Atmos. Chem. Phys. Discuss., 13, C8678–C8680, 2013
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Atmospheric Chemistry and Physics Discussions

ACPD
13, C8678–C8680, 2013

Interactive Comment

Interactive comment on "Vehicle emissions of greenhouse gases and related tracers from a tunnel study: $CO:CO_2$, $N_2O:CO_2$, $CH_4:CO_2$, $O_2:CO_2$ ratios, and the stable isotopes ^{13}C and ^{18}O in CO_2 and CO" *by* M. E. Popa et al.

Anonymous Referee #2

Received and published: 1 November 2013

General Comments: The manuscript by Popa et al., describes measurements of multiple greenhouse gases, and selected stable isotopes, O2, and CO for three week days in summer 2011. Measurements were made near the entrance and exit of an uphill tunnel run in Switzerland. Results are used to estimate enhancements of the various gases relative to CO2 and are reported to provide an update on emission factors for European motor vehicles. The study was carefully executed and proves useful new information relevant to ACP.

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Interactive Discussion
Discussion Paper

In terms of exposition, the paper is well-written and could be published with minimal revision. The title accurately describes the content of the paper, the paper provides useful references to related work, the scientific method and assumptions are sufficient described so that future work can repeat or extend the work to other areas to examine the generality of the results. The results provide updated emissions factors and and somewhat novel (for this reader) results of isotopic fractionation from combustion processes.

I would recommend publishing with minor revisions.

I offer the following questions/comments:

General comments:

- The automated traffic counts measured for this tunnel and other roads provides an opportunity to examine the generality of traffic present in the tunnel. The authors might arguably increase the value of the paper by including a brief discussion of how tunnel traffic conformed or differed from other roads/areas where traffic data was available.

- The enhancement ratios for N2O:CO2 are quite variable and appear to change with time of day (from 0.005 early in day to 0.025 ppb/ppmÂăby $\sim$ 1000 local time). Could it seems likely that the early N2O:CO2 ratios might be due to a ponding effect similar to that observed for CH4 (higher mixing ratio at entrance than exit). I would consider using data from more well-mixed periods.

Specific Comments:

pp 23550, line 17. Perhaps add, "of O2 depletion per CO2 enhancement".

pp 2351, line 9. Please consider adding reference to UNFCC emissions factor documents here.

pp 23559, line 5. What was the average slope of the tunnel (m/km). Is this atypical of road slopes ? Would the uphill grade lead of unusual load or emissions from the

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vehicles ?

pp 23567, line 11-15. Could meteorological conditions produce wind blowing into the tunnel exit that drive flow back toward the tunnel entrance under conditions of low traffic flow ?

pp 23574, line 7. Perhaps you might consider replacing monotonously with monotonically ?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 23549, 2013.