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Atmospheric Chemistry and Physics Discussions

Interactive comment on "How have both cultivation and warming influenced annual global isoprene and monoterpene emissions since the preindustrial era?" *by* K. Tanaka et al.

K. Tanaka et al.

ktanaka@jamstec.go.jp

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We are very grateful to Reviewer #2 for his/her time and careful reading in pointing out where improvements could be made. We will appropriately address each of the points raised and have altered the text, figures, references, and Table 1 to address the concerns as follows in the revised manuscript.

Response (R) to Comments (C):

C1: p16517l4: The authors claim in the introductions that SOA "absorb solar radition". This is slightly missleading in that SOA do indeed absorb SW and LW radiation but to a far lesser extend than black carbon aerosl (SOA are refferred to as "brown aerosol").

The important difference lies in the fact that BC aerosols are climate warming agents (short-term climate forcers) with a single scattering albedo of 0.4 to 0.5 whereas SOA have a single scattering albedo around 0.95 0.98 and are thus generally considered to have a negative forcing (i.e., SOA are cooling the atmosphere). It would be good to be a bit more rigorous on these details to avoid confusion for the general reader.

R1: We have replaced "absorb solar radiation (Andreae and Crutzen 1997)" with "directly scatter or absorb solar radiation (Andreae and Crutzen 1997; Chung and Seinfeld 2002)" in the newly revised manuscript. Chung and Seinfeld (2002) stated that direct forcing from SOA would likely lead to a cooling effect, as did Reviewer #2. Chung and Seinfeld (2002) has been cited as a reference.

C2: p16523l20: To help the reader it may be good to restate the definition of LAIc and LAIp at this point. Maybe just "...vegetation type and cultivation in a grid, using LAIc (current month) and LAIp (previous month). So the reader does not have to go back to the previous page(s) to the original definition.

R2: We replaced "LAIc, and LAIp" with "LAIc (current month) and LAIp (previous month)," as suggested.

C3: p16524l25: averaging over all monoterpene species is maybe not the best way of combining all species into one lambda_L(y) because the one extraordianry high value for ocimene may be overemphasised in the results. Other options are using the median or calculating an epsilon-weighted lambada_L(y) which may avoid overemphasising one species. Some sensitivity analysis could show whether this is really and issue or not. This is more a comment on my side than a request for change.

R3: After consideration of Reviewer #2's comment, we calculated the value as the weighted-average, weighted by the values of emission factors (ε) of both potential vegetation type and cropland and the areas at all grids for eight species. We replaced the sentence with "Here, the λL(y) values for monoterpenes are given as the weighted-average, weighted by emission factors (ε) of both potential vegetation type and crop-

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land and the areas at all grids for eight species (Table 1)." We also revised Figure 6d based on these results and have replaced the current figure. The interannual variation was less than the previous value, which was closer to 0%.

C4: p16525l10-14: please rephrase this sentense and maybe even split up into two because I cannot make head or tale of it.

R4: We replaced the sentence with "Tatebe et al. (2012) found that the anomalies were similar to those observed in SAT data from 1948 to 2006 and were reanalyzed by the National Centers for Environmental Prediction/National Center for Atmospheric Research (NCEP/NCAR) (Kalnay, 1996). In particular, the magnitude of the reanalyzed interannual SAT was near that of the 10-yr running mean of reconstructed interannual SAT."

C5: p16525l24: replace "east-northward" by "northeastward"

R5: We replaced "east-northward" with "northeastward."

C6: p16533l4: there is also a paper by C.L. Heald et al. investigating the impact of CO2 and worthwhile mentioning: Response of isoprene emission to ambient CO2 changes and implications for globa budgets Author(s): Heald Colette L.; Wilkinson Michael J.; Monson Russell K.; et al. Source: GLOBAL CHANGE BIOLOGY Volume: 15 Issue: 5 Pages: 1127-1140 DOI: 10.1111/j.1365-2486.2008.01802.x Published: MAY 2009

R6: We added the following sentence: "Heald et al. (2009) incorporated an empirical model of the observed response of isoprene emissions to both ambient CO2 in the long-term growth environment and short-term changes in intercellular CO2 concentration into the MEGAN embedded within Community Land Model (CLM). They showed that CO2 inhibition has little impact on predictions of present day global isoprene emission." after "Arneth et al., 2007" in p16533l5. The reference has been added to the reference list.

C7: p16535l13: citation "Geron et al., 2006" in the text is actually "Geron et al., 2002"

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in the references

R7: Geron et al. (2006) is correctly cited. In the reference list, Geron et al. (2002) has been replaced with the following: Geron C, Owen S, Guenther A, Greenberg J, Rasmussen R, Bai JH, Li QJ, Baker B. 2006. Volatile organic compounds from vegetation in southern Yunnan Province, China: Emission rates and some potential regional implications. Atmos Environ 40(10):1759-1773.

C8: p16537l27: reference "Badan et al." does not seem to appear in the text

R8: “Badan Pusat Statistik (BPS)” is cited in p16535l11.

C9: p16544l5: reference "Staudt et al." does not seem to appear in the text

R9: “Staudt et al.” is cited in p16532l21.

C10: p16546Table1: there are several problems here: 1) it is not clear whether the units are mg m-2 h-1 or mgC m-2 h-1 2) if the units are mg m-2 h-1 emission factors cannot be summed up easily because of differing molecular masses. 3) isoprne emission factors are given as mg m-2 h-1 while terpene emission factors are given as 1.0E-03 mg m-2 h-1 which leads to exceedingly high totals for the emission factors. Given that the global total emission magnitudes are reasonable for all species I presume the problem exists only in this table. i reccommend using ngC m-2 h-1 for ALL (including isoprene) in which case totals canbe calculated and have a meaning.

R10: We used the current unit after original sources but also feel that it is confusing. We have unified the units as ‘mg C m-2 h-1’ (i.e., mg m-2 h-1 for carbon), not ‘mg m-2 h-1’ for compounds (isoprene / monoterpene) in the table. Therefore, all values have been changed based on the ratio of 5C to (5C and 8H).

C11: p16552Figure6: in Figures a and b the lines are actually red and BLUE (and not green as stated in the caption). Furthermore, in Figures c and d most of the lines are referred to as being "dashed" while they in fact appear as "solid". either change line style or (more simple) the description in the caption

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R11: “green” has been replaced with “blue.” The lines whose intervals were too narrow are not regarded as dashed lines. Therefore, we deleted “dashed” and “solid” from the caption. We have also replaced “DSA” with “DSR” in the caption since it is incorrect.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 16515, 2012.

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Interactive Comment

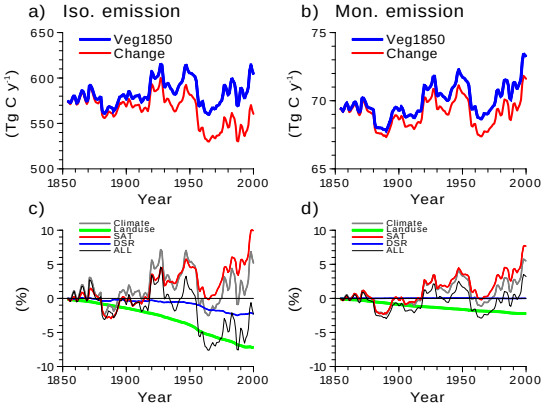

Fig. 6

Fig. 1.

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