

Integrated non-CO₂ Greenhouse gas Observing System

Cabauw CH₄ experiment 2012

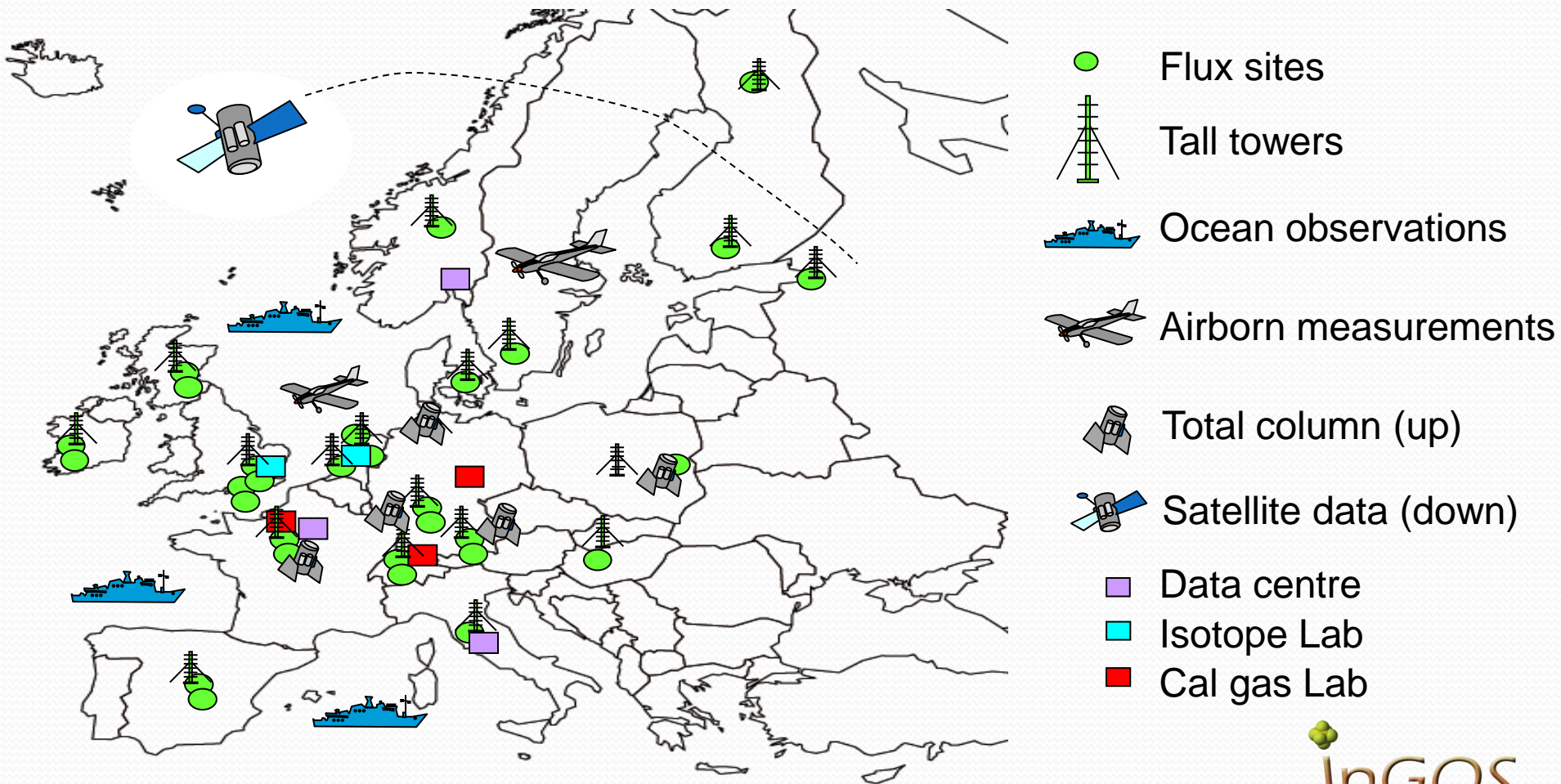


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Bosveld, Eiko Nemitz, Anders
Lindroth, Timo Vesala Ko, van
Huissteden

COST ABBA meeting Paris
September 3 2012

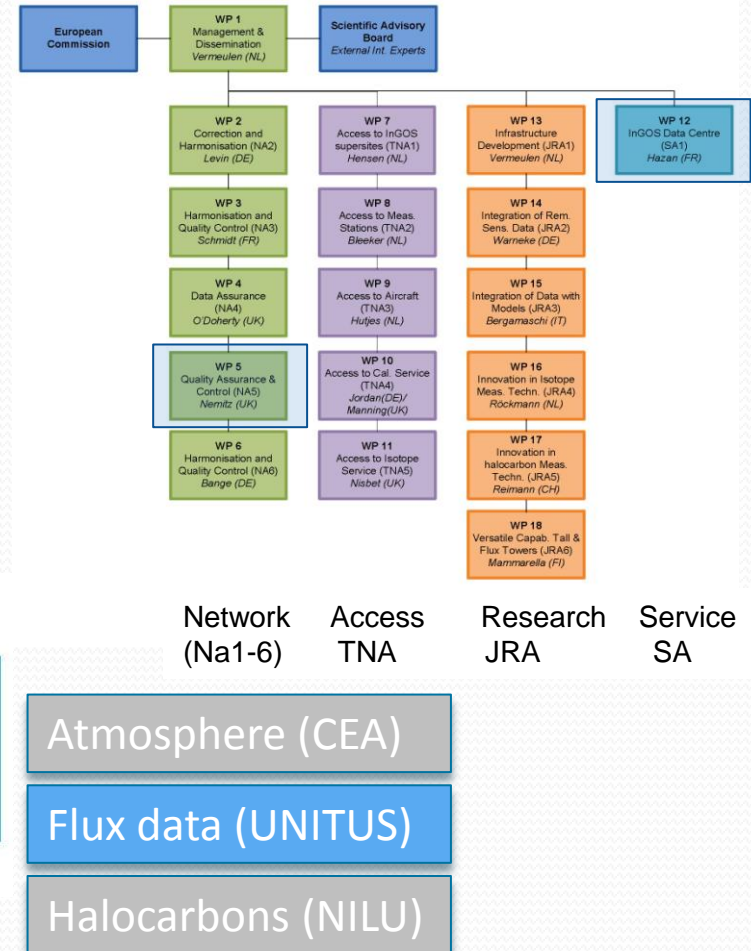
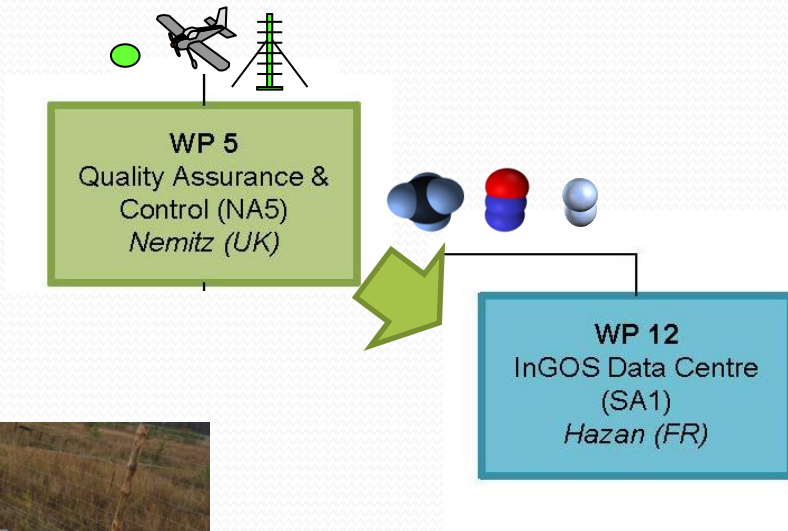


