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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Estimates of biomass burning emissions in tropical Asia based on satellite-derived data" *by* D. Chang and Y. Song

D. Chang and Y. Song

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Dear Referee,

We have manuscript entitled "Estimates of biomass burning emissions in tropical Asia based on satellite-derived data" (MS No.: acp-2009-431), and attach our responses to the comments in detail as another sheet in this cover letter.

We have recalculated the burned areas and fire emissions using March as the starting month for a fire year, and the results do not change greatly.

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Interactive Discussion

Discussion Paper

We would like to appreciate you very much for your kindly help.

Sincerely yours

Song Yu

Responses to Anonymous Referee #1

“Estimates of biomass burning emissions in tropical Asia based on satellite-derived data” (acp-2009-431) by D. Chang and Y. Song

General Comments The authors estimate emissions from biomass burning in tropical Asia for the years 2000-2006 using two different burned area products. The subject matter is appropriate for ACP and will be of interest to readers.

Specific Comments One important issue that should be clarified by the authors is how the L3JRC burned area product, despite reporting much less burned area in the region as a whole in almost every land cover type, results in emissions very nearly as high (or even higher) than the emissions obtained from the MCD45A1 product (see Tables 1 and 6). This outcome is unlike the results of previous studies which found that differences in the spatial distribution of burned area produce very large differences in emissions (e.g., Korontzi et al., 2004). Presumably at least some of the unexpectedly high L3JRC emissions arise from the higher proportion of peat burning in this product. It would help if the authors would clarify how the other factors in Equation (1) are compensating for the factor of _2 difference in burned area. A spatially explicit map of at least the fuel load would help greatly, as it is very difficult to keep track of the many different fuel loads that were used as described in Section 2.2.3.

Table 7 - Here the L3JRC product is producing much higher CO2, CO, CH4, NOx, OC, and PM emissions from forest burning despite consistently reporting much less (_0.6×) burned forest area than the MCD45A1 product. This same trend propagates into Table 8. As requested above, please clarify how this is happening.

Response: As shown in section 3.1, MCD45A1 reported much more burned area than

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L3JRC (85277 vs. 43514 km2 yr-1). But the burned peat area calculated using L3JRC (674 km2 yr-1) was about twice the MCD45A1 burned area (317 km2 yr-1). Because of the high peat biomass loading (about 64 kg C m-3) in tropical Asia, the amounts of peat burned calculated form L3JRC were greatly larger than that estimated from MCD45A1. The amounts of aboveground vegetation burned and peat burned derived from L3JRC and MCD45A1 were listed below: for L3JRC, the aboveground biomass burned was 27 Tg yr-1 and the peat burned was 47 Tg yr-1; for MCD45A1, the aboveground biomass burned was 57 Tg yr-1 and the peat burned was 22 Tg yr-1.

As shown, the total amounts of biomass burned derived from these two products were comparable, and peat burning contributed a majority of L3JRC-based burned biomass (63%). As we used the same values for other factors (fuel load, CF and EF) in estimating the L3JRC- and MCD45A1-based emissions, it is probably the higher burned peat area detected by L3JRC that caused the fact that the L3JRC-based emissions were comparable to MCD45A1. We also clarify this point in the revised manuscript.

Page 19609 - Among the other differences described between the L3JRC and MCD45A1 burned area products is the very large and completely burned region near Punjab that persists from 2004-2006 in the MCD45A1 product. Some discussion about this fairly major difference would be helpful. Any idea what this might be?

Response: We appreciate the referee's suggestion very much. As an agriculturally important state dominated by rice and wheat in Indo-Gangetic Plains, large sections of Punjab State are completely burned after the harvest season each year (Biopact team, 2008). Based on Indian Remote Sensing Satellite (IRS-P6) Advanced Wide Field Sensor (AWiFS) data, it is estimated that the size of the agricultural area burned in Punjab during May and October 2005 was 5504 and 12685 km2 respectively (Badarinath et al., 2006). This study calculated that the MCD45A1 and L3JRC agricultural burned areas in Punjab for May 2005 were 9509 and 0.84 km2, respectively. In October 2005, MCD45A1 reported an area of 1486 km2 burned in cropland and L3JRC did not detect the burns. This shows that the MCD45A1 data were much more comparable to the

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AWiFS data than were those from L3JRC. We added this discussion about the burning in Punjab region in the revised manuscript.

Page 19615, line 3 - "Overall, the MCD45A1 product performed very well in Thailand, while the L3JRC showed substantial under detection of burned areas." I don't think this claim is completely justified. Plotting the data in Table 4 on which it is based, it is clear that while the L3JRC product performs very poorly (consistently underestimating burned area as the authors say), the MCD45A1 product hardly performs "very well" (r2= 0.012). In fact, for three of the six fire years (2004, 2005, 2006) the L3JRC estimates are much closer to the FFCD estimates than are the MCD45A1 estimates.

Response: Accepted. We reworded this part in the revised manuscript as follows:

A comparison of the burned forest areas in Thailand derived from L3JRC and MCD45A1 with the statistical data obtained from Forest Fire Control Division (FFCD) was shown in Table 4. The FFCD data were collected from 120 forest fire control stations in Thailand, which cover 21% of the national forest area (Prayoonyong, Forest Fire Control Division, personal communication, 2010). This information could be the lower limit of the fire-affected area. Accordingly, comparison in Table 4 illustrated that there was a significant underestimation of burned area for L3JRC.

Technical Corrections Page 19606, line 6 - As written sentence makes it sound as though MODIS has only seven bands. Change "...all seven bands of the MODIS..." to "...all seven 500-m bands of the MODIS...". Response: Accepted.

Page 19610, line 15 - "...Indonesia processes about 80.4% of total peatland..." Do you mean possesses about 80.4% of total peatland?

Response: We are sorry we made a spelling error and we revise the word "processes" to "possesses".

Page 19615, line 22 - Change significantly to significant.

Response: Accepted.

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Page 19616, lines 6 and 8 - Here 22 values from Table 6 are duplicated in the text. This is redundant and difficult to read, and makes it very difficult to compare the average annual emissions for each species. I suggest presenting this material only once in Table 6.

Response: Accepted.

Page 19617, line 27 - Here again is a long list of numbers duplicated from a table (Table 8). This is not necessary and makes the text difficult to read.

Response: Accepted.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 19599, 2009.

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Interactive Comment