InGOS

Integrated non-CO₂ Greenhouse gas Observing System

The InGOS Project:
Setup and First Results

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InGOS overview

Improving and extending European observation capacity for non-CO_2 greenhouse gases

- **Infrastructure project: Integrating Activities**
- **Budget 10 M€, EU 8 M€**
- **34 (35) partners, 14 (15) countries, 24 (28) observing stations**
- **1 October 2011 – 1 October 2015**
- **Will integrate the non-CO_2 observations in ICOS infrastructure**
- **Builds on: CHIOTTO, SOGE, CarboEurope, GHGEurope, IMECC etc.**
- **Coordination: ECN, NL**
- http://www.ingos-infrastructure.eu

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Activities

- Networking activities:
  - Improve historic datasets CH_4, N_2O, SF_6, H_2, CO
  - Good practice development for all gas, isotope and flux observations
  - Near real-time provision of tracer data and
  - Provision of QA'ed new observational data
- Trans National Access:
  - 18 stations
  - Provision of
    - lab calibration standards
    - Gases for comparisons
- Service activities: databases (linked/shared with ICOS/AGAGE/WMO etc)
- Research activities
  - Testing and (co-)developing new sensors/instruments/methods
  - Integration of measurements and (inverse) modelling, network optimisation.
  - Link with remote sensing (TCCON)
  - Development of new observations (halocarbons, isotopes)
  - Integration of flux and concentration measurements at tall tower sites

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Transnational access (TNA)

- Facilities and services open for external parties,
  (travel and subsistence costs covered)
- Supersites: join our campaigns
- Atmospheric and flux sites open e.g. for:
  - Bring your instrument for comparison/tests
  - Take bag/flask samples at interesting sites
  - Visit site or laboratory for training
- Two CH4 flux surveyor aircraft
- $^{13}CH_4$ and ^2H isotope analysis
- Working standards for non-CO2/halocarbons

Apply for TNA through web site:

http://www.ingos-infrastructure.eu/ -> Get Access

- Databases: Get Access -> Data Center

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Results: Historic data CH$_4$

Abbrev	station name	lat	lon	altitude	period	partner
ZEP	Zeppelin	78.90	11.88	475m+10m	since 2001	NILU
PAL	Pallas	67.97	24.12	565m+7m	2004-2011	FMI
VOI	Voeikovo	59.95	30.70	72m+6m	2001-2013/gaps	ECN
TT1	Angus	56.55	-2.98	313m+222m	2006-2012	UEDIN
LU1	Lutjewad	53.40	6.35	1m+60m	since 2001	CIO
BI5	Bialystok	52.25	22.75	183m+300m	since 2005	MPG
MHD	Mace Head	53.33	-9.90	25m+15m	since 2001	UNIVBRIS
WEY	Weybourne	52.58	0.37	21m+10m	since 2010	UEA
CB4	Cabauw	51.97	4.93	-1m+200m	since 2000	ECN
OX3	Ochsenkopf	50.05	11.82	1022m+163m	since 2006	MPG
HEI	Heidelberg	49.42	8.67	116m+30m	2000-2011	UHEI
KAS	Kasprowy W.	49.25	19.98	1984m+5m	since 2009	AGH-UST
GIF	Gif sur Yvette	48.71	2.15	165m+?m	2007-2012	CEA
SIL	Schauinsland	47.91	7.91	1205m+8m	2001-2011	UBA/UHEI
TRN	Trainou	47.96	2.11	250m+180m	2007-2012	CEA
HU1	Hegyhatsal	46.95	16.65	248m+96m	2006-2012	HMS
JFJ	Jungfraujoch	46.55	7.98	3580m+10m	2004-2012	EMPA
IPR	Ispra	45.80	8.62	223m+15m	2008-2011	JRC-IES
PUY	Puy de Dome	45.77	2.97	1465m+10m	2010-2012	CEA
LMP	Lampedusa	35.52	12.63	45m+10m	since 2006	UNITUS

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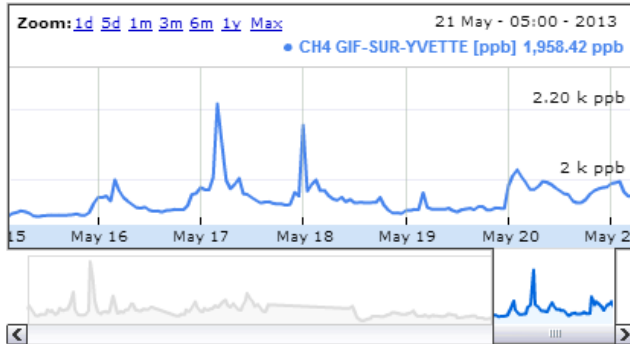
Example CH4 Heidelberg 2000-2012
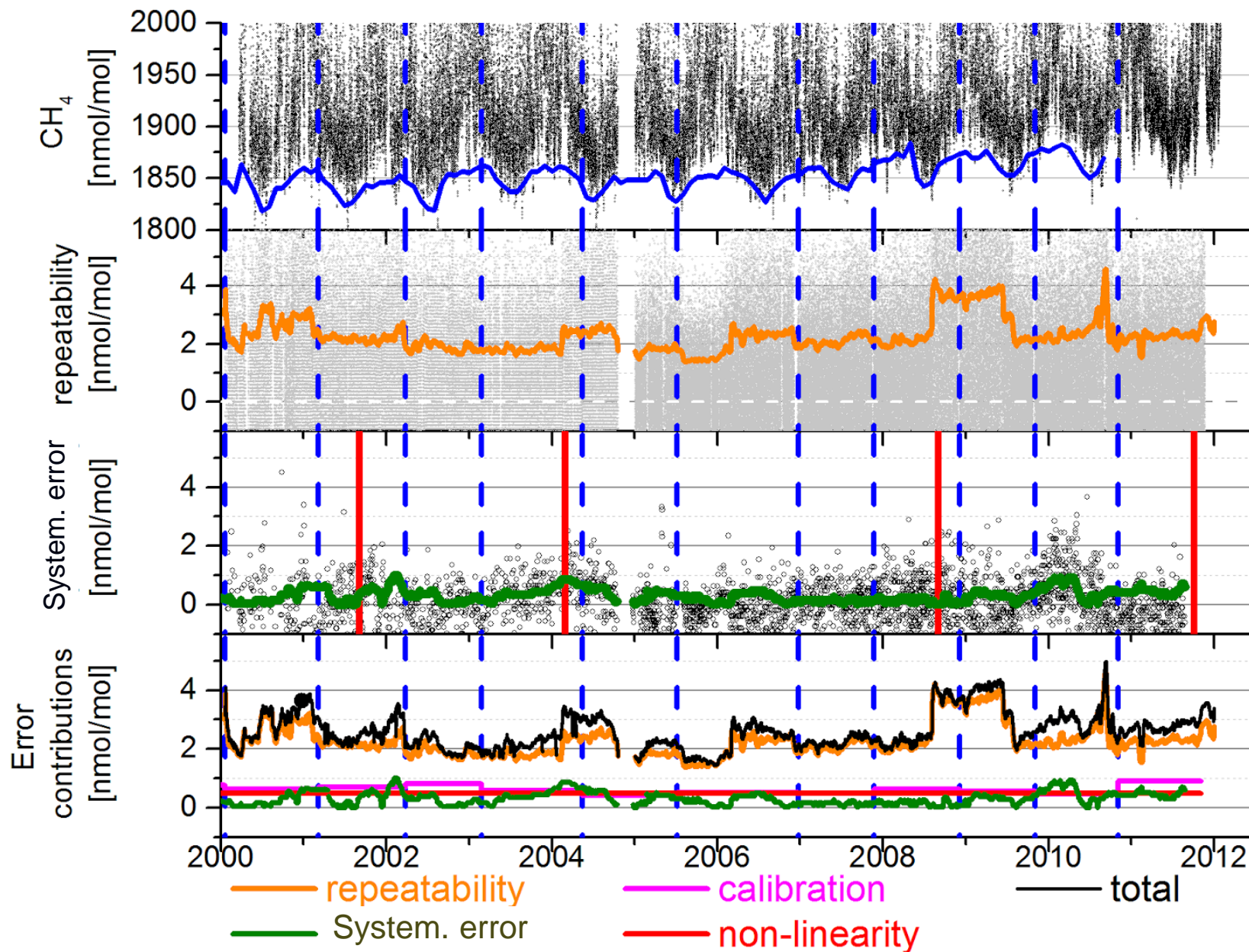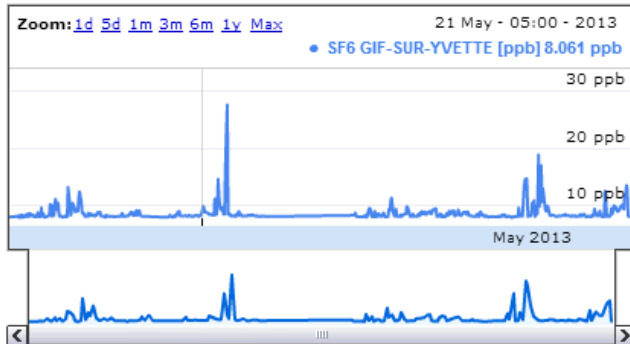
GIF - NRT data view tool