InGOS existing infrastructure



COST-ABBA LINK Flux Harmonisation

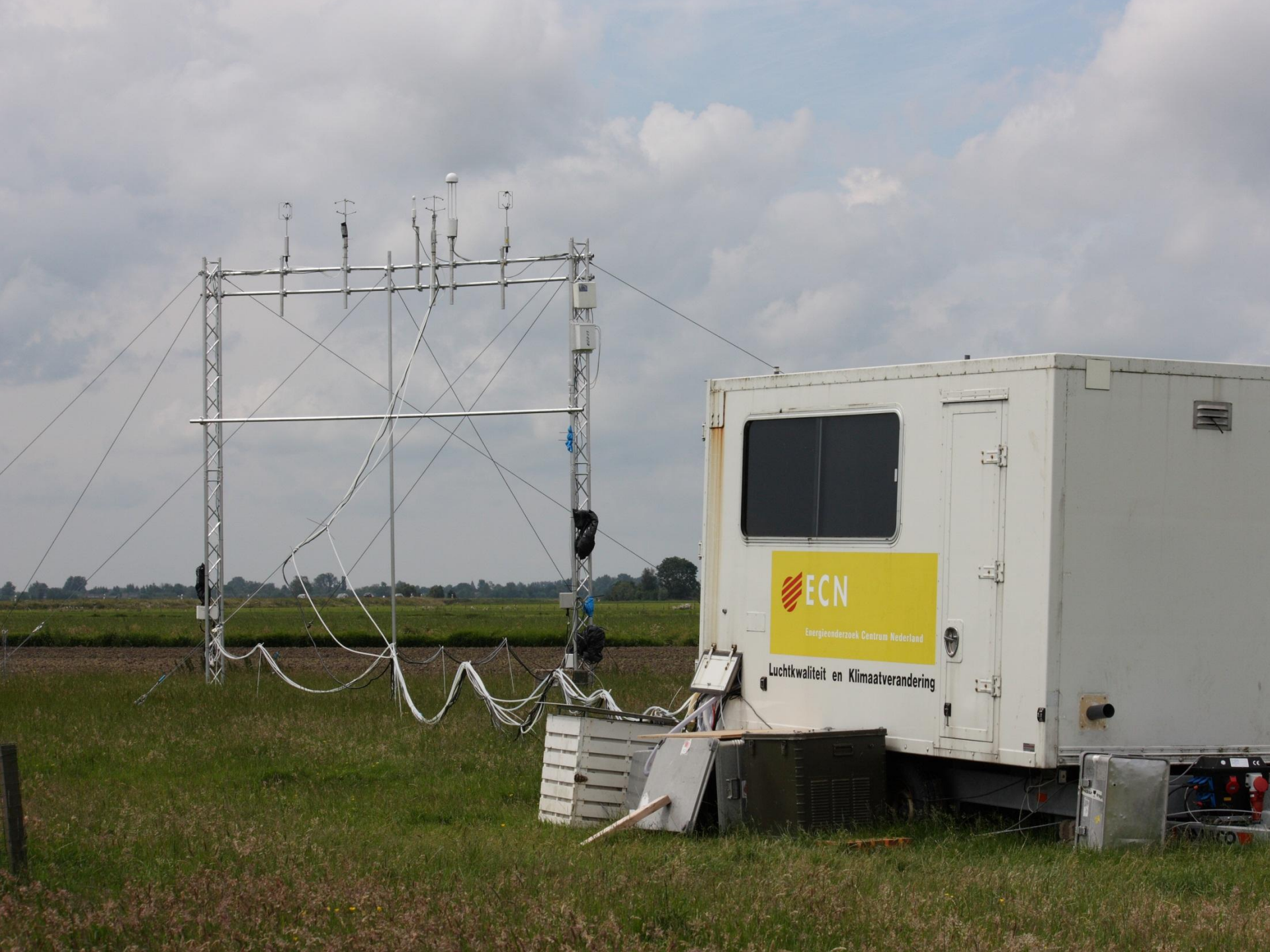
NA 5: Harmonisation for Flux data



Where and when

- Cabauw the Netherlands
- NA5: 6.6.-27.6.2012
- JRA6: 2.7.-25.7.2012

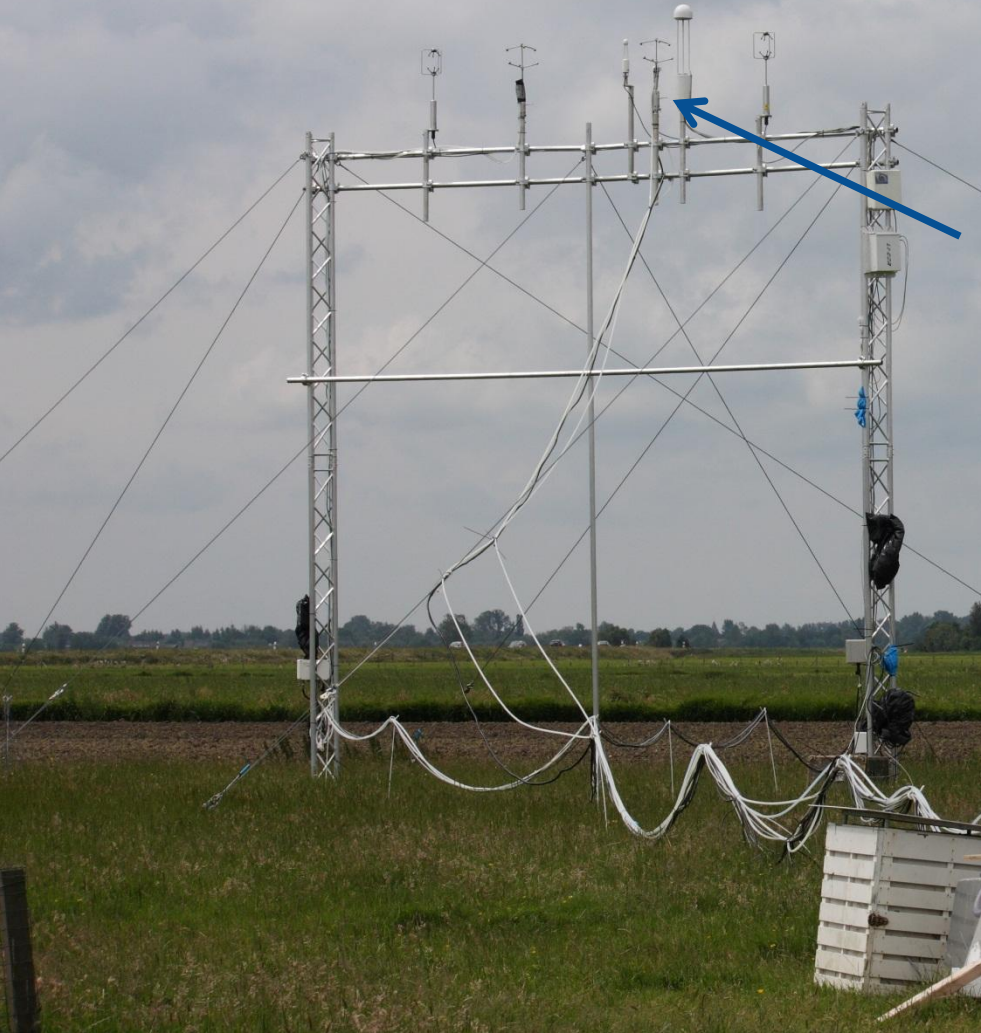




ECN
Energieonderzoek Centrum Nederland

Luchtkwaliteit en Klimaatverandering

Instrument comparison (NA5)



Anemometer: METEK USA-1

Gas analysers:

- LI-7500 (LI-COR) $\text{H}_2\text{O}, \text{CO}_2$
- LI-7700 (LI-COR) CH_4
- G2311-f (Picarro) $\text{CH}_4, \text{CO}_2, \text{H}_2\text{O}$
- FGGA (Los Gatos) $\text{CH}_4, \text{CO}_2, \text{H}_2\text{O}$
- DLT-100 (Los Gatos) CH_4

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- FMA (Los Gatos) CH_4
- G1301-f (Picarro) CH_4, CO_2
- FMA (Los Gatos) $\text{CH}_4, \text{H}_2\text{O}$
- QCL (Aerodyne) $\text{CH}_4, \text{N}_2\text{O}, \text{H}_2\text{O}$

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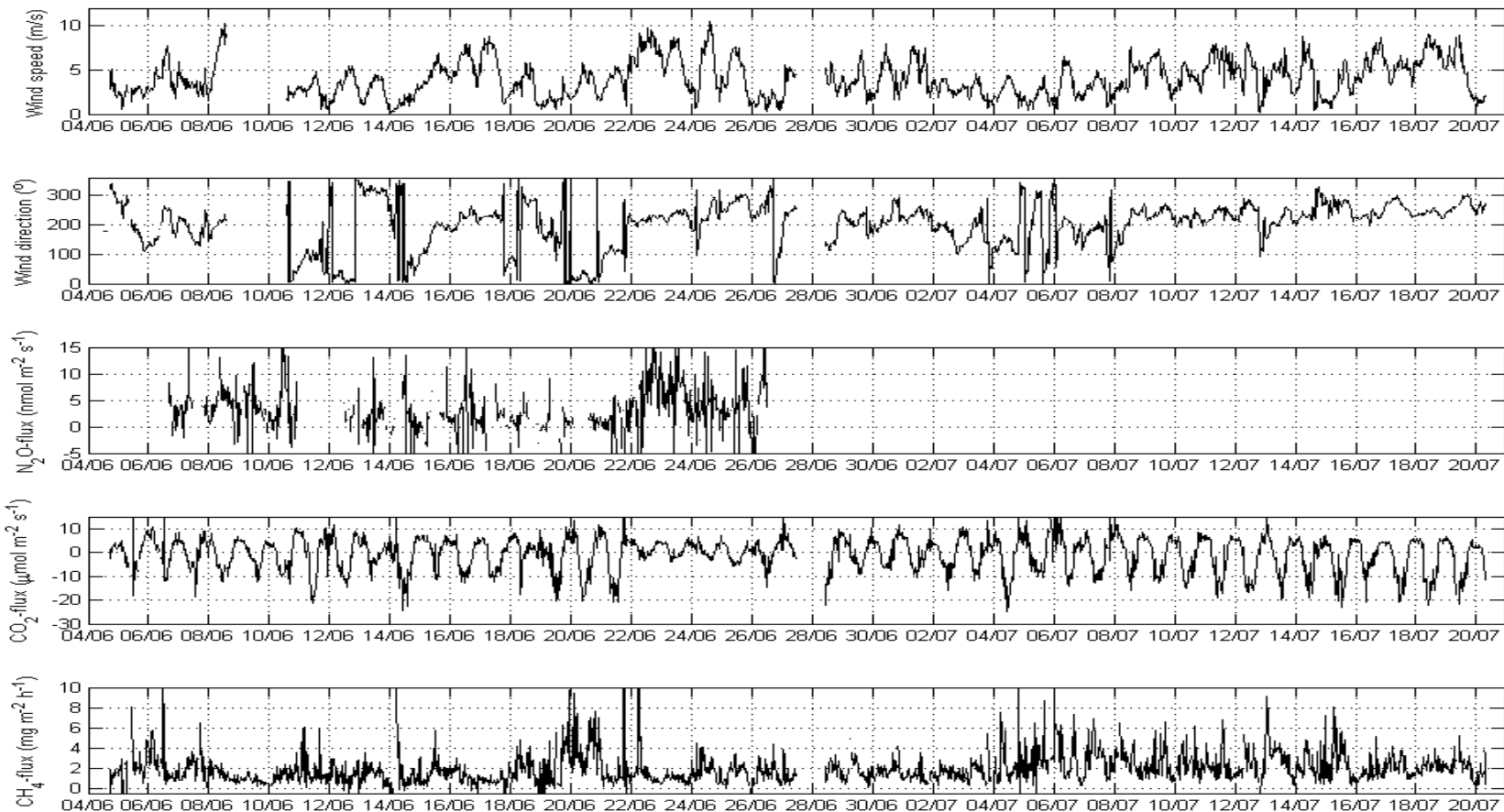


Inlet lines: 25-35 m 10mm or 1/2"
Course filter at the inlet
Filter just before the instruments

All data logged in labview application
(CEH CAROLE !)

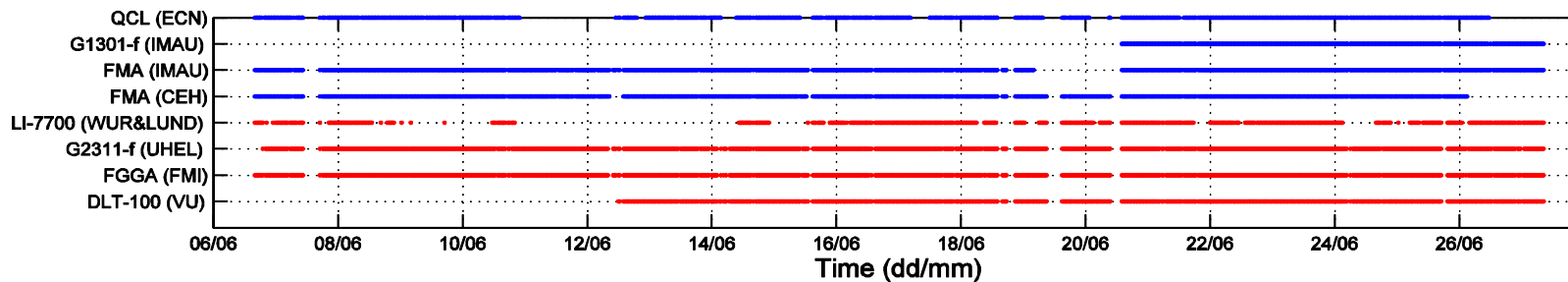
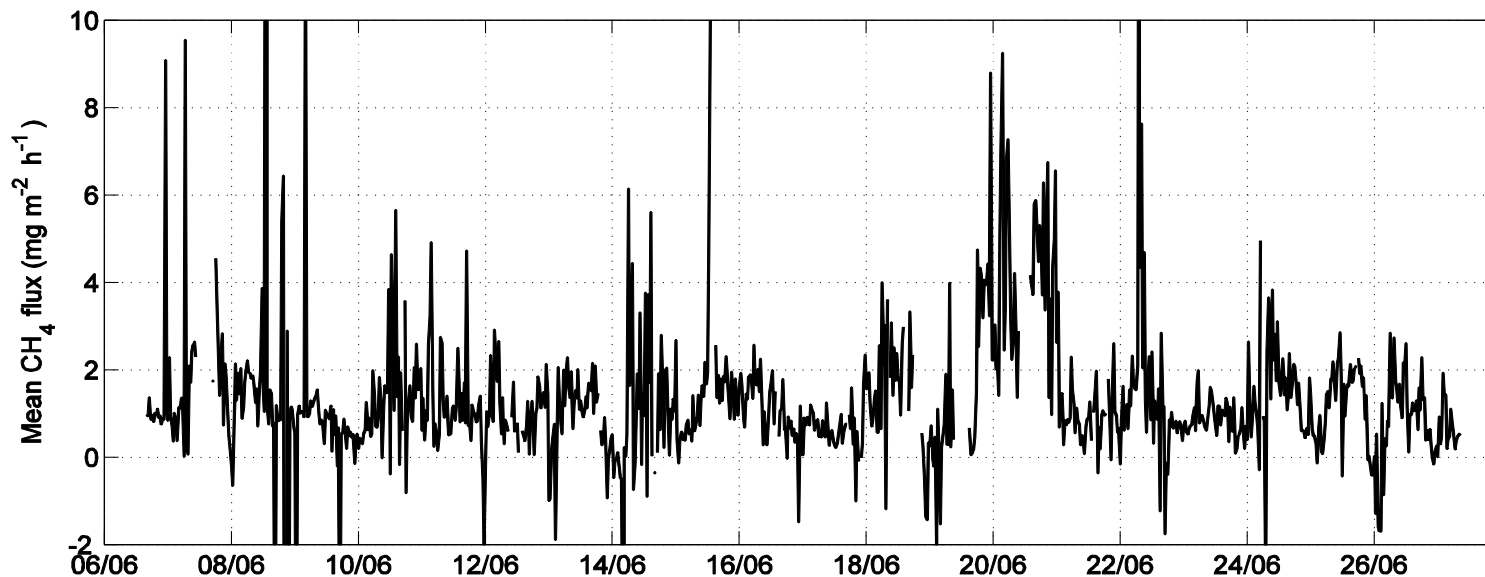


Data !



