Referee # 2

Review on ACP-2016-232

« Monthly trends of methane emissions in Los Angeles from 2011 2 to 2015 inferred by CLARS-FTS observations » by K.W. Wong et al

General comments :

This paper combines column ground-based measurements of CH4 and CO2 and tracer-tracer correlation technique to provide monthly estimates of CH4 :CO2 ratios (R) in the Los Angeles basin over a four year period (Sept. 2011 – Aug.2015). Methane emissions are then estimated by combining the R estimates with CO2 emissions from bottom-up emission inventories. Some efforts have been made to take into account for the monthly variability of these emissions into the inventories.

A specific feature of this paper is that it relies on remarquable FTS datasets collected from the CLARS instrument on Mt Wilson, pointing both above and within the LA basin.

This study was a real pleasure to review. It is very well written and clear, adressing the hot topic of improving urban greenhouse gas emission estimates. It is very well suited for publication in ACP. I have only some minor revisions to advise and a few questions for the authors.

Specific comments :

What were the constrains that led to a number of 28 points for the LABS measurements ? How well do 28 points represent the spatial variability of the CH4 emissions in the LA basin ? By reading your paper further, I see this question is a bit adressed on p.12, but it could be discussed more. And, at least one sentence would be welcome in the methods section (p.4) to explain why you ended-up to this number of 28 sites.

Regarding possible biases relative to advection, would it be technically feasible, and do you think it would be correct, to point the FTS to the surface on background upwind areas (i.e. not contaminated by LA emissions), and then infer the urban plume (XCH4svo-XCH4bkg) :(XCO2svo-XCO2bkg) ratio rather than the XCH4xs :XCO2xs described in your paper ?

How many observations did you collect per month ? Are there some months with low number of observations (issues with clouds…) ? Can this cause biases in the comparison of the R estimate from one month to the other ? Please better quantify this piece of information. See below my comment on p.10 lines19-20.

Also, do you have the same amount of observations for each hour of the day (do you have biases linked to the hour you were able to collect measurements regarding clear sky conditions) ?

Detailed comments :

p.4 Line 23 : the chosen strategy is, in each measurement cycle, to collect one set of LABS measurements and four SVO measurements. Please explain the motivation for this strategy.

p.6 lines 5-7 : please choose one single notation (ppm CO2)-1 or ppm-1

p.6 lines 6-7 : please make it clearer : are the +/-0.8 and +/-0.0 indicating the uncertainty of the results or their variability ? How do the uncertainties compare between this study and the former ones ?

p.7 line 30 : The inventory-R based value underestimation of 30% seems effectively much larger than the CLARS R uncertainties, but please quantify this later (apparently from Fig.2, something like 3% ?).

p.8 lines 12-13 : You made the choice of distributing regularly the CARB CO2 emissions on the twelve months of the year. However, as you mention p.9 lines 25-26, the three better resolved inventory show similar monthly variability. Why don't you apply this variability around the mensual mean to distribute the annual CARB CO2 emissions ? This would likely be more accurate and interesting to compare with the three highly resolved inventories.

p.10 line 1 : Please explain why you believe more in Hestia estimates than in the others.

p.10 lines 9-10 : K. Gurney is a co-author of the study, please remove « (K. Gurney, 10 personal communication, 2016) ».

p.10 lines 19-20 : please quantify what « partial » means here (see my specific comments).

p.13-15 : It would be interesting to give also here some information on the role of the different emission sectors as seen by the monthly-resolved inventories, and to compare this information with the top-down results cited in this section.