

Interactive  
Comment

***Interactive comment on “No detectable aerobic methane efflux from plant material, nor from adsorption/desorption processes” by M. U. F. Kirschbaum and A. Walcroft et al.***

**A. McLeod (Referee)**

andy.mcleod@ed.ac.uk

Received and published: 22 August 2008

General Comments

This is an interesting study that makes a useful contribution to the debate about aerobic methane efflux from plants. The most valuable experimental contribution is to examine the magnitude of the adsorption/desorption flux and the demonstration that empty Plexiglas chambers may experience an increase in measured methane concentration, indicating that careful controls are essential.

The manuscript also provides a careful summary of past published observations, although there have been recent additions to the literature on satellite remote sensing of

S1494

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



methane and the role of UV radiation that should be included in any revised version.

### Specific Comments

1. The satellite observations of plumes of methane from tropical forests (Frankenberg et al, 2005, 2006) have now been qualified (Frankenberg et al, 2008) by a report of problems with data retrieval such that the methane observations above tropical forests may not be so large as previously reported. The manuscript should include reference to this latest development.

2. There has been a further publication by Keppler et al (2008) using isotopic labelling demonstrating the role of UV radiation in methane production from pectin. There has also been a publication by McLeod et al (2008) reporting the role of solar UV radiation in driving methane emissions from plant pectins and live tobacco leaves at ambient UV levels including sunlight.

These new publications and their observations should be incorporated into any revised version of the manuscript. In particular, the authors might consider whether the range of evidence for a potential role of UV might now modify their concluding suggestion that a coherent picture is not emerging. Those studies that did not include UV irradiation (this manuscript, Dueck et al, 2007; Beerling et al, 2008; Wang et al., 2008 - the latter in the dark) all report no or only one species showing methane release. However, studies in sunlight or with UV appear to have all demonstrated some methane release, although experiments in sunlight could also heat samples.

3. It would be helpful to state the diameter of the cylindrical chambers as well as their volume.

4. The authors should also state the computer package used for their statistical analysis and a specific and clear statement of the test(s) used in the text. The main text and figure captions introduce some uncertainty/confusion about what was done.

5. Fig 1 caption and Results text P2782, L1 needs to restate that test samples were

## BGD

5, S1494–S1497, 2008

Interactive  
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



cellulose filters for clarity.

6. The paper clearly shows the implications of using Plexiglas enclosures and the importance of having empty/control replicates as the empty chambers do show a slow increase in methane concentration. The authors make a valuable discussion of possible leakage of ambient methane into the chambers as a cause but fail to mention the possibility that many plastic materials do release organic molecules that could form a methane source on degradation. There might also be a direct release of methane by (photo)degradation of the plastic material? These effects would be revealed if the methane concentration in their sealed empty chambers increased at the same rate when filled with air at ambient methane concentration. This is just a comment, not a criticism.

7. My only serious criticism of this paper relates to the statement in the Discussion that "A stimulation of aerobic methane release by high UV exposure is thus primarily important for dead plant materials as UV radiation itself would likely damage metabolic pathways that might be responsible for methane release in intact plant materials." The published papers on aerobic methane release all show a strong temperature dependence and an increase in methane release up to temperatures that would reduce the activity or destroy most enzymes. This implies that the mechanism may not involve enzymic metabolism. Publications suggest that UV has an impact on structural molecules and methane release may therefore be dependent only on the original metabolic synthesis of the target molecules. UV is always present in sunlight and plants have a number of mechanisms to cope with the potential damaging effects of the UV component of ambient sunlight. Thus, I feel that the author's sentence is far too speculative and does not follow from their careful experimentation and analysis in the paper. In addition, dead plant material, as litter on the ground, does not receive much UV exposure in many ecosystems as it is absorbed by the canopy above. So, I suggest that UV effects on dead material may not be so important and the authors should consider revising this statement.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

8. Vigano et al (2008) and McLeod et al (2008) both indicate that UVA radiation can also drive some methane release and this should also be mentioned in addition to UVB.

9. This paper is well written and after some minor revision it will make a valuable contribution to the debate on aerobic methane release.

### References

Frankenberg C, Bergamaschi, P, Butz, A., Houweling, S, Meirink, JF, Notholt, J, Petersen, AK, Schrijver, H, Warneke, T, Aben, I. 2008. Tropical methane emissions: A revised view from SCIAMACHY onboard ENVISAT. *Geophys. Res. Lett.*, 35, L15811, doi:10.1029/2008GL034300.

Keppler F, Hamilton JTG, McRoberts WC, Vigano I, Brass M, Röckmann T. 2008. Methoxyl groups of plant pectin as a precursor of atmospheric methane: Evidence from deuterium labelling studies. *New Phytologist* 178: 808-814.

McLeod, AR, Fry, SC, Loake, GJ, Messenger, DJ, Reay, DS, Smith, KA, Yun, B-W. 2008. Ultraviolet radiation drives methane emissions from terrestrial plant pectins. *New Phytologist* doi:10.1111/j.1469-8137.2008.02571.x

---

[Interactive comment on Biogeosciences Discuss., 5, 2773, 2008.](#)

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)