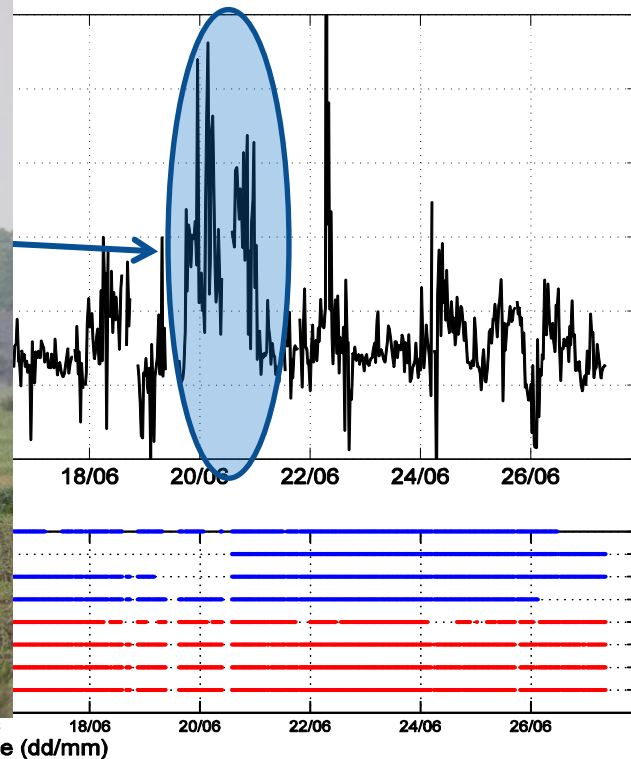
28-5-2013

Data coverage

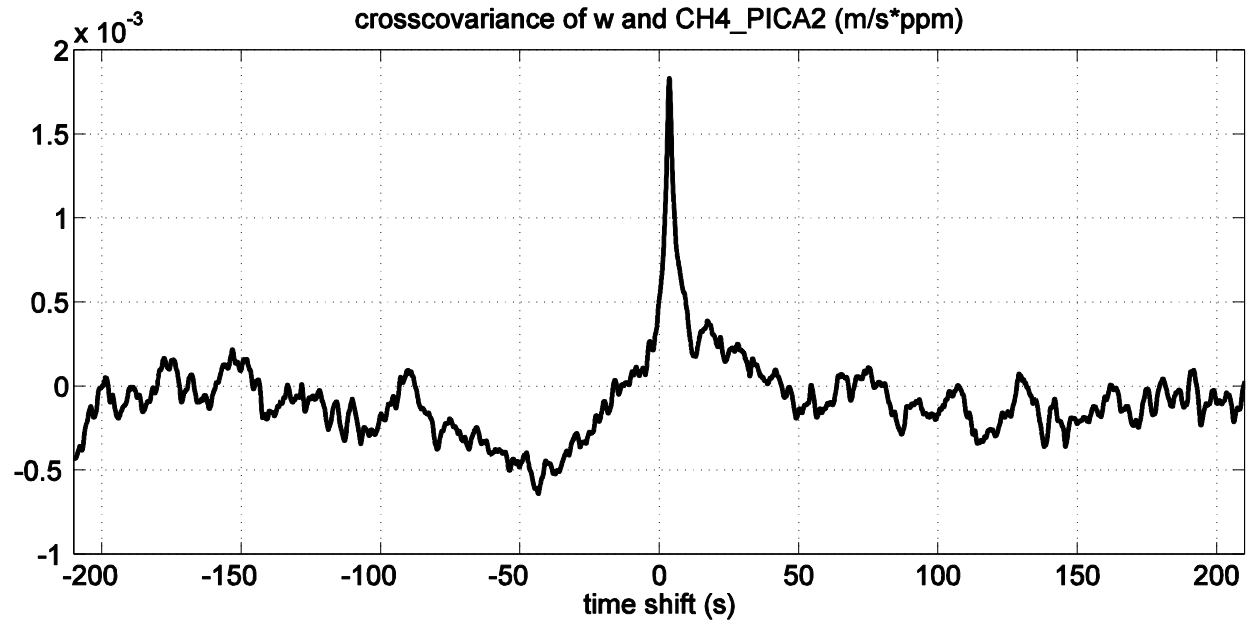


Emission: Dutch-Ditch maintenance

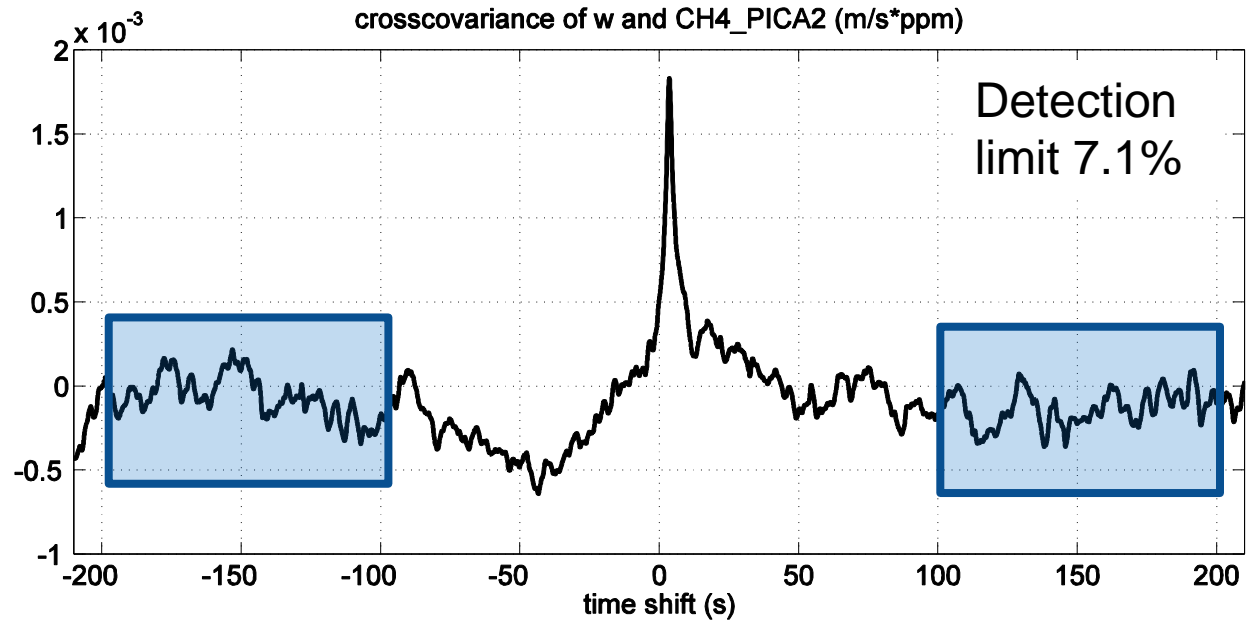
21.6.2012



Detection limit



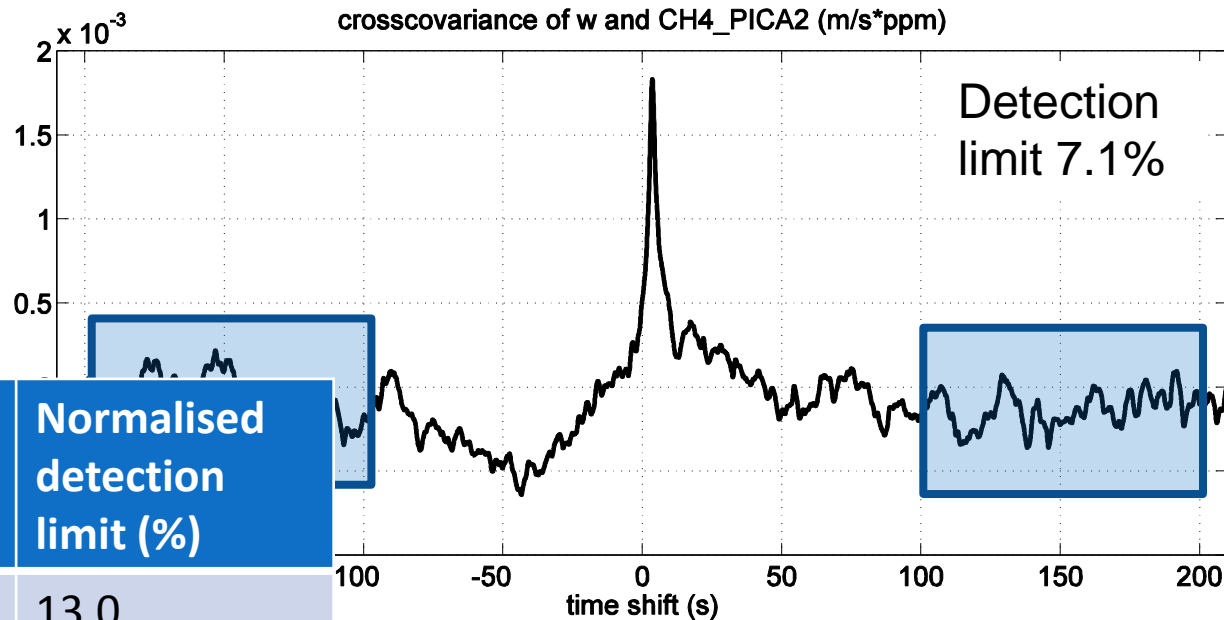
Detection limit



Detection limit calculated
according to Wienhold et al. (1994)



And the winner is

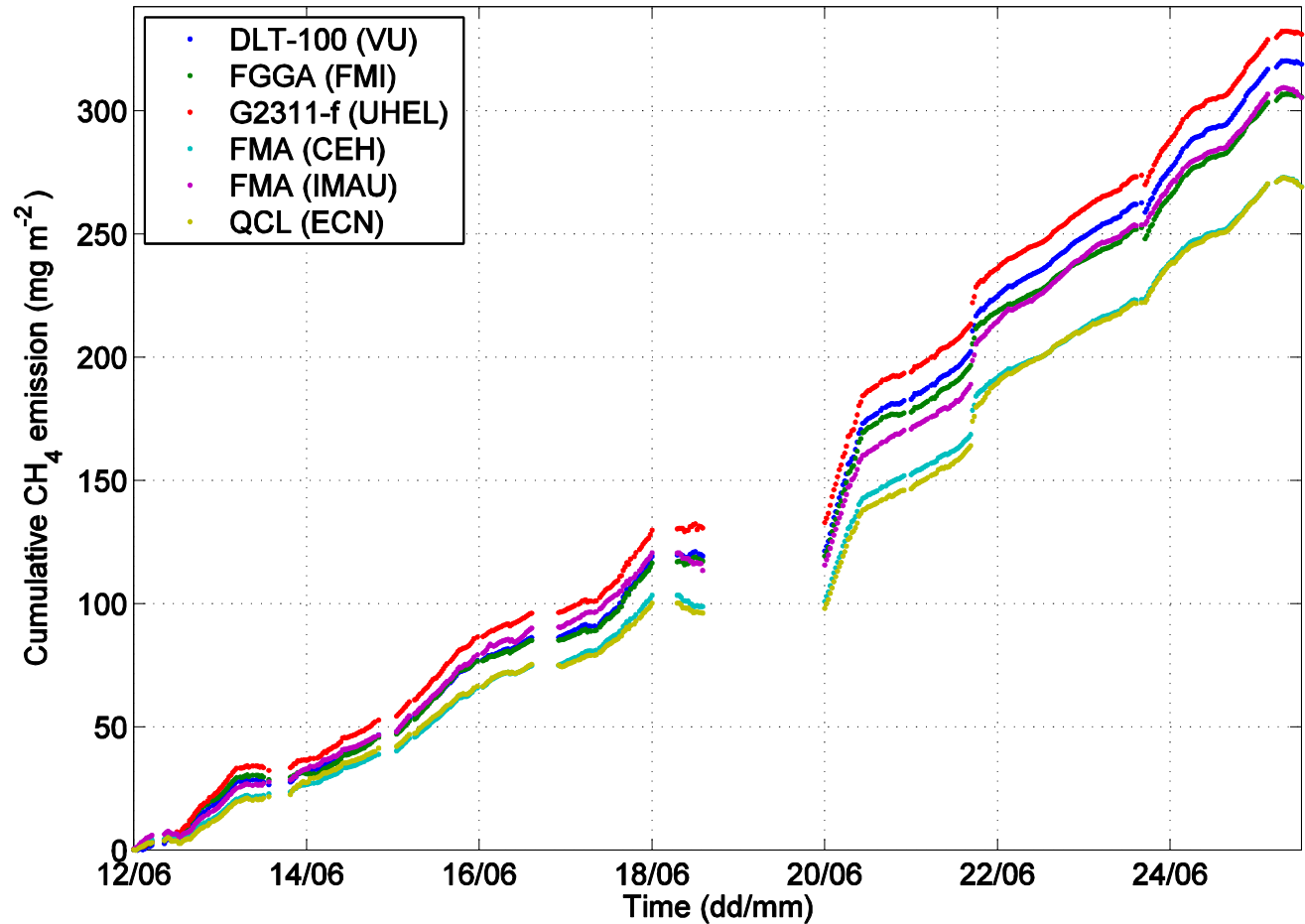


| | Normalised detection limit (%) |
|----------------------|--------------------------------|
| DLT-100 (VU) | 13.0 |
| FGGA (FMI) | 12.4 |
| G2311-f (UHEL) | 13.7 |
| LI-7700 (WUR & LUND) | 23.3 |
| FMA (CEH) | 13.7 |
| FMA (IMAU) | 20.6 |
| QCL (ECN) | 19.2 |

