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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Direct ecosystem fluxes of volatile organic compounds from oil palms in South-East Asia" *by* P. K. Misztal et al.

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This comprehensive paper Misztal et al. is very exciting as it reports the first ecosystem-scale flux measurements of biogenic volatile organic compounds from Oil Palm, a plant that is increasingly used as a global source of biofuel. This is an important step in addressing the environmental impacts of biofuel plantations. I strongly recommend this paper for publication in Atmospheric Chemistry and Physics.

However, there are a number of specific comments the authors should address.

Specific comments

Abstract: The reported isoprene flux of 30 mg m-2 hr-1 is extremely large compared with other previous measurements in the tropics of $\sim$1 mg m-2 hr-1 in Amazonia (Karl

et al., 2009), 2.5 mg m-2 hr-1 in Costa Rica (Karl et al., 2004). A extensive discussion on this point is needed.

Abstract: Instead of reporting an emission flux of isoprene and a canopy resistance for MVK+MACR, it would be useful to also report deposition flux for MVK+MACR. That way, you can report the fraction of the carbon emitted as isoprene that is recaptured by the ecosystem.

Abstract: "We propose that it is important to include deposition in flux models, especially for secondary oxidation products, in order to improve flux predictions." This has already been proposed. See (Karl et al., 2010).

Introduction: "VOCs play many important roles in atmospheric chemistry, for example serving as sinks for OH radicals, and thus indirectly prolonging the lifetime of pollutants and greenhouse gases in the troposphere." This may not be the case. Rapid OH recycling in a low NOx atmosphere has now been demonstrated in the tropics (Lelieveld et al., 2008).

Introduction: I think a few sentences on the biological function of VOCs from oil palm is needed.

Introduction: "It has only recently been found that oil palms are very high isoprene emitters. . ." How high and relative to what standard?

Introduction: What is "frond-level"?

Introduction: Do you want to include a summary paragraph of what you actually did?

Site and sampling system: What was the actual flow rate through the line? What was the delay time? Did this change? Without heating the tubing exposed to the outside of the instrument trailer, loss of VOCs will occur, especially sesquiterpenes. Why was the tubing only heated on the inside of the instrument trailer?

PTR-MS: Please discuss why the long dwell times were used (500 ms) with a mea-

surement frequency of 0.5 Hz and the consequence to miss the high frequency eddies (10 Hz). What was the total cycle time?

PTR-MS: Please include the primary ion signal (MHz) and the sensitive (cps/ppbv) for each compound and a description of the calibration technique and how often it was done.

PTR-MS: It is not appropriate to use m/z 81 to quantify monoterpenes as many compounds can have this mass as a fragment such as the green leaf volatiles (Fall et al., 1999). Without evidence (eg GC-PTR-MS) that m/z 81 is derived exclusively from monoterpenes, it is therefore necessary to quantify monoterpenes using m/z 137. The analysis should be redone using m/z 137.

Mixing-ratio distributions, detection limits and statistical summary: Please state what the limits of detection are for the different compounds. Stating that they are very low is not useful.

Dirunal trends of mixing ratios: This section needs to be expanded as in its present form (3 short sentences) it is too short to justify including the large figure 3. Please explain details of the patterns of diurnal concentrations. What influences them? Why do some not have a clear diurnal pattern (but I would expect one from these biogenic compounds).

Fluxes of dominant VOCs: Why is a resistance approach used from MVK+MACR when eddy covariance data was collected? How does this resistance approach compare with the eddy covariance results?

Methyl vinyl ketone (MVK) and methacrolein (MACR) (m/z+ 71): Why would the ratio of MVK+MAC/ isoprene be lowest during the daytime compared with other times?

Hydroxyacetone (HA) (m/z+ 75): The authors should acknowledge the potential presence of methyl acetate at m/z 75.

Toluene (m/z 93): Authors should mention that toluene emissions has also been ob-

served from a desert plant (creosotebush) (Jardine et al., 2010). Has toluene not been reported in enclosure studies of oil palm?

Figure 1a: How did the authors identify these VOCs as no effort appears to have been made to acquire GC-MS data.

Figure 2: 2b is missing it's label. Need to define VMR. Acetaldehyde graph needs rescaling.

Figure 4: Why are there lines connecting some points but not others?

Figure 7 and 9: These are very beautiful graphs!

References

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 12671, 2011.