



First Emission estimates from the UK DECC network

Key Objectives

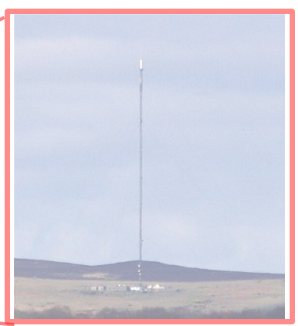
- Establish new tall tower network to measure greenhouse gases across the UK
- Resolve English, Scottish, Welsh and N Irish emissions of GHG & halocarbons using the inversion methodology INTEM
 - and use these emission estimates for inventory verification
- Assess trends in emissions and concentrations of GHGs & halocarbons; identify departure from expected trends & causes

UK Deriving Emissions linked to Climate Change Network

Mace Head



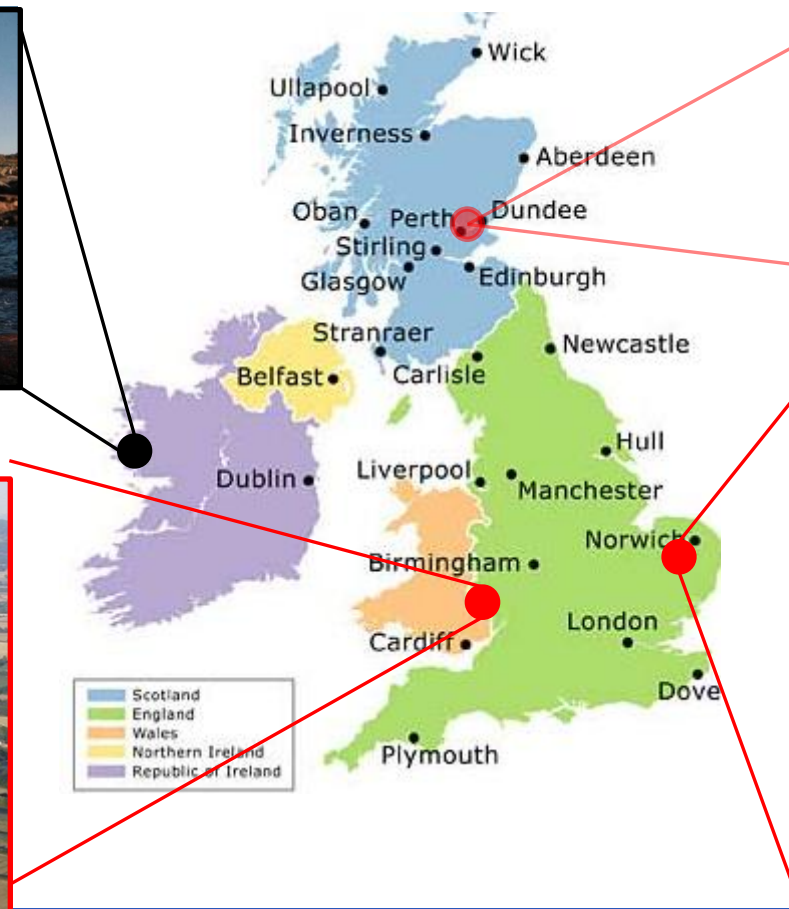
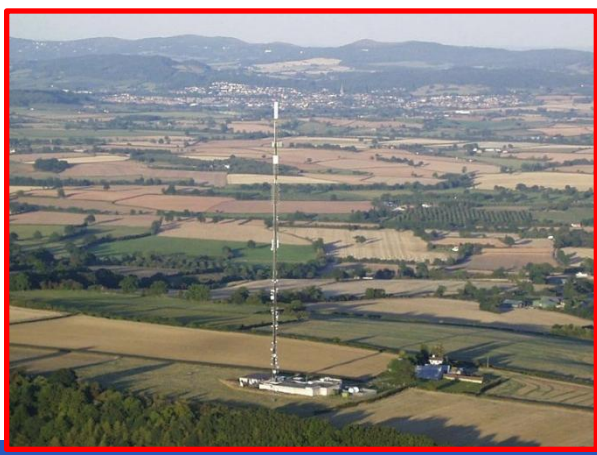
Angus