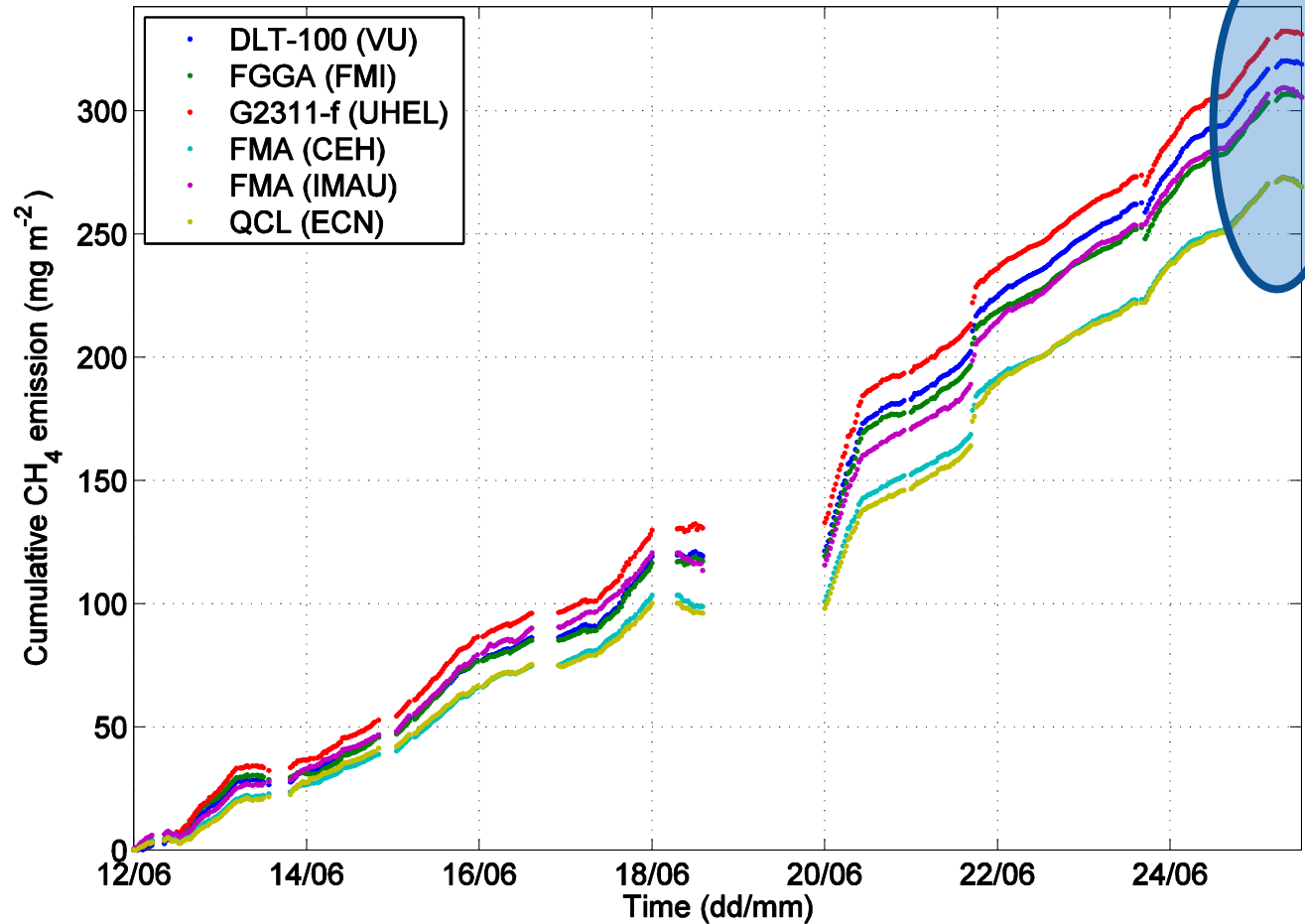
Detection limit calculated according to Wienhold et al. (1994)



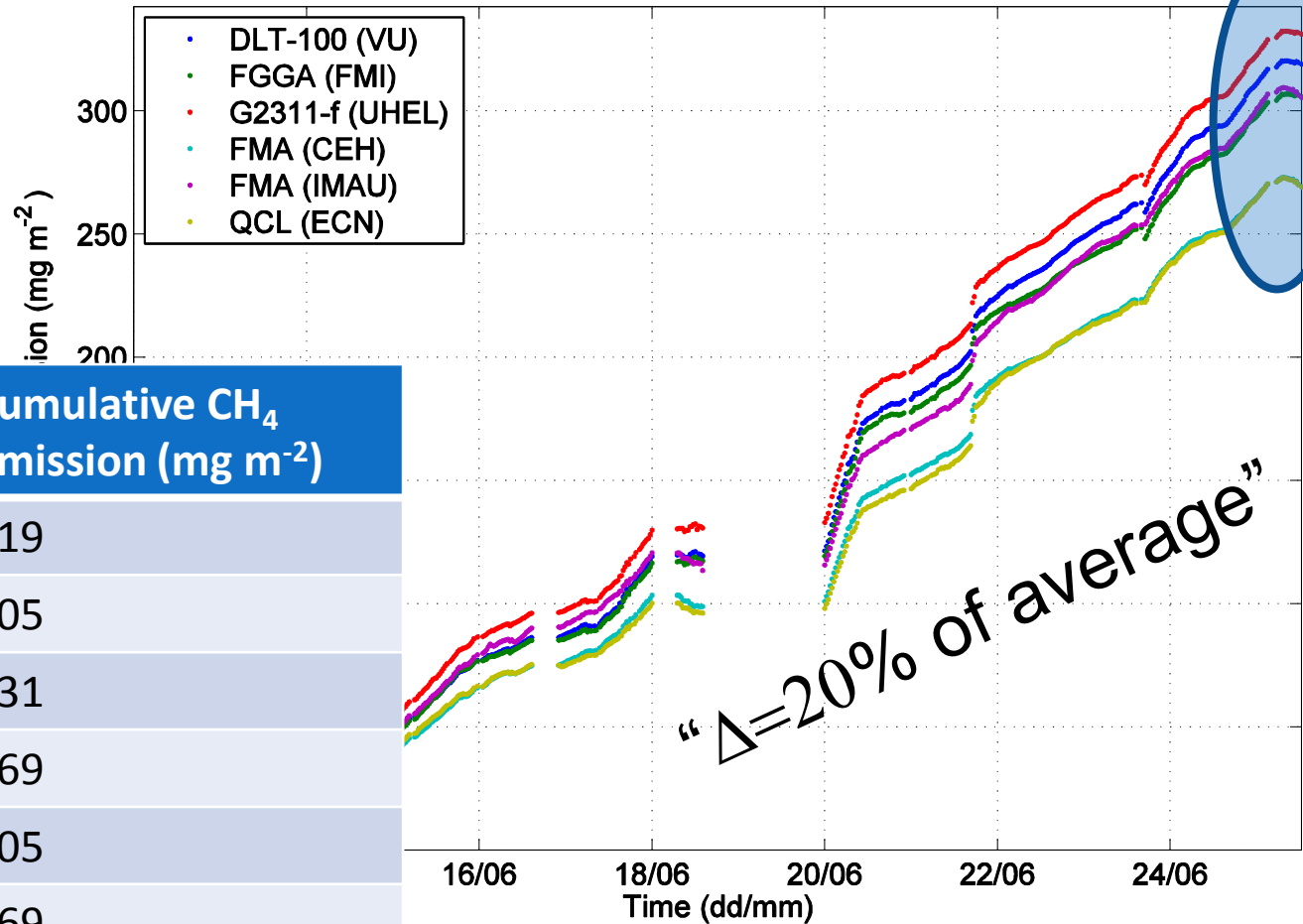
Cumulative sum



Cumulative sum



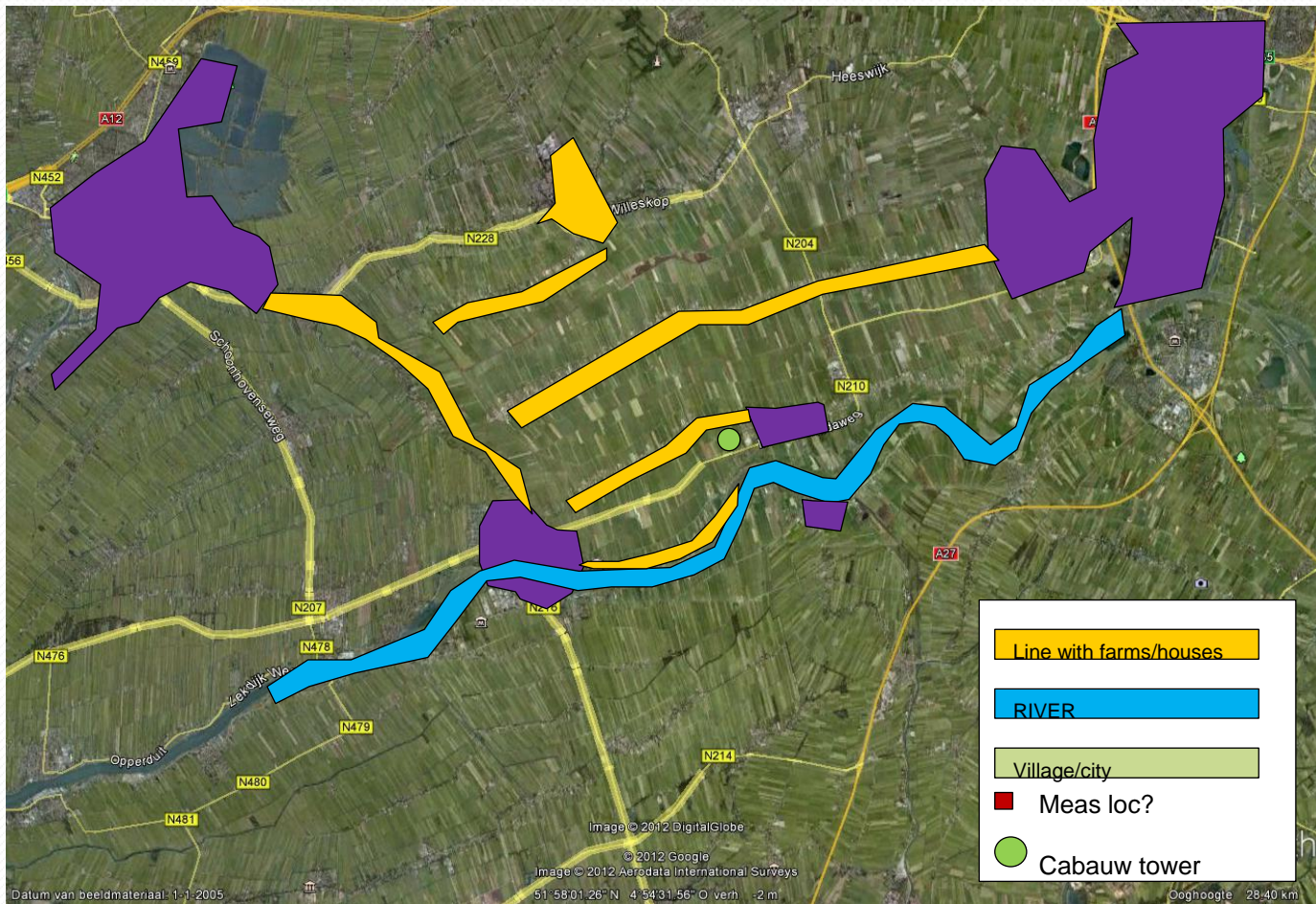
Cumulative sum



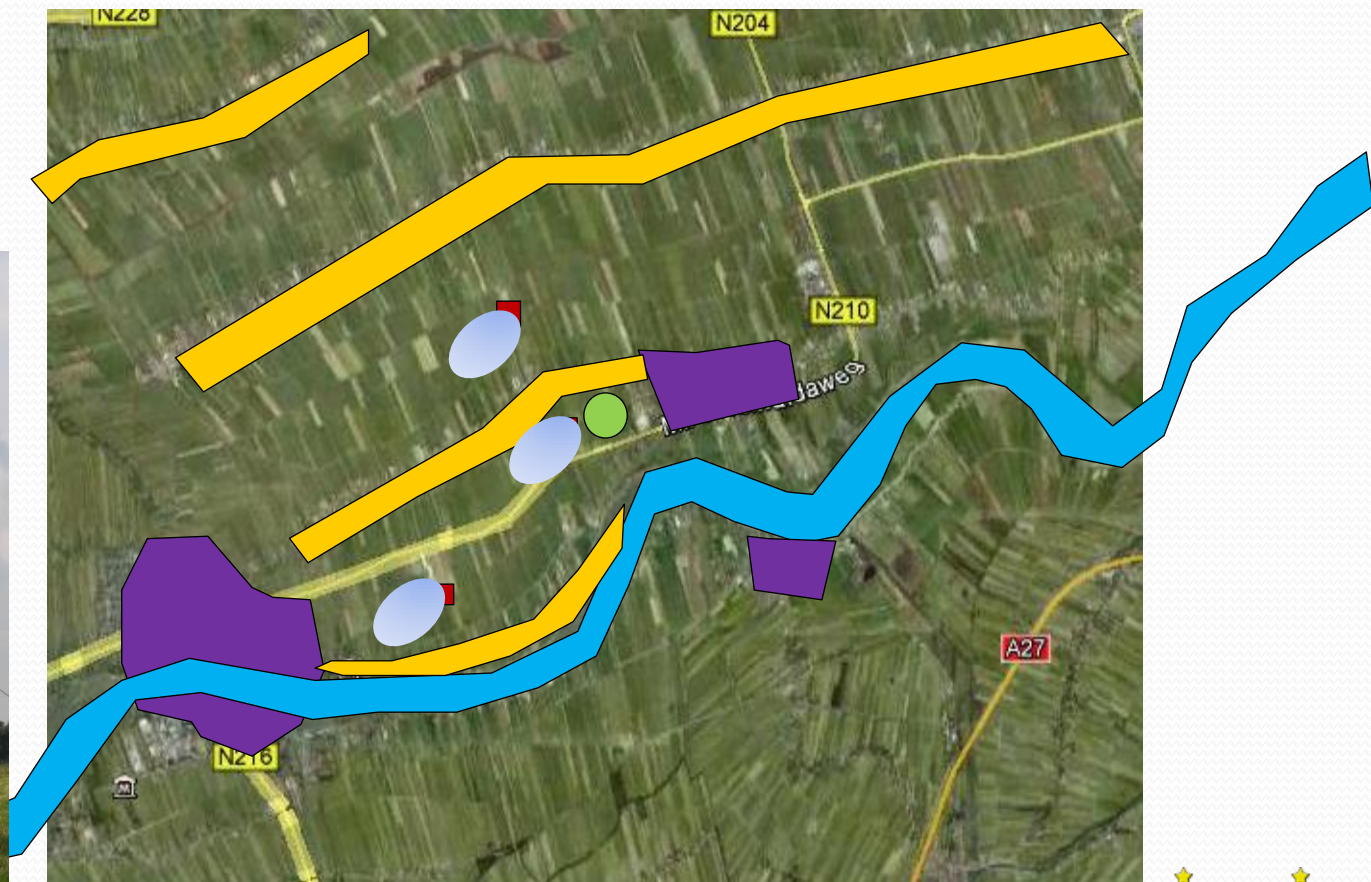
| | Cumulative CH ₄ emission (mg m ⁻²) |
|----------------|---|
| DLT-100 (VU) | 319 |
| FGGA (FMI) | 305 |
| G2311-f (UHEL) | 331 |
| FMA (CEH) | 269 |
| FMA (IMAU) | 305 |
| QCL (ECN) | 269 |



