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ICOS INTEGRATED CARBON OBSERVATION SYSTEM
POTSDAM GHG FLUX WORKSHOP
From Natural to Urban Systems
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SETTING UP AN EDDY COVARIANCE SYSTEM TO MEASURE N_2O FLUXES EXCHANGED BY A PRODUCTION CROP - FIRST STEPS

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INTRODUCTION

Nitrous oxide :

- Produced by **soil microorganisms**, depending on soil oxygenation conditions and N and C content
- Major anthropogenic emissions contributors : **production crops**
- Main drivers : **pedoclimatic conditions** and **farming practices**

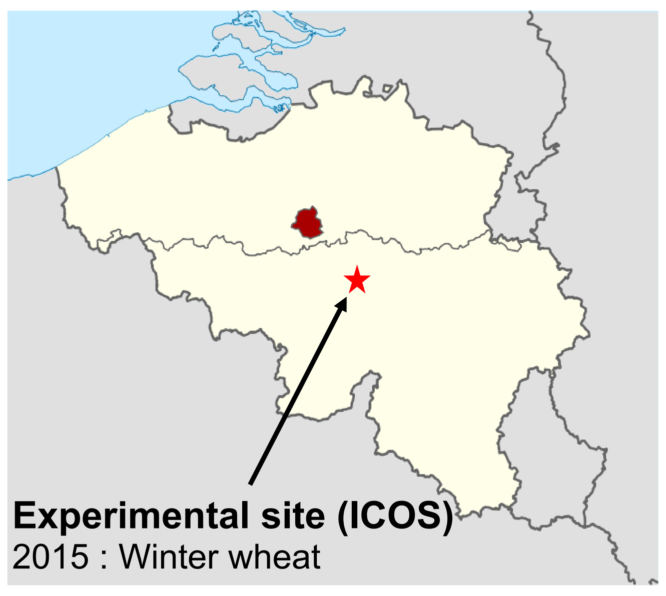
Master thesis objectives :

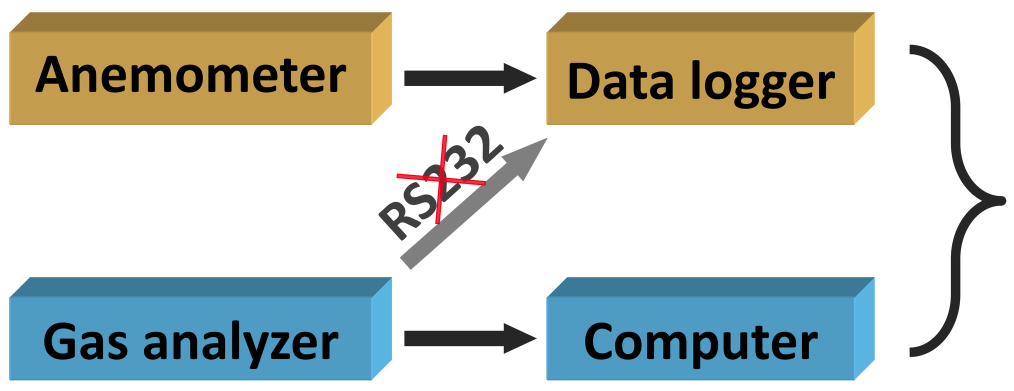
- ☐ **System follow-up**
- ☐ **Data preprocessing**
- ☐ **Flux calculation investigation**

MATERIAL

Eddy covariance system :

- **Terrestrial Observatory of Lonzée (ICOS)**
  - **Sonic anemometer** (Gill, HS-50)
  - **High frequency gas analyzer** (closed path Aerodyne QCLaser)
  - **Pedoclimatic sensors**



