Integrated non-CO_2 Greenhouse gas Observing System

InGOS progress report

ICOS final project meeting

Biarritz, 25 March, 2013

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 optimalis.
  - 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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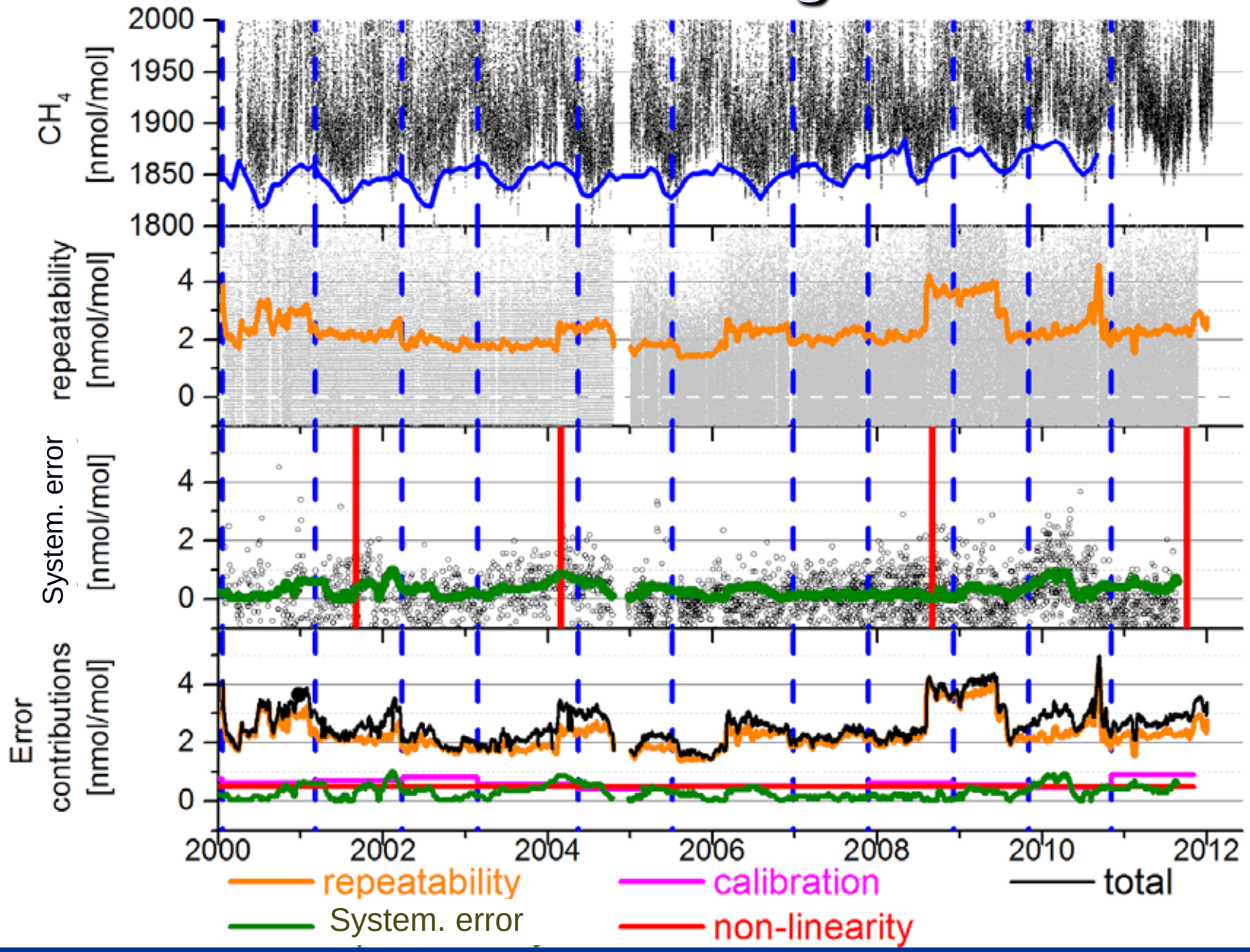
Results: Historic data CH_4

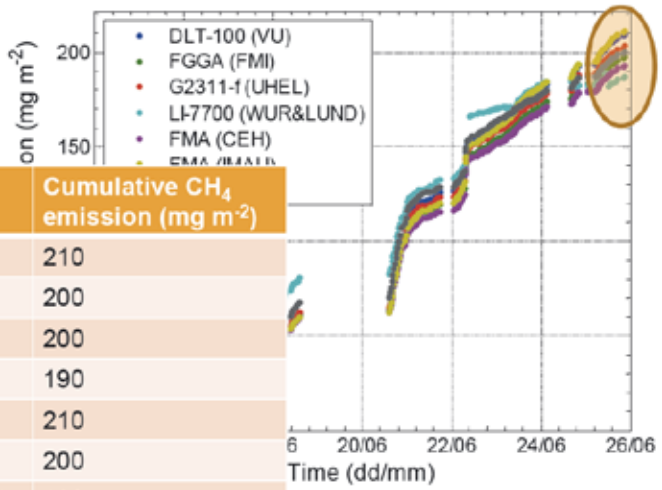
Abbrev	station name	lat	lon	altitude	period	partner
ZEP	Zeppelin	78.90	11.88	475m+10m	since 2001	NILU
PAL	Pallas	67.97	24.12	565m+7m	2004-2011	FMI
VOI	Voeikovo	59.95	30.70	72m+6m	2001-2013/gaps	ECN
TT1	Angus	56.55	-2.98	313m+222m	2006-2012	UEDIN
LU1	Lutjewad	53.40	6.35	1m+60m	since 2001	CIO
BI5	Bialystok	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 2001	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

