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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Methane emission from tropical savanna *Trachypogon sp.* grasses" *by* E. Sanhueza and L. Donoso

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Response to anonymous Referees #1 and #2

Referee #1

General

1. Savanna grasses produce methane:

The fact that savanna grasses produce methane was already present ("latent") in published data from three Venezuelan sites: Chaguarama (Hao et al., 1988), Guri (Scharffe et al., 1990) and Calabozo (Sanhueza et al., 1994a); in average, clearly, the soil-grass system emitted methane but we did not know why. Flux measurements from undisturbed and cleared plots performed in Calabozo in 1990 and reported in this 2006 ACPD paper, gave us the opportunity to investigate/evaluate separately the CH_4 soil fluxes and fluxes from the soil grass system. The results showed a clear difference between both sets of data, strongly suggesting that grasses emit methane; as expected soils consume methane. A t-test analysis of the data indicates that the two sets (undisturbed and cleared plots) are statistically different, whether we include all the data together or the two groups separately, with an α value of 0.05 (95% significance); e.g., during the 1-7 Nov period, average flux from undisturbed plots is significant different than the one from cleared plots. This information will be included in the revised version of the paper.

Therefore, unless there is another unknown aerobic process to explain emission of methane from the soil-grass system, the conclusion that savanna grasses produce methane is not only supported by the results presented in this paper but also by those published in the literature (see Table 1).

2. Lumping the data:

It is important to realize that the soil-grass system is quite complicate. CH_4 consumption by soils would depend on soil moisture and soil temperature (Castro et al., 1995; Hanson and Hanson, 1996), on the other hand, CH_4 production by plants would depend on ambient temperatures and solar irradiation (Keppler et al., 2006), and also if plant are live or dead. Therefore, it is not surprising to obtain quite different fluxes, from the same plot, under different soil and ambient conditions. According with Referee #2 "the variability inherent in the measurements provides additional evidences supporting a plant source of methane". In the paper, maybe we failed to indicate that during both periods (23-26 Oct. and 1-7 Nov.) the same plots were measured; this will be included in the revised version.

Likely, there is "optimum soil conditions" (moisture and temperature) for methane consumption, which it seems occurred (or closely occurred) during the 1-7 Nov. period. Also, low soil moisture and high soil temperatures should produce high temperatures in the air surrounding the grasses; which we speculate may produce physiological stress and a decrease of methane productions. On the other hand, conditions in the 23-26 Oct. period seems to favor methane emission from the soil-grass system; e.g., clearly soil consumption is lower than the one observed in the Nov. period (Fig. 1, cleared plots).

Considering that savanna aerated soils continuously change from “wet” and “dry” conditions, which in turn conditioned soil and near surface temperatures, “to lump” together the data obtained during the two periods, to obtain a mean value, is quite valid or justified. Furthermore, the mean flux ($\sim$10 ng CH_4 m^{-2} s^{-1}) used to extrapolate the emission to the word savanna contemplate/include the results observed at the other savanna sites cited in Table 1 (see lines 3 to 10 in page 6847 of the ACPD paper), which were measured under different soil and ambient conditions. We will emphasize this in the revised version.

Minor issues

Abstract: As discussed above, the extrapolation indirectly “contemplate” the results obtained at various savanna sites.

Field measurements: The appropriate/pertinent reference is in page 6843, line 26.

Results:

Soil moisture: the information is in page 6844, line 11.

Savanna area: the information is in page 6847, line 9.

Referee #2

General:

We agree with the referee and, in the revised version, the quantitative aspects of the global extrapolation will be removed from the abstract. In addition, in the Discussion section we will emphasize that the global extrapolation “contemplate/include” the results obtained at the various savanna sites cited in Table 1.

Specific Concern:

We are glad that the referee agrees with us in the interpretation/explanation causing the differences between the two groups of measurements.

The paragraph will be change to:

"In Keppler et al. (2006) laboratory experiments, the exposition of live or dead plants to solar radiation induced a large increase of the emission of methane, which continued by a relatively long period of time (∼15 min) after the light was off. As mentioned, in our field CH_4-flux measurements, plants or detritus present in the experimental plots were exposed to the sun light until the chamber was set in position and the fluxes were calculated using the firsts four time points (less than 15 minutes). However, since emissions from plants is not well understood we do not know what sort of response would be found if samples were illuminated with sunlight during flux measurements."

The Kirschbaum et al., 2006 paper, which global savanna extrapolation (2.2-6.6 Tg yr^{-1}) is in the same range than our extrapolation (∼5 Tg yr^{-1}), will be included in the revised version.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 6841, 2006.

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Interactive Comment