# Pyrochar decomposition under french grassland monitored by $^{13}C$ natural abundance

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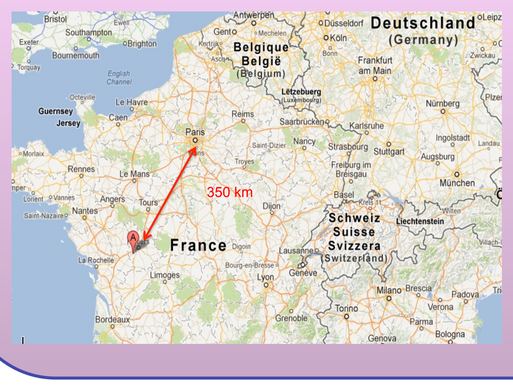
## Objectives

Up to now pyrochar decomposition has been assessed mostly during laboratory analyses while field experiments are lacking. **The aim of our study was to investigate the carbon storage potential of biochar produced by gasification after field exposure**. Our experimental approach included field application of C4 labelled pyrochar produced from corn residues by gazification at around 1100 °C

## Field Experiment : Lusignan (France)

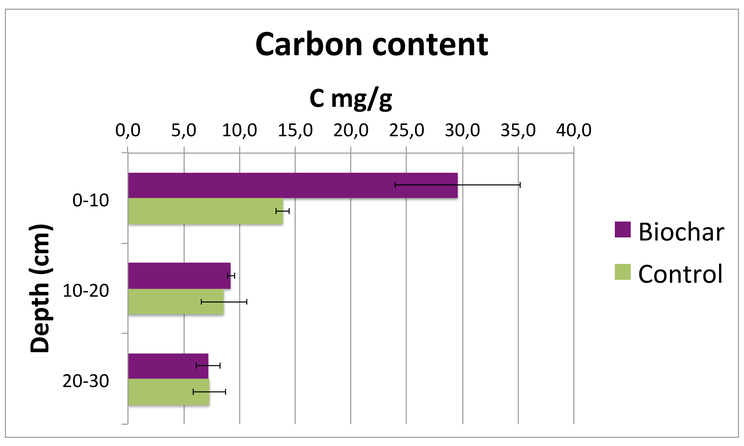


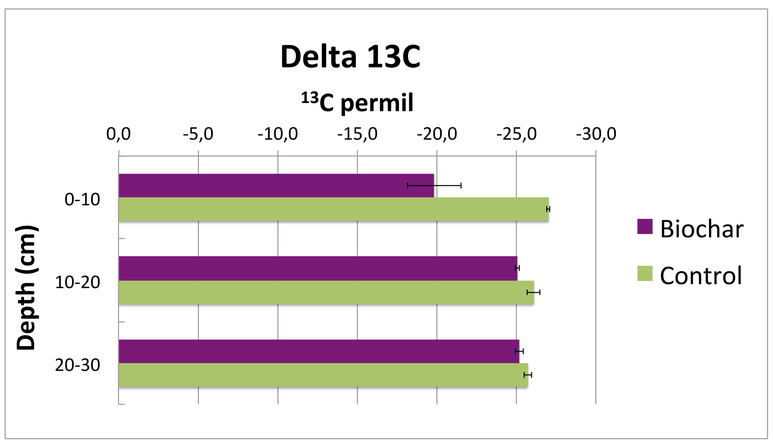

- Loamy soil
- Grassland
- April 2012
- 4 replicates + 4 controls
- Biochar: Maize = C4 plant input : 30t/ha (3 kg for 1 $m^2$)

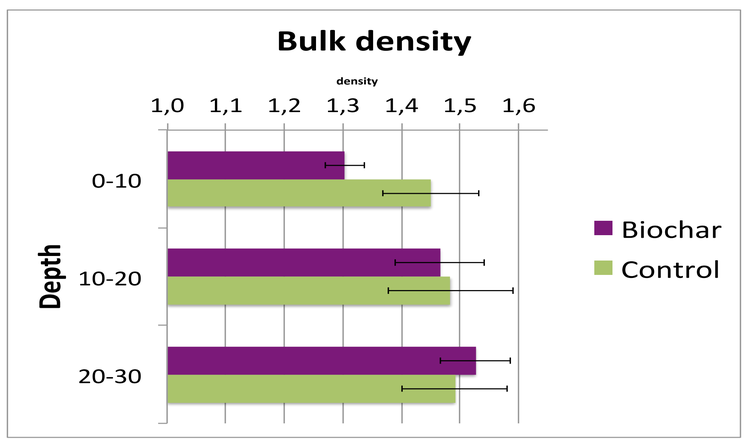
### Gas analyses

- automated chambers and plots with roots exclusion for C mineralisation
- $^{13}C$ measurements on $CO_2$ with Laser adsorption spectroscopy (LAS) and Mass Spectrometry (IRMS) for biochar contribution

## Soil analysis in July 2012



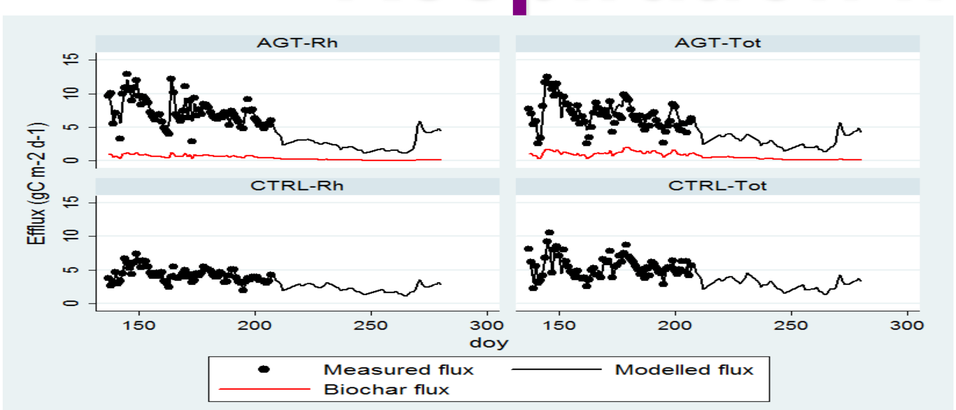

- Biochar addition increased the soils C content in 0-30 cm and decreased the stable C isotope ratio
- Biochars addition reduced soil bulk density
- Biochar contribution to total soil C stock showed high variability

## Respiration measurements

Biochar = AGT

$CO_2$ total from grassland: CTRL-Tot and AGT-Tot

$CO_2$ with roots exclusion CTRL-Rh and AGT-Rh



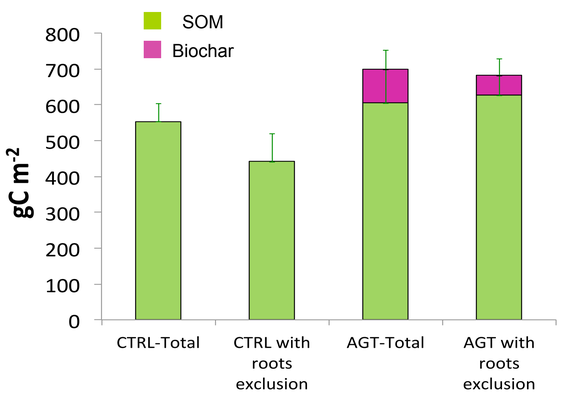




Fig. 2: Cumulative fluxes by treatment. Vertical bars are standard error (n=3). No significant difference in total flux was detected among treatments (p>0.05)

Biochar degradation after 143 days

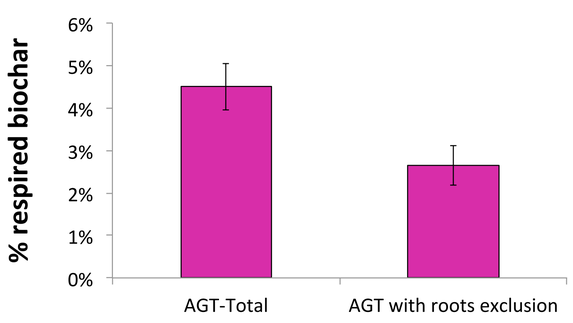
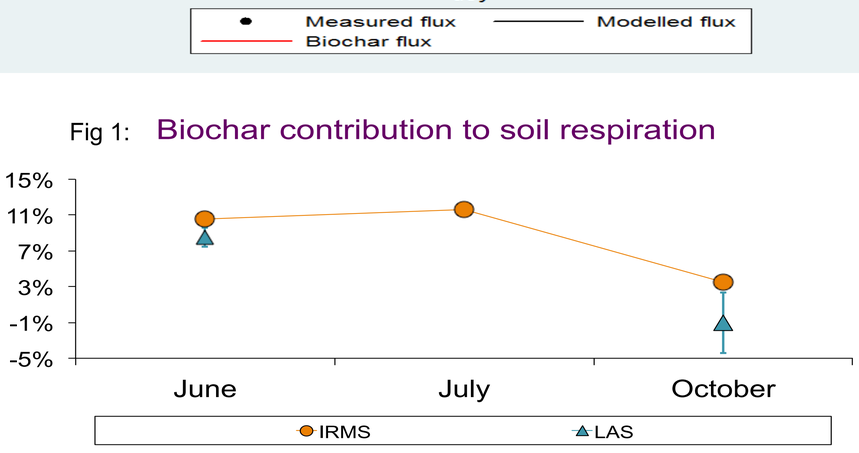



Fig. 3: % of biochar which has been respired by treatment. Bars indicate standard error (n=3). The difference is not significant (p=0.06)

Fig 1: Biochar contribution to soil respiration




$$f = \frac{\delta^{13}C_{\text{Soil respiration}} - \delta^{13}C_{\text{Soil organic matter}}}{\delta^{13}C_{\text{Biochar}} - \delta^{13}C_{\text{Soil organic matter}}}$$

- Pyrochar contribution to carbon mineralization was detectable during the first three months after application with no increase of the total soil respiration

## Conclusion :

**Soils analysis seems adapted for a long term monitoring of C4 biochar degradation in soils. Respiration measurements showed strong reductions of biochar mineralisation after 7 month under grassland.**

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