVG} trend] Raw (Adjusted)
0.1 to 10	+0.075 (+0.067)	+0.006	8.2% (7.0%)
10 to 100	+0.049 (+0.056)	+0.020	41.7% (34.7%)
100 to 1,000	+0.065 (+0.083)	+0.041	63.7% (57.2%)
>1,000	+0.117 (+0.205)	+0.078	66.9% (56.8%)
All	+0.072 (+0.073)	+0.016	22.1% (21.8%)

Rural
 Peri-Rural
 Suburban
 Urban
 ALL



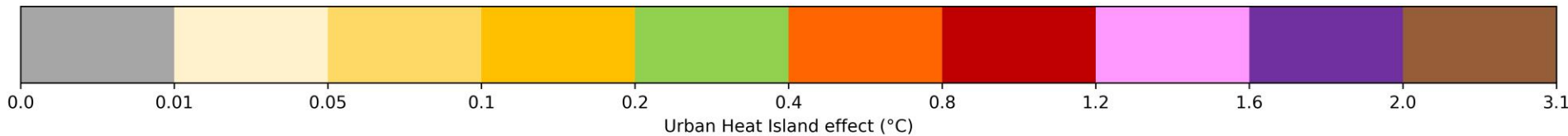
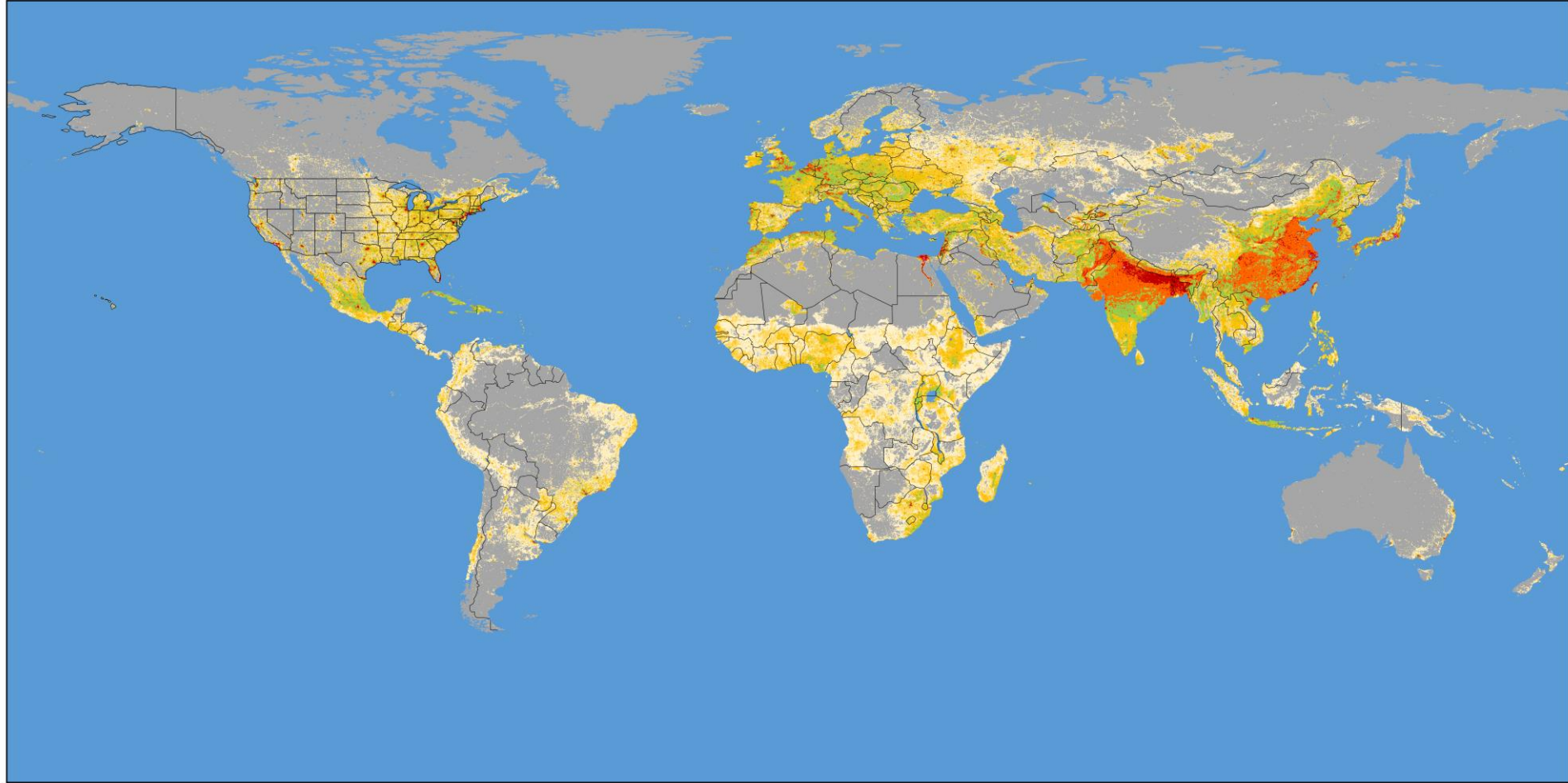
UHI EFFECTS FROM GLOBAL GHCN DATA ANALYSIS