Heidelberg

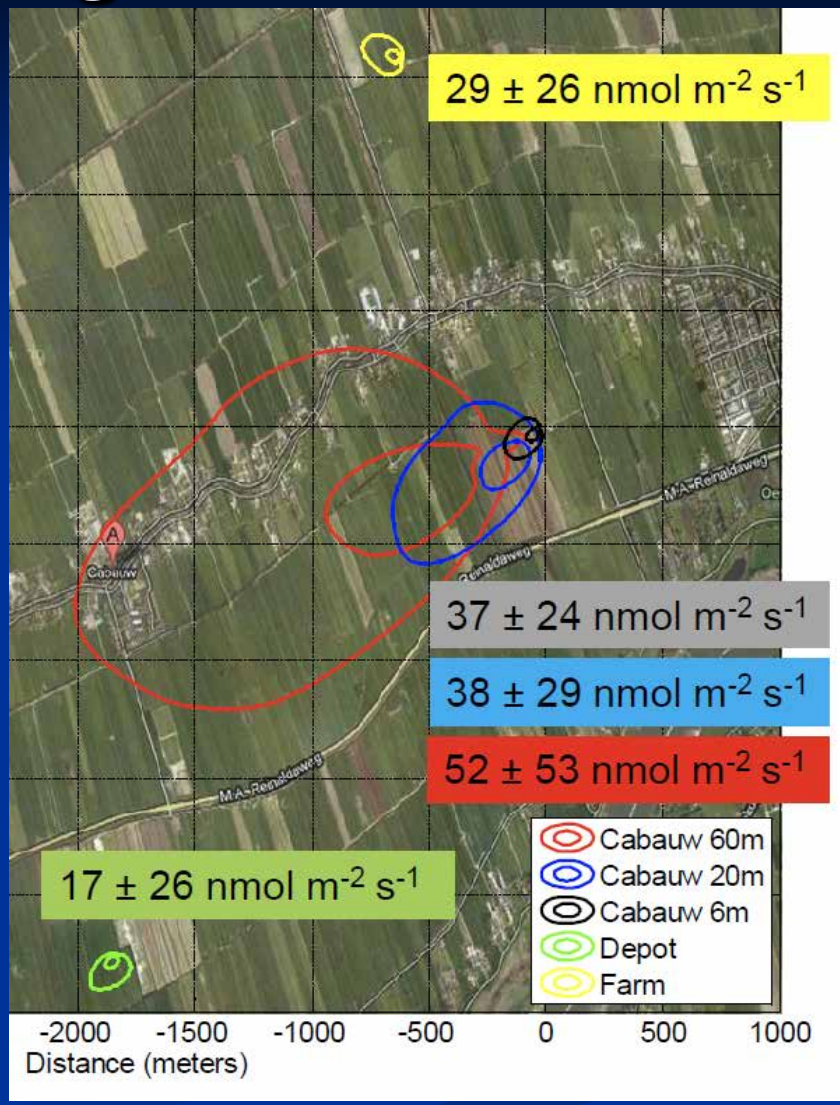

CH4 [nmol/mol]
2000
1950
1900
1850
1800
repeatability [nmol/mol]
4
2
0
System. error [nmol/mol]
4
2
0
Error contributions [nmol/mol]
4
2
0
2000
2002
2004
2006
2008
2010
2012
repeatability
calibration
total
System. error
non-linearity

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



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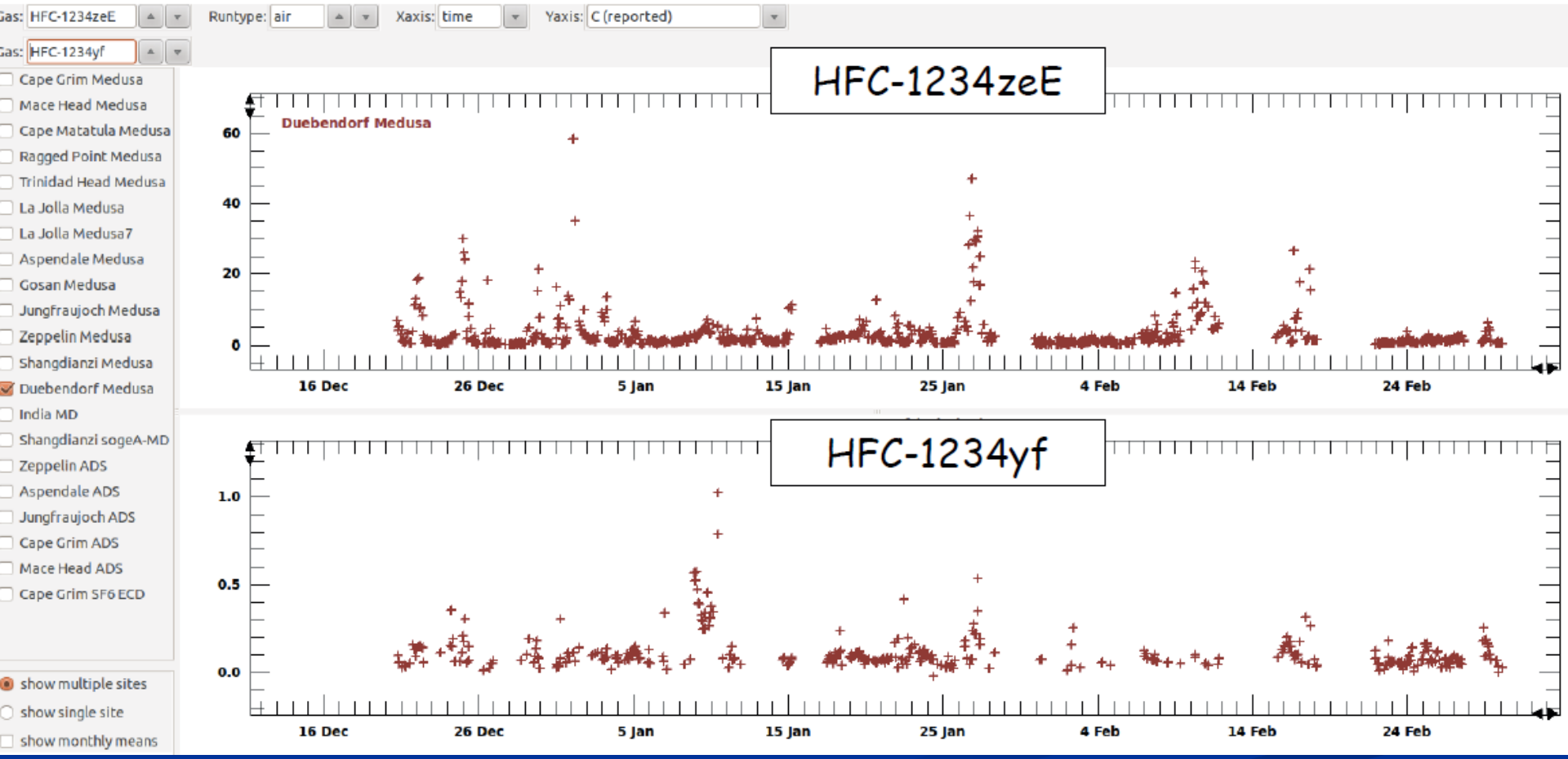
Results: new compounds



