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## ***Interactive comment on “Effects of business-as-usual anthropogenic emissions on air quality” by A. Pozzer et al.***

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This manuscript describes the likely air quality impact of a historical and future emission scenario that assumes 'business as usual' political practices, as simulated by the EMAC model.

The manuscript is well written, and I recommend it be published with minor revisions.

I have one moderately important recommendation:

I feel the term 'per capita multi-pollution index (PCMPI)' is misleading because per capita usually implies 'per person' and implies the quantity divided by the number of people. This is not what the authors use (appropriately so). I recommend that the name of their function be renamed to 'population weighted multi-pollution index (PWMPPI)'.

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Note that this is only a change in the name.

I have the following general minor suggestions:

- 1) Because I am most involved with simulating the global background state of the atmosphere, I was surprised to see such a large discrepancy between the CO predicted by the model and the CO measured in urban areas. I do not question the authors' explanation that this is caused by measurements being made local pollution that is unresolved by the model. Since CO is such a long-lived gas, I therefore assume that this problem affects the other species too. What I would like to see in the paper is a brief comment about the implication for the validation of the other species, and whether this has any implication for the results and conclusions of the paper.
- 2) Although the emission scenario assumes that there is no change in air pollution technology, the scenario does assume that energy efficiency increases (p9626, line 16). I would like to see a comment to clarify whether or not these assumptions are consistent (I expect they are consistent). This will also help highlight that even this pessimistic scenario implicitly assumes some improvements.
- 3) There are some places in the manuscript where the words sound as if the predictions for the scenario are facts rather than model predictions. I am sure this is the result of the authors working to write a clear paper that is not burdened by repetitious caveats, which is a good goal. However, I suggest the authors consider whether there are places and ways that the manuscript can be tweaked to make it clearer to the reader when the manuscript is reporting model predictions rather than facts, without making large changes. I stress that this is a minor concern.
- 4) I note that there are several weblinks on pages 8627-8. I mention this only because I am not familiar with journal policy on the inclusion of weblinks.

I have several specific minor suggestions for the consideration of the authors:

p8618, line 9: Replace 'feasible' with another word, such as: reference, possible, plau-

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sible, realistic, or likely.

line 25: Replace 'Following the' with 'Following this'.

line 27: Delete the last 'the'.

p8619, line 2: Insert 'a' after 'is'.

line 7: Rearrange to: 'Air quality is a major issue in megacities worldwide, which are increasing in size and number.'

line 9: Add comma after 'sources'.

line 11: Add comma after 'countries'.

line 24: Add a reference for EDGAR-CIRCE, or mention that it will be discussed later.

line 27: Rearrange to clarify.

p8629, line 3: Insert 'and' between 'optimistic' and 'pessimistic'.

p8621, line 2: Might also mention that 'It is also important for policy makers to understand the consequences of inaction.'

line 3: Replace first 'The' with 'This'.

line 9: Replace 'from' with 'between'.

line 11: Replace 'the' with 'our'.

line 17: Replace 'an' with 'a'. Replace 'of' with 'for'.

line 18: Replace 'and with a vertical resolution of 31 level,' with 'with 31 vertical levels'.

line 20: Replace 'and here' with 'so'. Add 'here' to end of sentence.

p8622, line 2: Insert 'described' after 'submodel'.

lines 1-4: It would be helpful to specify the general type of the aerosol model (eg, bulk,

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modal, sectional).

line 4-5: Replace with 'The emission and deposition routines are described in ...'

line 11: I prefer to use 'GHGs' when referring to multiple greenhouse gases.

line 13-14: Delete 'The boundary conditions of .. ECHAM5,'

line 15: Delete 'the'. Delete the comma.

line 18: Replace 'a climatology' with 'climatologically representative'.

lines 18-21: Delete the whole sentence: 'The same dynamics ...', because it duplicates earlier comments in the paragraph.

line 21: Replace 'performed' with a comma.

line 23: Add a comma after 'total'.

line 27: It may help to describe how similar SC\_natural is to 1850 conditions.

p8623, line 9: Replace 'in Sect 2' with 'below'.

line 11: Replace 'of' with 'to'. Insert 'concentration' after 'radical'.

line 12-13: Delete the whole sentence 'The GHG used....', because it has already been stated.

p8624, line 6: Insert 'and' after 'processes'.

line 8: Delete 'world'.

line 13: Replace 'emissions' with 'emission'.

line 16: Add references for the POLES model and scenarios (if available).

line 21: Insert 'likely' after 'worst'.

line 22: Replace 'is' with 'was'. Replace 'since' with 'in'.

