Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-931-RC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Biomass burning smoke heights over the Amazon observed from space" *by* Laura Gonzalez-Alonso et al.

Anonymous Referee #1

Received and published: 9 November 2018

General

The paper presents interesting but contradicting findings regarding Amazonian smoke layer heights retrieved from passive and active satellite remote sensing. Most parts of the paper are well written. However, some clarifications are needed.

As an example, we need precise wording throughout the article. We have 'smoke plume height'! What does that indicate: layer base, layer center, layer top? Only after checking the paper back and forth, it became clear to me what is meant..... For meteorologists, cloud height, for example, means cloud base height, in your case it probably means top height.

Regarding averaging...: Could be temporal and/or spatial (horizontal) averaging... so

Printer-friendly version

Discussion paper

be more specific, say clearly what you did! ...throughout the manuscript.

The conclusions must be improved! What can we do with these so different findings (active vs passive remote sensing).

Details:

P1 L7: you write ....1100m maximum plume height average... lowest plumes occur over tropical forest fires (800m). What do you mean here? What is the maximum plume height (is that related to layer top)? The lowest plumes occurred at 800m (intuitively that means layer base...) ...? Please improve this unprecise wording! ...throughout the entire Abstract! ...and the entire paper! And regarding averaging: you mean... spatial averaging, temporal averaging, or just avergaing of all cases?

P3, L8: There is this Baars et al. paper (JGR 2012), now mentioned in the introduction. This is the first systematic investigation of smoke layer geometrical and optical properties over an Amazonian site (a bit north of Manaus). You mention it, but you do not make any attempt to compare their results with yours. They measured smoke AODs with Raman lidar, they have measured lidar ratios, they have multiwavelength information for aerosol typing (fresh vs aged smoke etc), and layer base and top heights and depths for the fire season of 2008. But you use the much more uncertain CALIOP observations. In the case of CALIOP, the lidar ratio is more or less a look up table value, the CALIOP return signals are rather noisy, the CALIOP data analysis team even estimates the aerosol type from some kind of look up tables!

So my simple question is, why not using the Baars et al. (2012) results for comparison in addition?

By the way, this reviewer is not Dr. Baars, but an EARLINET Raman lidar specialist.

P4, L16, L18, L19, L21, ...: Plume heights, yes I know, you mean plume top heights. Please, write that explicitly!

P5, L10: MINX computes several plume heights... you mean....top heights....

P5, L11: We use maximum and median smoke plume heights... Top heights? Median heights... regarding.... the entire season of a year, for the entire region you cover with observations??? Just all plumes, you collected???

P6, section 2.6: You concentrate on the comparison with CALIOP observations! How is the comparison of CALIOP with the Baars 2012 results for the fire season of 2008 regarding layer base and top heights, aerosol typing, lidar ratios?

P7: again precise wording is necessary...

P8, results and discussion sections 3: I would like to see a 1:1 case study, with a CALIOP fire smoke profile with indicated base height, center height, and top height, and then what you got from your MISR retrieval ... as layer top height (even if the measurments are done at very different times of the day and PBL evolution...). This would provide better grounds to discuss the huge discrepancies between passive and active remote sensing products regarding smoke layer tops.

P14, L10: 'complementary' What is complementary when the CALIOP and MISR products are so much different?

P14, L30: Nice to have all these references from very different regions. But the main question remains: What did Baars et al. (2012) report for the Amazonian forest in the Manaus area? And how does that fit into the picture seen by MISR and CALIOP?

P15, P16: At the end what is now the conclusion, having these huge discrepancies between spaceborne lidar and passive remote sensing lidar in mind?

I am lost after the discussion, and even after reading the conclusions. How to proceed with this? How can modellers make use of such contradicting MISR/CALIOP results?

Figure 1: Yes, I am a lidar scientist, but nevertheless, I had trouble to understand the text in the figure captions: smoke plume median heights? What does that mean here? There are then two color scales, what belongs to what? Yes at the end, I got it after minutes of 'research'. Colored circles for different aerosol types: green for dust, up to

12 km, really? Any idea about the dust source? Next: Dashed black line represents the averaged extinction profile (??) What did you average, and why is that a function of height? So, smoke is indicated by pink dots! Fine! But there seem to be a lot of clean/continental air parcles on 25 Sep, scattered all over the insert display, even at dust level heights of 10-12 km? Confusing! ... but understandable. The aerosol typing is based on questionable CALIOP look up tables!

Figure 9: What did Baars et al. (2012) observe in 2008?

Figure 10 shows the final result!

... and my personal spontaneous conclusion and main question after reading the entire manuscript is: Having these huge differences in the findings in mind, what is then complementary (after analysing CALIOP and MISR smoke observations)? How should modellers (most are not experts of passive and active remote sensing) use the 'combined' information? Can we, e.g., quantify ... from the combined observations... how much smoke AOD is in the layer below the MISR-derived top height, what is the residual AOD for the layer between MISR and CALIOP-derived top heights?

Please, explain that in the conclusion section what is now the concrete result of this work. How can we use these data sets. . .? What is the true information content. Many readers will not be familiar with passive or active remote sensing, but are interested in Amazonian fire smoke and the horizontal and vertical distribution, and potential consequences for long range transport and deposition. . .. Please help them to understand the findings.

I like the results! Many authors would hesitate to show us the 'real world' of observations, retrievals, and apparently contraditing products. I think it will not be so much work to revise the mansucript a bit to meet (some of) my points.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-931, 2018.