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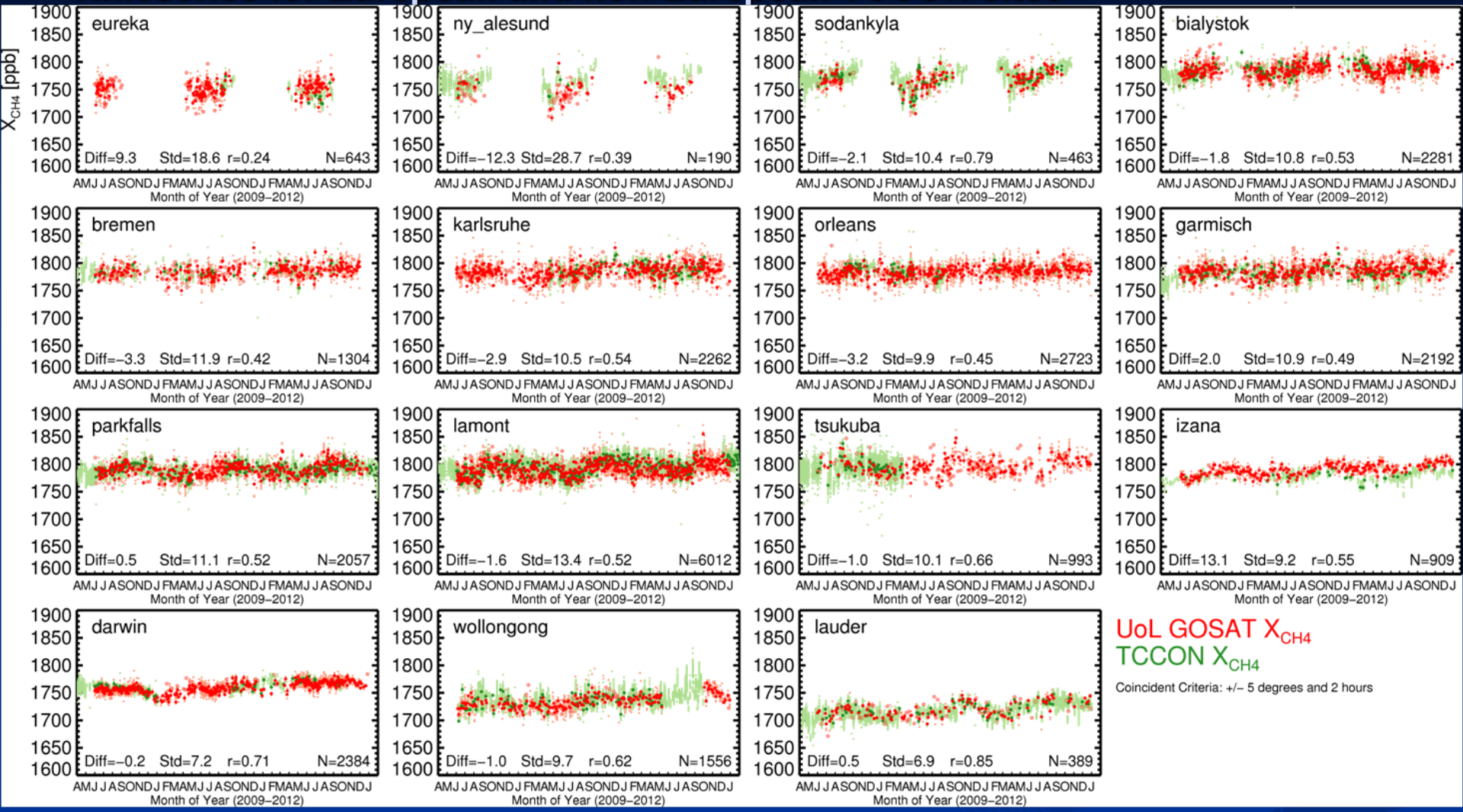
Results: Remote Sensing
Timeseries for European and non-European TCCON sites



- 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

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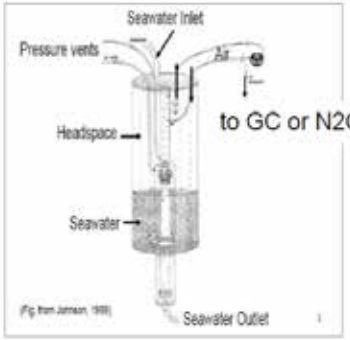
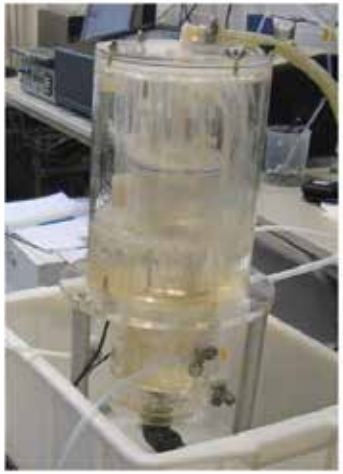
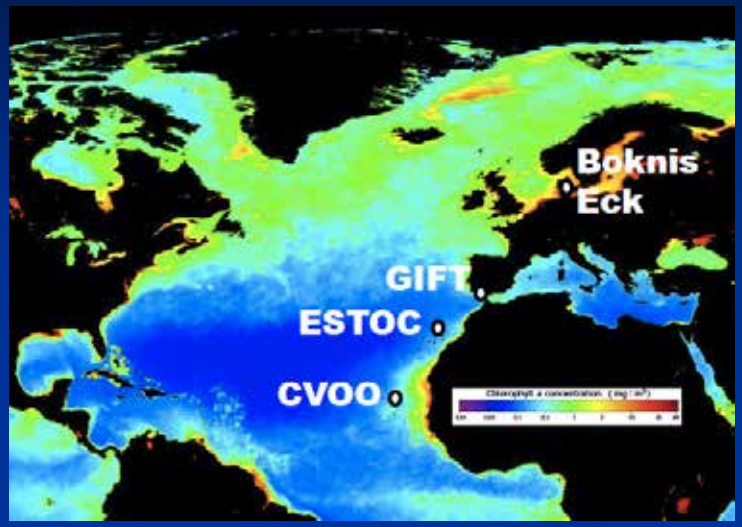
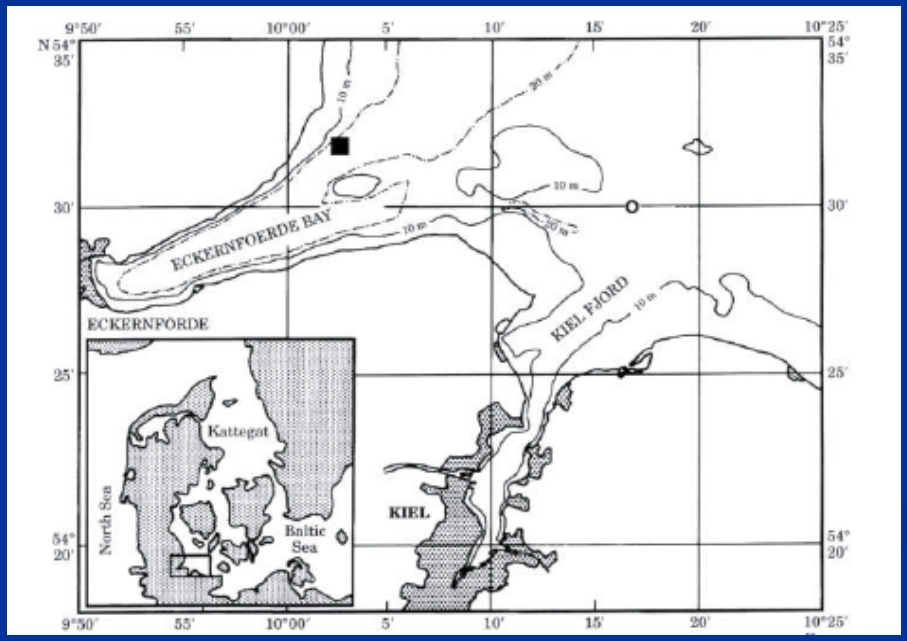
Results: Ocean