Tacolneston



Ridge Hill



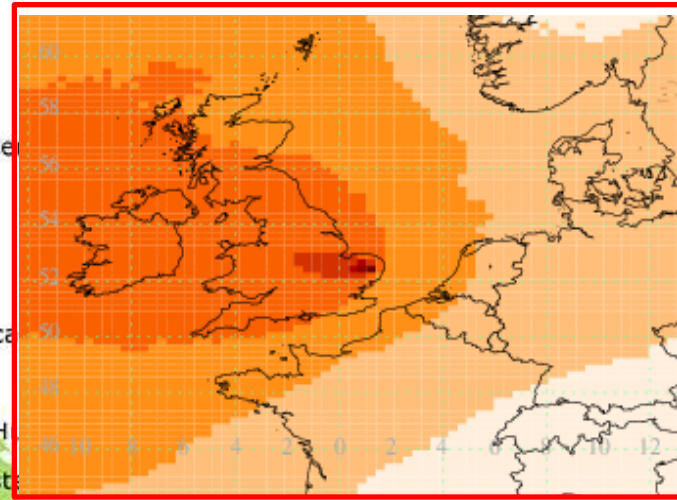
UK Deriving Emissions linked to Climate Change Network



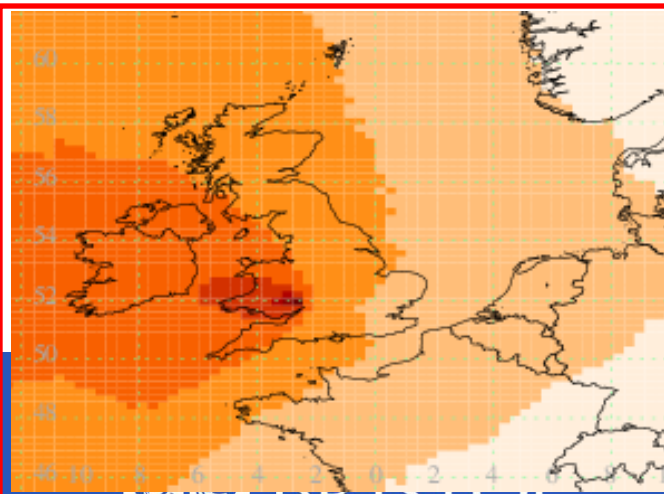
Mace Head



Tacolneston

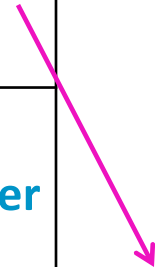


Ridge Hill

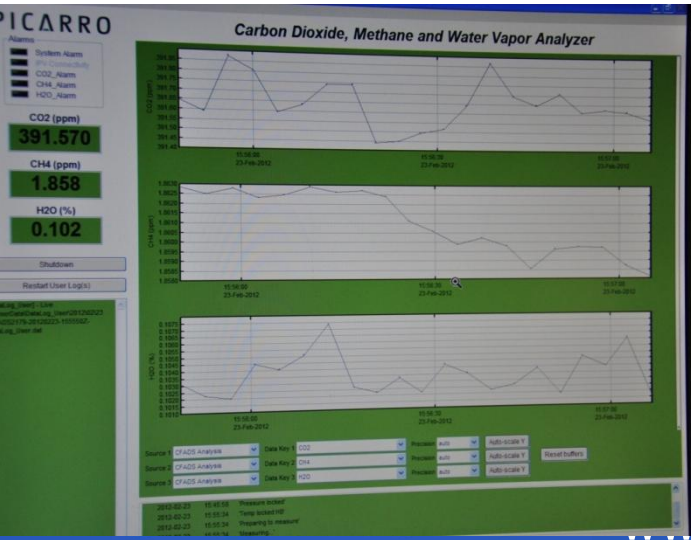
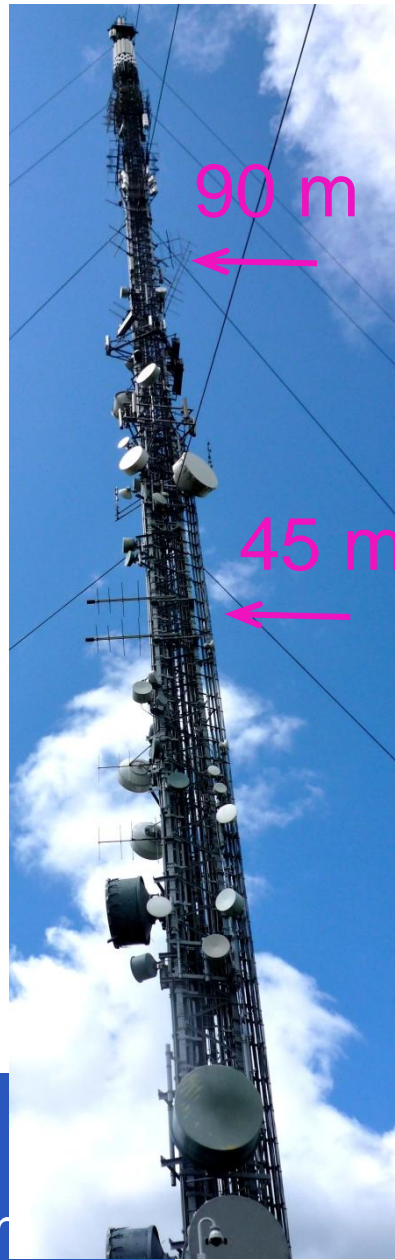


