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Comment

Interactive comment on “A numerical study of the contribution to the air pollutant in Beijing during CAREBeijing-2006” by Q. Z. Wu et al.

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Anonymous Referee #2 We thank the referee for the precious and constructive comments. Our detailed replies are given below.

Specific comments: p.5275, line 13-17: I do not understand this sentence. Provide a more complete explanation of what you did.

p. 5276: I disagree that ‘The Supplements provides more details on the tagged method’. The supplement does show 2 nice animations of a tag and how it evolves with time. I think a little more description of the tagging is needed. Tagging SO₂ and PM₁₀ is straightforward. Is NO₂ emitted directly and those emissions tagged? Or is NO emitted and then NO₂ formed? How is O₃ tagged? This is the sort of information

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I expected in the Supplement. I think it would also be appropriate in Section 2.2.

Reply: We will revised it following your comments in the revised version. p.5275 (line 13-17): The sentence has been deleted in the revised paper since it did not underline any particular process for MM5 simulations. The description was not therefore relevant.

p.5276: The air pollutant was tagged after emission and chemical reactions. In the supplement, the animation with 192 time steps has been provided and more description has been added in the revised paper. Concerning the NO₂, a part was emitted directly and tagged; the other part was formed from NO and tagged after chemical reactions. The ozone (O₃) was tagged after its formation as shown in supplement.

Section 2.3. Explain what sort of revising was done to the Streets inventory. Reply: Thank you for your comments. No specific revision has been performed on the regional Street inventory. Based on the Street et al., (2003), the main update was operated on Beijing local and surrounding areas emissions. We added updated personal communication data, mobile emissions, power plant emission of Beijing and its surrounding provinces (Tianjin, Shanxi, Hebei, Shandong, Inner Mongolia), the detailed local emissions data base of Beijing, industrial emissions of Tianjin and Hebei.

p.5278, line 17: What are 'Layer-2' and 'Layer-3'? Reply: Thank you for your suggestion. In this study, we used the observation from the Institute of Atmospheric Physics, Chinese Academy of Sciences (IAP) tower station. This station locatse at the north of the urban Beijing with a meteorological tower of 325m height, air pollutant measurements setup at 47m, 120m and 280m height, specified as vertical Layer-1(47m), Layer-2(120m) and Layer-3(280m) in the manuscript paper.

p.5281: Give more explanation about 'the upper layer'. Why was this altitude picked? 'the upper layer' is not a very explanatory label for this, and confusing. Isn't it still within the boundary layer. Throughout the paper I would use 'at 1 km' instead of 'at the upper layer'.

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Reply: The term of upper layer was simply used to compare the horizontal contribution at the surface layer to that at the 1.1km layer, since significant difference exists between estimated contributions for tagged species at the two considered layers. However, as you suggested, the term of upper layer has been changed into 1.1km layer in the revised paper.

p.5286, line 8: I don't understand how the analysis shown was 'separating pollutant transport layers'. Either this sentence should be rewritten to say that you looked at the surface and at 1 km, or the earlier discussion should say how the 'separating' was done.

Reply: The sentence has been revised as: "In addition to improved estimation of the contribution from nearby regions by considering different layers of pollutants transport, another important result from this study was."

Grammar: Abstract: Line 12: Define 'upper layer' Reply: the term of upper layer has been replaced by 1.1km layer.

Line 14: Country -> County ? Reply : County

Introduction, line 27: 'in-deep' -> 'in depth' p.5273, line 9: challenge-> challenging line 10: applied the CMAQ model p.5275, line 9: 'performed to' -> 'performed for' p.5276, line 2: 'produce' -> 'production' line 7: the jth grid is outside line 21: resting -> remaining line 22: emissions (spelling) p.5280, line 13: 'there was clear evidence' line 20: 'but with less amount' -> 'but with less' or 'but with lower amounts' p.5281, line 19: estimation of the contributions line 20: with a contribution p.5282, line 5: significantly -> significant line 23: particle matters -> particulate matter p.5283, line 9: 'pollution in Beijing was dominated' p.5285, line 28: 'was' -> 'is' p.5286, line 5: '22 tagged emissions regions'

Reply: thank you for your suggestions, above grammar errors have been corrected in the revised paper.

p.5275, line 6: 'p-vertical' -> pressure ? lines 11-12: the tense of this sentence makes

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it confusing Reply: the grammar errors have been corrected in the revised paper

p.5276, line 10-11: rewrite start of sentence: Compared to a sensitivity analysis where emissions from one region or source are switched off, : : : Reply: the grammar errors have been corrected in the revised paper

p.5278, line 14: rewrite: 'illustrating properly' Reply: the grammar errors have been corrected in the revised paper as "illustrating properly"

line 22: what do you mean by 'simulated out'? rewrite this here, and other places. Reply: "simulated out" has been replaced by "simulated"

p.5279, line 25: rewrite: 'in linkage' p.5280, line 6: 'entry-ways' -> 'pathways' (also other places in paper) Reply: the grammar errors have been corrected in the revised paper

line 11: what do you mean by 'accumulation/extinction processes' ? Reply: "accumulation/extinction process" has been replaced by "accumulation"

p.5282, line 4: except in Pinggu (or except from?) Reply: except in Pinggu County

p.5282, line 17-19: rewrite sentence – tense is wrong, meaning not clear Reply: The sentence has been rewritten as" The present result is undoubtedly helpful for more effective SO₂ control strategy over Beijing, especially for long-term county scale emission control."

p.5283, line 16: 'tracer gases' -> 'trace gases' , and what do you mean by 'more transportable'? Reply: line 16: the sentence has been rewritten as" the velocity of the transport of trace gases is higher than that of particulate matter which."

having a longer lifetime? Are transported greater distances? Reply: "are transported greater distance"

p. 5284, line 13-17: This sentence is hard to follow.

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Reply: The sentence has been corrected as:” the contribution from the nearby regions to NO₂ pollution in Beijing showed almost similar feature as that of PM₁₀ and SO₂; the percentage of the surrounding contribution (essentially from the southern regions) at the 1.1km layer was much higher than that at the surface layer (Fig 11)”.

Fig. 2 caption: should be ‘red shading indicates urban areas’. {could be ‘stands for’ instead of ‘indicates’}. Please say what other colors mean. Fig. 3: explain ‘Layer-2’ and ‘Layer-3’ in the caption. Fig 6: explain ‘upper layer’ in the caption. ‘the grey bars : : ’ should be the start of a new sentence: ‘The black bars and numbers in each county indicate the fraction of SO₂ in Beijing that comes from that county.’ Fig. 8 (11): say same as Fig 6 except for PM₁₀ (NO₂). Fig. 13: say upper left/right, lower left/right instead of up and down. What altitude are these plots?

Reply: Thanks very much for your suggestions! These grammar and technical errors have been corrected in the revised paper.

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