**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "TransCom continuous experiment: comparison of ^{222}Rn transport at hourly time scales at three stations in Germany" *by* S. Taguchi et al.

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This manuscript compares the Radon-222 simulations from the 'TransCom-4 continuous' model intercomparison against observations at 3 sites in Germany.

This is a valuable paper that deserves to be published after modest revisions.

The paper is generally well written in good English.

I believe there needs to be one moderate change, and I have a number of minor suggestions for the authors, which I list below.

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—- Moderate change —-

+) In figure 6 there are vertical lines indicating the 1-sigma variability in the monthly-mean difference. It isn't totally clear whether this variability is the spread among the datapoints in each month, or the uncertainty in the mean (ie the data spread multiplied by 1/SQRT(N)). I suspect it is the former. I think it is important to include the uncertainty in the mean in some way, so that it is clear whether the differences in figure 6 are statistically significant or not.

—- General, but minor, suggestions for the authors —-

+) I am not familiar with the distinction between local and non-local boundary layer schemes, so I suggest this be explained briefly somewhere in the manuscript.

+) For heights and altitudes I would like to see a clarification of the reference level, ie whether the heights are above mean sea-level (AMSL), above ground level (AGL), or above the model surface.

+) I usually see the diagrams invented by Taylor (2001) referred to as "a Taylor diagram" rather than "Taylor's diagram"

—- Specific minor suggestions for the authors —-

+) 19255, line 4: After 'simulated' insert 'by the models'.

+) 19255, line 20: Replace 'for emission control to' with 'to understand and'.

+) 19256, line 8: Replace 'is simulated are' with 'was simulated were'.

+) 19256, line 16: Insert commas after 'air' and 'concentrations'.

+) 19256, line 17: Insert comma after 'level'.

+) 19256, line 24: I suggest avoiding 'etc'.

+) 19256, line 25: Replace 'while it is' with 'and'.

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+) 19257, lines 7-8: Replace 'considered to be appropriate in terms of horizontal distances as well as vertical separation' with 'generally within the same model gridbox horizontally, but Freiburg is a low-level site and Schauinsland is a mountain site'

+) 19257, line 15: It is unclear whether the intention is to say that the ABL schemes were evaluated in the current manuscript or by Olivie, et al., 2004.

+) 19257, line 15: Replace 'TM3' with 'the TM3 chemistry transport model'.

+) 19257, line 29: I suggest avoiding 'etc'.

+) 19258, line 1: Insert 'and' before 'a spatially'.

+) 19258, line 15: After 'used', insert ', including the Transcom4 simulations analyzed for this paper and ...'

+) 19258, line 24: I suggest splitting the paragraph after 'BLH'.

+) 19260, line 27: It is unusual to use seven-hour means for '12-18 UTC', so please check that this is what was intended.

+) 19260, line 29: Delete comma.

+) 19261, line 7: Delete comma.

+) 19261, lines 15-23: I suggest mentioning whether or not differing soil types and conditions could provide an explanation.

+) 19262, line 22: I prefer 'hybrid' rather than 'mixed'.

+) 19263, line 6: The dashes look like minus signs.

+) 19263, line 21: I suggest referencing the paper by Taylor:

Taylor, K. E. (2001), Summarizing multiple aspects of model performance in a single diagram, J. Geophys. Res., 106(D7), 7183-7192.

+) 19264, line 10: I suggest referring to section 4.2.

+) 19264, line 17: Add 'of 222Rn' at end of sentence.

+) 19264, line 23: Could you clarify how the sampling of model K was done? Was it by interpolation?

+) 19265, lines 9-12: Replace sentence with 'We compared the model 222Rn concentrations at each altitude in the model to the observed concentrations at Schauinsland (1205m) using hourly data (Fig. 5).

+) 19265, lines 12-13: I am not sure what this sentence is meant to convey. I suggest clarification.

+) 19265, line 19: Add 'of Fig. 5' to the end of the sentence.

+) 19265, line 26: Replace 'near' with 'slightly below'.

+) 19265, line 26: At end of sentence add 'as seen by Patra, et al., 2008'

+) 19265, lines 26-28: Were the modeled concentrations from the nearest level or from interpolation?

+) 19266, line 13: Replace 'models overestimate' with 'mean-model overestimates'.

+) 19266, lines 21-24: Comment on whether or not this could be explained by uncertainties in the obervations.

+) 19266, line 24: Start new paragraph before 'At'.