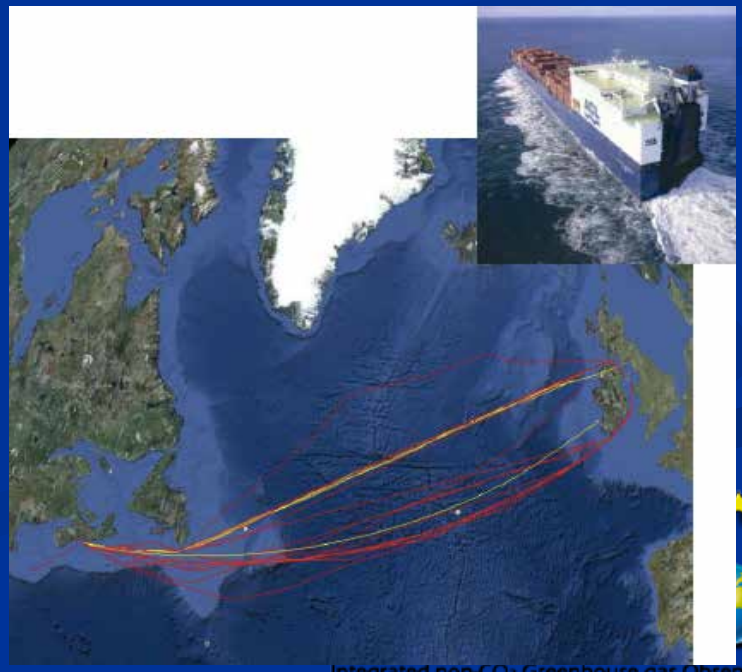
'Showerhead' Equilibrator
Design : R. Weiss (SIO)











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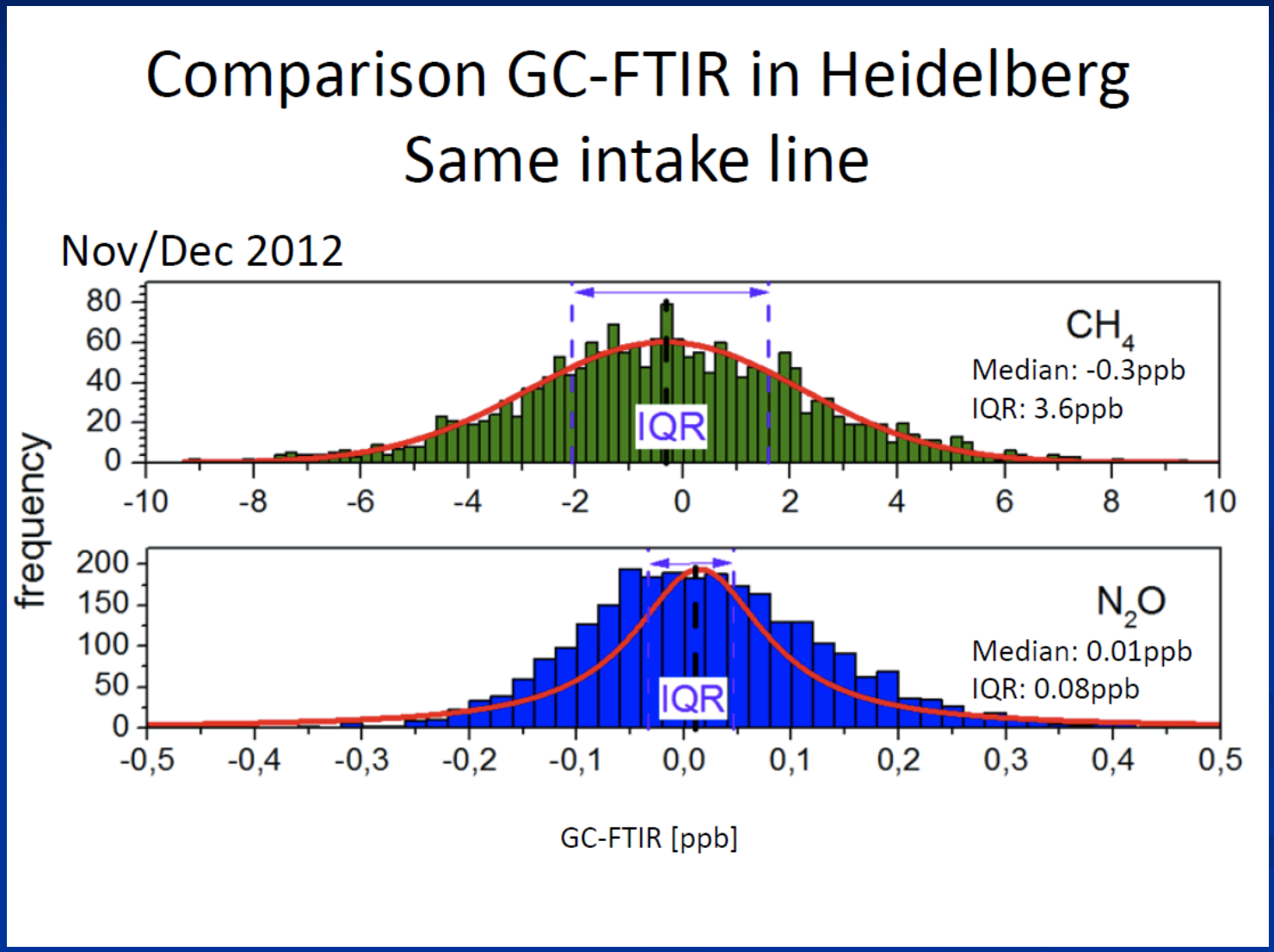
Significant scale offsets detected with new high precision instrumentation