This is an interactive time series line chart with optional annotations from the last measurements of N2O and CH4 from Gif-sur-Yvette station. Measurement are hourly resolved. Use the zoom links ("1d 5d 1m" and so on) to navigate into the time serie. Use your mouse to move into the time serie. below the time serie is the zoom range selection area (the area at the bottom of the chart). The outline in the zoom selector is a log scale version of the time series in the chart, scaled to fit the height of the zoom selector. You can also use the selector to move into the time serie. Note that the chart is rendered within the browser using Flash.

CH4

Zoom: 1d 5d 1m 3m 6m 1y Max   21 May - 05:00 - 2013
● CH4 GIF-SUR-YVETTE [ppb] 1,958.42 ppb

2.20 k ppb
2 k ppb

15   May 16   May 17   May 18   May 19   May 20   May 2

SF6

Zoom: 1d 5d 1m 3m 6m 1y Max   21 May - 05:00 - 2013
● SF6 GIF-SUR-YVETTE [ppb] 8.061 ppb

30 ppb
20 ppb
10 ppb
May 2013

N2O

Zoom: 1d 5d 1m 3m 6m 1y Max   04 May - 00:00 - 2013
● N2O GIF-SUR-YVETTE [ppt] 328.733 ppt

330 ppt
325 ppt

2 Apr 23 24 25 26 27 28 29 30 1 2 May 3 4

Near real-time example:
http://ingos-atm.lsce.ipsl.fr/GIF-NRT

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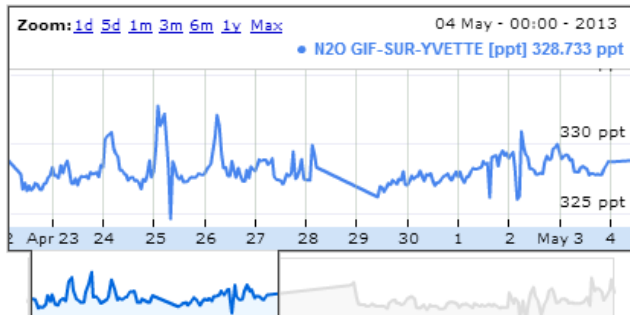
Results: CH4 flux campaign Cabauw
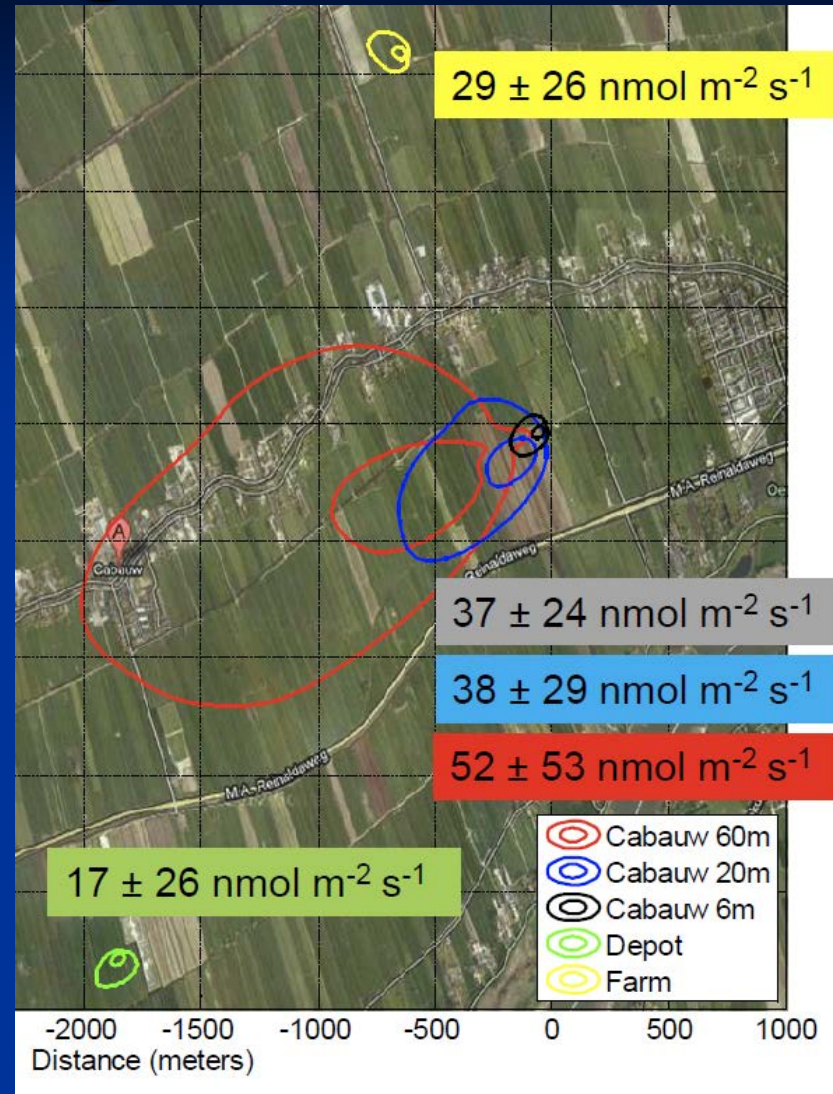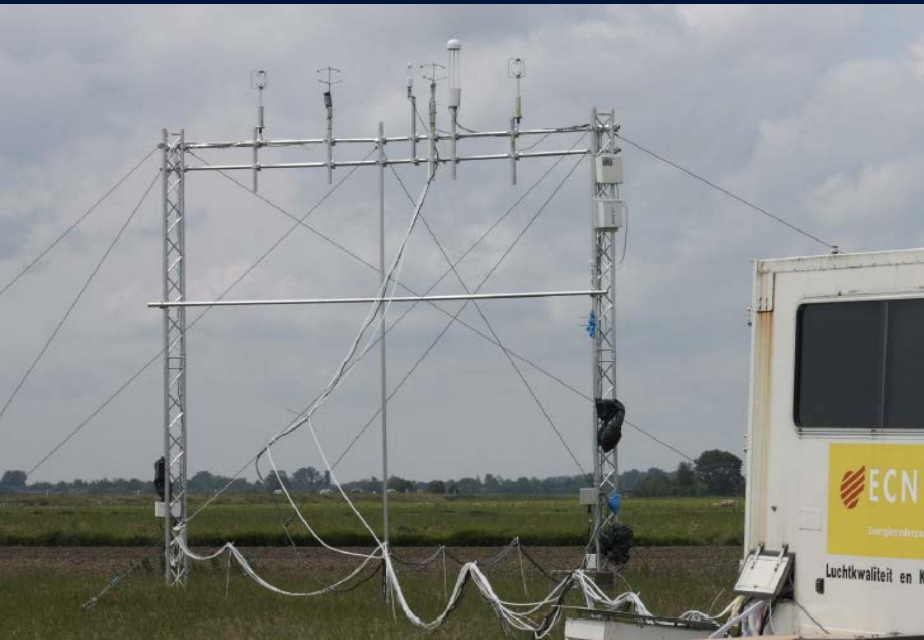
NA5: cumulative sum
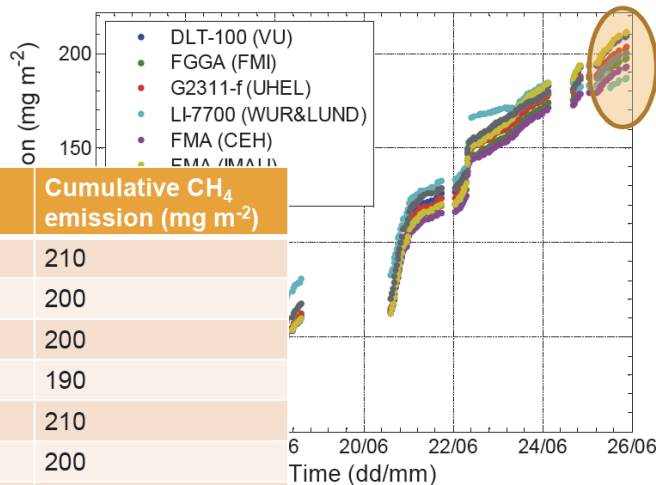
	Cumulative CH$_4$ emission (mg m^{-2})
DLT-100 (VU)	210
FGGA (FMI)	200
G2311-f (UHEL)	200
FMA (CEH)	190
FMA (IMAU)	210
QCL (ECN)	200
LI-7700 (WUR&LUND)	190

Plot legend:
- DLT-100 (VU)
- FGGA (FMI)
- G2311-f (UHEL)
- LI-7700 (WUR&LUND)
- FMA (CEH)
- FMA (IMAU)