+) 19267, line 1: It might be good to show the 800m mismatch in Fig 6.

+) 19267, line 8: Replace 'which' with 'that'.

+) 19268, line 4: Replace 'the same' with 'similar'.

+) 19268, lines 16-18: Should also mention that 'models also implicitly average over small scale features within a grid-box which reduces their variability.'

+) 19269, line 4: Delete 'Letters correspond to each model.' This is stated in the figure

caption.

+) 19269, lines 22 & 24: Should 'emanation' be 'exhalation'?

+) 19270, line 6: Replace 'super simplified, primitive' with 'simple'.

+) 19270, line 19: The usual spelling is 'Heaviside'. However, I believe that the function used by the authors is not a Heaviside function. Rather, the function is variously known as a 'top-hat' function, rectangular function, and boxcar function.

+) 19270-1: I suggest making the second letter a subscript for hx, hi, is, and ie.

+) 19271: I do not understand equation 2 as it is written. I think it is intended that it be a piecewise function with the first line applying when i \= ie, and the second line applies when i=ie. It current looks like f is a function of (i=ie).

+) 19271, lines 10-11: It might be clearer for the reader to put these numbers in a table.

+) 19271, line 11: Add commas around 'respectively'.

+) 19271, line 13: I think 'cyclonically' should be 'cyclically'.

+) 19271, line 27: I think it is false to say that a reduced nighttime BLH will make day time concentrations higher in the model. The daytime concentrations will only depend on the nighttime mass and the daytime ABL height.

+) 19272, line 2: I think it will be clearer to replace 'entrainment' with 'loss due to that ventilation'.

+) 19272, line 2: Insert 'subsequent' before the second 'daytime'.

+) 19272, lines 10 & 15: I would prefer 'regions' rather than 'patches'.

+) 19273, lines 4-5: Replace 'Future work might want' with 'It may be appropriate in future work'.

+) 19273, line 12: This seems to be too strong a statement. I suggest replacing 'not

reproduced in any model' with 'poorly reproduced by the models'.

+) 19273, line 14: Insert 'observations' after 'daytime'.

+) 19273, line 17: Insert 'the' before each 'seasonal'.

+) 19274, line 3: Delete 'at sites', and replace 'reliable' with either 'insufficient' or 'accurate'.

+) 19274, line 8: Modify line to say '... has largely been ignored up until now. Unfortunately, ...

+) 19274. The Acknowledgements could be shortened by referring to Law, et al., 2008.

+) 19280. Table 1.

-) The resolution for model J should be '2.5x2.0'.

-) I think all the semi-colons should be changed to colons.

-) In the caption, I prefer 'hybrid' instead of 'mixture'.

-) In the caption, definitions are needed for 'on', 'off', 'NL', and 'Kzz'. For 'Kzz', the description could be 'implicit scheme using diffusion coefficients from the metdata'. A more concise option is to reference Rotman, et al., 2008:

D. A. Rotman, C. S. Atherton, D. J. Bergmann, P. J. Cameron-Smith, C. C. Chuang, P. S. Connell, J. E. Dignon, A. Franz, K. E. Grant, D. E. Kinnison, C. R. Molenkamp, D. D. Proctor and J. R. Tannahill, Journal of Geophysical Research-Atmospheres 109 (D4) (2004).

+) 19281. Figure 1. It will help many readers if the names of the countries are added to the figure.

+) 19282, Figure 2 caption.

-) Add '(a)' before 'midnight'.

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-) Delete 'a' from the brackets.

-) Insert '(b)' before 'afternoon'

+) 19284, Figure 4 caption.

-) Add 'of 222Rn' after 'concentrations'.

-) At end of caption add: 'See text for details. Where sampling locations are the same for different models only one letter is shown.'.

+) 19285, Figure 5:

-) Add '(N.S.D.)' after 'deviation'.

-) Replace 'and' with 'to' in first line.

-) Replace 'in the left side' with 'on the left side'.

-) What are the strange bars that the arrows point to?

+) 19286, Figure 6.

-) As mentioned above, I think it is important to show the uncertainty in the mean for each month.

-) Some of the letters appear to be strangely bold.

+) 19287, Figure 7: Replace lowercase "o" in the caption with an uppercase "O" to match the figure.

+) 19289, Figure 9: I suggest adding the simplified ABL function used in the box-model.

+) 19290, Figure 10, caption: replace 'one dimensional model' with 'our one dimensional model, as described in section 5.1'

—— end of suggestions ——

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 19253, 2011.