

***Interactive comment on “The response of the terrestrial biosphere to urbanization: land cover conversion, climate, and urban pollution” by K. Trusilova and G. Churkina***

**Anonymous Referee #2**

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This paper applies the earlier paper of Trusilova et al. (2008) to carbon exchanges. It is worthy of publication once major revisions are satisfactorily made, as the approach adopted raises serious questions - assumptions about cities with no vegetation, which the authors themselves state are unrealistic. Moreover, details on the urban meteorological bias, the extent to which models adequately deal with cities etc are lacking. I highlight these concerns in some of the comments below.

Minor comments 1. Notation should be SI e.g. not /year but year<sup>-1</sup> or a<sup>-1</sup>; — ok formatting now lost – these should be superscripts (ditto below)

2. in the text, references should be listed in chronological order and must be complete

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(not et al.) in reference list.

1. Abstract/elsewhere: CO2 dome have the measurements by anyone been done to demonstrate that this exists? I think this is very misleading unless clearly defined what is meant. Those that first introduced this term were measuring behind vehicles not in the boundary layer (i.e. not a dome!).
2. 2246 - line 23 - in some settings (e.g. SW USA) vegetation coverage is increased by urbanization (i.e. urban planting schemes relative to desert surroundings)
3. 2247 - line 4 - 'lack of evaporation' - not necessarily - see previous comment
4. 2247 - line 2 - roads/traffic occur outside of cities too - so if all traffic is attributed to urban areas, exactly what is the definition of urbanized land?
5. 2248 - line 5 - I can see the reason to exclude ozone, but its ongoing effects do influence/damage vegetation and thus have an impact
6. 2248 - line 25 - industrial livestock rearing facilities - are these really urban?
7. 2449 - line 2 - it is not appropriate to model urban areas as vegetation free surfaces
8. 2249 - line 8 - treating the urban land fraction as barren land - is this because of the model does not treat the urban area?
  - a. 2454 line 12-15 the authors themselves acknowledge this is unreasonable.
9. 2249 - line 9 - what is the change and what's the basis for it?
10. 2249 - line 14 /15- need to insert degree symbols
11. 2449 - line 18 - how do these models treat the urban environment?
12. 2450 - line 5 on - more rationale for these years being used?
13. 2451 - line 8 - clearly there were cities in 1958
14. 2451 - line 27 - more details on the nature of the urban scheme are needed

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15. 2451 - line 25 on - CO<sub>2</sub> dome is not a good term to use. Produce a summary table of previous studies. It is absolutely critical that the scale, and representativeness, of the measurements be provided as context - are the increases referred to micro-scale street level or local scale observations? Very strong gradients exist horizontally and vertically in the boundary layer.
16. 2452 - this is not a good approach for simulating CO<sub>2</sub> concentrations - there should be relations developed to the sources e.g. fraction of roads. At the very least evidence should be presented to substantiate such an approach.
17. 2452 - equation (1 and those that follow) should be in scientific notation (rather than computer programming notation)
18. 2453 - why no interaction in the spin up? Was land cover change in that period taken into account?
19. 2453 grid cell not sell (below eqn)
20. 2454 U\* not defined; I think it is not friction velocity but shorthand Make clearer.
21. 2454 line Pg C year<sup>-1</sup> ?
22. 2455 - line 1 to end of paragraph. This material should be presented earlier. As noted above, the assumption of no vegetation in urban areas is inappropriate.
23. 2455 line 8-10 does this also assume no vegetation in urban areas?
24. 2455- line 25 the soil water would be impacted by the lack of vegetation in the cities
25. 2456 the results are dependent on a poor initial assumptions
26. Table 1 - values should be specified in addition to Y/N
27. Table 2 - give the height for the comparisons - surface level? Higher in the boundary layer?
28. Figure 1 Really not needed if included Time (year)

29. Figure 2 - indicate grid cell size in caption
  30. Figure 3 - more explanation is needed in the caption
  31. Figure 4 provide details on data source
  32. Figure 5 superscripts needs to be fixed in key 33. Figure 6 superscripts needs to be fixed. Indicate area in caption
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