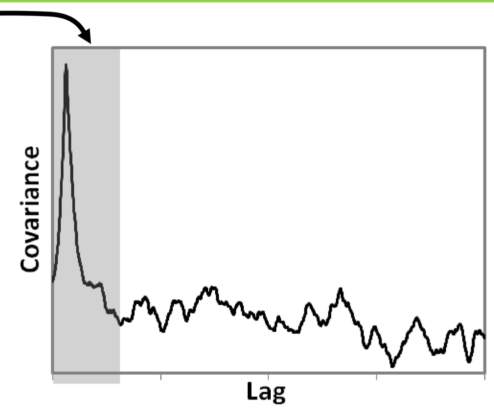


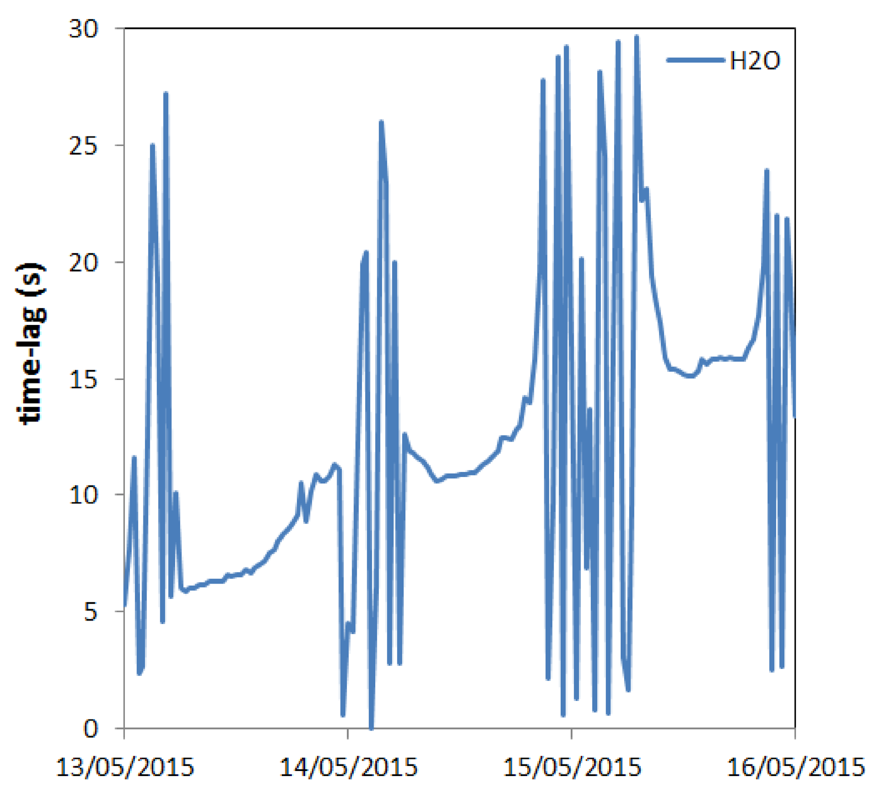
Assembling data manually into a single data set

RESULTS

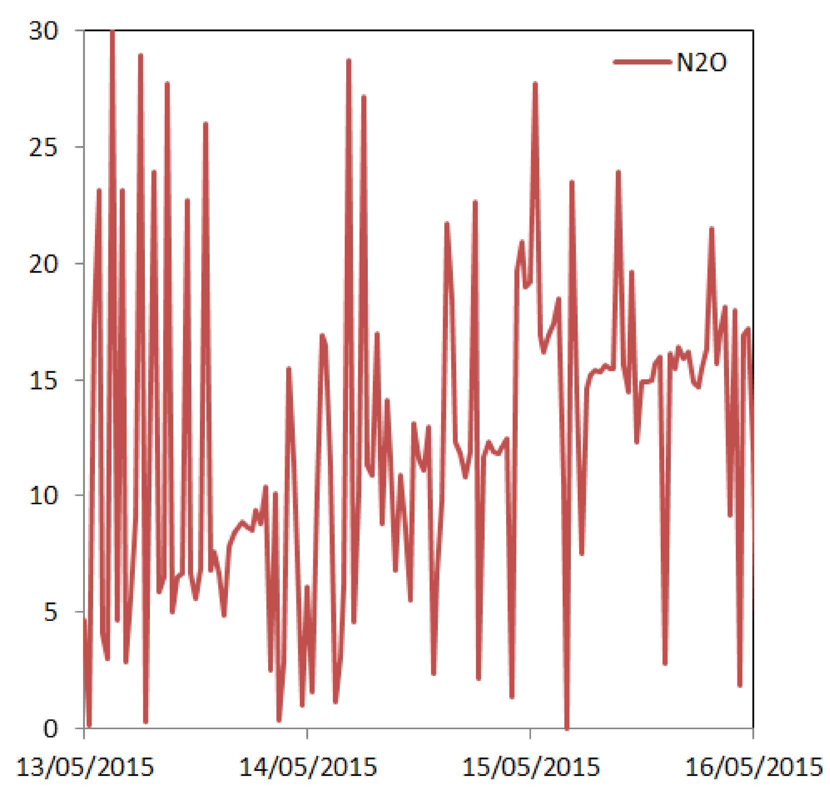
Time-lag :

- **Exploratory purpose** : in a lag interval from 0 to 30 seconds, search for a covariance maximum
- At present, only three days measurements available due to technical problems





