

Interactive comment on “Continuous CO₂/CH₄/CO measurements (2012-2014) at Beromünster tall tower station in Switzerland” by E. Satar et al.

Anonymous Referee #1

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The paper is describing the first two years of measurements of atmospheric mole fractions of CO₂, CH₄ and CO at Beromünster, Switzerland. The time series are analyzed to characterize seasonal, diurnal and correlation between species. Since this is a new monitoring site, I do recommend the paper for publication if the following points are considered: - the accuracy and repeatability of the measurements must be developed, even if this is more developed in another submitted manuscript. It is important to know the precision of the measurement, and how it has been assessed; - similarly the storage flux estimates are lacking an evaluation of the uncertainties, making very difficult to know what are the significant results. Only very vague comments are done about the uncertainties. - the authors must add information about the data availability, and where the time series can be downloaded.

Measurement system: I understand that the measurement protocol is fully describe in

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another manuscript currently under discussion, however I would request the authors to add information about 1/ the calibration of the instrument, and 2/ the assessment of repeatability and accuracy, and how it is controlled.

Seasonal variations: Background vs local/regional signals: I found confusing the presentation of the pollution events due to local and regional sources/sinks. You have to make it clear what do you consider as a 'regional' event. High values observed in winter during hours to days most probably correspond to frontal system passing over Western Europe. I am pretty sure that those events could be observed in other background stations in Netherlands, Germany, France or Italy. To me such events correspond to the transport of pollution events at the European scale by synoptic processes. Then in the discussion I noted some inconsistencies, like for example on Page 6 where you explained that after eliminating the so-called local/regional events you attribute the spring maximum observed for CH₄ to the agriculture source in Switzerland. To my understanding, Switzerland influence is part of the regional contribution, and so should not influence the background signal. Could you please have a much more clear definition and interpretation of local, regional, background scales?

I am surprised that you do not use any information about wind speed/direction to interpret and possibly classify the dataset. Don't you have such meteorological observations ?

Page7 (Line12/14): The explanation for having lower minimum at the topmost level of the tower compared to the surface does not convince me. The last sentence: "During summer and spring months when photosynthesis is active and vertical mixing is strong, atmospheric CO₂ accumulates near the surface", definitively needs more explanation, especially by making a clear distinction between daytime and nighttime signals.

Correlations between species Page 9 (line 4): Do you have confirmation of the winter-time CO maximum emission by the inventories ?

An analysis of the species correlations with back-trajectories would be useful, for ex-

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ample to check if you measure different CO/CO₂ ratios for air masses originating from Germany or France.

I agree with your analysis of the dependence of correlations slopes and r² to the sampling level. I would suggest adding a comment about the CO/CO₂ correlation in summertime which is more dependent to the height, which you can probably explain by the decoupling of CO/CO₂ sources due to the biosphere activity at this season.

Diurnal variations Could you please remind in this section which dataset you are using for the analysis of diurnal variabilities? I suppose you are using the full dataset without local/regional events filtering.

Page 10 (Line 11): Your interpretation of the CH₄ vertical gradients (higher mixing ratios near the surface => strong local sources) seems quite logical. However, looking at figure 4 we see that CO has exactly the same gradient, shifted in time by a couple of hours. Would you explain similarly this gradient by local CO emissions ? Could you please clarify?

Page 10 (Line 18): You mention a pronounced diurnal cycle of CO during summer months, which appears to be in contradiction with the first comment ('diurnal variations not visible') of this paragraph and figure 3c. I guess the vertical scale of the figure doesn't allow seeing the diurnal variations.

I would expect a specific comment for November which seems quite different from other months, with stronger vertical gradients for all species.

Flux estimation

Page 11 (Line18): large uncertainties: can you please provide an estimation of those uncertainties? The figure 6 is difficult to interpret not knowing which signal is significant or not. If none conclusion can be drawn for winter months, it is probably not useful to show those values on figure 6.

Page 11 (Line 23): 1.57 +/- 0.11 : Could you precise what means the +/-0.1. Is it a stan-

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dard deviation of daily estimates ? Why those values are much lower than Winderlich 2014 results (page 12) ?

Page 12 (Line 7): Would the CO₂/CH₄ analogy could be used to estimate uncertainties on CO₂ fluxes ?

Conclusions Could you please give indications on the data availability, where can they be uploaded, and the status of the tall tower regarding the continuation of the measurements for long term monitoring ?

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