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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source apportionment of methane and nitrous oxide in California's San Joaquin Valley at CalNex 2010 via positive matrix factorization" *by* A. Guha et al.

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1) My only significant criticism is that despite commenting on agriculture and energy resource related emissions from the southern valley (e.g., page 6083) the authors compare the relative source strengths derived from this 6 week (May-June) study with annual-average state-wide CH4 and N2O emissions (that contain significant contributions from coastal urban areas. The authors might consider revising the abstract and discussion to be specific that their results likely differ from state-wide annual average emissions, or better yet, also attempt to compare with an inventory-based emission estimates specific to the summer-time central valley.

Author response:

Please read response to Referee # 1 on a similar line of questioning (answer # 8 in "response to comments from referee 1").

Author's changes:

Additionally, I have taken Referee # 2's suggestion and made it amply clear in the abstract and discussion that we expect differences in the relative proportion of emissions from major sources in local and state emissions distributions and focus on the differences arising in the emission factors of specific sources that should remain consistent in all comparisons.

Specific comments: page 6079, line 1: Would it be correct to state that given the overwhelming signal from livestock that the PMF analysis is consistent with the current CA inventory estimate that only _ 5% of regional CH4 emissions are derived from oil and gas operations ?

Author's changes:

I understand what you are suggesting and I have incorporated another sentence into the abstract:

"The evaporative/fugitive source profile resembles a mix of petroleum operation and non-tailpipe evaporative gasoline sources, but was not responsible for any observed PMF resolved-CH4 enhancements. The uncertainty in the CH4 estimates from the oil and gas sector in the bootstrapping analysis is consistent with the $\sim$ 3 % contribution of fugitive emissions to the statewide CH4 inventory."

page 6089, line 15-25: Why assign uncertainty to GHG and CO measurements in proportion to the square root of hourly GHG enhancement rather than measurement uncertainty? Do the PMF results change significantly if the uncertainty for each time point is estimated in proportion to the standard deviation of the sub-hourly measurements used to construct each hourly average ?

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Author's response:

Yes, if the uncertainties ascribed to the individual data points for different species differ significantly as they certainly do in this study in case of gas chromatography-measured VOCs versus cavity ringdown spectroscopy-measured GHGs and CO, the PMF analysis is impacted. Since PMF is attempting to reproduce the time series of each tracer within its ascribed uncertainties, applying a very narrow range of uncertainties to GHGs and CO results in PMF not apportioning these species into multiple sources and instead lumping these species almost completely and exclusively into one source factor profile. This is done to keep the Q/Qexp ratio to a minimum which is what the statistical technique is trying to achieve but this defeats the purpose of using this method to apportion the tracer time series into multiple factor contributions. Hence, a different technique that allots higher uncertainties to GHGs and CO, and at the same time makes these relative uncertainties inversely vary in proportion to the magnitude of enhancements is adopted. This brings the uncertainties in line with those ascribed to VOCs.

Author's changes: None.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 6077, 2015.