

## ***Interactive comment on “Technical Note: A new coupled system for global-to-regional downscaling of CO<sub>2</sub> concentration estimation” by K. Trusilova et al.***

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Answers of authors are marked with "A:"

p. 23191, l. 4: the 13% figure was obtained by Gerbig et al. (2003) in specific conditions. Does it apply to the present study with its domain and its 72h trajectory length?

A: Indeed the statistical error for the regional contribution to the CO<sub>2</sub> mixing ratio estimated by Gerbig et.al is not strictly 13%. We corrected this statement in the text by saying “~13%”.

Equation (2) and (3): the integral on x should be written with the same typeset in both

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equations

A: done.

p. 23191: since this paper is devoted to validation, it is a pity that the PoI does not cover a full year.

A: as this manuscript was being written the surface fluxes calculated by the VPRM model used for the regional domain were not available for winter month. The data was missing due to difficulties with interpretation of MODIS data with snow cover.

p. 23194: why are the CNF s not assigned from Fposterior, consistent with the framework described in Roedenbeck et al. (2009)?

A: Certainly we could have used the Fposterior from the framework of Roedenbeck et al. (2009). Fposterior was retrieved by the inversion, which used the TM3 model and included the set of stations used for model verification in this paper. Using the Fposterior would provide apriori better match of TM3 model to observations than of the STILT model. For the fair model comparison we used the not-optimized surface fluxes (VPRM and IER) for the forward simulations of TM3 and TM3-STILT.

p. 23195, l.19: the restriction to hours between 10:00 and 17:00 UTC is arbitrary and should actually vary from station to station (or at least with respect to station height). In any case, in a validation study, data selection can be relaxed and other times could be studied.

A: we chose this time period in order to analyse signals of the well mixed atmosphere with no complex patterns due to nocturnal mixing, which the coarse resolution model TM3 would not resolve and the STILT model may resolve poorly. This time period was also used in the standard global inversion with the TM3 model.

p. 23197, l.2: since not all hours are included, the autocorrelation includes a varying number of points for each lag. This may be confusing and should be avoided.

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A: it would not be possible to include the same number of points into the autocorrelation analysis because measurement points are available in rather irregular time intervals (with multiple gaps). That is why we estimated confidence intervals for the autocorrelation values

Table 1: how did the authors choose the sampling level for each model? For instance, it would not be fair to use the lowest level for TM3 in the case of high altitude stations.

A: We added the explanation into the chapter “3 Model simulations”: The CNF value was sampled from both models in the following way: the sampling level in the TM3 model was defined above the sea level at which the mixing ratio of the corresponding grid cell was taken; the sampling height in the STILT model was defined above the ground level. Values of CNF from both models were compared to CNF extracted from observations.

Table 2: The unit of the RMSD cannot be guessed.

A: we added the units to the Table 2

Table 2: what the authors call ‘variance’ is actually the standard deviation. The former is the square of the latter. This should be changed.

A: done

Fig. 2: Some points seem to be linked over data-void period, which should be avoided.

A: we removed the lines that connect data-void periods longer than 30 days (1 month)

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 23187, 2009.

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