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ArcGIS ascii grid data and global images available at: <https://www.nsstc.uah.edu/public/roy.spencer/>

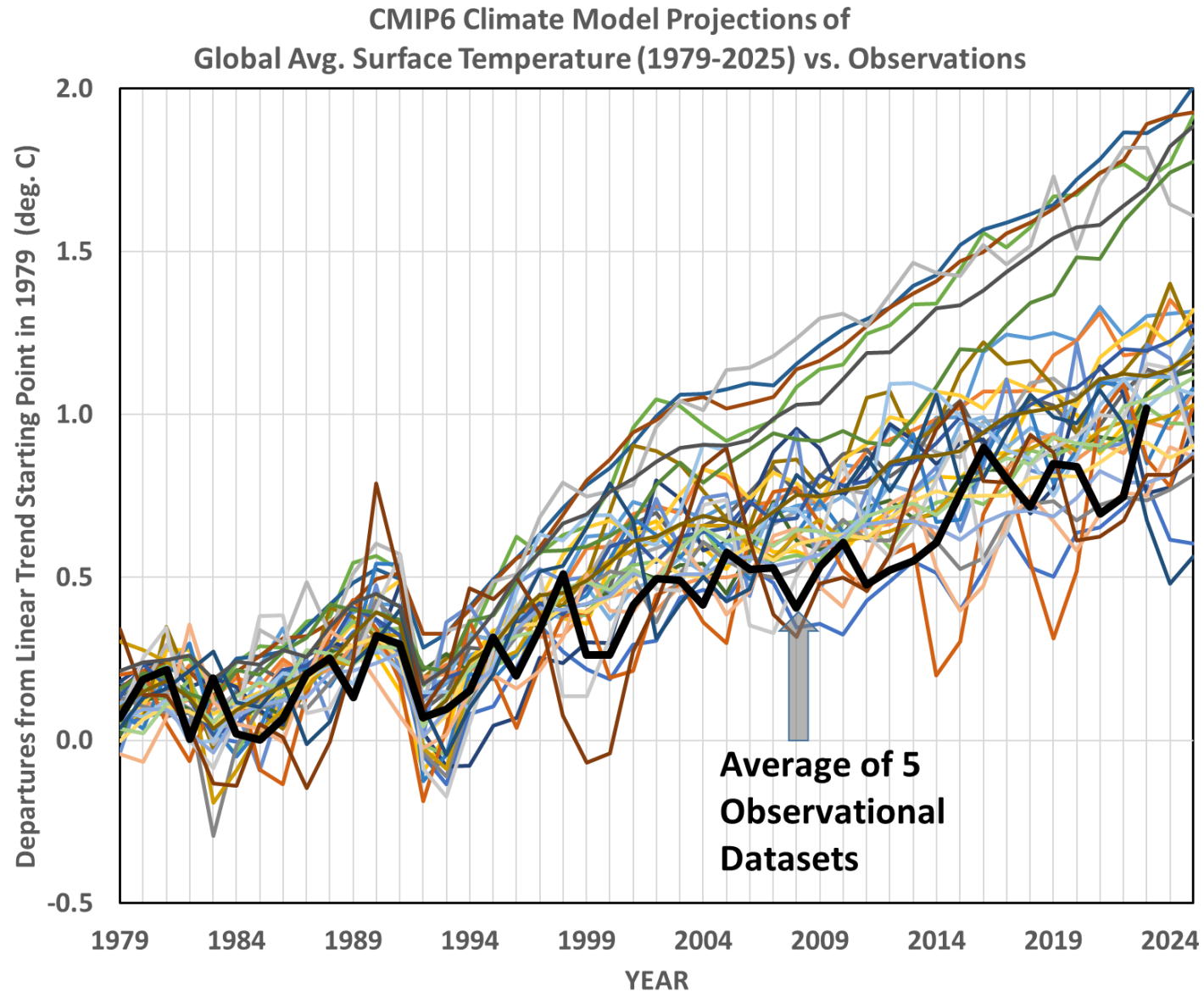
Tuhi_JUN_2023AD.asc



Our UHI results support recent work by O'Neill, the Connollys, Soon, Crok, de Vos, Katata, and others regarding remaining spurious warming remaining in GHCN datasets after “homogenization”.



THE BAD(?): MORE CO2 PROBABLY CAUSES WARMING



THE END



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