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Biogeosciences Discussions

Interactive comment on "Fluxes of CO_2, CH_4 and N_2O from soil of burned grassland savannah of central Africa" *by* S. Castaldi et al.

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Moderate duration of field campaigns: The amount of time that we could stay in the field was indeed quite limited and this was the reason we tried to simulate rain events and the occurrence of a range of soil water contents to measure gas fluxes. We are aware that the nutrients and microbial dynamics at the onset of the rain season might be different from a simple rain simulation and indeed we did not try to close an annual budget of GHG but only to make comparative observations between unburned and burned plots. This was briefly addressed in the discussion. Given that we had a control (unburned) area a pre-burning campaign might not be necessary, assuming that the spatial variability of the area is sufficiently homogeneous. In this case the area is a flat grassland with a quite homogeneous grass distribution and homogeneous soil. Clearly

having more time available pre-treatment campaign might be advisable in any case to be sure of what we get.

It is also true that again for logistic reasons we could not have true replicates but that the areas saved from yearly burning was just one and that within this area and an equivalent area in the burned plot rain-sheltering tents were mounted. Within this single area then different plots were replicated with different treatments (4 chambers per each treatment). This spatial limitation was also mentioned in the discussion as a source of possible uncertainty.

The abstract has been shortened.

The site is representative at least for the coastal region of central Africa (Kouilou region in Republic of Congo, coastal Gabon) for the type of soil. Pointe Noire is probably just slightly dryer than Tchizalamou when comparing the data of the meteorological of the site (in function since July 2006) and the long term data of the airport. The temperatures are the same. The coast is only at 10 km of the site, so probably no difference between Pointe Noire and Tchizalamou exists in regard of the ocean effect. The Airport meteorological station is the only long term meteo station in the region. Some sentences have been added in the text to give more information on this.

p. 4095 l 13-14. This was a bad wording of the sentence. The sentence has been modified. We did not have uncombusted material in the analysed plots.

p. 4095 l.18 – For sure the areas of rain exclusion might have been bigger to have a better exclusion of rain although we are aware that even a wider tent at 2 meters height could have not protected the soil form big rain events with strong winds. But in any case there was no rain in the 15 days before the starting of the two campaigns, nor during the campaigns.

p.4095 l.23 – the size of the subplots is given in the method section.

p. 4096 l. 1 – We did not have true replicates for logistic problems related to rain-sheltering and watering of the plots (no water available at site). So every sheltered area was divided in 4 subplots where the 4 treatments took place. In each subplot we had 4 chambers for gas measurements. The area presents very homogeneous soil and vegetation cover. However we are aware that a higher number of true spatial replicates would improve the experimental design and given a more representative average of the fluxes at site.

p. 4096 l.13 – The soil humidity and temperature measurements were done outside the collars at about 5 cm distance to avoid to disturb the soil inside given that the collars were not moved from their position during the campaigns. This has been specified in the text.

p.4097 l.3 This concept has been better explained.

p. 4097 l. 14-15 the volume of the headspace has been specified in the text. The volume of the soil was such that we can expect a bulk density around 1 g/cm3. Soil is basically sand with very low organic matter so it tends to compact quite a lot.

p. 4097 l22 – We assumed that 24 hours of incubation were necessary in order to be able to detect a significant flux inside the incubation jars, in particular from the zero water addition treatment. This was necessary in particular to get a detectable flux of N_2O. Indeed as can be seen from the values in the graph the flux values were very low. Concerning linearity we generally observe a slightly faster increase in the 1 hour but this cannot be generalized and depends on the rate of the emission. We did not measure O_2 concentration in the jars over 24 hours but at the measured rates of soil respiration we do not expect that the level of oxygen would be limiting for aerobic activity.

p. 4099 l.10 we checked and corrected the text. The vials have a volume of 20 ml while the loop on the GC as a volume of 2 ml.

p. 4017 l.27 We followed the instructions for authors which say that works "submitted

to", "in preparation", "in review", or only available as preprint, should also be included in the reference list. p. 4108 l 1-5 Indeed from our data it seems that methane emissions rather than uptake are increasing upon watering. So if methane uptake increases upon watering the source of methane must increase at a faster rate to get a higher emission rate. p.4110 l 25-28. We agree with the referee comment. We indeed meant soil GHG emissions. This has been corrected in the text. Minor corrections have been included in the text as suggested by the referee.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/7/C1946/2010/bgd-7-C1946-2010-supplement.pdf

Interactive comment on Biogeosciences Discuss., 7, 4089, 2010.