Axis: on (mg m^{-2}), values 150, 200; Time (dd/mm): 20/06, 22/06, 24/06, 26/06

29 ± 26 nmol m^{-2} s^{-1}

37 ± 24 nmol m^{-2} s^{-1}

38 ± 29 nmol m^{-2} s^{-1}

52 ± 53 nmol m^{-2} s^{-1}

17 ± 26 nmol m^{-2} s^{-1}

Legend:
- Cabauw 60m
- Cabauw 20m
- Cabauw 6m
- Depot
- Farm

Distance (meters): -2000, -1500, -1000, -500, 0, 500, 1000

May, 2013

Results: new compounds
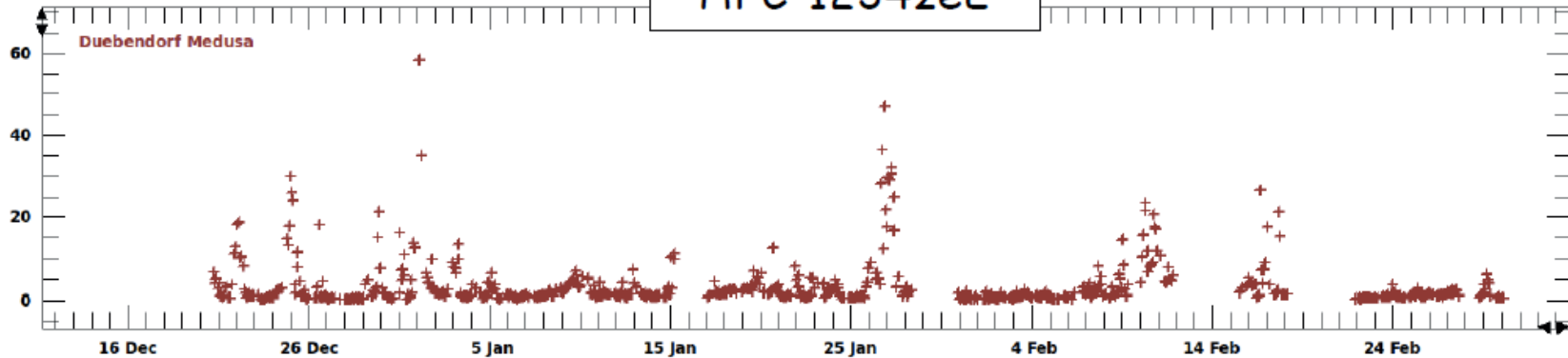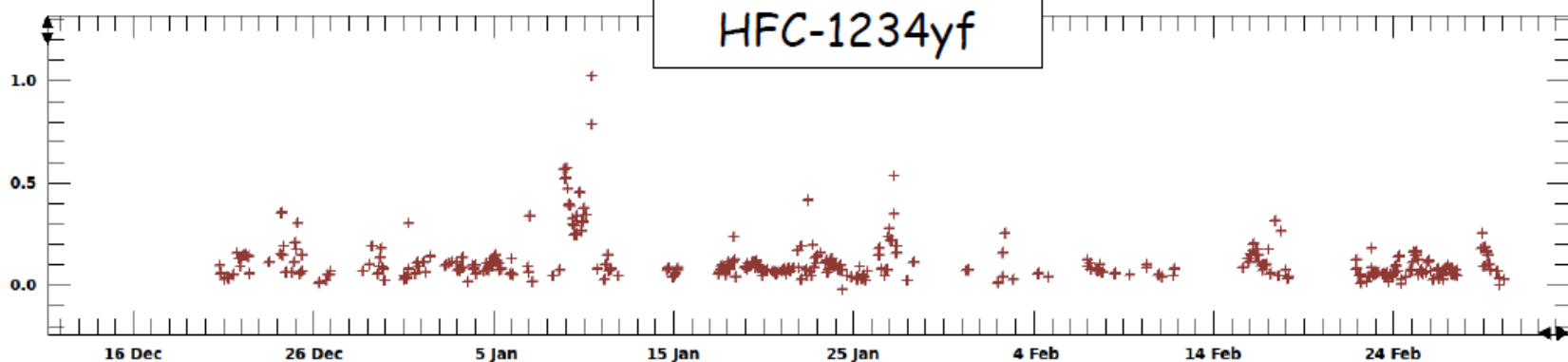
Results: Remote Sensing
Timeseries for European and non-European TCCON sites
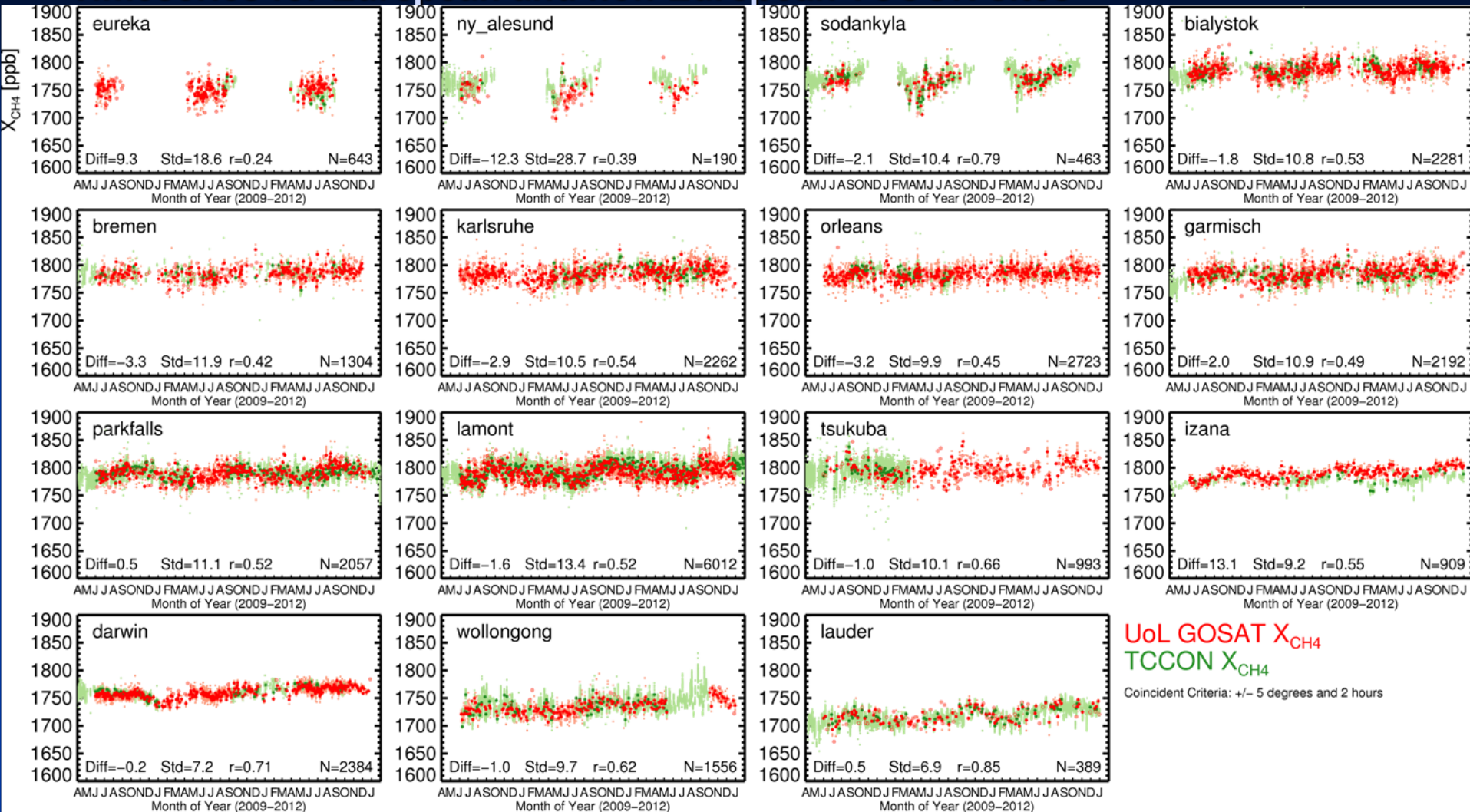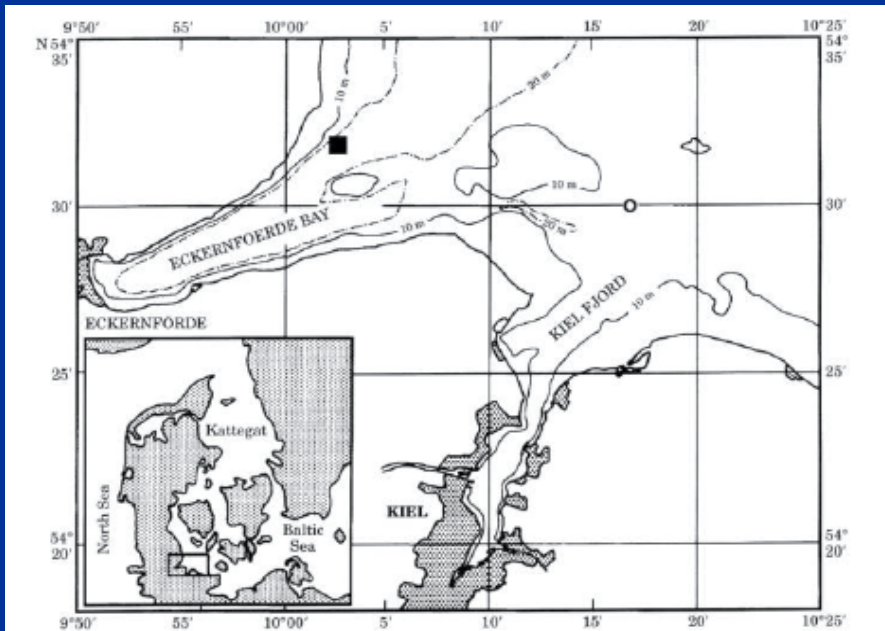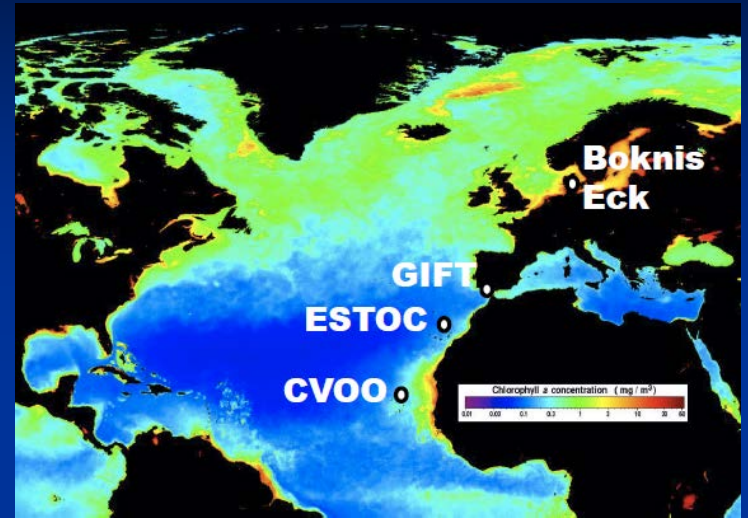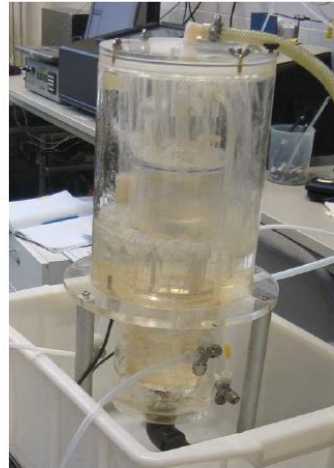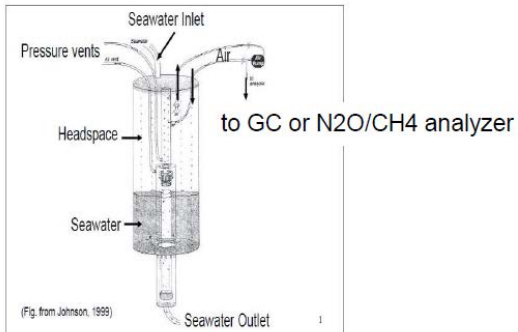

