

Dear Editor,

The Authors have addressed most of the questions in an acceptable way and have revised the manuscript accordingly. Still I am not fully convinced about the terms 'historical urbanization' or 'prior to human settlement'. Clearly it is a sensitivity study on the effect of urbanization (roughness elements, excessive heat) on boundary layer structure (dynamical, thermal) which in turn feeds back on chemical reactions and chemical transport processes.

Using identical emissions for different model scenarios further does not relate to a 'true' development but highlights more or less an idealized analysis which tries to separate chemical and dynamical effects. A minor point here is, that 'shrubland' is not supposed to be the dominant land use from 'before human settlement' I think, but more a combination of wetland/grassland/shrubland however. Maybe try to just highlight more prominently that the sensitivity study purely treats the conversion from 'real' urban morphology to shrubland for the urban area of LA. In this case I would also recommend to change the term 'present day' to 'Urban'.

Please use the term WRF-Chem instead of WRF/Chem

Compared to your past work, what is the benefit of including the 'shadow model'?

Question 1: The scope of the study...

Please further highlight your conclusion about the 'most important land surface factors'

Question 2: irrigation module

I still do not get the benefit of using the irrigation module and not discussing the sensitivity on the model results.

Question 3: Past model exercises have shown, that including the multi-layer UCM rather than the single layer model is not per-se a more complex exercise, as it basically just involves changing a switch in the namelist.input. In my understanding, the urban canopy model is further not coupled directly to WRF-Chem but to the (Noah) land-surface model and the link to air chemistry works over the changed atmospheric dynamics. It is correct though, that only a couple of boundary layer schemes do work with BEP and the vertical levels have to be adapted, but besides the potential higher computational costs, there should not be an enormous amount of extra work. Please comment briefly on that in the revision, or leave out some of the statements.

Question 10: introduction

How did recent studies make it possible to utilize 'satellite land surface data'. What is meant by the latter term?

Comment Line 86:

still unclear about the term 'meteorology can affect emission rates'

Comment to Line 119:

The way the urban canopy model treats the land surface is not different to other existing studies. The mean values of the various parameters for a grid cell classified as 31,32,33 however are calculated from a potentially higher resolution and state of the art input data set. Maybe I am wrong here, but as you are not considering the tile-approach, the UCM essentially should treat an urban grid cell also as 'homogenous'. I think it is fair to say something like 'the urban canopy model is configured for the urban area of Los Angeles, whereas the values in each urban class are calculated including high

resolution land surface/building data. Not sure though if the impact of this high resolution data set on the final result differs much compared to a more simple urban canopy parametrization and what would be the effect on the difference between Urban-NoUrban.

I would recommend to better clarify these points in a revised version in the methodology and discussion/conclusion section.

Abstract

change the term 'before human settlement' here

Underestimation of PM 2.5:

The main reason for underestimation of the PM_{2.5} concentration in my opinion is the vertical resolution of the model in combination with the problem in comparing point with grid cell. Much of the pollutants measured at the surface might well be diluted by vertical mixing within the first 10s of meters. Can you please present this discussion more clearly, stating further if the particularly poor correlation has the same reasons. I can understand that these systems are not able to picture near surface concentrations, but however you should try to highlight better what are the main points you are interested in (e.g relative differences instead of absolute values).