Atmos. Chem. Phys. Discuss., 5, S3391–S3393, 2005
www.atmos-chem-phys.org/acpd/5/S3391/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Volatile organic emissions from the distillation and pyrolysis of vegetation" *by* J. P. Greenberg et al.

J. P. Greenberg et al.

Received and published: 21 October 2005

1. We acknowledge the concern of the reviewer that he only has our written commitment to making changes detailed in our responses.

Since the discussion forum may include subsequent comments, it is impractical and confusing to post new versions of the manuscript repeatedly. We have not been instructed by the journal to post revised versions until the discussion period is closed and after we receive instructions from the editor. However, we will attempt to be somewhat more specific about revisions in future responses.

2. VOC:CO ratio: The reviewer notes that VOCs are only produced in low temperature pyrolysis (CO is predominantly released in high temperature pyrolysis). Both processes

occur in charcoal kiln. Previous measurements may have underestimated this ratio.

The results in our manuscript indicate that the VOC:CO ratio for distillation and low temperature pyrolysis is higher than previously reported by others. This, it is suggested, is because additional O-VOCs were measured in the current experiments. Consequently, the reviewer suggests that we argue for a higher ratio, closer to the results we present. We will follow this argument and include it in the revised section on charcoal production.

3. The reviewer feels that the discussion of the flammability of emissions does not recognize or utilize the extensive investigation of this phenomenon by fire scientists; that some terms used (i.e., sparks) have different definitions in fire science community, and that this journal is not normally read by fire scientists.

The experiments described in this manuscript allow for the calculation of emission rates of VOCs during low temperature pyrolysis. This allows for a simplified calculation of concentrations near the leaf surface and the canopy atmosphere. The calculation indicates that, at low pyrolysis temperatures, experienced before the higher temperatures associated with active fires, the concentrations near leaf surface may reach flammability limits, while those in the canopy probably do not. Ignition near leaves may occur spontaneously, above a threshold temperature, or may be initiated by a glowing ember (we will substitute this term for “sparks”) or other appropriate source. This is not inconsistent with the description the reviewer provides. What is lacking, perhaps, are some remarks describing the process of fire propagation, as generally accepted. If the reviewer can recommend an appropriate reference, we will include that description and remarks indicating where the present study relates to the process.

4. We have reviewed the earlier reviewer discussion comments (28.9.05) and would like to provide added emphasis on several points previously made. One point is that oxygenated volatile organic compounds (OVOCs) are primarily emitted during the distillation and pyrolysis phases of combustion. Consequently, emission factors (g/kg) for the OVOCs can most directly be measured in the experiments described in the

ACPD

5, S3391–S3393, 2005

manuscript, instead of in the sampling of fire plumes, where the distillation/pyrolysis emissions are mixed with the emissions of other VOCs from all phases of combustion. Additionally, the results from distillation and pyrolysis may be applied to smoldering combustion. To illustrate and argue these points, we propose to convert Figure 6a (emission factors), which is difficult to read in the logarithmic scale, into a table, which will also include a comparison with previously published emission factors (essentially a much expanded Table 3, where comparison was made with several previous reports, but which did not include the important Christian et al. 2003 references previously suggested by reviewer). Unfortunately, the format of the ACPDiscussion does not allow a new table to be contributed at this time. A new section of the manuscript will be added to comment on the data comparison and illustrate that the distillation/pyrolysis derived emission factors agree well for OVOCs previously reported from whole fire samples. This comparison will support the argument that OVOC emission factors measured in this study may be applied to fire plumes (representing all phases of combustion) and smoldering combustion.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 9097, 2005.