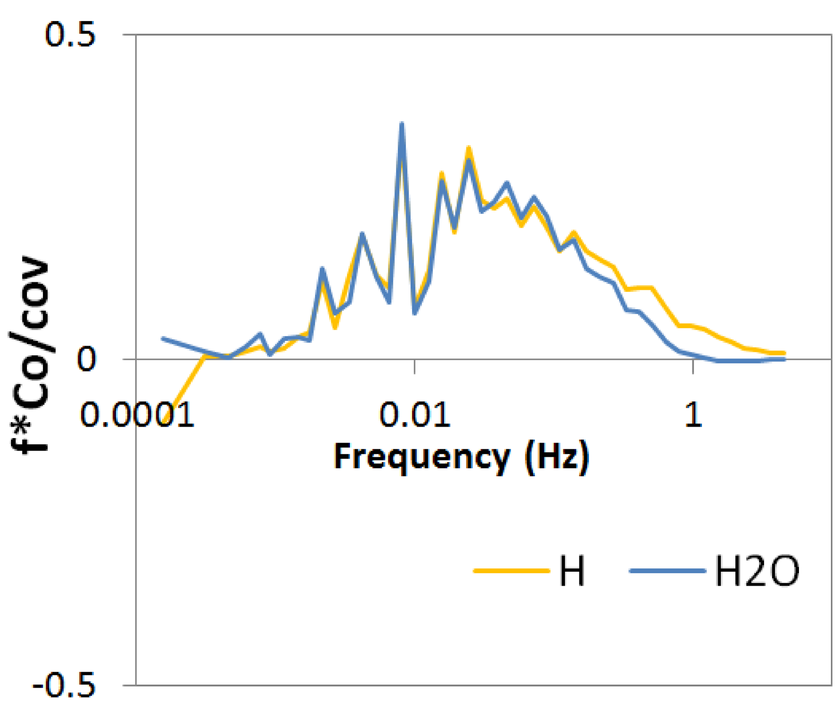
- **Drifting time-lag** (gas analyzer internal clock drift)
- Possible **influence of air humidity** at dawn and dusk (to investigate further)



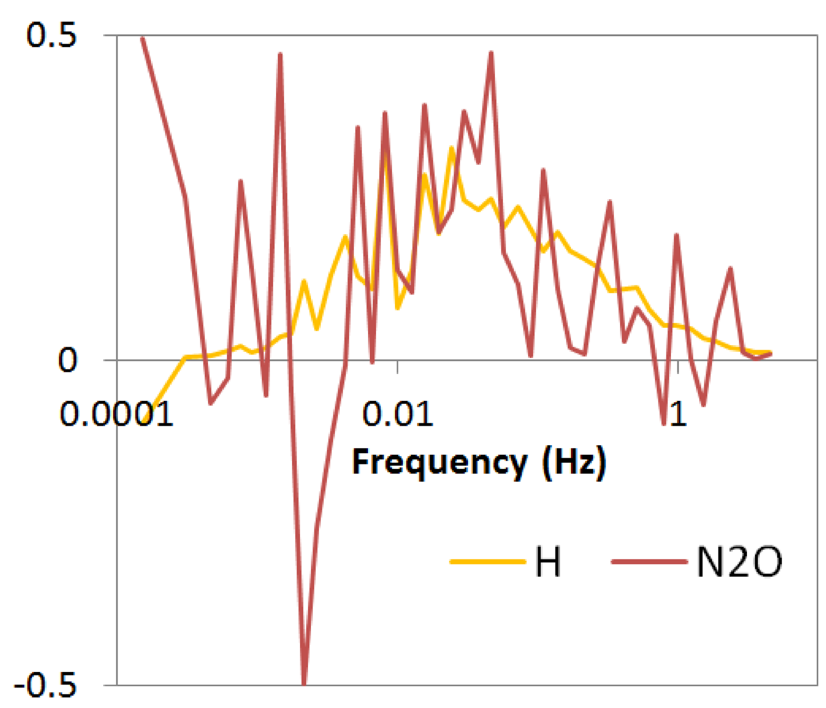
- **More chaotic** : low fluxes ⇨ poor covariance
- **No distinct maximum** in the covariance function at a consistent time-lag in the interval

High frequency loss :

- **Experimental approach** : comparison of gas cospectra (H2O and N2O) with sensible heat cospectrum (H) ⇨ **transfer function**
- **Gaussian curve** fit to experimental transfer function ⇨ estimation of the **system cut-off frequency**



- H2O-specific cut-off frequency : **0.53 Hz**
- Further investigation : **air humidity influence** and **adapted curve** to fit the experimental transfer function



- At present, **too low fluxes** to get a suitable N2O cospectrum
- **Current dataset prevents** the determination of the N2O-specific cut-off frequency

CONCLUSIONS

Issue	Insight
Time-lag :	
• Drifting time-lag	⇨ Search for a covariance maximum in a moving lag interval
• **N2O** : poor covariance and no proxy available for periods with low fluxes	⇨ **N2O** : possibility of smoothing the covariance function
High frequency loss :	
• **H2O** : a basic curve was used to fit the experimental transfer function	⇨ When more data available, look for an adapted fitting curve
• **N2O** : no valid cospectrum	

PERSPECTIVES

Pending questions :

- **N2O time-lag determination :** which method to use ?
- **Spectra or cospectra :** which one is best suited to high frequency loss evaluation ?
- **Data quality test (Vickers and Mahrt, 1997) :** how to adapt them for N2O ?

Set-up improvement :

- **Gas analyzer container :** shading and air-conditioning systems

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