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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of biomass burning and anthropogenic emissions on ozone, carbon monoxide and black carbon concentrations at the Mt. Cimone GAW-WMO global station (Italy, 2165 m a.s.l.)" *by* P. Cristofanelli et al.

Anonymous Referee #1

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The manuscript 'Influence of biomass burning and anthropogenic emissions on ozone, carbon monoxide and black carbon concentrations at the Mt. Cimone GAW-WMO global station (Italy, 2165ma.s.l.)' by P. Cristofanelli et al. characterizes CO and O3 mole fractions and black carbon concentrations measured at Mt. Cimone. The contribution of biomass burning and anthropogenic emissions is investigated using a Lagrangian particle dispersion model (FLEXPART). Five major transport events ranging from local to global scales were studied in more detail. The measurements seem to

be of good quality and the methodology / model used for data interpretation is sound and provides interesting insights to the factors affecting the observed CO and O3 mole fraction and BC concentrations at Mt. Cimone.

General remarks:

The paper is well written and clearly structured. The abstract provides a good summary of the paper. The measurements as well as the methods and model used for data evaluation are scientifically sound, and the results are an interesting contribution for the readership of ACP. The paper therefore should be published after addressing the following mainly minor issues.

Specific comments:

The term 'concentration' is used throughout the manuscript to describe CO and O3 mole fractions (unit ppb) and BC (unit ng/m3). Concentration is only correct for BC; for the gaseous species, mole fraction (or mixing ratio) should be used. Consequently, 'concentration' should also be omitted in the title.

Both 'ppbv' and 'ppb' are used to describe CO and O3 mole fractions. Only 'ppb' (or nmol/mol) should be used, 'ppbv' is not correct.

Spelling: No uniform use of American / British English (e.g. both analysed and analyzed are used in the manuscript).

Page 21405, Lines 2-4: It is stated that the CO measurements have an accuracy of $\pm$0.5%. This seems very optimistic, since the uncertainty of standards is usually not better than 0.7% (k=2) (e.g. NOAA), and drift may also contribute to the uncertainty. Please consider revising the uncertainty budget. Furthermore, RGD detectors are often non-linear, and the use of only one working standard does not account for this appropriately. Has the non-linearity of the system been checked?

Page 21406, Line 20: '. . .emissions with age less than 20 days and thus still not mixed within the atmospheric background': Would it not be better to say 'still not fully mixed'?

Mixing of emissions with background air is a process, and it starts immediately after emission.

Figures 6 and 7 are too small and hard to read in the printer friendly version of the manuscript.

Page 21410, Line 2: 'BB transport at ICO-OV accounted for a total of 21 days over the three years.' It should also be mentioned here that only events with a contribution of larger than 10 ppb were considered (if I understood correctly).

A general concern on the methodology for the detection of BB events is the difference between the 21-day running mean and the 3 hourly averages. The variability of other potential contributions to the CO mole fractions at ICO-OV are neglected; however, they may significantly influence the 21-day running mean, and detection of BB enhanced CO might become somewhat difficult / arbitrary.

Page 21410, Line 10: Are only 5 of total 16 events associated with increased CO mole fractions at ICO-OV? If yes: Why do you see no enhancement during the other events? If no: Based on which criteria were these 5 events selected?

The summary (Section 6) comprises many repetitions of the findings described in the previous sections. It should be considered to shorten the summary and integrate the parts which are new into the previous section. The paper could than end with a new section 'Conclusions' (instead of Summary), which describes very briefly the major findings of the work together with concluding remarks and an outlook.

Technical remarks:

Page 21404, Line 24: mercury vapour, not vapours

Page 21406, Line 28: 'showed' instead of 'presented'?

Page 21407, Line 15: 'thoseat' should be 'those at'

Section 3.1.2 and 3.1.3: refer also to Figure 1, since O3 and BC are also shown.

Page 21410, Line 3: 'Basing' should be 'Based'.

Page 21413, Line 4: GDAS-NCEP abbreviation needs to be spelled out.

Page 21413, Line 25/26: no commas after that and after FLEXPART

Figure S4: The numbers are difficult to read.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 21399, 2012.