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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fluxes and concentrations of volatile organic compounds from a South-East Asian tropical rainforest" *by* B. Langford et al.

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I am very satisfied by the answers by the authors to my comments. However, the following comment (RC) and the response to it (AR) deserve further discussion.

RC: Page 11989, line 16 – page 11990, line 10. The fitting of the G06 algorithm to the flux data ignores the effect of light attenuation within canopy on the functional form of the PAR response. Thus I would refrain from adjusting the functional form of the algorithm based on this analysis even though the ecosystem scale base emission rates based on the flux data can be useful on modeling purposes.

AR: We would argue that because we are fitting the G06 algorithm to our directly mea-

sured fluxes the effect of light attenuation through the canopy has been fully captured by our measurements. Therefore the functional form we present is in fact representative of the canopy-scale response to PAR measured at the top of canopy.

I have to disagree with this approach. The original algorithm for the light and temperature dependent isoprene emission by Guenther et al. (1991) is not purely empirical, but based on the light dependency of electron transport rate and temperature dependency of enzyme activity and we can argue that similar dependencies should exist for de novo monoterpene emission. This basis on the biological mechanisms is one of the reasons why this algorithm is so successful in describing the isoprene emissions from various ecosystems and even de novo monoterpene emission. Now, implicitly including the light attenuation to the algorithms would lead to two things. First, the applicability and generality of the algorithm would be reduced as all the parameters would need to be separately estimated for each ecosystem with different canopy structures and densities. Second, the algorithm would lose its basis on describing the biosynthesis of terpenoids and become a purely empirical one.

Instead of the empirical approach suggested by the authors, I would much more like to see a model in which the biological synthesis (and emission) and light attenuation are treated separately. This would enable development of more process based parameterizations and thus more insight to the processes behind emissions.

References

Guenther, A. B., Monson, R. K., & Fall, R., 1991: Isoprene and monoterpene emission rate variability: Observations with eucalyptus and emission rate algorithm development. J. Geophys. Res., 96, 10799-10808.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 11975, 2010.