Gases & Instrumentation

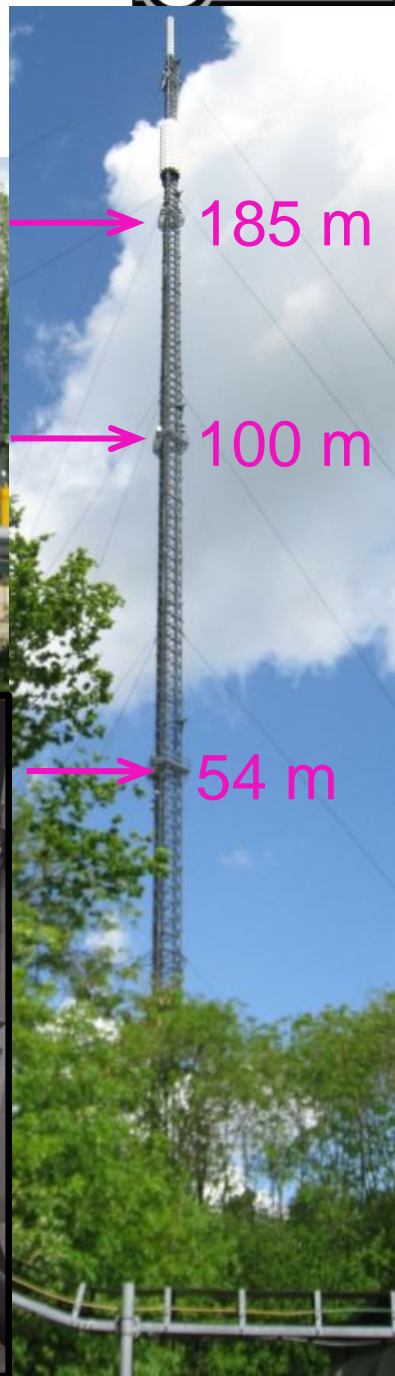
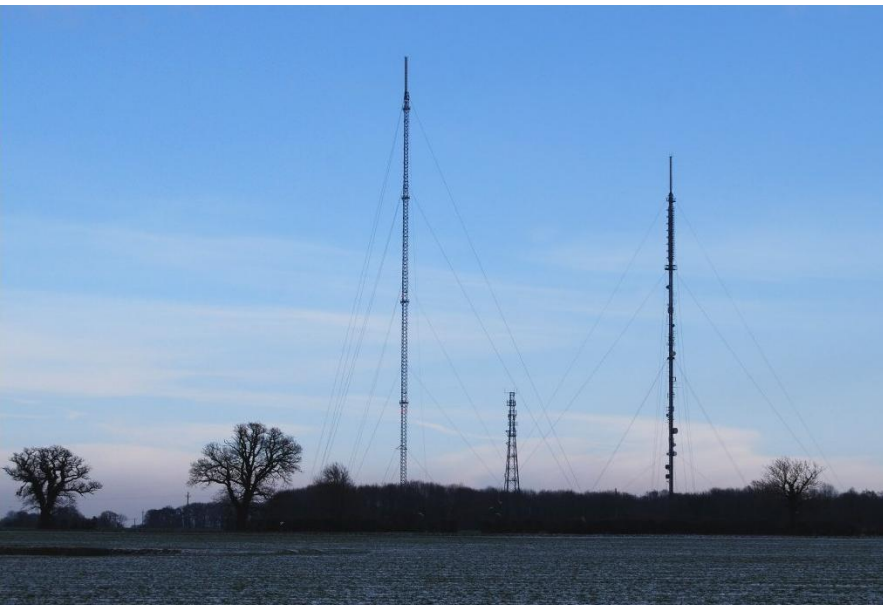
Tacolneston & Mace Head	Ridge Hill	Angus	Frequency	Instrument
CO ₂ CH ₄	CO ₂ CH ₄	CO ₂ CH ₄	1 second	Picarro – CRDS
N ₂ O SF ₆	N ₂ O SF ₆		10 min	GC-ECD
H ₂ CO			10 min	PP1/RGA3
PFCs HFCs HCFCs CFCs Halons Etc.			1 hour	GC-Mass Spectrometer (Medusa)