- Retrieval algorithm of tropospheric XCH4 for TCCON
- A good agreement found between GOSAT and TCCON with mean difference < 3.5 ppb (0.2 %)
- Higher latitude sites: difference due to different a priori assumptions?
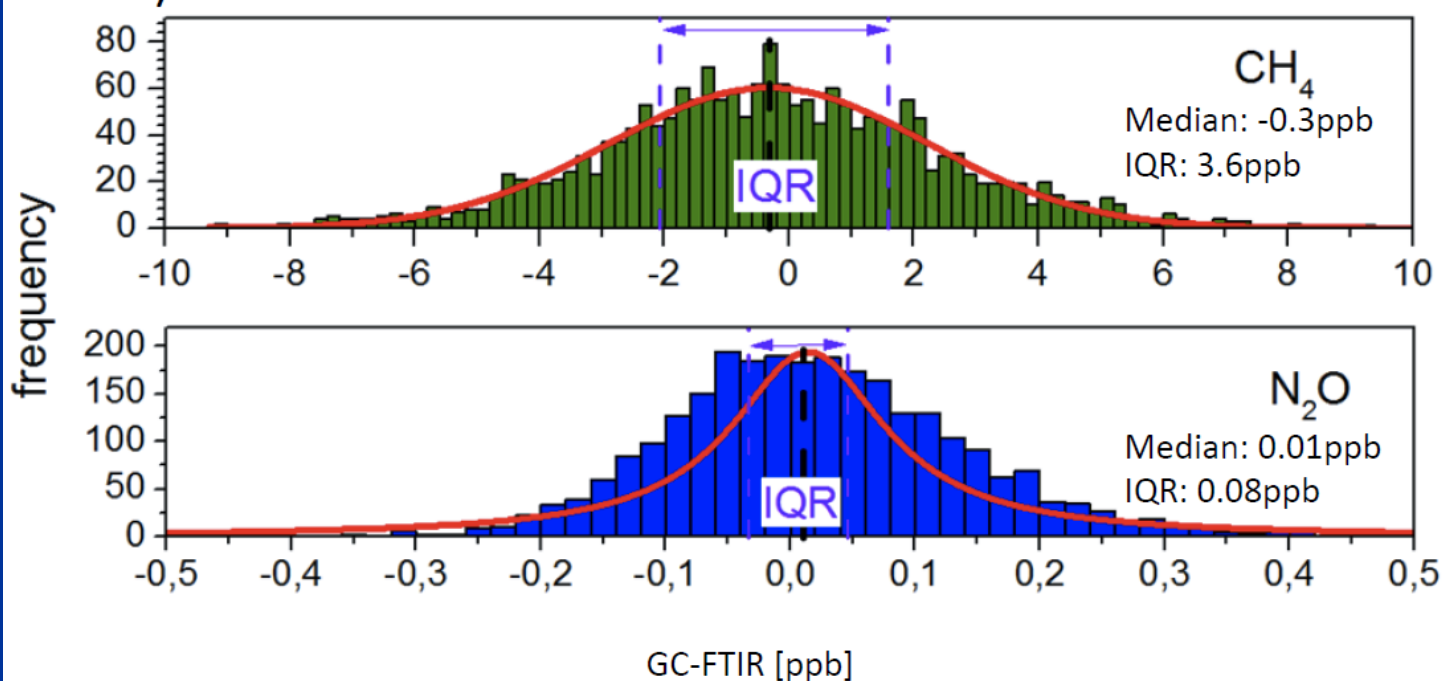
Byckling, UoL