Sanam Vardag
UHEI

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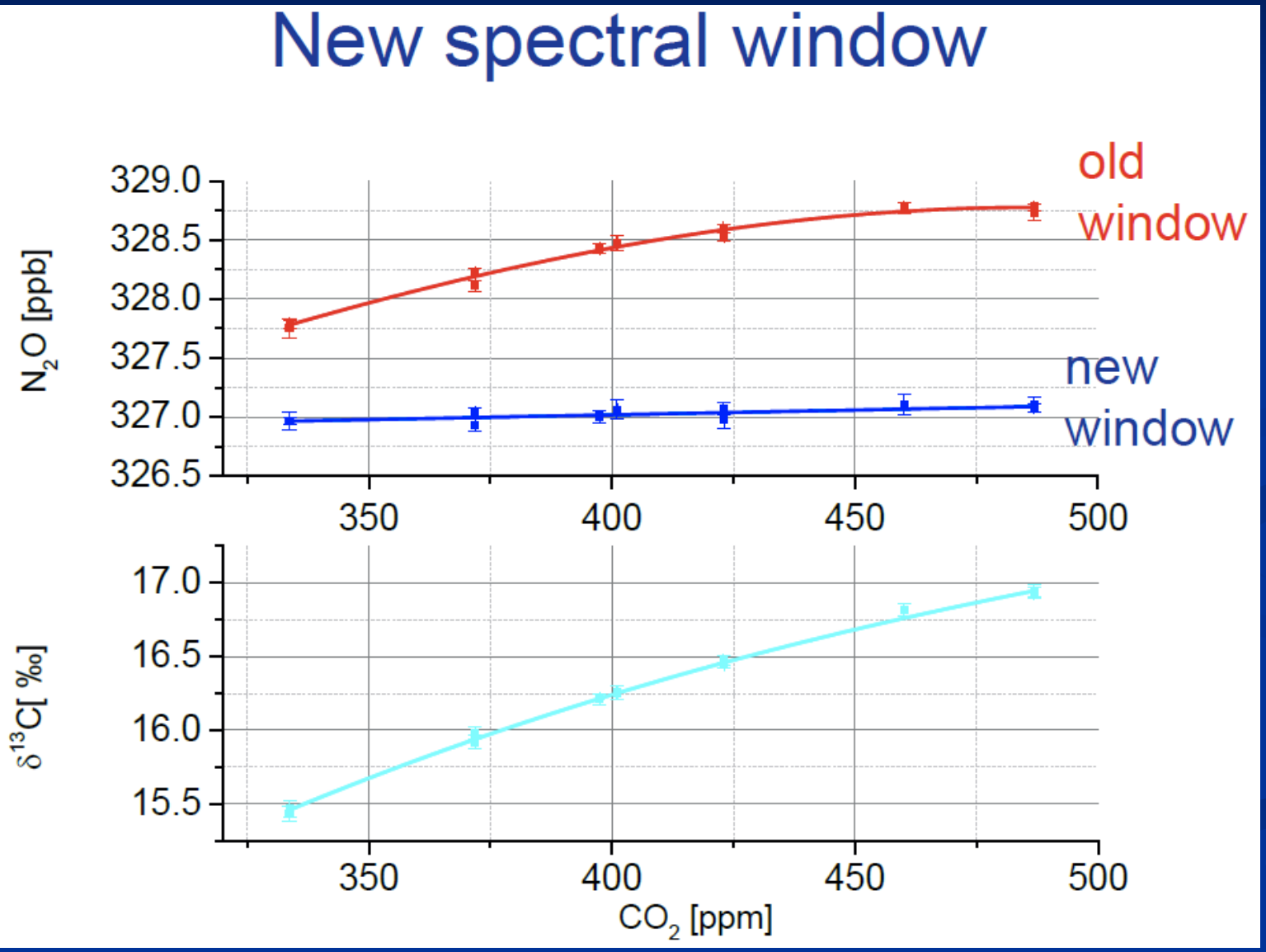
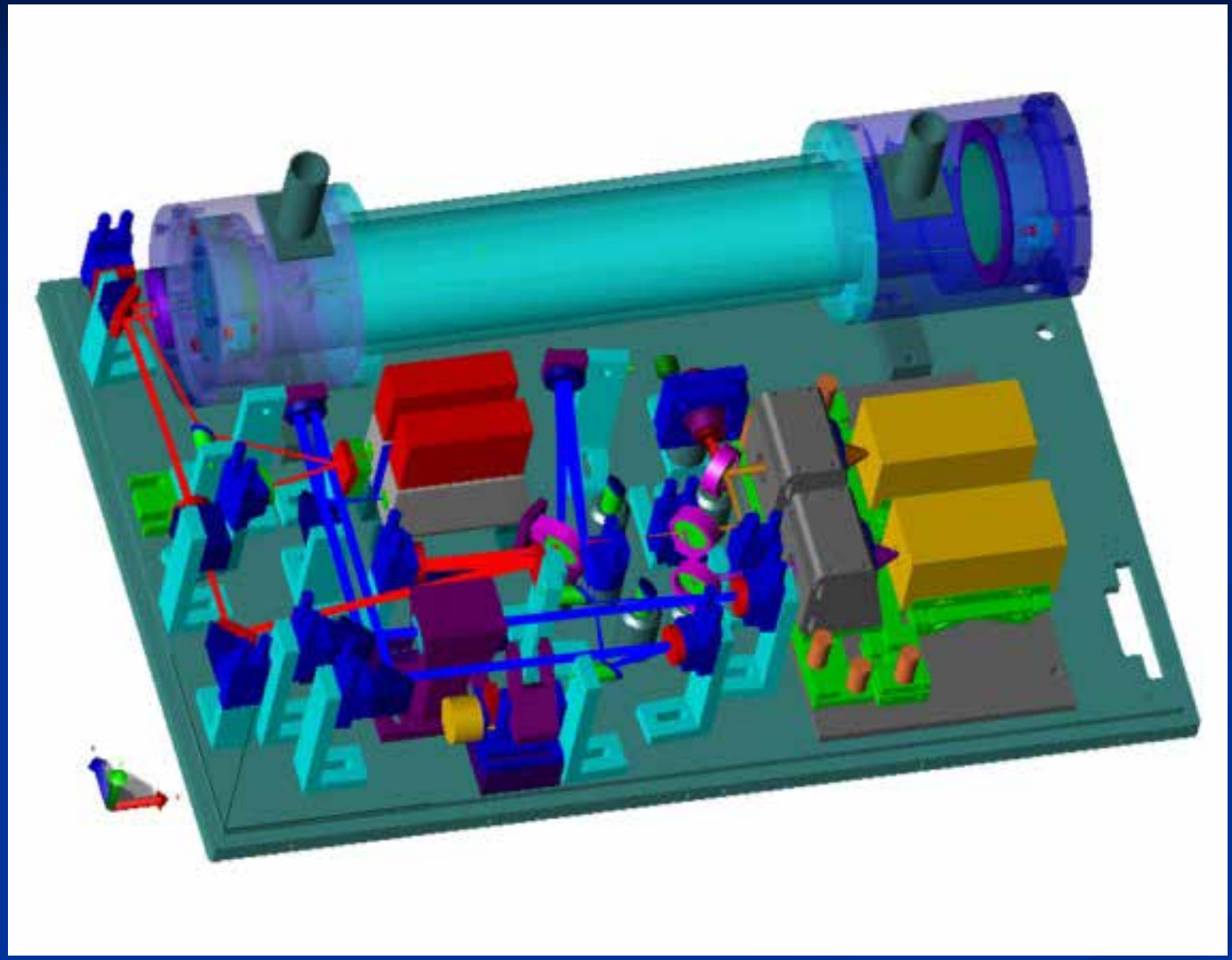
Instrument improvements



