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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The regional impact of urban emissions on climate over central Europe: present and future emission perspective" *by* Peter Huszár et al.

Anonymous Referee #1

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The regional impact of urban emissions on climate over central Europe: present and future emission perspective

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General comment:

Huszar et al., (2016) makes use of the coupled regional climate model RegCM4.2 and chemistry transport model CAMx with two-way interactions to study the regional impact of urban emission of Central Europe cities on climate for two periods, (2001-2010) and (2046-2055). Numerous simulations are done to evaluate the impacts of ozone and various aerosol species. Authors find that non-CO2 emissions are not the main

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players to impact regional climate, while the urban canopy meteorology plays a major role. Despite the authors find negative bias in surface temperature and positive bias in precipitation, the coupling between regional climate model and chemical transport model is a useful and valuable tool and the modeling approach presented is scientifically reasonable. The paper is in general a systematically organized one. I believe the study could benefit the research community after clarifying or providing scientific evidence regarding the items listed below.

Specific comments:

1. P.5, For the future emission used in the study, it is said "A moderate climate policy is assumed . . ." on p.5 (line27), how would the findings change if mitigation strategies in moderate climate policy fails, or not achieving the emission target? Could the authors provide some context about this? Especially, authors remarked in the conclusion (p.13 beginning from line 10), that the radiative impacts of urban emission presented here are at lower limit. It would be essential and interesting to compare the radiative impacts of chemical perturbation under a less-successful mitigation climate policy and to the one presented here for moderate climate policy.

2. P.7, session 3.1 model validation, suggest to write a brief summary about the validation of chemical species here to facilitate the readers' understanding.

3. P.7 and P.10, model biases in surface temperature and precipitation would greatly affect the aerosol loadings within the boundary layer through, for example, wet scavenging and turbulent eddy transport of aerosols. Moreover, the vertical distribution of the aerosol species and ozone would also be affected by surface temperature and precipitation. Although the authors give reasons for the model biases (P.10-P.11 session 4), the author should further elaborate and provide support about the findings in this study is robust or at least not significantly affected by such model biases. Noting that authors already partly addressed (P.13 line 11-12) that the radiative impacts will be under-predicted, it would be good to give some quantitative measure of the underpre-

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diction or some sensitivity test results to strengthen the conclusion.

4. P.11 line 30-31, it is about the long-wave heating rate and temperature of air and the surface. It would be more convincing to provide numerical results and/or figures about the vertical heating rate profiles obtained from different simulations. Especially because the model results are known to have negative surface temperature bias.

5. P.12 line 31, suggest to provide results of atmospheric stability obtained from different simulations to further support the argument "...delayed propagation of aerosol signal...".

6. P.13 line 3, please clarify how to reach the number "10% of the total cooling" or relate to other session in the paper. It is not clear to readers how author reach this "10%".

7. P.13 line 22, "...climate impact of urban emissions is very small..." but P.13 line 10, "... lower limit", then it is not legitimate to say "climate impact of urban emission is very small,..." Please rephrase appropriately.

Technical comments:

1. Abstract (line 17), suggest removing the minus sign in "... -1 m and -6 m decreases ...", the minus signs cause confusion. The word "decrease" is sufficient to mean reduction.

2. Abstract (line 22), what do you mean by "... urban surface trough urban canopy meteorological effects"? Do you mean "trough" or "through"?

3. P.2 (line 20-21), suggest rephrasing the sentence, it is too long to be understood.

4. P.3 (line 35), Do you mean "Our region of focus..."?

5. P.11 (line 21), "tinner" should be "thinner"?

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