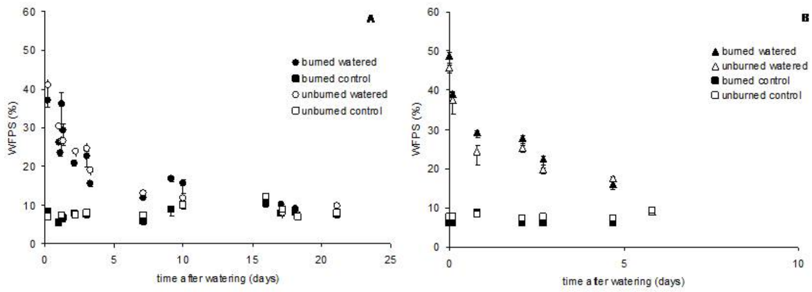

A
B
WFPS (%)
time after watering (days)
burned watered
burned control
unburned watered
unburned control
burned watered
unburned watered
burned control
unburned control

Fig. 1.

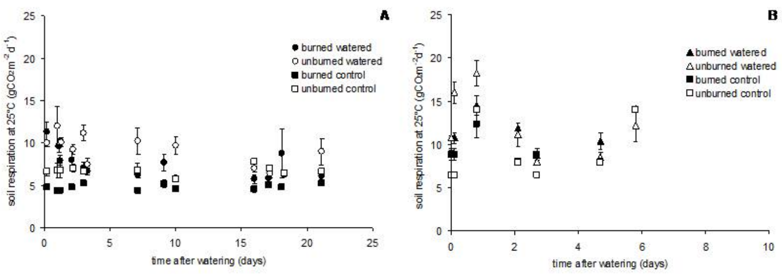

A
B
soil respiration at 25°C (gCO2m-2d-1)
time after watering (days)
burned watered
unburned watered
burned control
unburned control
burned watered
unburned watered
burned control
unburned control

Fig. 2.

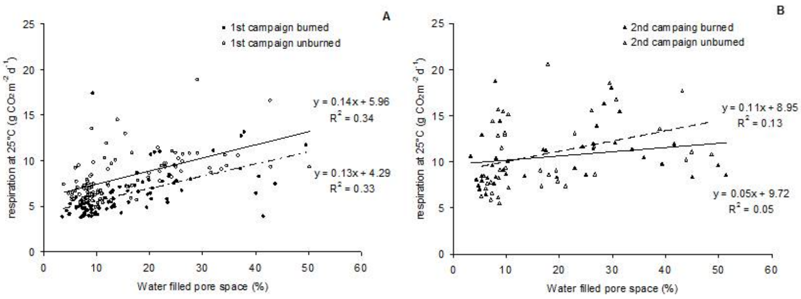

A
1st campaign burned
1st campaign unburned
y = 0.14x + 5.96
R² = 0.34
y = 0.13x + 4.29
R² = 0.33
respiration at 25°C (g CO2 m⁻² d⁻¹)
Water filled pore space (%)
B
2nd campaing burned
2nd campaign unburned
y = 0.11x + 8.95
R² = 0.13
y = 0.05x + 9.72
R² = 0.05
respiration at 25°C (g CO2 m⁻² d⁻¹)
Water filled pore space (%)

Fig. 3.