Sam Hammer
UHEI

QC laser spectrometer for real-time CH4 isotopic measurements



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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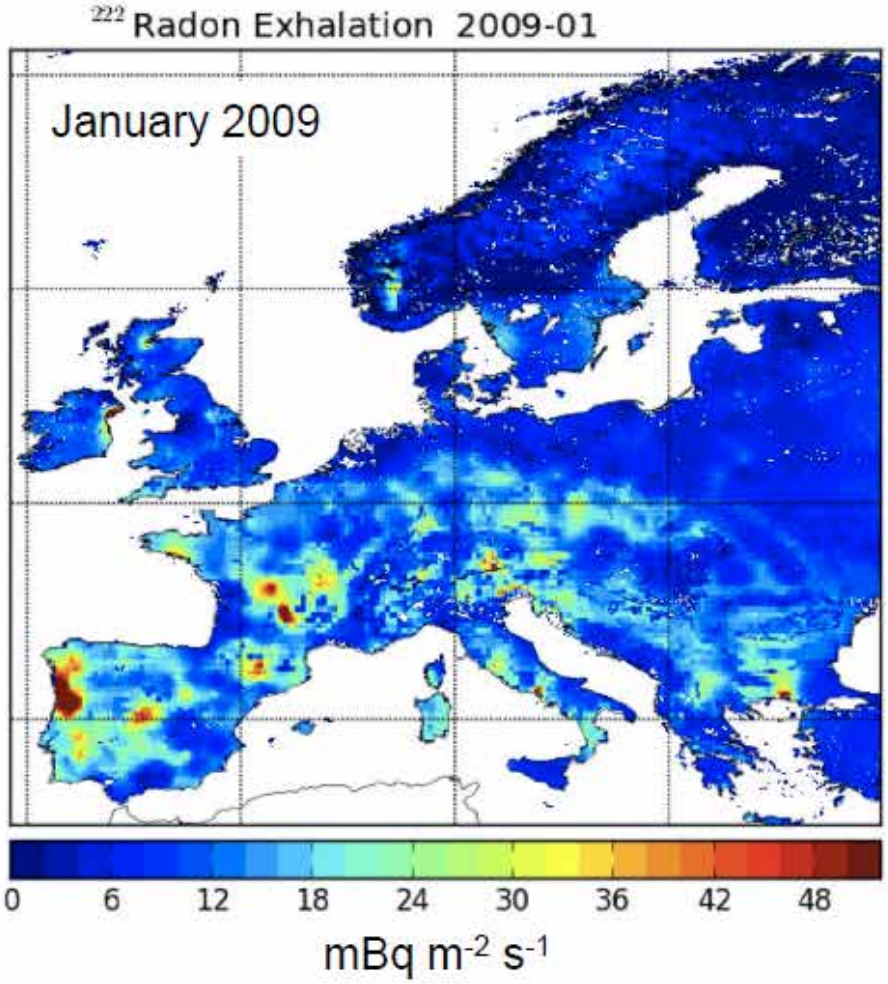
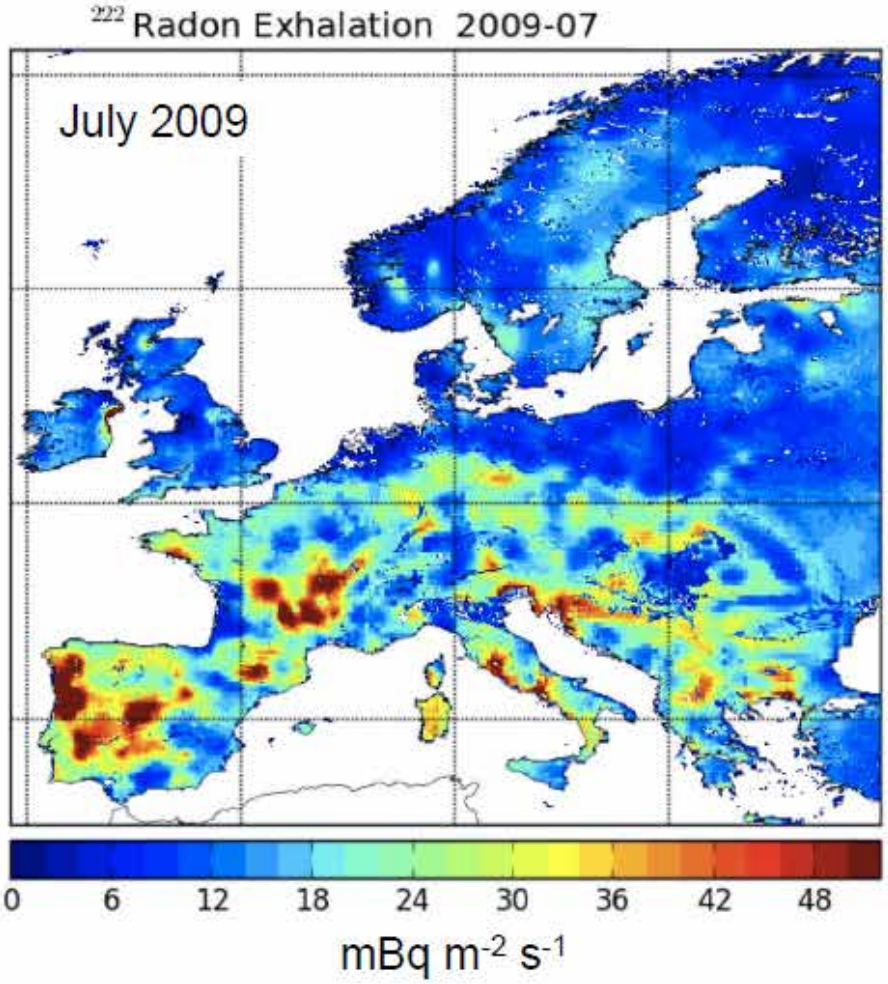
InGOS ^{222}Radon Flux Map version1.0





