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Interactive comment on “Photochemical modelling in the Po basin with focus on formaldehyde and ozone” by L. Liu et al.

Anonymous Referee #1

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The paper describes observations and 3D CTM simulations of HCHO, O₃, CO and NO_y species downwind of the Milan metropolitan area. Ground-based observations at two different sites, as well as airborne measurements are compared with the model. Differences in HCHO in-situ and remote sensing measurements are assigned to different measurement fetches, with biogenic emissions affecting the LP-DOAS measurements only. In general the paper is well written and describes an interesting data set in one of the most polluted areas in Europe. Thus it deserves publication in ACP after some revision:

Main point:

My main criticism is that the comparison between observations and simulations is

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mostly qualitative. E.g., on page 5068 the authors state that the model results for HCHO agree well with the Hantzsch measurements at Alzate, but closer inspection of Figure 4 shows large differences in absolute concentrations (up to a factor of 2) and a phase shift in the peak values of diurnal variations between measurements and simulations after August 15. In order to get a fair idea how good the agreement is, the authors should perform the comparison in a more quantitative way. To some extent they do so, by comparing average and median values (but without citing variability reflected in the standard deviations). But it would be better to include some additional graphs, e.g. showing scatter plots between observations and simulations or relative deviations between these two. This will help the reader to judge how good the agreement really is.

Minor points:

The authors cite a number of measurement techniques that have been recently used for tropospheric HCHO measurements, but don't even mention the TDLAS technique, which has been applied successfully e.g. by Alan Fried (NCAR) in a number of measurement campaigns. Why was the TDLAS technique not included in the HCHO inter-comparison?

In the conclusions the authors state that the comparison of LP-DOAS and Hantzsch point-measurements demonstrate the importance of experimental configurations, since differences can lead to quite large deviations. This is a valid point, but the same is true for a comparison between observations and 3D model results. The grid box of the model (even at 15 km² resolution) is generally much larger than the fetch of the observations. It would be nice if the authors could comment on the value of comparing a point measurement with an area averaged model simulation.

Typos:

Page 5068, lines 26 and 29: it should read Steinbacher et al., 2005

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