Concept for second part (JRA6)



Concept for second part (JRA6)





Farm site:

Anemometer:

METEK USA-1

Gas analysers:

LI-7000 (LI-COR)

CO₂, H₂O

FMA (Los Gatos)

CH₄





Farm site

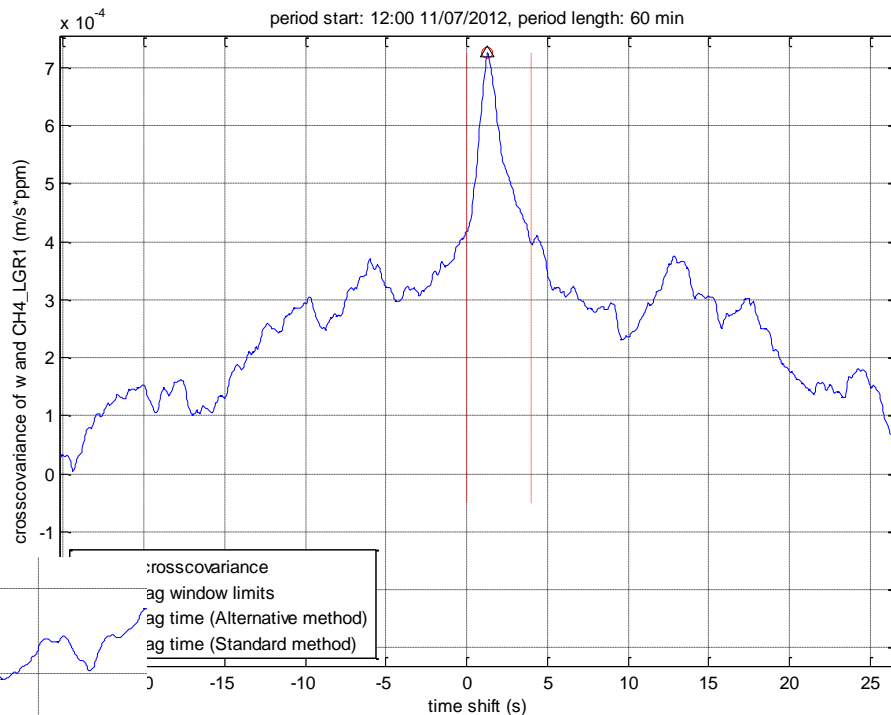
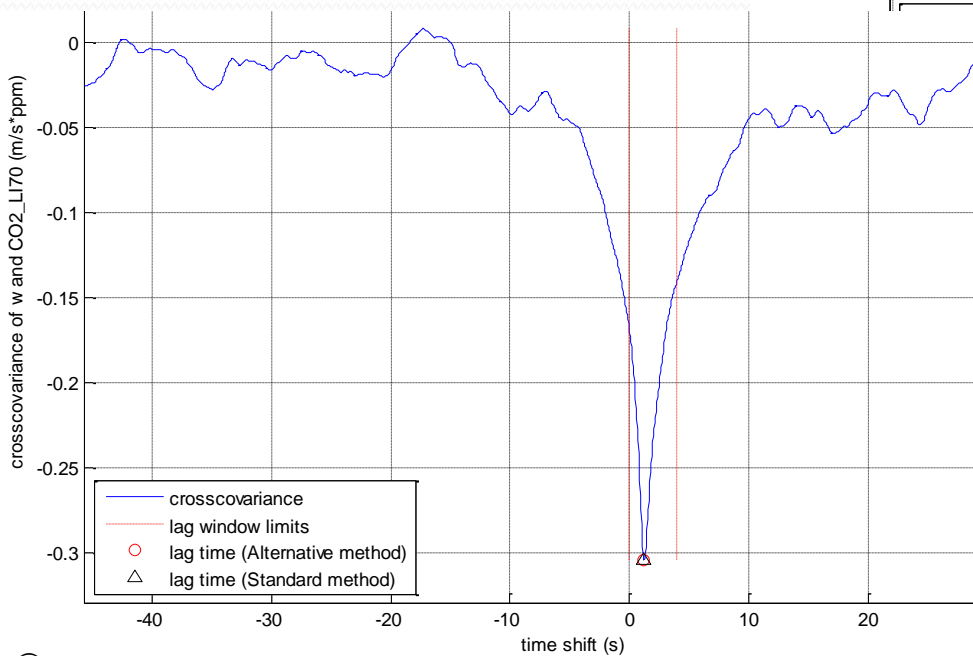
LGI

CH₄ 1.3 sec

Licor 7000

CO₂ 1.2 sec

H₂O 1.4 sec



CH₄ emission

CO₂ uptake

Depot site:

Anemometer:

Gill R2

Gas analysers:

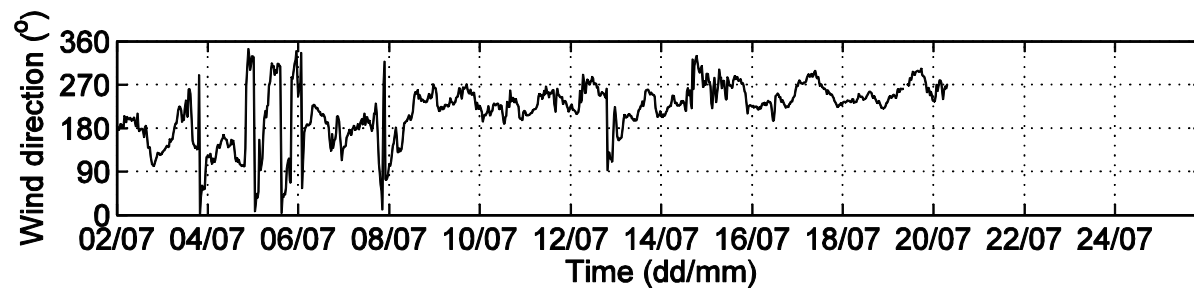
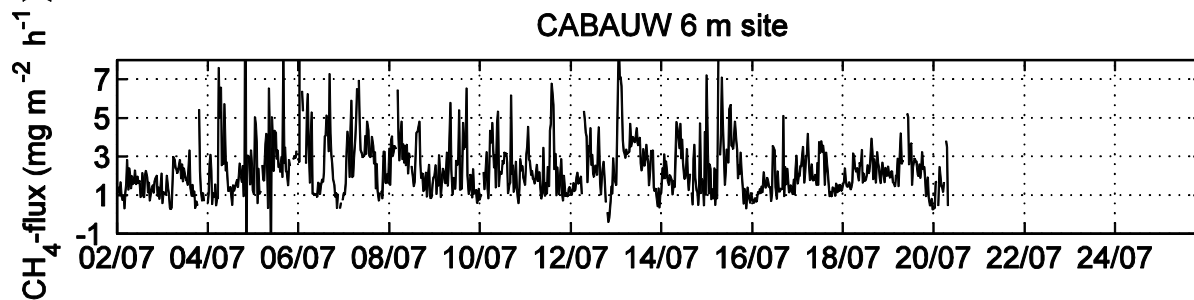
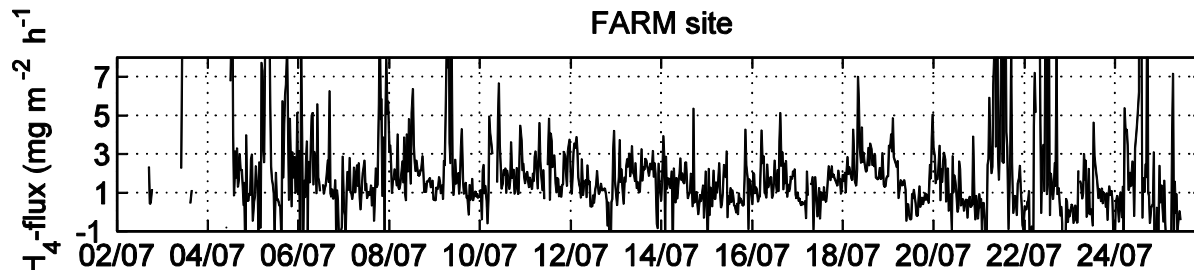
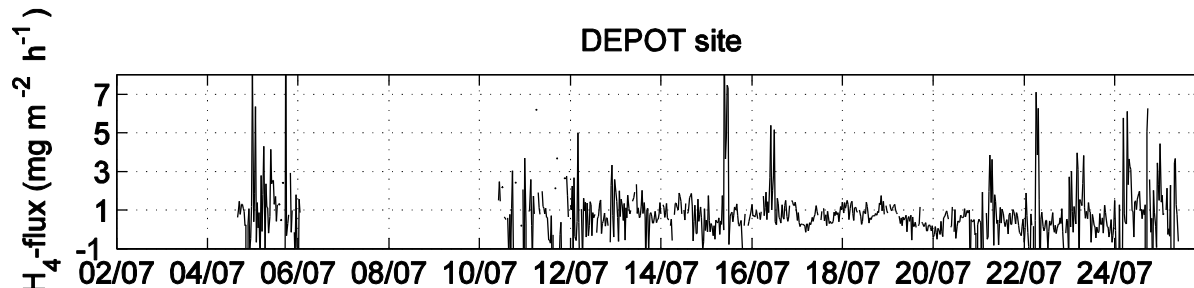
DLT-100 (Los Gatos)