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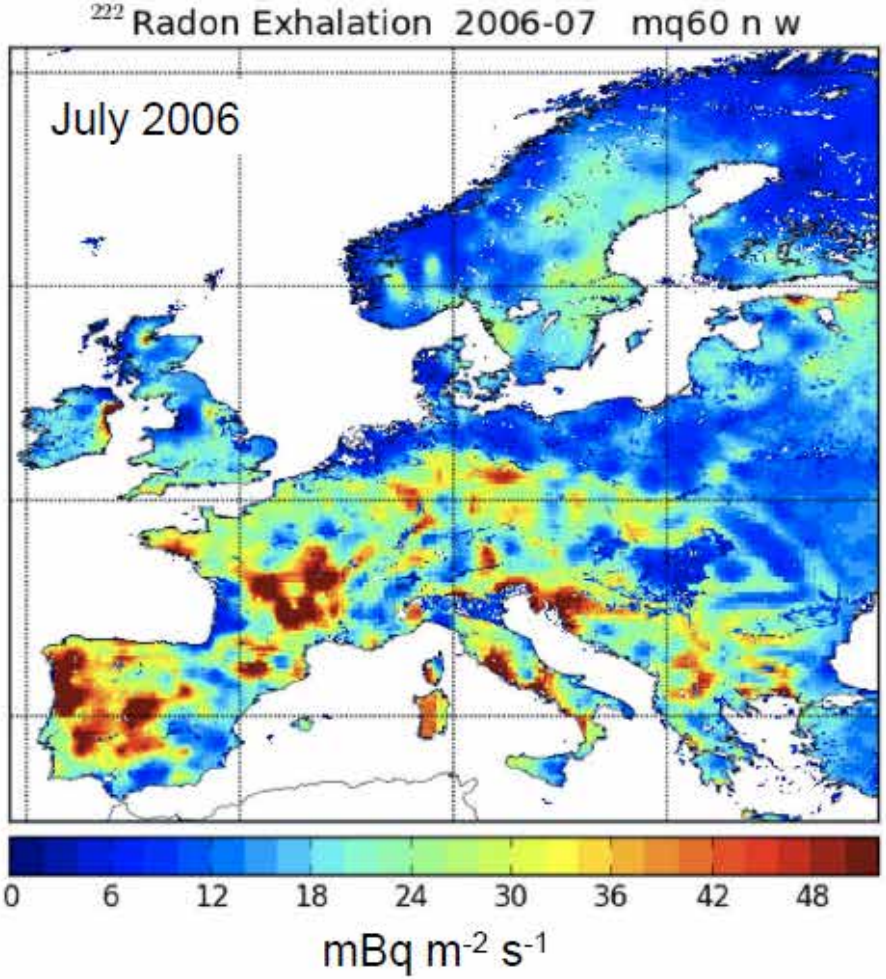
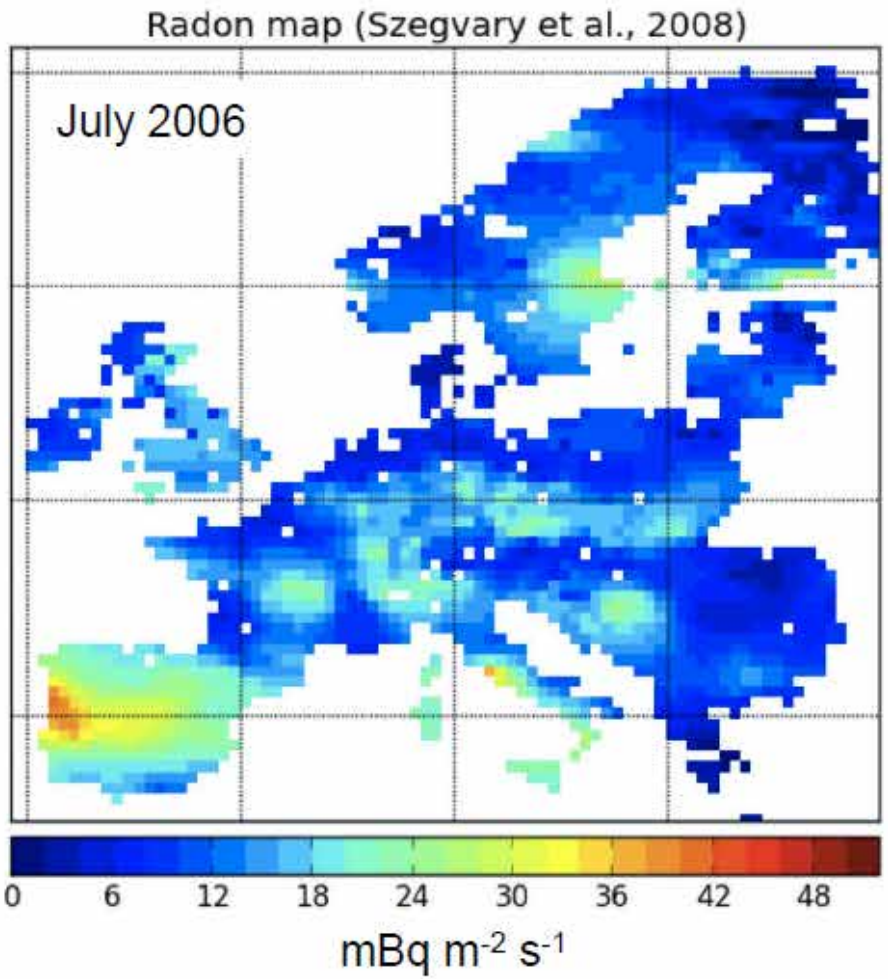
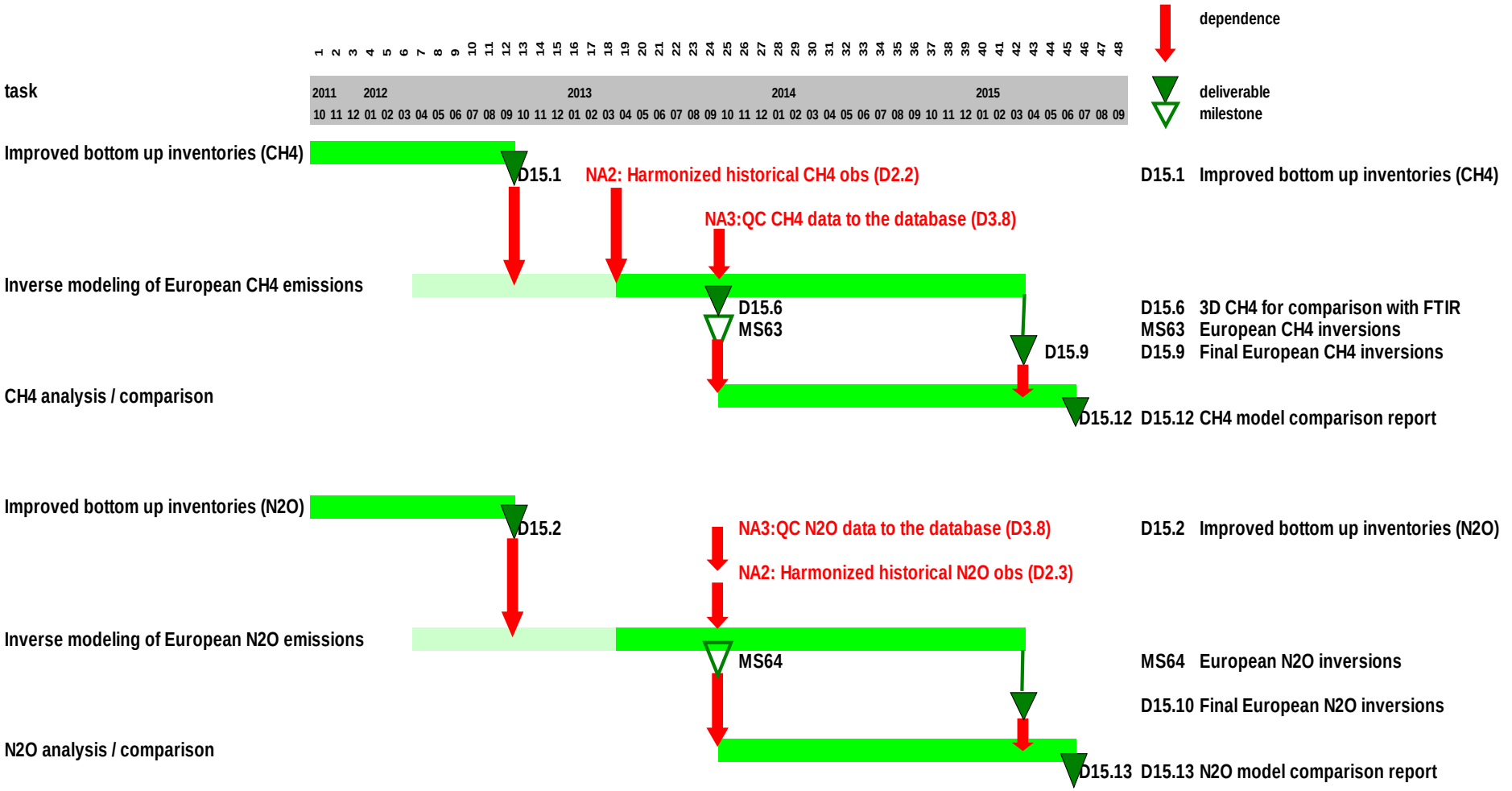
Comparison with existing ^{222}Radon Flux Map





