

## ***Interactive comment on “Methane emissions from boreal and tropical forest ecosystems derived from in-situ measurements” by V. Sinha et al.***

### **Anonymous Referee #2**

Received and published: 4 October 2007

### Manuscript Information

MS-Number: 2007-0386

Title: Methane emissions from boreal and tropical forest ecosystems derived from in-situ measurements

Author(s): V. Sinha, J. Williams, P. Crutzen, and J. Lelieveld

General comments: The authors use about 2 weeks of continuous measurements of CH<sub>4</sub> mixing ratio from a Boreal site in Finland with a simple boundary layer model to estimate CH<sub>4</sub> emissions from the surrounding area. This flux is extrapolated to global Boreal regions. Part of the emphasis of the study is to better quantify CH<sub>4</sub> emissions from vegetation. Unfortunately, the paper's experimental methods section

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

is incomplete, and it is not clear if the diel cycles in CH<sub>4</sub> used to estimate night time fluxes are real or an experimental artifact. Also, nothing is shown and very little is mentioned about how the quality of the measurements was assessed. The method used to calculate fluxes is straight forward, but I question some of the assumptions made without supporting data.

Specific comments: 1. Experimental methods: The description of the experimental methods is incomplete and raises questions that impact the usefulness of the measured diel cycles. a. How was sample air dried? Dilution effects can cause errors of 10s of ppb. b. How was the pressure of the GC sample loop controlled? What was its volume? Was its temperature controlled? c. Was the detector linearity tested or assumed over the range from ambient CH<sub>4</sub> to the 4 ppm standard? d. How was the instrument response calibrated? At what frequency? I would not have confidence in these measurements if the GC was only calibrated 3 times as stated on page 14017. e. What GC column packing was used? f. The quoted precision, 2%, is much greater than what is typically obtained with a GC system. Why?

2. Data: What quality control and quality assurance procedures were used to insure that the measurements are reasonable? a. A plot of CH<sub>4</sub> mixing ratios, either raw data or 15 min averages, should be presented for 1 day to give readers a feel of instrument variability. b. These measurements should be compared with measurements from other programs for comparable latitudes. The low end of the measurement range at Brownsberg is significantly lower than CSIRO measurements of CH<sub>4</sub> at Cape Grim at high southern latitudes. This could not be correct. Could errors in the standard be responsible for the entire difference? c. At Brownsberg, there is significantly less variability between 1400 and 1630 than at other times; why does it change so abruptly during this period? After 1630, the range of observations is very asymmetric; why?

3. Flux calculation: I am not entirely convinced that the assumptions made are appropriate. a. While the profiles of T nicely define the NBL height, I am not convinced that the NBL was well mixed. The lack of vertical gradient in CO<sub>2</sub> at night does not

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

convince me, because I do not know the CO<sub>2</sub> flux. Could it be very small at this time of year? For a significant flux of CH<sub>4</sub> or CO<sub>2</sub>, I would still expect a gradient within the NBL because, at such low wind speeds, mixing would be slow. b. Is the calculated Boreal flux consistent with the work of Bergamaschi et al. (ACP, 5, 2431-2460, 2005) where very low CH<sub>4</sub> fluxes are reported for Finland. c. Could variations in atmospheric pressure and temperature through the night systematically affect the conversion factor used to go from mixing ratio to number density?

4. Tropical measurements: Given the relatively large uncertainties in these measurements, the SCIAMACHY column averages, and the TM3 results, even qualitative statements about tropical fluxes may not be appropriate.

5. CH<sub>4</sub> emissions from vegetation: I am not sure that 10 days of measurements at one site in Finland extrapolated to the entire Boreal region add much new to our understanding of CH<sub>4</sub> emissions from vegetation. How can these results be reconciled with the work of Dueck et al.?

Technical comments: 1. "Data" is plural. 2. References to IPCC should be avoided when original studies can be cited. 3. P14017, L5-6: random and non-random components to uncertainty are normally added in quadrature.

---

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 14011, 2007.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper