1. Objectives
- Measurement of CH4 fluxes over a grazed grassland in Belgium.
- Identification of CH4 fluxes drivers on a grazed grassland.
- Evaluation of management practices impacts on CH4 fluxes.

2. Material and Methods
Methane fluxes emitted by a grazed meadow were measured continuously since June 2012 at the Dorinne Terrestrial Observatory in Belgium (50° 18' 44" N; 4° 58' 07" E; 248 m asl.). Measurements were made with the eddy covariance technique, using a fast CH4 analyzer (Picarro G2311-f). Carbon dioxide fluxes measurements were made with the eddy covariance technique, using (LI- 7000) and various micro-meteorological and soil variables, biomass growth and stocking rate evolution were also measured at the site. N2O emissions are currently measured through continuous observation of the meadow (LI- 7000) and various micro-meteorological and soil variables, biomass growth and stocking rate evolution were also measured at the site. N2O emissions are currently measured through dynamic closed chambers (Beekekerk van Ruth et al., Geophysical Research Abstracts, Vol. 15, EGU2013-3211, 2013) and the carbon budget of the site has already been investigated (Jerome et al. Geophysical Research Abstracts, Vol. 15, EGU2013-6989, 2013).

3. Results

Cattle emissions
Methane emissions were measured during cattle presence as well as during cattle absence.
- Fluxes during cattle absence were commonly found to range between 0 and 0.05 µmol m-2 s-1 and were only exceptionally negative.
- When cattle was present on the meadow, emissions were much higher and were strongly linked to stocking rate with a regression curve corresponding to the equation: \( F_{\text{CH4}} = (7.9 \pm 0.5) \times SR + 11.9 \pm 3.4 \) \times 10^{-3} kg CH4 m-2 s-1.

Daily cycle

Environmental drivers
When no cows were present on the meadow, a relation between CH4 fluxes and environmental drivers was investigated. We plotted CH4 fluxes according to two environmental drivers; soil temperature at 5 cm depth (°C) and soil moisture at 5 cm depth (% volume). As both drivers are correlated, we divided each dataset in 3 categories according to the value of the other driver.
- No significant relation was found between methane fluxes and soil temperature.
- A significantly negative relationship between CH4 fluxes and soil moisture was found for each temperature category and for the complete dataset.

4. Conclusions
- Our CH4 analyzer is very stable and easy to use, leading to a high data coverage of about 90.2 % of the measurement period.
- Methane emissions were found to be strongly correlated with cattle stocking rate with a slope of 39.8 ± 2.5 kg CH4 year-1 LSU-1 (against 57 kg CH4 year-1 LSU-1 for IPCC tier 1 emission factor - IPCC, 2006. Guideline for National Greenhouse Gas Inventories).
- No net methane sink has been observed. The meadow behaves as a methane emitter, even in the absence of cows.
- In the absence of cows, no significant relation can be established between methane emissions and soil temperature. However, a significantly negative relation can be established between methane emissions and soil moisture. This negative relation is quite the opposite of our expectations.
- During grazing periods fluxes are highly variable. This phenomena could be due to cow digestion rhythm and cow movements in and out the measurement footprint zone. Cattle geo-localization is needed to disentangle these two potential causes.

5. Perspectives
Further developments are ongoing in order to automatically count the number of animals present in the measurement footprint. This is a critical point if we want to deal with the high variability of flux measurements during cow presence periods. Two cattle geo-localization systems are currently under development:
- Home-made GPS devices fixed on cows will measure a position every 5 minutes and will have an autonomy of several weeks. GPS measurements are interesting but difficult to implement for long durations because of the high level of maintenance work required.
- A thermal camera will allow detection of cow presence around the measurement site day and night without much maintenance work. The camera orientation will be automatically controlled by a pan-tilt unit in order to always face the footprint zone.