Atmos. Chem. Phys. Discuss., 15, C7865–C7867, 2015
www.atmos-chem-phys-discuss.net/15/C7865/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "NO_x lifetimes and emissions of hotspots in polluted background estimated by satellite observations" *by* F. Liu et al.

Anonymous Referee #2

Received and published: 12 October 2015

General comments

The proposed method is an extension of a previous method developed by the same author's for estimating NOx emission and lifetime from satellite-based observations. It is a very elegant approach, as not dependent on modeling assumptions. In this manuscript the method is extended to sources located in polluted background, while it was presented originally only for megacities with relatively low background pollution. Uncertainties on emission estimates are still very large and this study contributes n reducing these uncertainties. The paper is well written and the methodology appropriate. I recommend publication on ACP after addressing the following specific and technical comments.

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

Specific comments

1) P24182 L9 You could maybe mention the nominal spatial resolution at nadir here.

2) P24 L13-14 I think the reference to other works could be improved.

You might want to cite a similar methodology for fitting described by: Fioletov, V. E., C. A. McLinden, N. Krotkov, M. D. Moran, and K. Yang (2011), Estimation of SO2 emissions using OMI retrievals, Geophys. Res. Lett., 38, L21811, doi:10.1029/2011GL049402.

Or more recently in: Fioletov, V. E., C. A. McLinden, N. Krotkov, and C. Li (2015), Lifetimes and emissions of SO2 from point sources estimated from OMI. Geophys. Res. Lett., 42, 1969–1976. doi: 10.1002/2015GL063148."

You could also discuss more in the introduction for example the results (including e.g. the advantages and disadvantages) of the methodologies presented by Valin et al. (2013), Lu et al. (2015) and de Foy et al. (2015). At the moment these papers are just mentioned. What were their main features and results?

Could you also comment on the applicability of your methodology for SO2 polluted sources too somewhere in the manuscript?

3) P24186 L7-8 You mention here that 8 wind sectors are used for lifetime estimation but later in section 2.2.3a only 4 sectors are considered for Eq. 5 when emissions are estimated. Could you comment on that?

4) P24190 L15 Because only clear sky pixels are considered you might want to comment also on the eventual bias on emission and lifetime due to for example to specific wind patterns and accelerated photochemistry under clear sky conditions.

5) P24191 L25 and Fig. S3 I think that this kind of methods would be useful to estimate changes in emissions over time. Would it be feasible to estimate the emissions for these two different periods (2005-2008 and 2009-2013) in order to quantify the emis-

ACPD

15, C7865–C7867, 2015

sion reduction expected in US east-coast? If so, could you provide the results?

6) P24200 L16-18 Could you comment more on how the methodology is applicable elsewhere, e.g. in Europe? I suppose there the emission source patterns might be even on smaller scale. In the original paper (Beirle et al. 2011) only 2 European cities, Madrid and Moscow, were included, and Helsinki (plus Saint Petersburg and Stockholm) in a following paper by Ialongo et al. (2014) so I suppose Europe would be one of the main areas to assess the applicability of this new method. Could you comment on that?

More in general, could the method be applied to sources smaller than 1x10ˆ15 molec/cm2 if the fit results are good? How small the source could be? Is there a minimum ratio between the source and the background, which is critical for the fitting performances? And how close the sources can be to each other to successfully perform the fit? Could you comment on these issues?

Technical corrections

P25197 L14 explaintion -> explanation

Fig. S4 The yellow color chosen for spring and autumn are very similar, especially in a very busy figure like this is. Maybe you could replace the autumn yellow with something closer to lime or green? Or any other color you can distinguish a bit better?

References section Several references (for example Butler et al., Gu et al., Levelt et al., Martin et al., Richter et al.) have the title not starting with a capital letter: you might want to check through. I think they should go with capital letter.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 24179, 2015.