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line 25: Replace 'combination' with 'combinations'.

line 27: Replace 'equivalent' with 'equivalents'.

p8625, line 1: Clarify whether 'Tg' is of carbon or the whole chemical.

line 2: Add a comma after '2005'.

line 4: After 'situation' insert ', since it will strongly depend on political choices'.

lines 8-9: I am not sure what is meant by the final clause: "indicating ....".

line 10: Add comma after '2005'.

p8626, line 6: Replace 'sources' with 'source'.

p8627, line 26: Replace 'of' with 'from'.

p8626, line 15: Replace both instances of 'database' with 'databases'.

line 17: It would be helpful to know whether the observations sample uniformly over 24 hours.

p8629, line 27: Delete 'respectively'.

p8630, line 11: Replace 'what' with 'that'.

p8631, line 15: Replace first 'The' with 'This'. Replace 'also appears by the' with 'is consistent with our'.

p8632, line 11: The quality of the agreement between model and data is a matter of opinion. Personally, I would replace 'very good' with 'reasonable'.

p8633, line 10: I am not sure what is meant by 'since 2005'. Should it be 'in 2005'?

line 19: Replace 'in' with 'into'.

p8634, line 2: Replace 'accord' with 'accordance'.

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line 6: Replace 'influenced' by 'affected'.

line 11: Replace 'by' with 'from'.

line 14: Replace 'will be' with 'is'.

line 18: Add a comma after 'Also'.

line 19: Add a comma after 'America'. Replace 'although' with 'because'.

line 20: Replace 'can' with 'will'. Replace 'of' with 'in'.

line 26: Add a comma after 'SC\_2050'.

P8635, line 1: Replace 'Different from' with 'In contrast to'.

line 3: Replace 'in future the' with 'in the future its'.

line 15: Replace 'and' with 'to'.

line 16: Delete 'the'.

p8636, line 28: Replace 'recycling' with 'production'.

p8637, line 1: Insert 'the' before 'future'.

line 2: Replace 'recycling' with 'production'.

lines 8-13: It would help to mention why PM2.5 is so large over deserts and the southern ocean (presumably dust and sea-salt emissions).

line 15: Rearrange final clause to say 'while SO<sub>2</sub> and NO<sub>x</sub> emissions are both projected to increase by a factor of two.'

line 18: Would it be appropriate to replace 'larger' with 'largest'?

line 27: Replace '/' with 'and'.

p8638: line 8: Replace 'a' with 'an'.

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line 18: Replace 'such' with 'this'.

p8639, lines 3-6: I do not understand the sentence 'For these compounds...'. Can it be rephrased?

line 17: Rephrase sentence to say 'Hence, the MPI definition must be used carefully...'.

line 18: Add a comma after 'values'.

p8640, line 9: Delete 'a'.

line 18: Delete 'an'. It might help to clarify whether increased emissions from ships contributes to the appearance of intercontinental connections.

line 19: Replace 'extends' with 'extend'.

line 20: Add a comma after Hemisphere.

p8642, line 3: Replace 'estimated time normalized (ie decadal)' with 'rate of'.

line 4: Delete 'more or less'.

line 5: Replace 'very drastic' with 'rapid'.

line 19: Delete 'relatively'.

line 20: Replace 'low' with 'poor'.

line 21: Replace ', have both' with 'both have'. Note the deletion of the comma.

line 29: Delete comma after 'that'.

p8643, line 1: Replace 'strongest' with 'largest'.

line 8: Replace 'petrol' with 'oil'. Replace 'deteriorate' with 'degrade'.

line 12: Delete 'relatively'.

line 16: Replace 'countries' with 'country'.

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line 22: Delete 'per capita'.

line 23: Replace 'shows' with 'includes'. Delete 'are shown to'.

p8644, line 23: Add a comma after 'region'.

p8645, line 1: Replace 'extending' with 'weighting'. Replace 'with' with 'by'. Replace 'per capita' with 'population weighted'.

line 2: Replace 'decreased' with 'deteriorated' (to avoid confusion about the direction).

line 3: Add 'the' before 'future'. Add a comma after 2050.

line 4: Delete 'Especially'.

line 20: Delete the second 'the'.

line 21: Replace 'research' with 'project'. Delete 'has'.

p8658: Replace 'The yearly standard deviations' with 'The standard deviations due to the seasonal cycle'.

p8672: Replace the '/' in the caption with 'and'.

p8673: Replace the '/' in the caption with 'and'.

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Interactive comment on *Atmos. Chem. Phys. Discuss.*, 12, 8617, 2012.

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