Atmos. Chem. Phys. Discuss.,
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Satellite-derived emissions of carbon monoxide, ammonia, and nitrogen dioxide from the 2016 Horse River wildfire in the Fort McMurray area" *by* Cristen Adams et al.

Anonymous Referee #1

Received and published: 5 November 2018

In this work, Adams et al. analyse wildfire events in Northern Alberta and Saskatchewan in May 2016. They utilize various satellite datasets to derive emission ratios, emission factors and total emissions of CO, NH3 and NOx. The results have been compared to several external dataset, like global fire models, emission inventories as well as in-situ surface concentrations measurements. A considerable part of the work is dedicated to the quantification of method uncertainties. As detailed below, my major concern is that errors of the satellites' total column observations have not been taken into consideration quantitatively. Nonetheless, the paper fits well into the scope of ACP and I support its publication after the comments below have been addressed appropriately.

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Specific comments:

P4, L2: ‘which showed overall good results and performance’

This sentence is very general and does not contain useful information. There should be quantitative error estimates of the total CO column amounts, which can be used for the error analysis within the present work.

P4, L6: ‘and showed an overall good performance’

This part may be deleted since quantitative numbers for uncertainties of IASI NH3 total column amounts are provided subsequently.

P4, sections 2.1 and 2.2:

Please provide information about the vertical averaging kernel for each IR product. In general, mid-IR nadir sounding is not sensitive near the ground (with few exceptions in case there are large temperature differences between the surface temperature and the temperature of the atmospheric boundary layer). Thus, the information on the trace gas concentration in the lower layers, which is used to determine the total column amounts is mainly determined by the a-priori profile.

P8, section 4 and Table 1:

A chapter on the uncertainties connected to the total column observations should be added.

P9, L2-4:

For the baseline VCDs only IASI-A morning and CrIS daytime values have been used. Why not IASI-B and evening/night data? Is there any explanation, why CrIS and IASI values of NH3 baseline VCDs differ by a factor of 10?

P10, L30: ‘The direction of the NH3 plume aligns best with winds between 1000-800 hPa (approximately 0-2 km), suggesting that the bulk of the NH3 plume is within this

altitude range.'

You should consider discussing the influence of the CrIS averaging kernel here, since it is not sensitive to the lowest layers.

P14, L1: 'Note that the IASI CO and NH3, and CrIS NH3 are measured at infrared wavelengths and therefore are not sensitive to the smoke plume.'

This is not entirely correct. Since smoke is absorbing at mid-IR wavelengths, there should be an influence on the results in case it is not taken into account explicitly in the satellite retrieval procedure. I would be interested if there are any sensitivity calculations for IR retrievals in presence of smoke.

Technical:

P13, L32: 'due the' -> 'due to the'

P14, L22: 'emissions' -> 'emission'

P16, L28: 'then applying conversion factor' -> 'then applying a conversion factor'

P18, L5: '1.0' -> '1.0 g/kg'

P18, L6: '3.7' -> '3.7 g/kg' and '3.9' -> '3.9 g/kg'

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