Results: Ocean
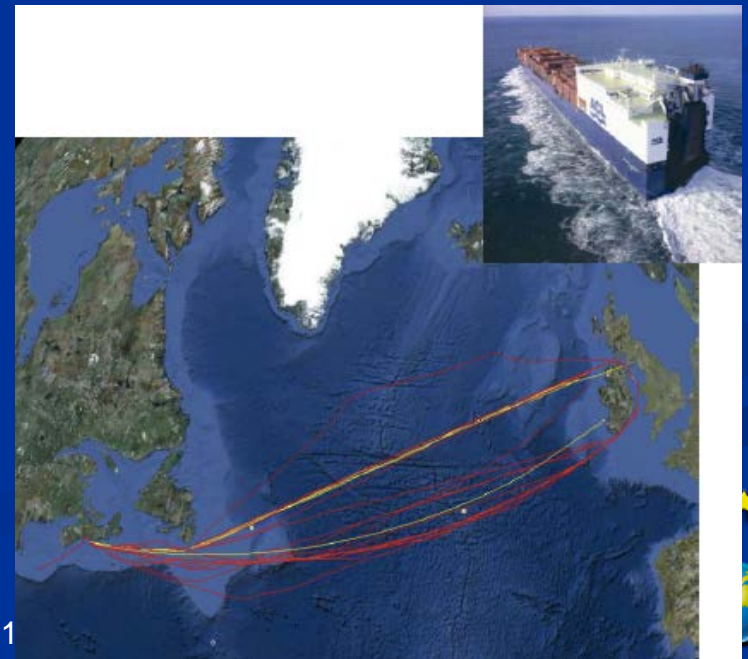
Significant but small scale offsets detected with new high precision instrumentation
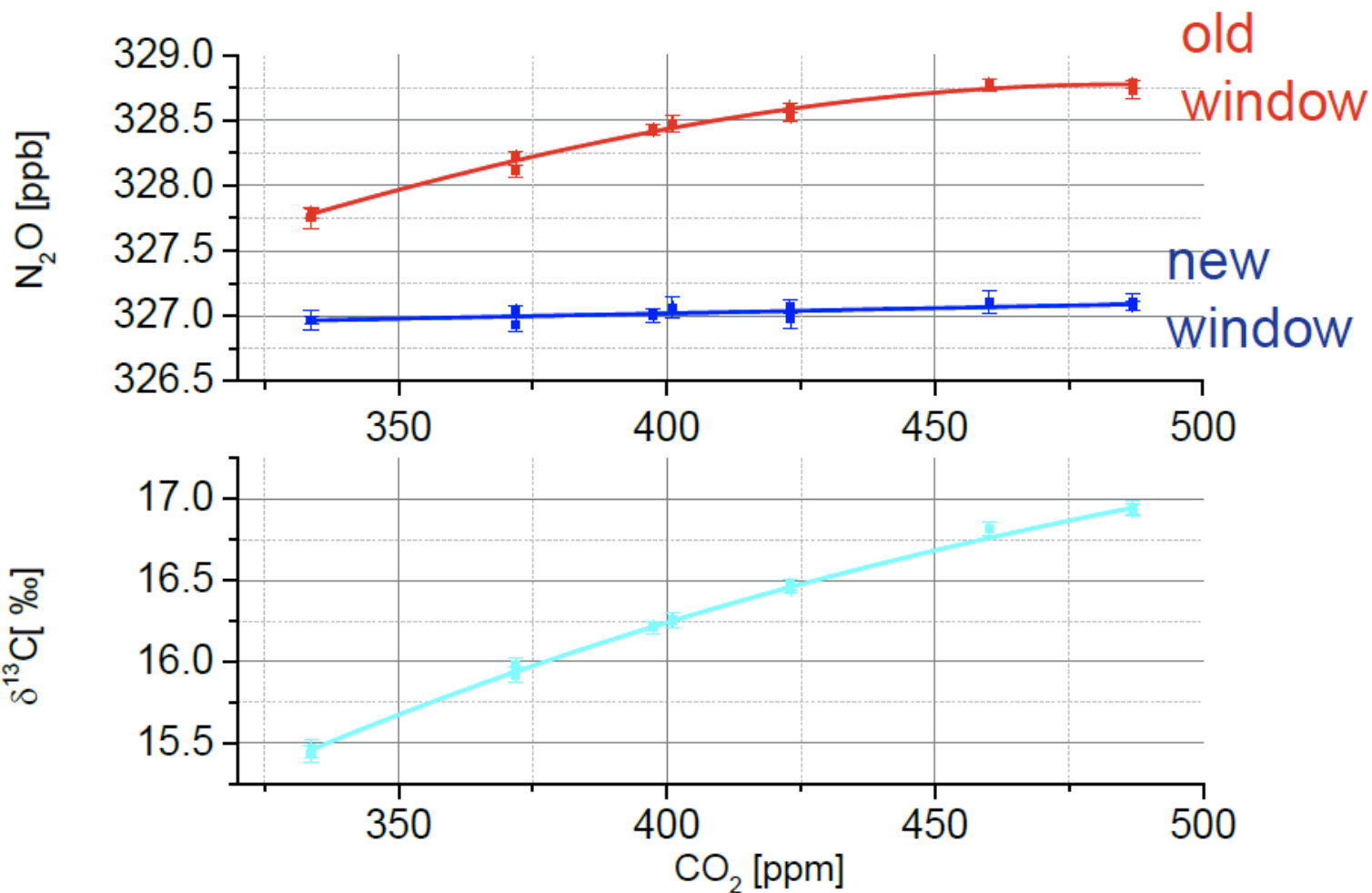

