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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.

Anonymous Referee #2

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The authors report source apportionment for methane and nitrous oxide using a 6 week hourly-resolved summertime measurement time series of CH4, N2O, CO, and 46 volatile organic compounds from a surface air quality monitoring station in the southern end of California's central valley. Results of a positive matrix factorization (PMF) suggest dairy/livestock sources contribute the majority of CH4 (70-90%) and N2O (60-70%) emissions, with a detectable contribution ($\sim$ 25%) from agricultural soil for N2O. Somewhat surprisingly, no clearly detectable PMF correlate is found between CH4 and evaporative/fugitive petroleum associated VOCs, nor between N2O and vehicle associated VOCs, despite both of those source categories appearing in the respective state

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emission inventories for CH4 and N2O.

General comments:

This study adds useful information on source apportionment of CH4 and N2O emissions from an area with important air quality control problems. The research was conducted carefully, the manuscript is generally well-written, and the results are interesting. This work could reasonably be published with minor revisions.

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.

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 $\sim$ 5% of regional CH4 emissions are derived from oil and gas operations ?

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 ?

page 6102, line 5: shouldn't units of CH4/N2O ratio be gC/gN (not gC/gC)?

page 6103, line 17-19: As above, it appears that the PMF does not constrain CH4 emissions at the 5% level. If so, wording here might be modified slightly to reflect this.

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