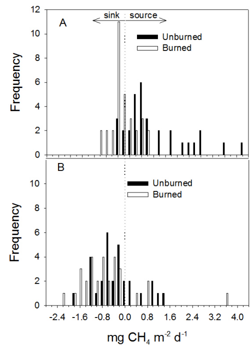
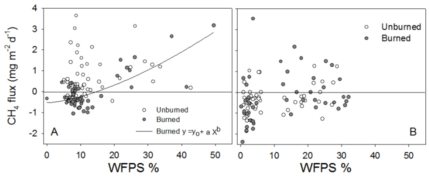
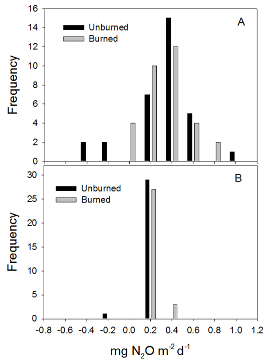

A
sink
source
Unburned
Burned
Frequency
B
Unburned
Burned
Frequency
mg CH4 m-2 d-1

Fig. 4.



CH4 flux (mg m-2 d-1)
WFPS %
Unburned
Burned
Burned y =yo+ a Xb
A
B

Fig. 5.



Frequency
Unburned
Burned
A
B
mg N2O m-2 d-1

Fig. 6.

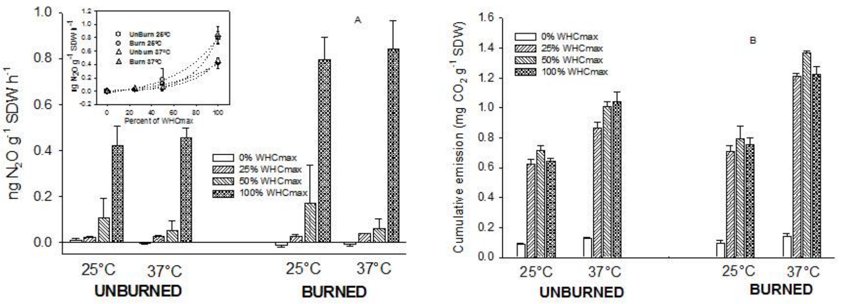

A
ng N2O g-1 SDW h-1
0% WHCmax
25% WHCmax
50% WHCmax
100% WHCmax
Percent of WHCmax
25°C
37°C
UNBURNED
BURNED
B
Cumulative emission (mg CO2 g-1 SDW)
0% WHCmax
25% WHCmax
50% WHCmax
100% WHCmax
25°C
37°C
UNBURNED
BURNED

Fig. 7.

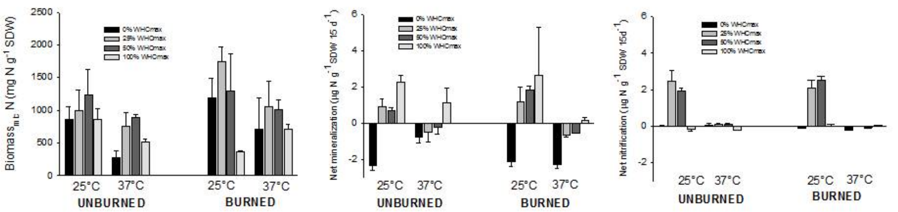

Biomassmic N (mg N g-1 SDW)
0% WHCmax
25% WHCmax
50% WHCmax
100% WHCmax
25°C
37°C
UNBURNED
BURNED
Net mineralization (µg N g-1 SDW 15 d-1)
Net nitrification (µg N g-1 SDW 15d-1)

Fig. 8.

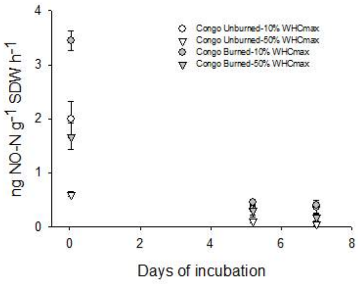

Congo Unburned-10% WHCmax
Congo Unburned-50% WHCmax
Congo Burned-10% WHCmax
Congo Burned-50% WHCmax
ng NO-N g-1 SDW h-1
Days of incubation
0
1
2
3
4
0
2
4
6
8

Fig. 9.