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Atmospheric Chemistry and Physics Discussions

Interactive comment on "OH reactivity in a South East Asian Tropical rainforest during the Oxidant and Particle Photochemical Processes (OP3) project" *by* P. M. Edwards et al.

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The presented manuscript describes an interesting dataset of total OH reactivity measurements in the tropical rain forest of Borneo. The total OH sink was measured directly and compared to simultaneous observations as well as to model simulations. Although these results are discussed in detail and allow some interesting conclusions, the manuscript starts with a rather poor abstract. A motivation is missing and the total OH reactivity is not defined correctly in the first sentence of the abstract. The total OH reactivity is the reciprocal of the OH lifetime which depends on the reaction with its sinks. Additionally, in the abstract as well as later on in the text the authors write about

the “lifetime of OH reactivity”. As the total OH reactivity is defined as the inverse of the OH lifetime, I wonder what is the “lifetime of OH reactivity”?

The introduction part describes in detail the current situation and explains the question of interest: Is there missing OH reactivity in the tropical rainforest? And what is its origin? However, the authors could describe more precisely the “debate” about the reactive BVOCs that is mentioned in p.5237, l.13. When explaining the recent findings in detail, the authors should add the relevant reference. E.g. the PROPHET study is published in Di Carlo et al 2004 (see p.5237, l.16-22). Another recent study might be interesting for the authors. Nölscher et al 2012 ACP observed highest missing OH reactivity of almost 90% in summertime boreal forest, a totally different ecosystem than the tropics. In this study the measurement of total OH reactivity from two different heights allowed to conclude that under high temperature conditions the forest canopy was a great source for OH reactive biogenic compounds which possibly explain a large fraction of the observed missing OH reactivity.

It is impressive that such a high quality set of data was obtained during OP3. This makes the analysis from the total OH reactivity measurements great and puts it into a well defined framework. The authors mention the complex local dynamics caused by the measurement site. Is there a difference in variability of the total OH reactivity measurements during daytime opposed to nighttime? As the measurements were taken in 5 m height, how big is the influence from the forest and vegetation? And which layer of the forest does have the biggest influence? Can you estimate how representative are your observations for the tropical rainforest? In other words, how dependent are the conclusions drawn to the height of the measurements relative to the canopy? Without a vertical profile through the forest it would appear that results shown may be specific to the positioning of the inlet.

The role of the most prominent OH sink in the tropics – isoprene – was investigated using an interesting new approach. The ratio of total OH reactivity and isoprene reactivity connects isoprene lifetime and OH lifetime. The greater the ratio, the less de-

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pends the total OH reactivity on isoprene. However, the authors write "The α-value can be considered the isoprene flux multiplier for reactivity, i.e. how much extra reactivity over the initial oxidation step an emission of isoprene represents" (p.5244, l.1-2). This needs more explanation since it is not intuitive and difficult to understand. Similarly, the authors draw the conclusion that the value α=10 equals the number of isoprene OH attackable bonds. This needs more explanation. In this manner, isoprene reactivity seems to be not only the OH reactivity caused by isoprene itself but also its photooxidation products? If this is the case, better wording is needed in order to differentiate between the isoprene OH reactivity and the OH reactivity caused by isoprene and all it's secondary products. Since, the ratio α is focus of further discussion and conclusions, could you please carefully define and explain this novel approach?

At the end, the authors conclude that a global perspective on the total OH reactivity may elucidate the role and impact of organic carbons. But, why is this referred as "the budget of "emitted" reactivity" and what is meant by the "(sources and sinks)"?

Please correct the typo in Figure 14: Isoprene = 36.8%.

One final question: In which season was the data obtained? Is April in northern Borneo rain or dry season?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 5233, 2013.