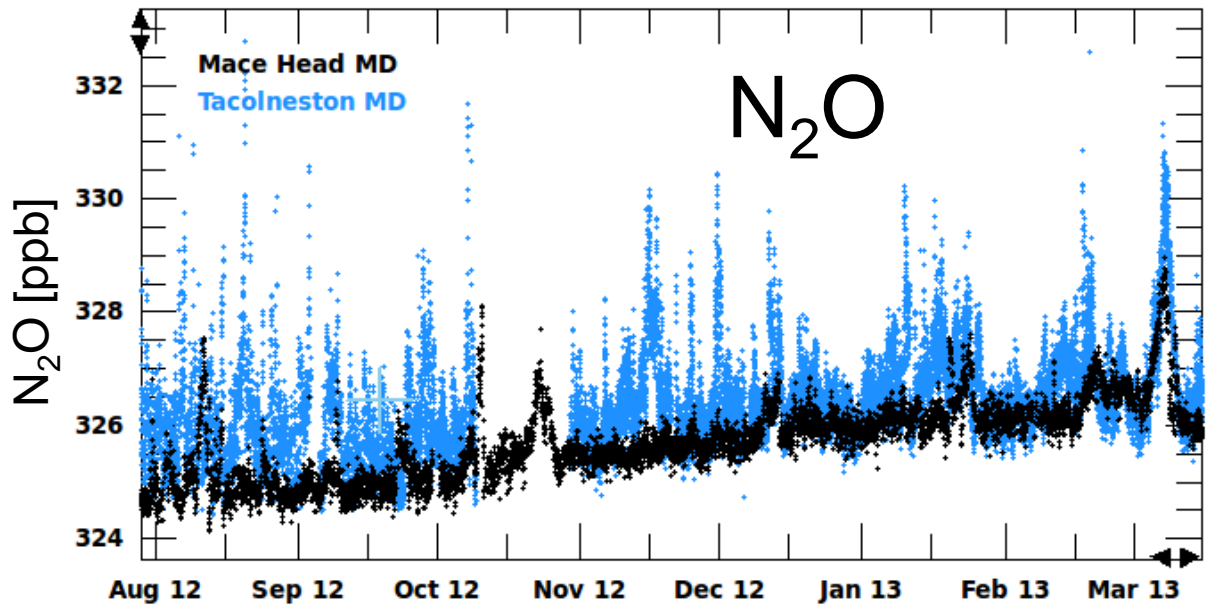
Ridge Hill



Tacolneston

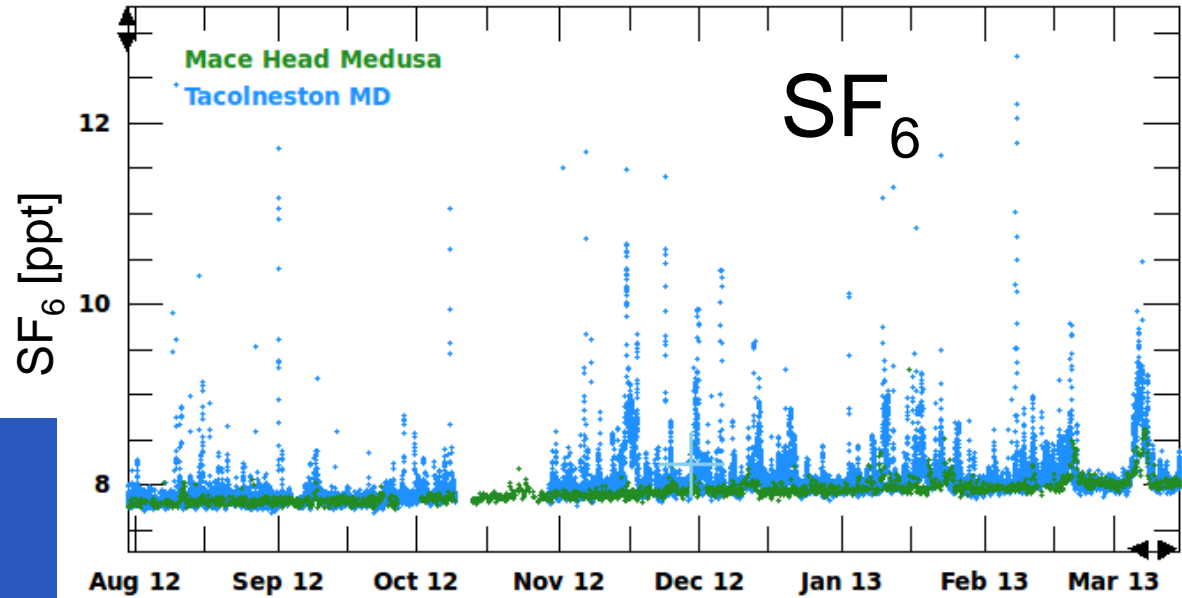


Data at Tacolneston



Mace Head
Tacolneston

