Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-331-RC1, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "IASI-derived NH_3 enhancement ratios relative to CO for the tropical biomass burning regions" *by* Simon Whitburn et al.

Anonymous Referee #1

Received and published: 4 June 2017

The manuscript by Whitburn et al. presents a new dataset of global enhancement ratios (ERs) of ammonia (NH3) relative to carbon monoxide (CO) for biomass burning events derived from multi-year observations of the IASI instrumentation on Metop satellites. The dataset is derived in combination with information on fires by the MODIS instrument and nitrogen dioxide (NO2) observations by GOME-2 on Metop. The calculated ERs are compared to a variety of previous measurements and are discussed in relation to different biomes and different regions. Further, their inter-annual and seasonal variability is investigated.

General comments:

Printer-friendly version

Discussion paper

This new dataset is very well presented and analysed and the methods are sufficiently described. The differences to previous observations are discussed with the necessary caution towards the own dataset and possible explanations are given. Unfortunately no clear cause for the discrepancies has been discovered which is not surprising given the large global variability and the various observational methods. In my opinion, the observational constraints on the NH3 and CO dataset should be a bit more detailed such that some estimated error range could be attributed to the derived ERs (see comments below). In summary, after having addressed the specific comments below, I support publication of the manuscript.

Specific comments:

3_30, 'have shown fair agreements between IASI-NH3 observations and other measurements':

The expression 'fair' is only qualitative. Please describe the agreement in more quantitative terms.

4_1, 'We also have assumed a similar sensitivity for IASI to NH3 and CO in the lower layers of the atmosphere, which is not expected to introduce a significant bias in the studied regions due to a generally positive thermal contrast prevailing during daytime':

- Can you demonstrate this assumption e.g. by presenting typical averaging kernels showing such a similar sensitivity of the NH3 and CO retrievals at the lower altitudes.

- Due to the different values of thermal contrast between surface and the lower atmosphere for different observations, an error could be introduced in the dataset which might partly be responsible for the overall variability of the ERs. Have you tried to correlate the temperature contrast with your dataset and can you exclude such an influence?

4_5, 'Whitburn et al. (2016b) have calculated that the use of an alternative profile could affect the retrieved column up to 50%':

It would be very helpful if one could try to derive a quantitative error assessment for the NH3/CO ratios combining estimated errors of NH3 and CO, taking into account such effects as described. At least it would be very helpful to put together a table where specific uncertainties and their sources are listed for NH3 and CO separately.

5_26, 'with a relative error lower than 100% for NH3':

Which kind of error is this? Only due to spectral noise?

8_5, 'The agreement would become even better if we consider in addition a possible bias due to the use of a non-representative NH3 vertical profile':

What is the reason that the agreement would improve and not becoming worse when using another a-priori NH3 profile?

10_8, 'These differences may be explained by various factors including. . .':

In this list, possible errors regarding the NH3 (and CO) IASI retrievals is missing, though it has been mentioned before.

23_Table1:

It would be very helpful if you could list, e.g. after each number, the result from the actual analysis for a similar biome and geographic region.

Technical comments:

3_29, 'on a two-dimensional look-up tables':

'on two-dimensional look-up tables'

8_27, 'are':

-> 'is'

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-331, 2017.