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

Schedule inverse modeling CH4 / N2O



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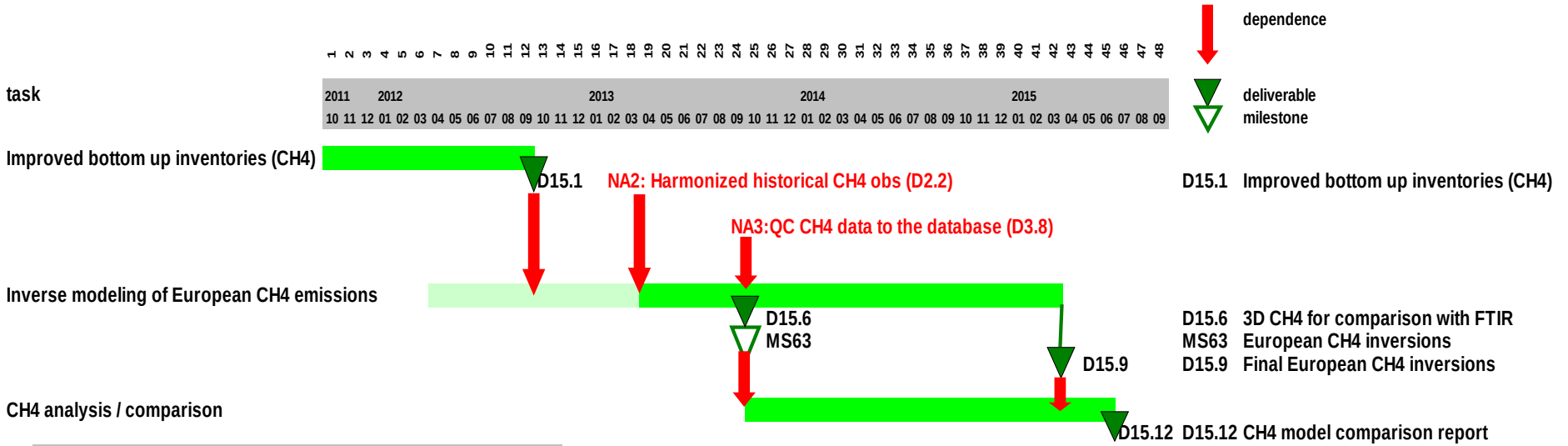

CH_4 Modeling protocol
Draft: 15 April
Final : 30 April

update CH_4 Modeling protocol
October 2013

CH_4 inversions
deadline : 31 August
-> first comparison joint JRA3/NA23 WS end September
-> FTS data / 3D fields 15.4

update CH_4 inversion
January 2014

TTorch summer school 2013

Hyytiälä, 1 Oct-10 Oct

- **Challenges in measurements of greenhouse gases and their interpretation**
- Max 35 participants
- Facility+Travel funded by ESF
- 10 teachers with a.o.:
  - Ingeborg Levin
  - Martin Heimann
  - Christoph Gerbig
  - Sander Houweling
  - Maarten Krol
  - Timo Vesala
  - …
- Open procedure: 1 April 2013

More info: http://www.ttorch.org

TTorch summer school 2013

TTORCH summer school 2013

	Mon 30-Sep-13	Tue 01-Oct-13	Wed 02-Oct-13	Thu 03-Oct-13	Fri 04-Oct-13	Sat 05-Oct-13	Sun 06-Oct-13	Mon 07-Oct-13	Tue 08-Oct-13	Wed 09-Oct-13	Thu 10-Oct-13	Fri 11-Oct-13
08:00		Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast	Breakfast
09:00			Lecture Atmospheric physicsand chemistry T. Roeckmann?	Lecture Other GHG overview I. Levin	Lecture Measurement approaches overview	Lecture Isotopes + other tracers C. Brenninkmeijer	Lecture Anthropogenic emissions T. Pulles	Lecture Satellites, FTIRs S. Houweling	Lecture Modeling overview M. Heimann	Lecture Regional inversions C. Gerbig	Practical Processing results, preparing presentations	Transport to Helsinki
09:30		Welcome, introduction										
10:30		coffee break	coffee break	coffee break	coffee break	coffee break	coffee break	coffee break	coffee break	coffee break	coffee break	
11:00		Lecture Climate system M. Heimann	Lecture Carbon Cycle M. Heimann	Lecture Interaction biosphere - soil - atmosphere J. Kesselmeier	Lecture Measurement instrument principles C. Gerbig	Lecture Concentration measurements, scale issues I. Levin	Lecture Arctic A. Lindroth	Lecture Flux measurements T. Vesala	Lecture Global modeling, inversions M. Krol	Field trip Wetland T. Vesala	Practical Processing results, preparing presentations	
12:45		Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	
14:30		Discussion The Climate debate: sceptic vs. scientist? B. Verheggen	Field trip Overview field measurements Hyytiälä T. Vesala	Discussion Session of exercises and discussion 1	Practical Field measurements (T. Vesala + helpers, E. Popa, A. Lindroth, ...)	Practical Field measurements (helpers, E. Popa, A. Lindroth, ...)	Practical Processing results, preparing presentations	Discussion Session of exercises and discussion 2	Practical Modeling (M. Heimann, M. Krol, A. Vermeulen, C. Gerbig)	Practical Modeling (M. Heimann, M. Krol, A. Vermeulen, C. Gerbig)	Student presentations, results, end of summer school	
16:00		coffee break		coffee break			coffee break	coffee break			coffee break	
16:30	Transport from Helsinki	Time to know each other, free time		Poster session			Processing results, preparing presentations	Poster session			Student presentations, results, end of summer school	
18:00		Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner	Dinner / Party	Dinner	Dinner	
19:00			Movie evening	Poster session (cont)								






THANK YOU!

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