Comparison GC-FTIR in Heidelberg
Same intake line

Sanam Vardag
UHEI

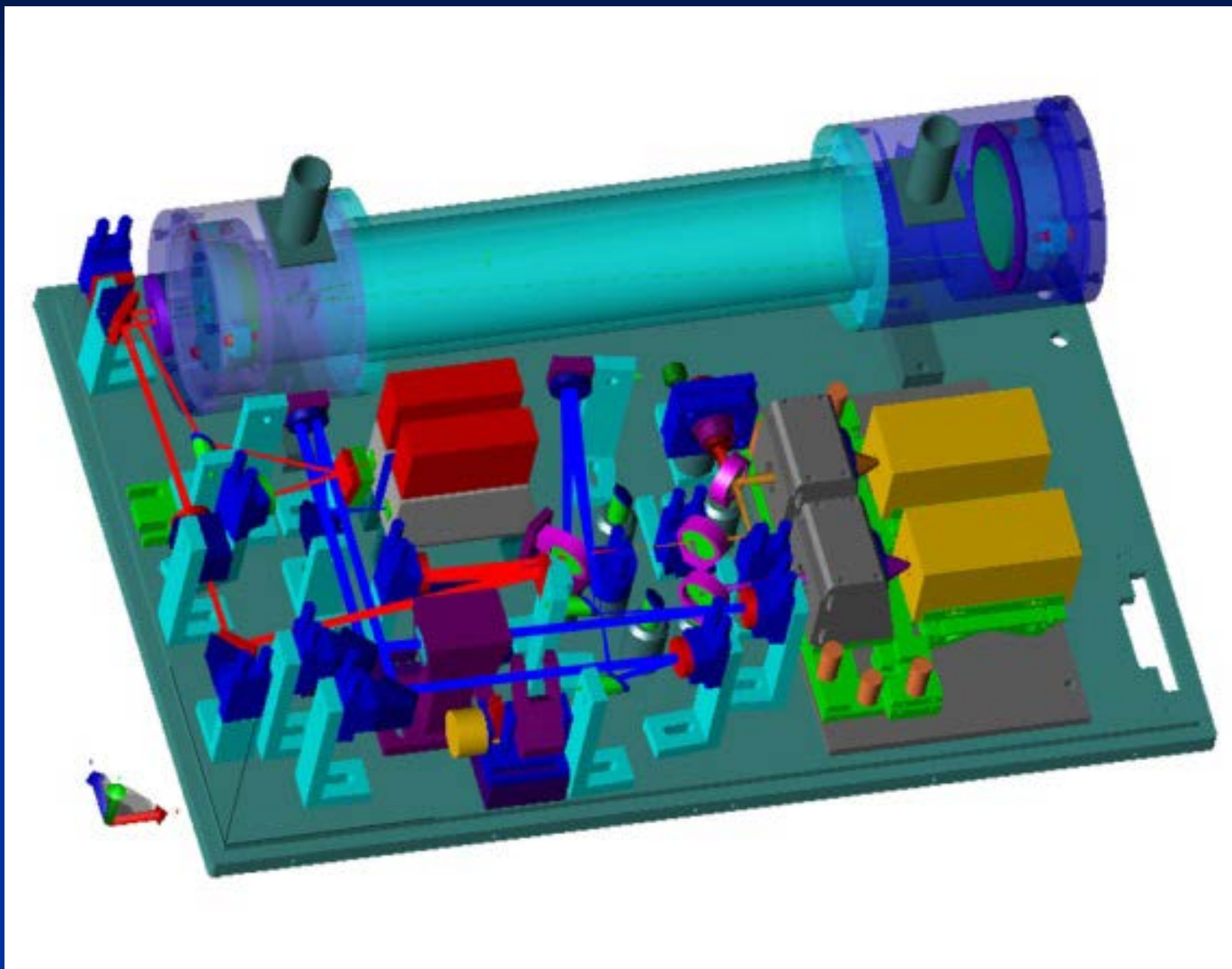InGOS

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Instrument improvements

New spectral window

Sam Hammer
UHEI

QC laser spectrometer for real-time CH4 isotopic measurements
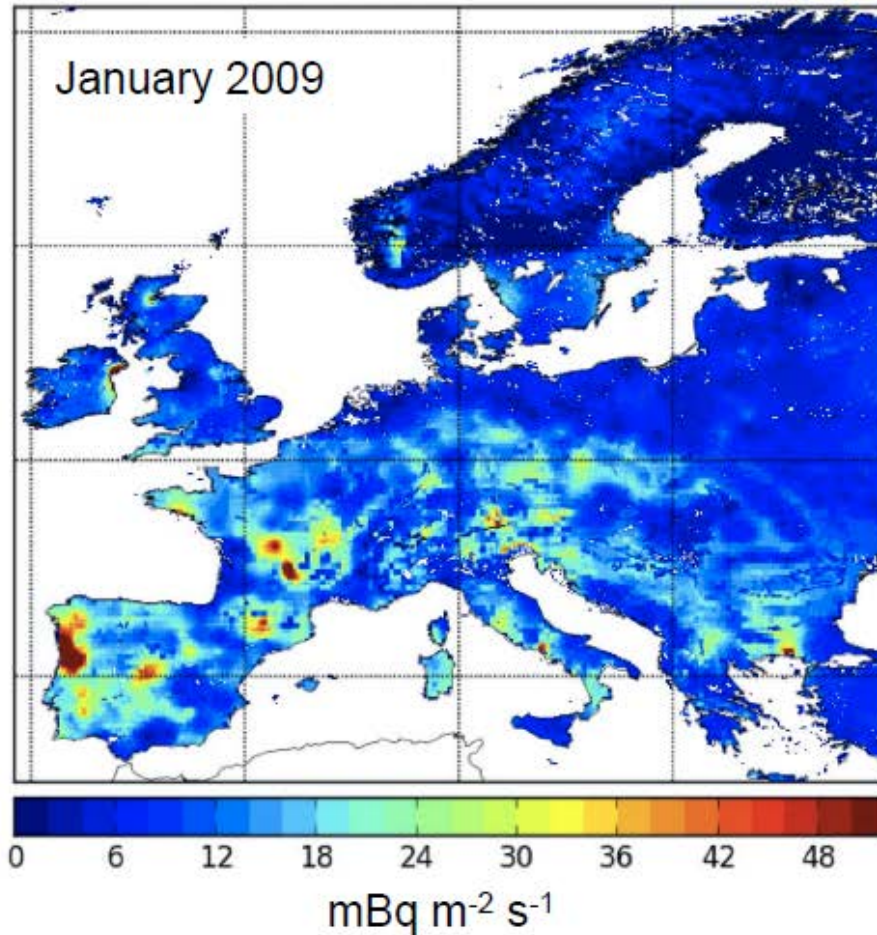## ¹³C + ²H, WP16 (JRA5), EMPA

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Integration of models and obs.

- CH_4+N_2O:
  - Network sensitivity for current network (22), ICOS (34), ICOS to be (50) stations
  - Special EDGAR 4.2FT for prior emission estimates
- High resolution ^{222}Rn emission maps for model validation (connects with Transcom-BLH)
- Forward and inverse modelling by 7 independent global and/or regional models
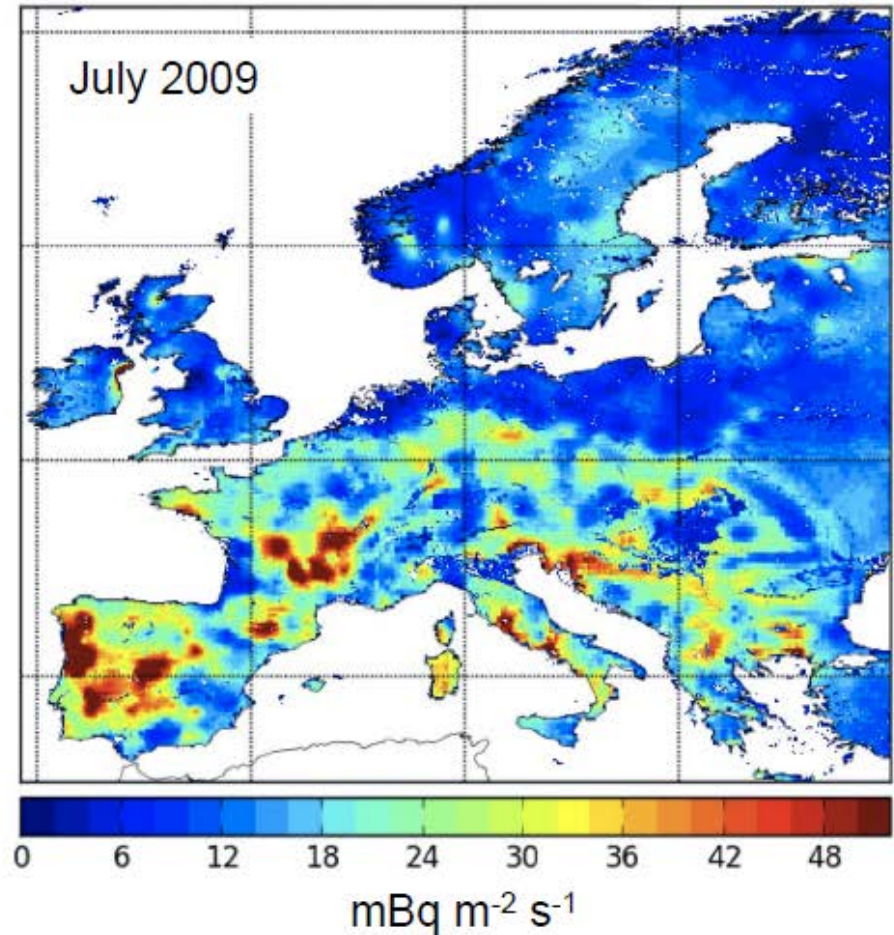- $^{13}CH_4$ tracer modelling
- Halocarbon inversions

