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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Isoprene oxidation mechanisms: measurements and modelling of OH and HO_2 over a South-East Asian tropical rainforest during the OP3 field campaign" *by* D. Stone et al.

Anonymous Referee #1

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General Comment

The manuscript presents a model study in which a variety proposed oxidation mechanisms are implemented in order to explain the HO_x measurements levels during the OP3 field campaign in Borneo in 2008. Despite the effort, the authors found no single mechanism that can well reproduce both OH and HO_2 observations and recommend further experimental work. The manuscript fall well within the scope of the journal and it is well written. I recommend publication only after the major comment is taken into consideration and the other required changes are made.

Major Comment

Although the analysis the authors make is very detailed and makes use of the appropriate tools, the level of detail in the implementation of the Peeters mechanism is not very high and with some inaccuracies. For example, there is no separation between E and Z isomers of ISOPAO2 and ISOPCO2 (Paulot et al., ACP (2009) proposed 15:85 initial production ratio). The photolysis products of PACALD proposed by Peeters and Müller (2010) are OH and ketenes. However, ketenes are not included in the model and the photolysis of PACALD2 is set to give $CH_3COCH_2OH + CO + OH + HO_2$ (Table 7). This makes a significant but unfaithful HO_2 production of about 10^7 cm^{-3} $s-1$ (Figure 7h) in the Peeters mechanism. Furthermore, Peeters and Müller(2010) proposed a production of 2 OH radicals after PACALD photolysis and not 1 OH as in this case. Therefore, simulations for the Peeters mechanism should be repeated after at least having eliminated the above mentioned HO_2 production and introducing a production of 2 OH radicals. Although, the authors seems to have done sensitivity simulations with PACALD2 photolysis not resulting in HO_2, the description provided in Table 8 is not clear and probably is a result of a typo. Since the requested changes will likely improve both OH and HO_2 results with the Peeters mechanism, satisfactory results may be achieved for both OH and HO_2. Therefore, this may weaken (or even reverse) the major conclusions of the manuscript.

Minor Comment

I agree with the comment of D. Kubistin concerning the modelling studies of Lelieveld et al., (2008) and Kubistin et al., (2010) in which the OH-recycling mechanisms

$C_5H_8 + OH \rightarrow ISOPO_2 + nOH$

and

were used only as proxies and in both articles it was explicitly stated. Therefore, all the paragraphs (p10346 l14, p10362 l13, p10362 l26, p10372 l25) in which these articles are mentioned and commented should be reformulated accordingly.

p10346 l18 : Lelieveld et al(2008) did not present box model results. Instead, global simulations as in Butler et al.(2008) were shown. Therefore, the citation should be put next to Butler et al(2008).

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 10343, 2011.