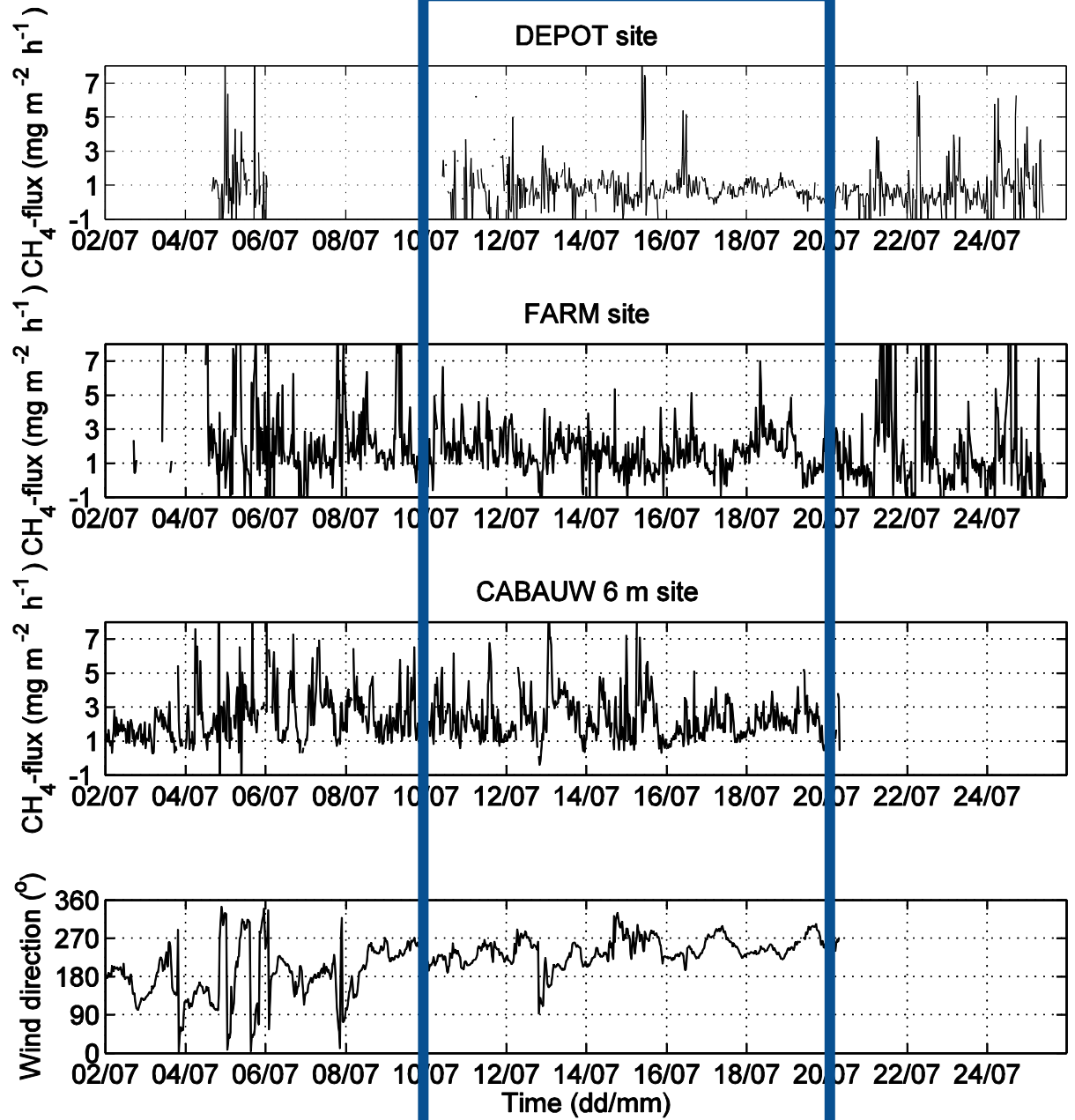
CH₄



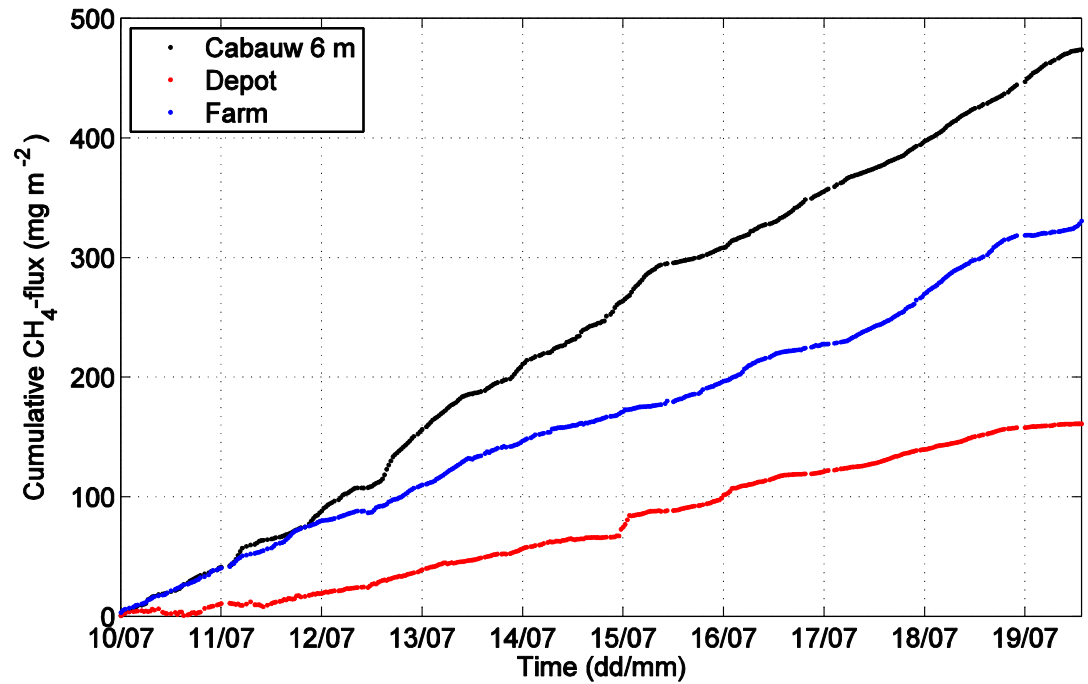
Depot site



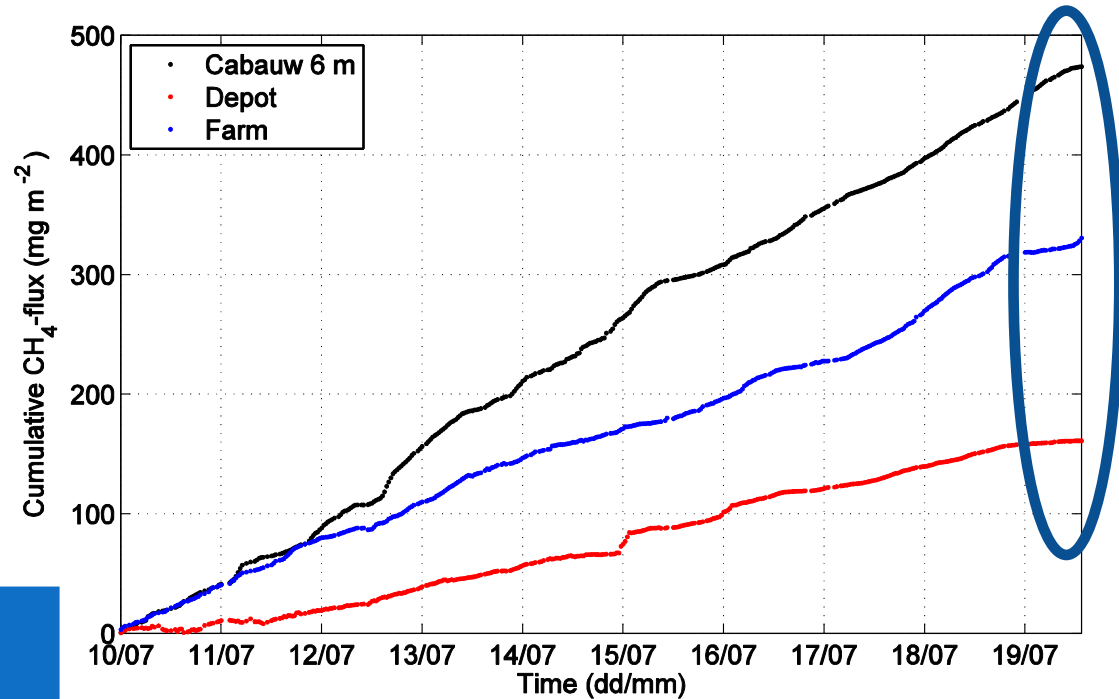




Cumulative for each site



Cumulative for each site



| | Cumulative CH ₄ flux (mg m ⁻²) |
|------------|---|
| Depot site | 160 |
| Farm site | 330 |
| Cabauw 6 m | 470 |

“ $\Delta=100\%$ of average”



Cabauw site (6 m)

Anemometer:

METEK USA-1

Gas analyser:

- G2311-f (Picarro)
- CH₄, CO₂, H₂O



Cabauw site (20 m)

Anemometer:

Gill R2

Gas analysers:

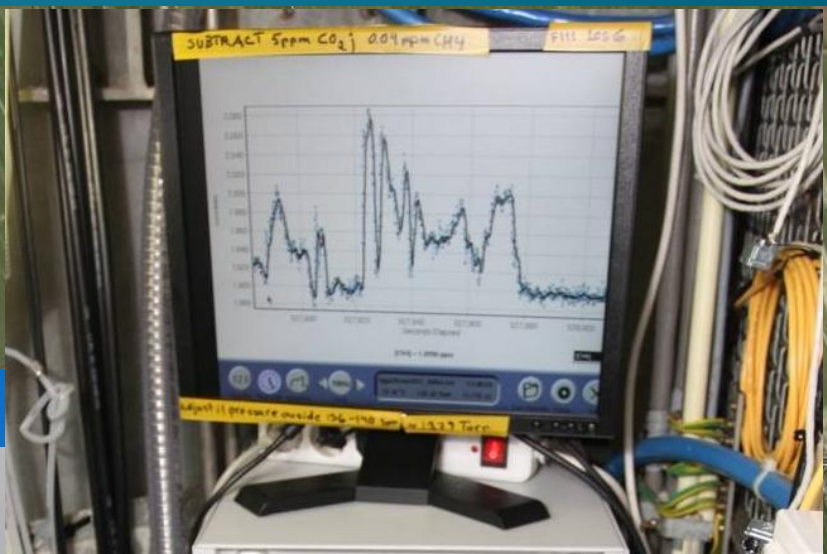
FMA (Los Gatos)

CH₄, H₂O

G1301-f (Picarro)

CH₄, CO₂





Cabauw site (60 m)

Anemometer:

Gill R3

Gas analysers:

FGGA (Los Gatos)

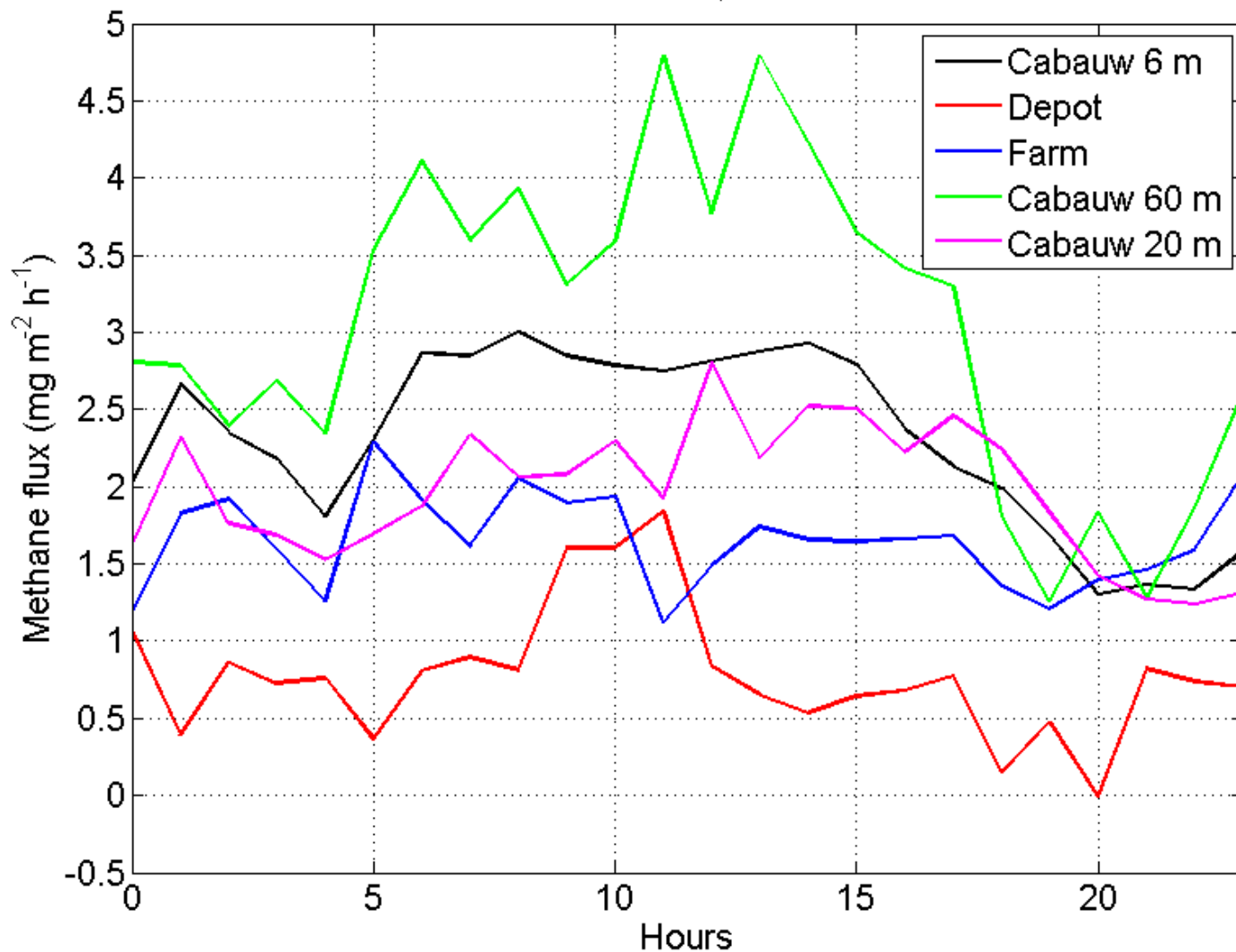
CH_4, CO_2, H_2O

QCL (Aerodyne)

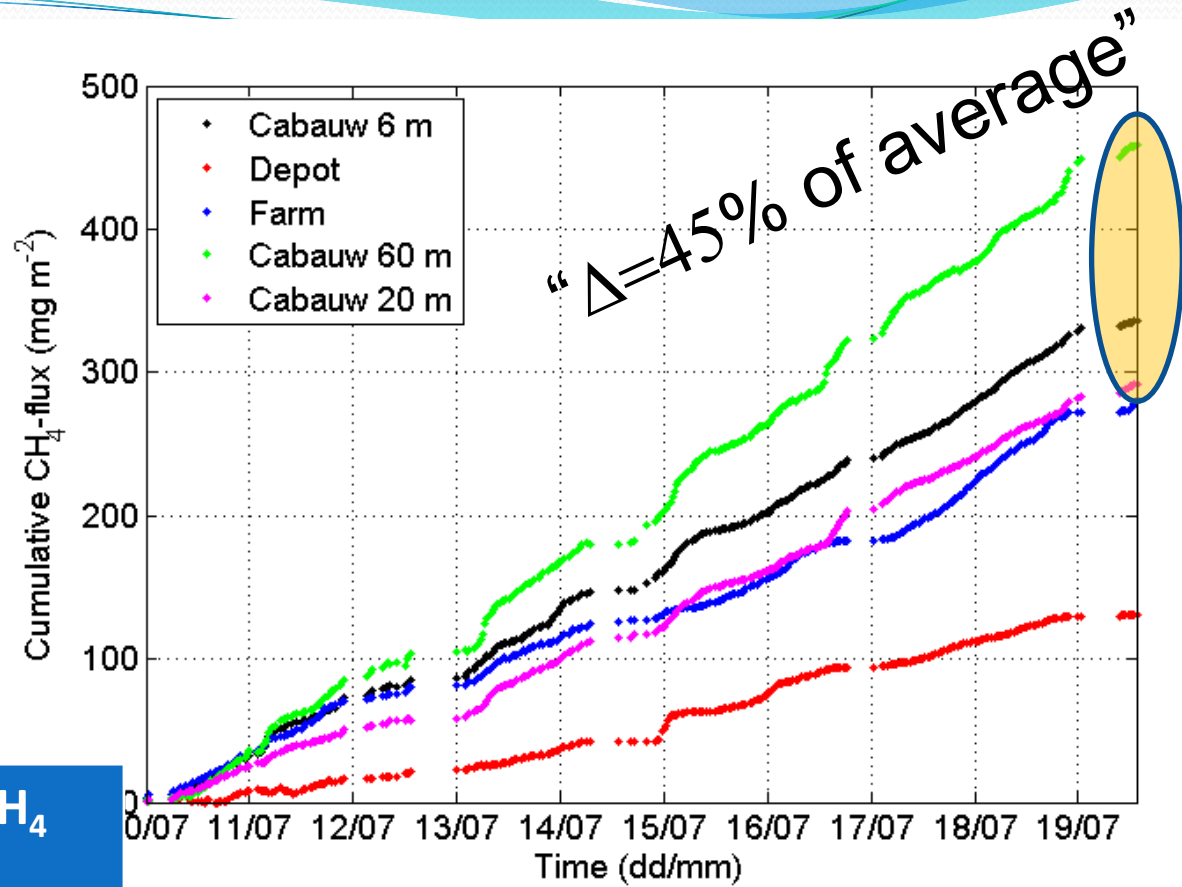
CH_4, N_2O, H_2O



Diurnal pattern of CH₄-flux (10.7.-20.7.)



