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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 #2

Received and published: 16 October 2012

General comments:

This paper describes the observations of O₃, CO and BC at the Mt Cimone GAW-WMO station and analyzes the interannual and seasonal variability observed using trajectory calculations with the FLEXPART model. More particularly, the relative contributions from biomass burning and anthropogenic emissions to the observed variability is discussed. The correlations between the observed species is also investigated.

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This paper is clearly written and organized, and provides a comprehensive analysis of an important dataset, allowing the monitoring of atmospheric composition in a Mediterranean background. It is therefore interesting for the atmospheric chemistry community and I recommend publication with minor corrections/precisions, as detailed below.

Specific comments:

My main comment is that all source attribution is based on CO tracers simulated by the FLEXPART trajectory model. There should be more discussion about the reliability of this tool and of this approach. I think it's a very useful approach to get a first idea, but the conclusions are subject to uncertainties due to transport errors and – probably more importantly – to emissions uncertainties. The biomass burning emissions are extremely difficult to estimate so that I think the COfire tracer should be discussed more carefully. Although the main signatures are generally correct, specific events may be strongly over or underestimated.

This needs to be discussed as possible explanations for the negative CO enhancement values for the BB events III and IV. It is long range transport so one really expects enhancements of CO. Since it has been transported over long distances, the probability that there was transport errors in the simulations is increased. Maybe the plume actually traveled a little bit North? A quick look at satellite observations may provide useful indications (MOPITT has online visualization pages at NCAR for instance, and there is also IASI CO for 2009). Diffusion of the CO plumes during long-range transport is generally overestimated in the simulations compared to “reality”. In addition to transport errors, uncertainties on the emissions may be critical. I think that the discussion of the ER for these two plumes is therefore not convincing, and should be discussed separately and with caution.

For the discussion of the ER in the BB plumes, it would be very interesting to link the slopes with the age of the plumes. A link to the source region and type of vegetation burnt would also be extremely useful in order to better understand the information

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available in these observations.

In the discussion of the anthropogenic contributions, it would be interesting to indicate the region of origin in the case of aged plumes/long-range transport.

Technical comments:

- p. 21407, l.15: "those at"
- p. 21410, l.3: "Based on the FLEXPART..."
- p. 21410, l.20: "with respect to"
- p. 21412, l.5: "this could possibly..."
- p. 21413,l.16: " We turn now TO..."

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

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