SETTING UP AN EDDY COVARIANCE SYSTEM TO MEASURE N₂O 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

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

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<tr>
<th>Issue</th>
<th>Insight</th>
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<tr>
<td>Time-lag:</td>
<td>⇒ Search for a covariance maximum in a moving lag interval</td>
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<tr>
<td>- Drifting time-lag</td>
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<td>- N₂O: poor covariance and no proxy available for periods with low fluxes</td>
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<tr>
<td>High frequency loss:</td>
<td>⇒ When more data available, look for an adapted fitting curve</td>
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<tr>
<td>- H₂O: a basic curve was used to fit the experimental transfer function</td>
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<td>- N₂O: no valid cospectrum</td>
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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

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

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