Cumulative



| | Cumulative CH ₄ flux (mg m ⁻²) |
|------------|---|
| Cabauw 60m | 450 |
| Cabauw 20m | 290 |
| Cabauw 6 m | 330 |



Conclusions June intercomparison (Na5)

- Nice data cover good meteo conditions (West!)
 - Except for open path set !
- Instrument setup
 - FMI Los Gatos vs DTL 100 Los gatos
 - Picarro fine too
 - Licor open path & Dirty-dutch conditions....
 - QCL: we need a newer one (→ Werner Braunschweig)

- $\Delta=20\%$ of average between instruments

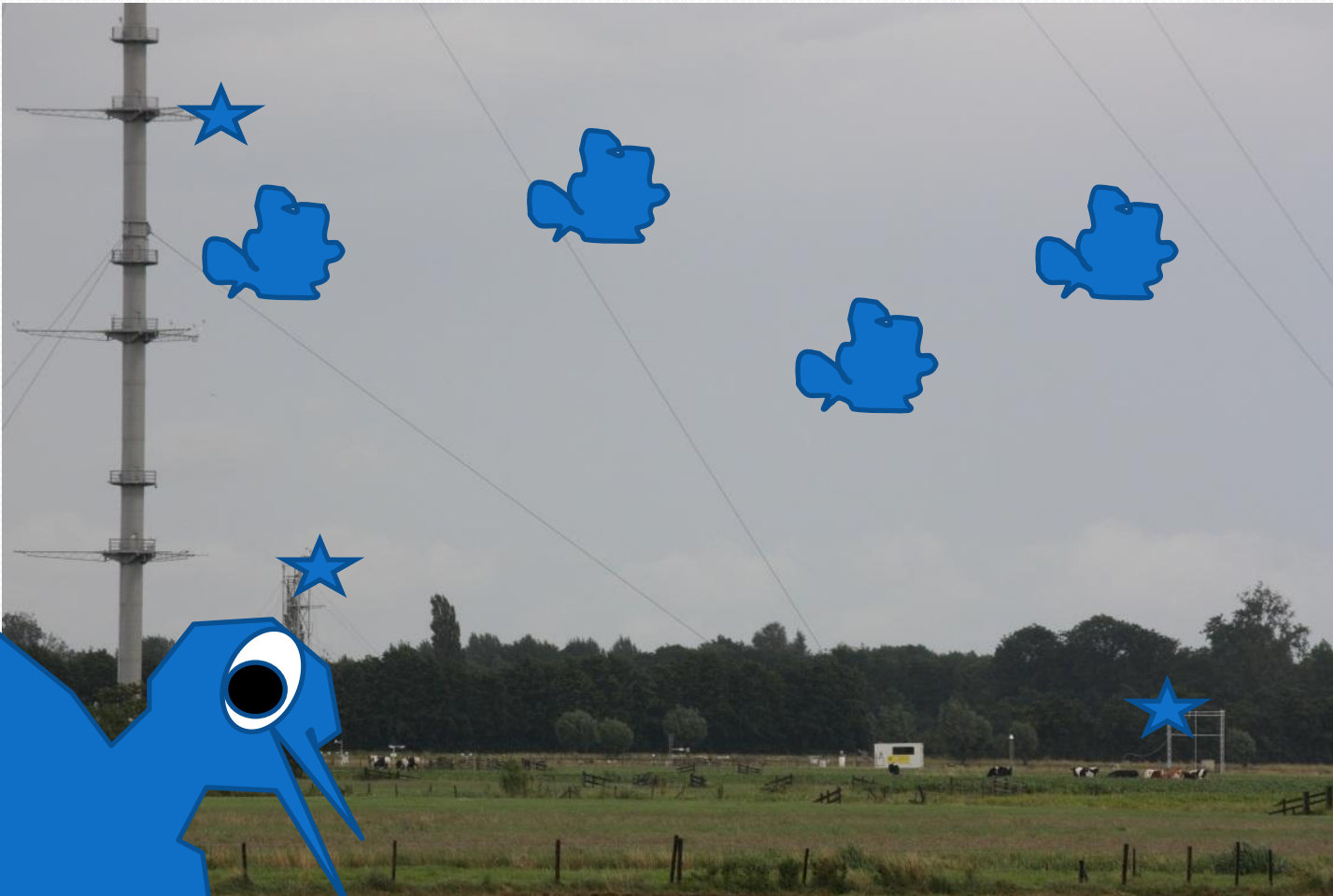
July campaign (JRA6)

- Reasonable data cover good meteo conditions (West!)
 - Edwards pumps are not nice!
 - Bad luck for QCL (60m)
 - Labview needs big PC's
- Lot of data combi on tall tower & depot site
- Less data combi tall tower & Farm site

- $\Delta = 20\%$ of average between instruments
- $\Delta = 45\%$ of average between 6-20-60m heigh on the tall tower
- $\Delta = 100\%$ of average between 3 sites



50 CAMEB's (50 m Cruising Altitude Methane Emitting Birds...)



<http://www.ingos-infrastructure.eu>

N_2O EC intercomparison
Campaign
foreseen spring 2013
at Easter Bush
Scotland





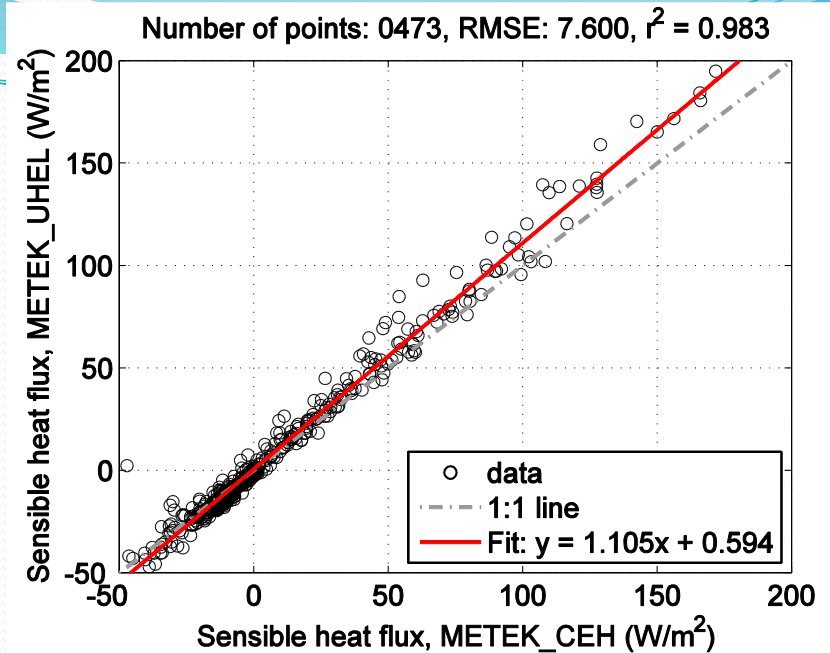
Thank you for
your attention

<http://www.ingos-infrastructure.eu>

28-5-2013

Problems (Na5)

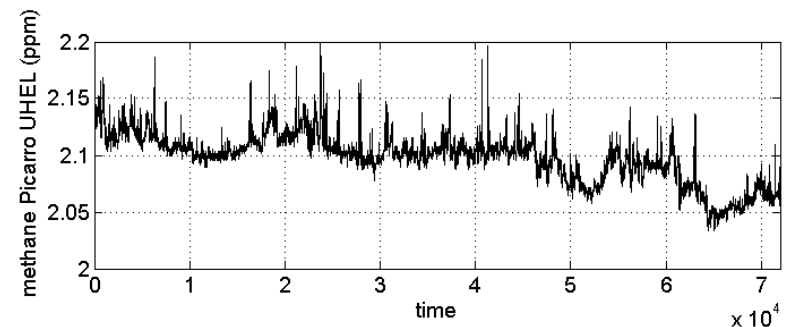
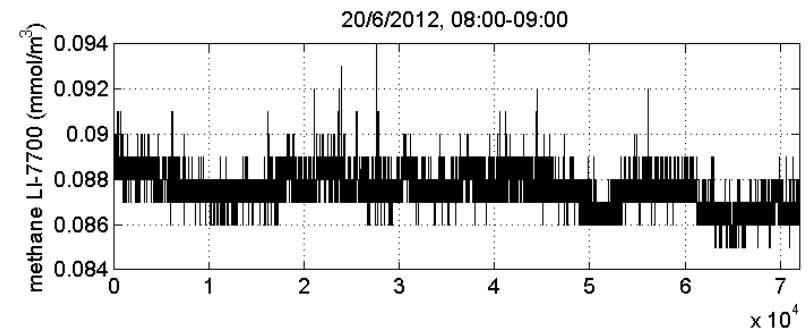
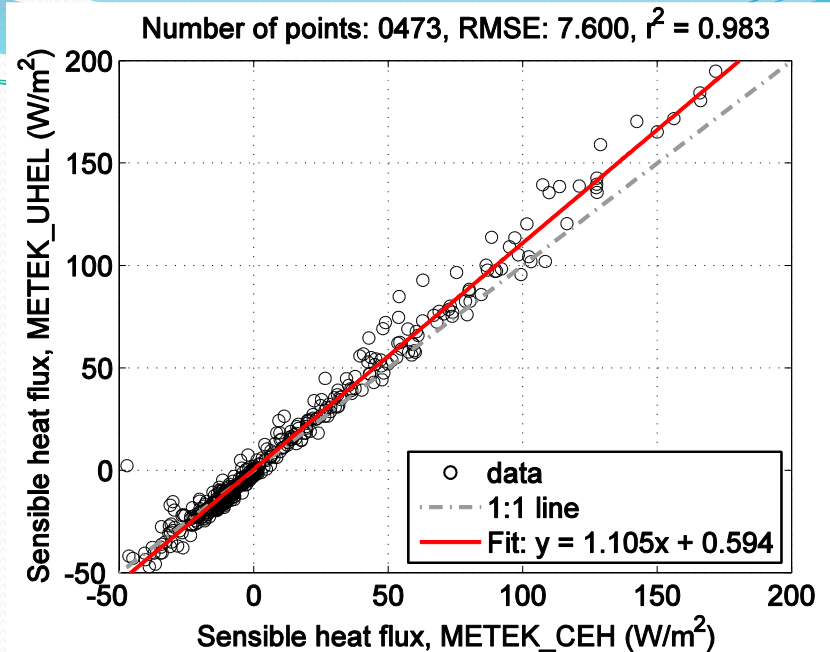
- Problem 1: Sensible heat fluxes from the two METEKs are different
 - Possibly caused by a difference in head correction
 - If so can be corrected during post-processing
 - CH4-fluxes will show this difference



Problems (Na5)

- Problem 1: Sensible heat fluxes from the two METEKs are different
 - Possibly caused by a difference in head correction
 - If so can be corrected during post-processing
 - CH₄-fluxes will show this difference
- Problem 2: LI-7700 data was not saved with high enough resolution
 - Small variation in LI-7700 measurements was lost (=high frequencies)

