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Modelling UHI

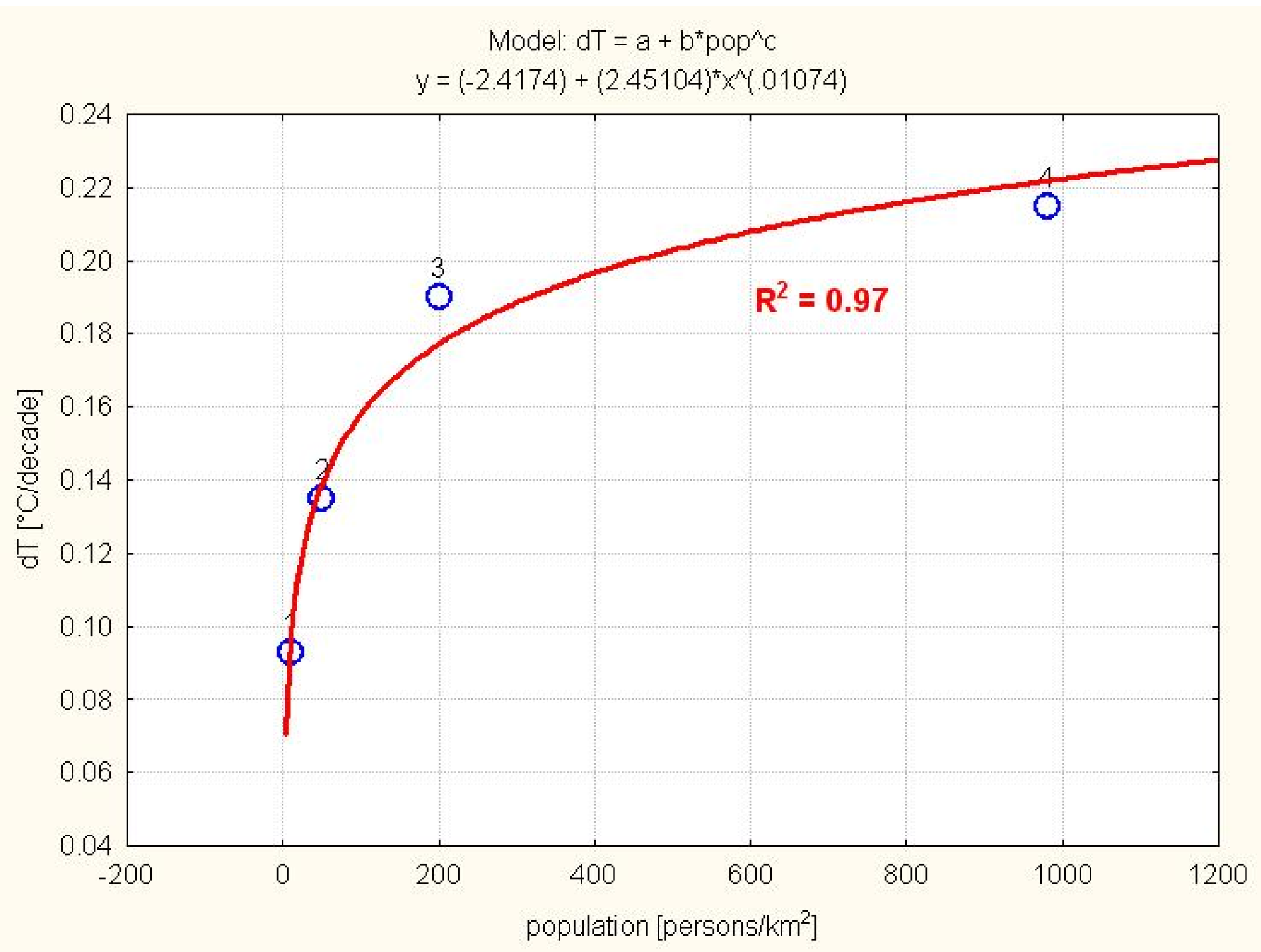
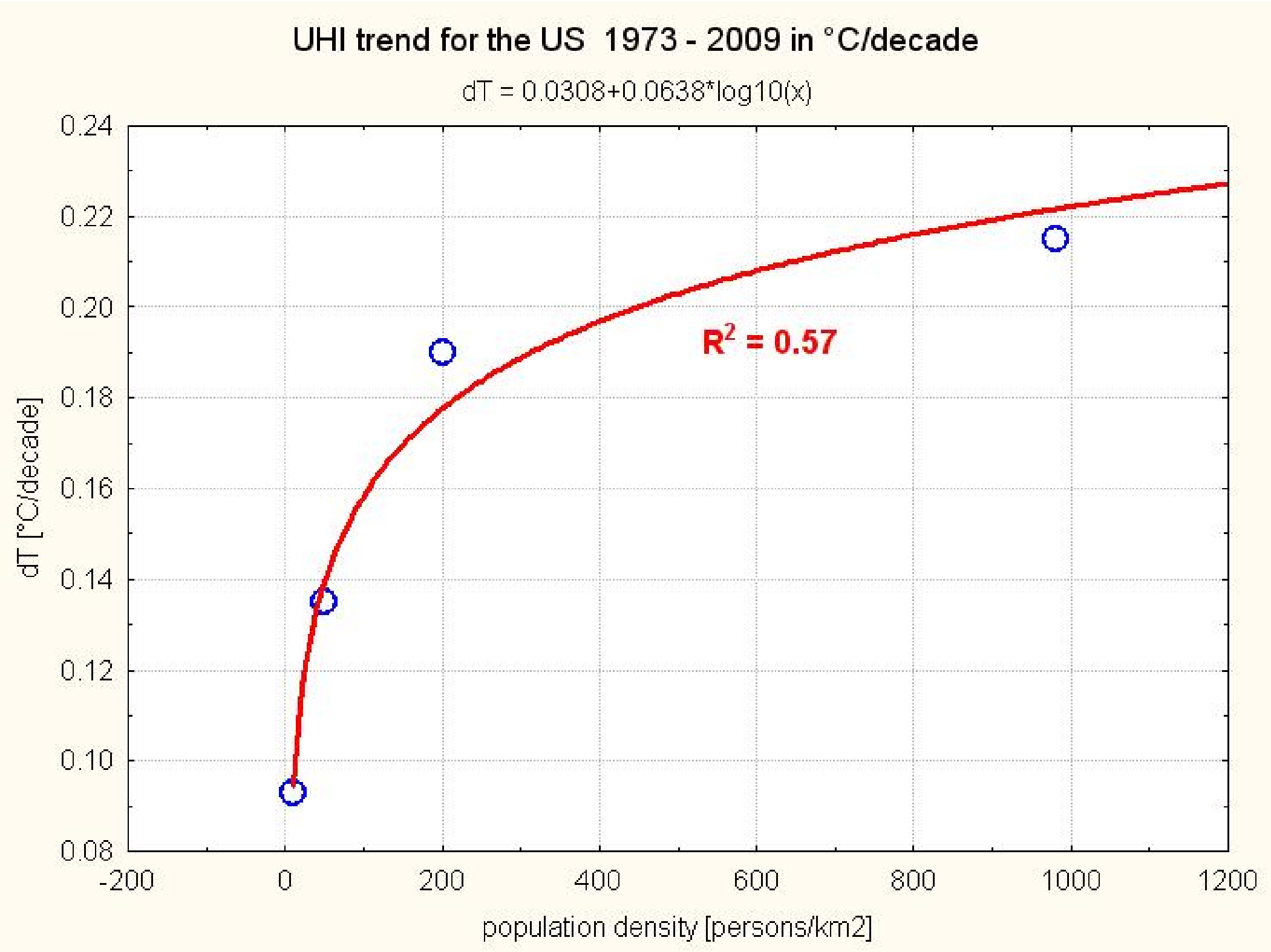
Dr. Roy Spencer from UHA has a very interesting [article](#) on how UHI could contaminate the GHCN (Global Historic Data Net) temperature series that form the basis for GISS and HADCrut3 . From his graph showing the decadal trend versus population density I extracted the following 4 data couples (first column = population density, last column = temperature trend in °C/decade).

pop	dT
10	0.093
50	0.135
200	0.190
980	0.215

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Dr. Spencer gives a logarithmic fit of the form $dT = a + b \cdot \log(\text{pop})$. The problem with this type of fit is that $\log(0)$ is minus infinite, and as such can not give a mathematical plausible answer to the question: *what would have the warming if population density had been zero?*

I tried another model, based on a fractional power of population density: $dT = a + b \cdot \text{pop}^c$
For a comparison, here are the 2 fits with their R2 score (R2 = percentage of variance explained by the model):



Clearly the power model gives a much better R2 score (it is a tremendous result!): the model explains more than 97% of the observed variability!

Four data points are not too many for such an analysis, so please take these results with a grain of salt. The power model suggests that true US temperature change would have been a **warming** of $-2.4174 + 2.45104 = 0.033$ °C/decade for the period 1973-2009 if there had been no UHI (i.e. $\text{pop} = 0$).

Conclusion: **no UHI, no warming!**

See also this excellent article in The Blackboard [here](#).

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