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InGOS ^{222}Radon Flux Map version1.0

^{222}Radon Exhalation 2009-01

January 2009

^{222}Radon Exhalation 2009-07

July 2009

mBq m^{-2} s^{-1}

mBq m^{-2} s^{-1}

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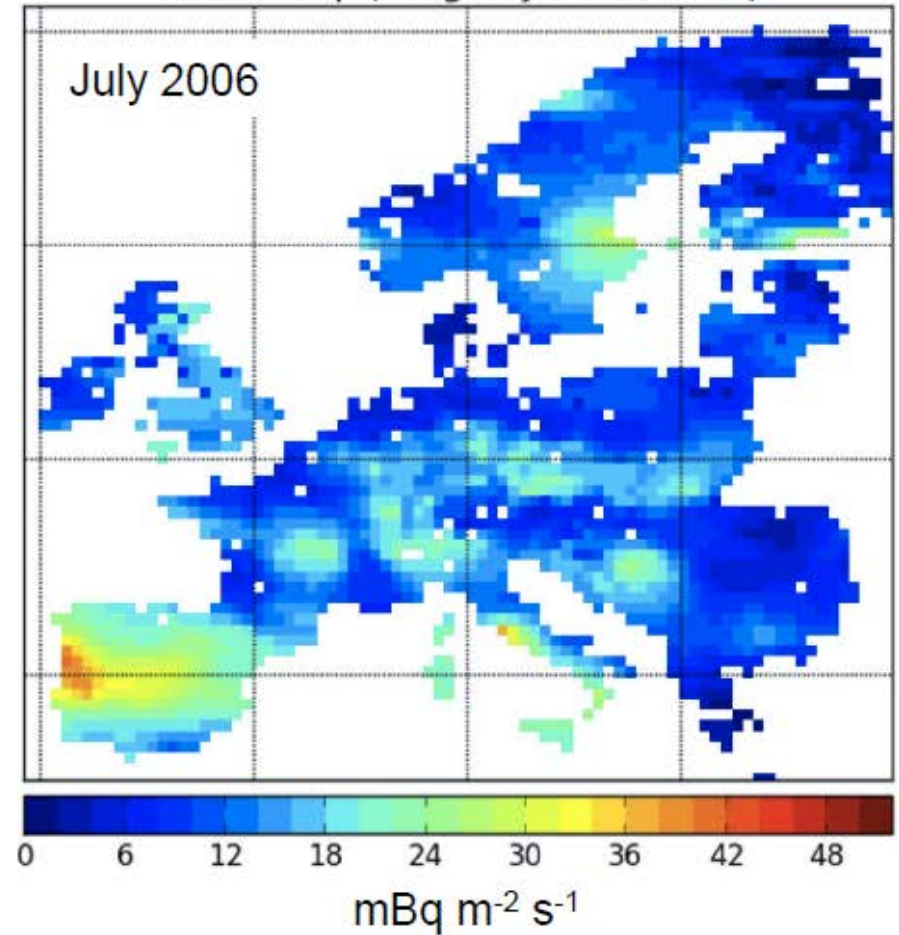
Comparison with existing ^{222}Radon Flux Map

^{222}Radon Exhalation 2006-07   mq60 n w
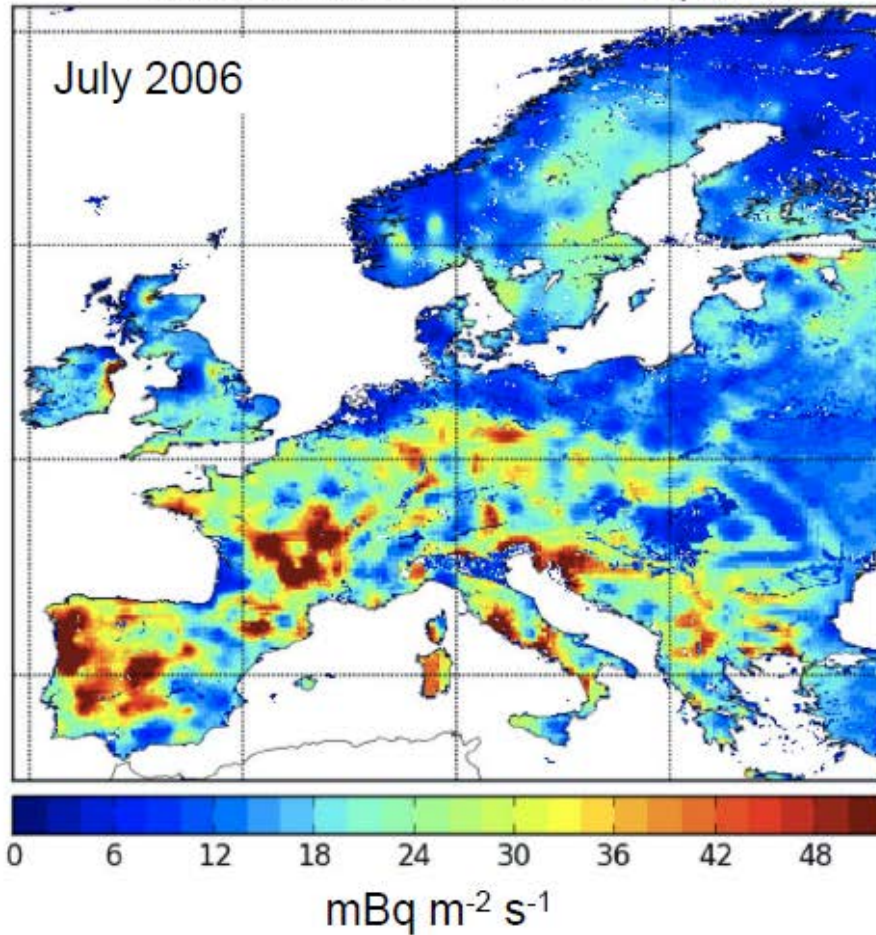
Radon map (Szegvary et al., 2008)

Radon flux based on correlation with γ-dose rate measurements (Szegvary et al., 2008)

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Summary

- **InGOS** now well underway (18 months) showing good progress

- **InGOS** integrates different communities (surface measurements, remote sensing and modelling)

- **InGOS** will provide

  - Harmonized historic datasets for continuous European obs. of CH_4, N_2O, SF_6, H_2, inclusive error analysis

  - Near realtime continuous data for CH_4, N_2O, SF_6, H_2, ^{222}Rn…

  - Improved regional emission estimates (bottom up+top down)

  - Network design for non-CO_2 monitoring

  - Improved measurement techniques and methods

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THANK YOU!

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