=> this intercomparison does not tell much about the flux-performance of LI-7700

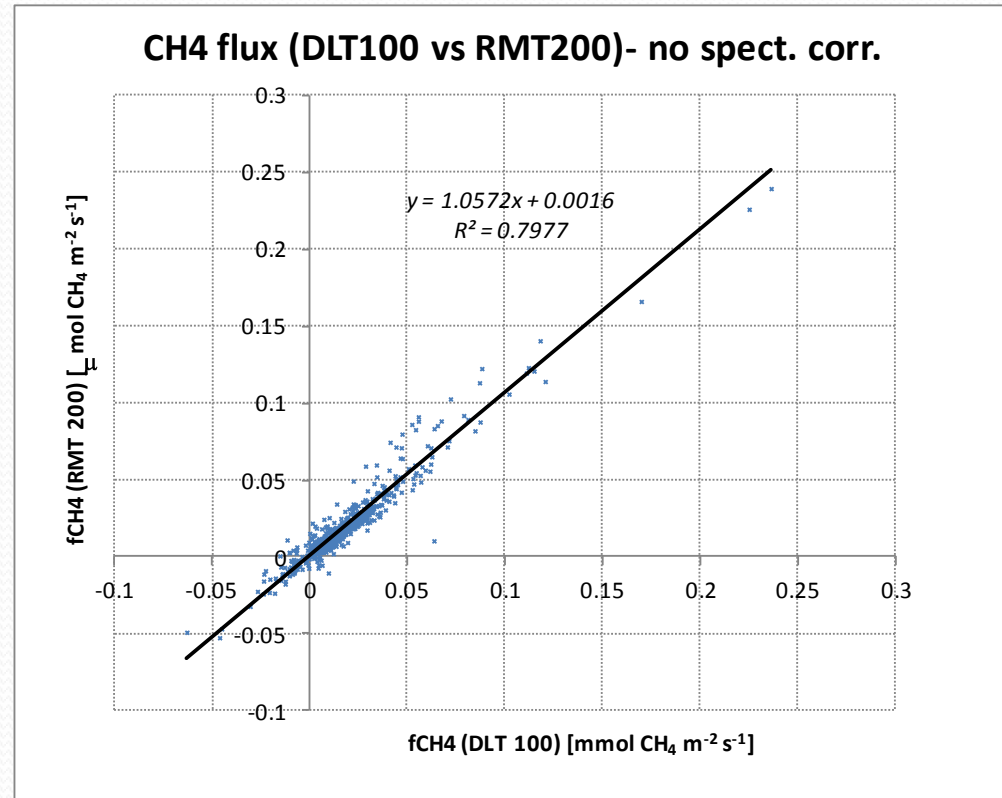


Data analysis

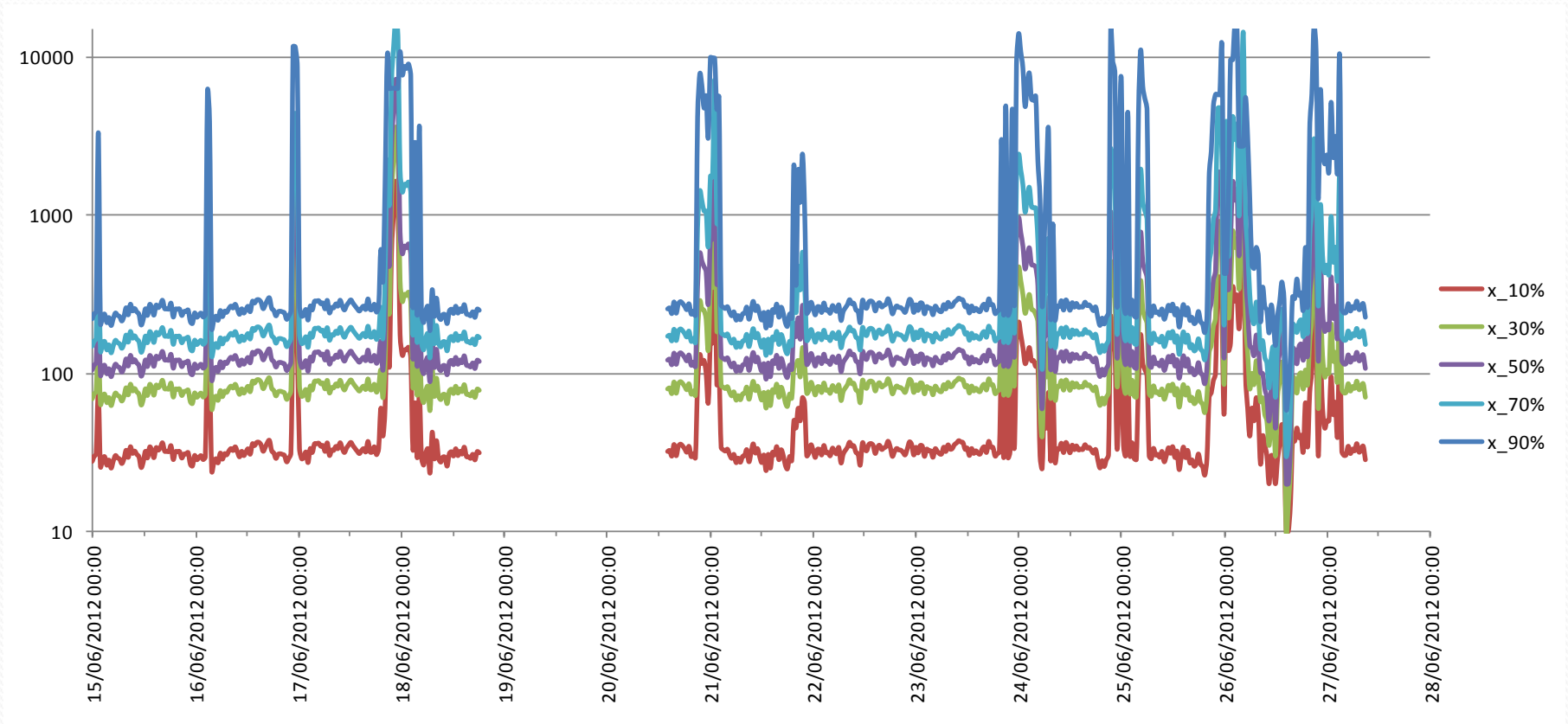


Olli -Graphs: processed with EddyUH
(http://www.atm.helsinki.fi/~mammarel/Eddy_Covariance/EddyUHsoftware.php)

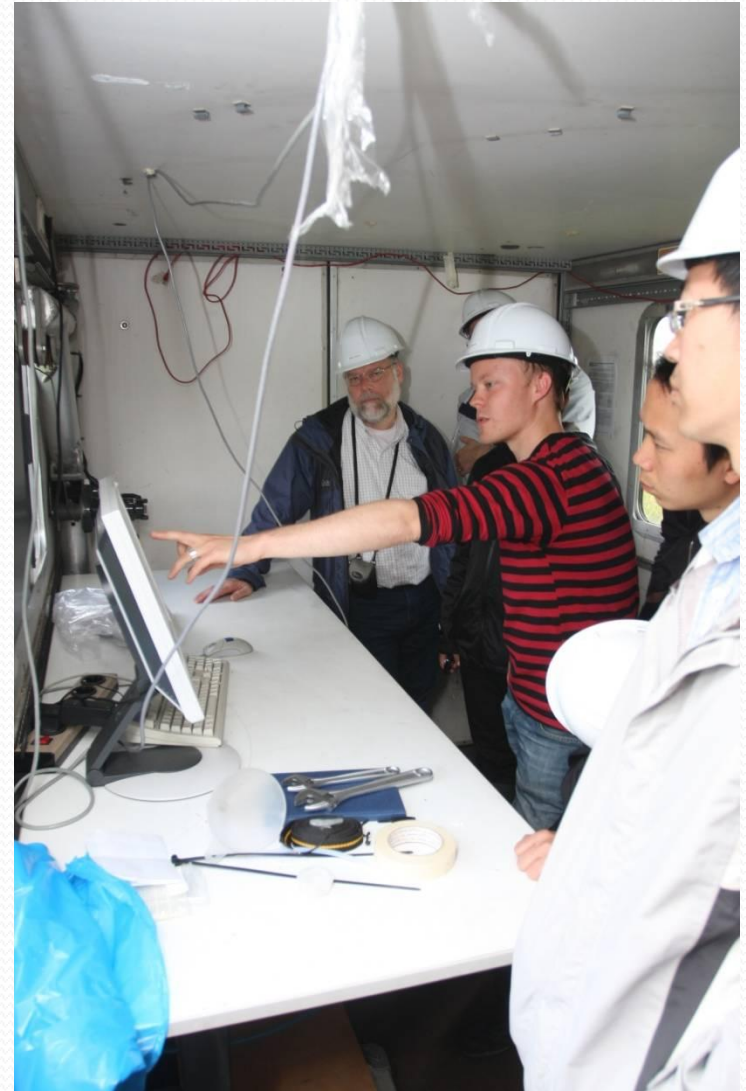
Luca Belelli VU Amsterdam: Eddypro

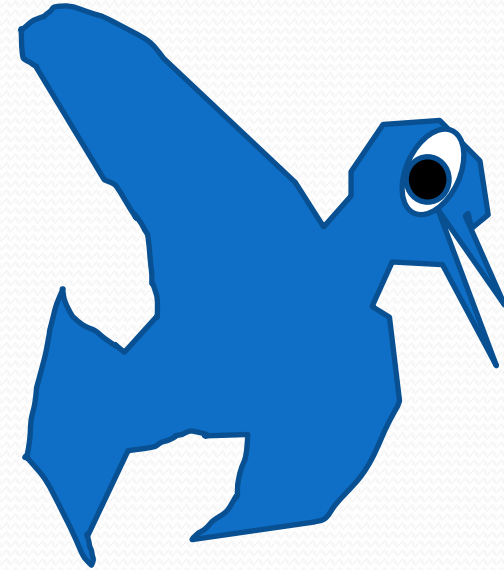
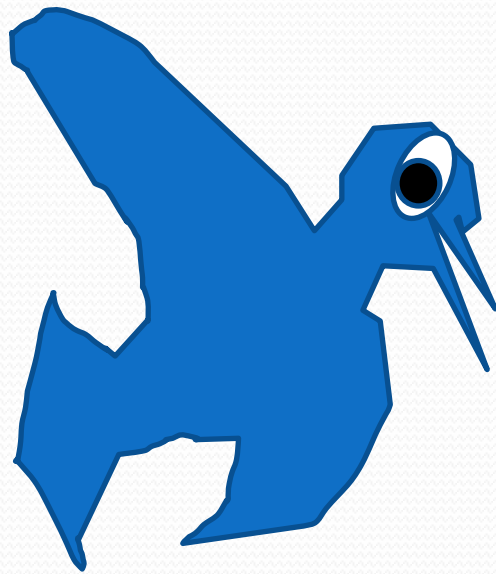


Footprint



Olli explains more..





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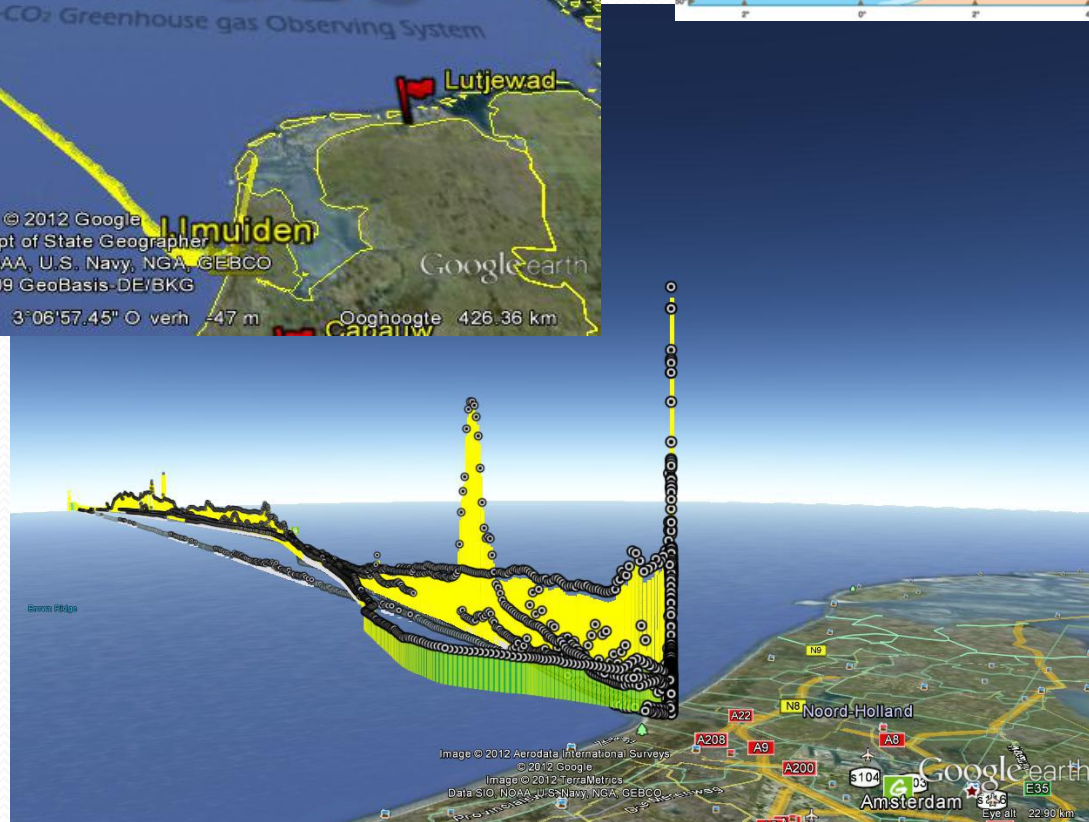
Olli Peltola



Integrated non-CO₂ Greenhouse gas Observing System

Elgin plume





More info..

<http://www.ingos-infrastructure.eu>

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