

Interactive comment on “The influence of traffic and wood combustion on the stable isotopic composition of carbon monoxide” by M. Saurer et al.

Anonymous Referee #1

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The manuscript presented here tackles the possibility of using carbon and oxygen isotope compositions of atmospheric carbon monoxide to assess the influence of anthropogenic sources such as road traffic and wood combustion. The subject is not new and has already been widely discussed in the past (the first study probably dating back to 1977; Stevens et al.). Nevertheless, this new study applies the isotope tool to the atmosphere of Switzerland with similar success. The added value of the manuscript resides in the confrontation with a CO/NO_x-isotope model.

Still, I would have interrogations/comments that I think could help improve the overall quality of the manuscript. They are listed below:

Why do the authors restrict the CO input to only 3 different sources (wood, road traffic and background)? Even if in Switzerland, I guess that industrial emissions would play a role in the overall picture.

What defines the background pollution? Is it the "natural" end-member, or the minimum concentration (with corresponding isotope compositions) that you can encounter in Switzerland (but which already results from anthropogenic inputs)?

Answering the previous point will be able to explain why the authors can consider this background to be a constant (which in my eyes is not a given conclusion).

As the authors are stating, I don't agree that the background value for NO_x is nil, and thus should not consider it as so.

The EMPA wood stove experiment is also intriguing:

In Fig. 1 when was the sampling done? Do the data correspond to the collection of a whole "30 minutes CO". If so, why do the authors get different concentrations? My guess is that sampling was done at different times during the experiment.

As atmospheric CO is very low, I would have expected a constant d18O as soon as the combustion is producing significant CO levels. Can the authors explain why then they obtain a mixing line?

On one side of this mixing line we have the characterisation of the wood combustion, but on the other? My guess is that it should show a mixing with atmospheric end-member (characterised by a low CO content). Then can the authors explain why they find an oxygen isotope composition as low as probably 5 per mil (generally atmospheric studies yield higher d18O; see Huff Thiemens)?

The discrimination used between the wood and road traffic emissions heavily relies on the assumption that road traffic d18O is restricted to the atmospheric oxygen value of 23.5 per mil. There is no reference in the text comforting this hypothesis, and moreover, previous studies showed that depending on the vehicle, emissions in fact yielded a

larger range of oxygen isotope compositions (from 10 to more than 30 per mil). If we apply this range here, the discrimination becomes not so trivial. A missing (but at the same time I do understand it can be difficult to obtain the samples) part of the study would be a test similar to the EMPA for road traffic emissions.

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