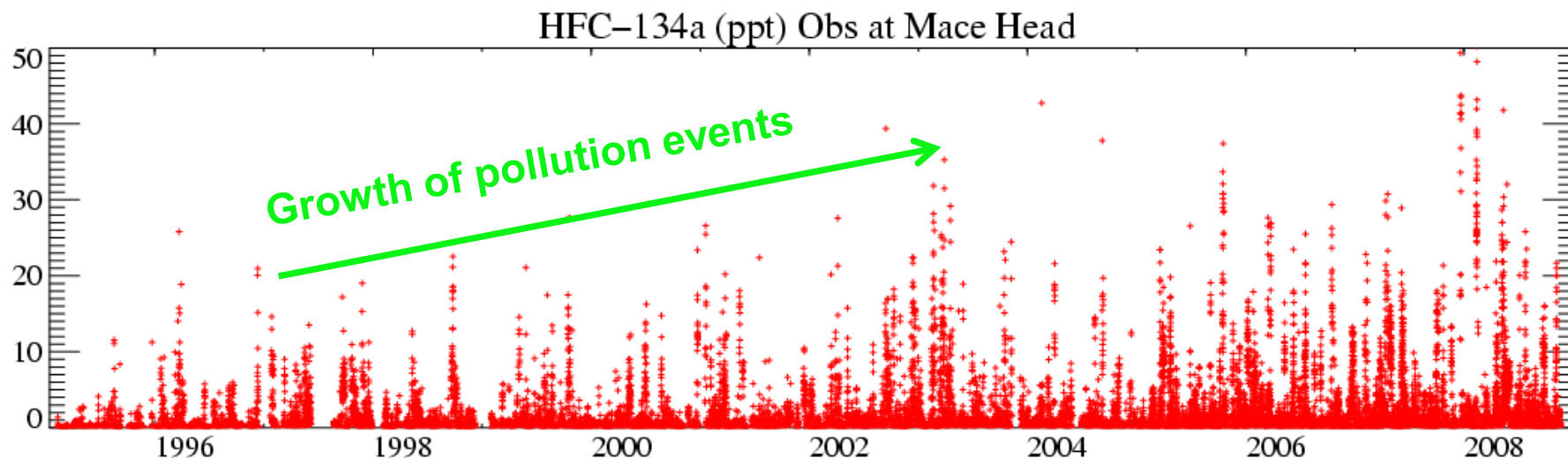
Mace Head
Tacolneston



🌿 Step 1: Estimating the Baseline

using **InTEM** (Inversion Technique for Emission Modelling)

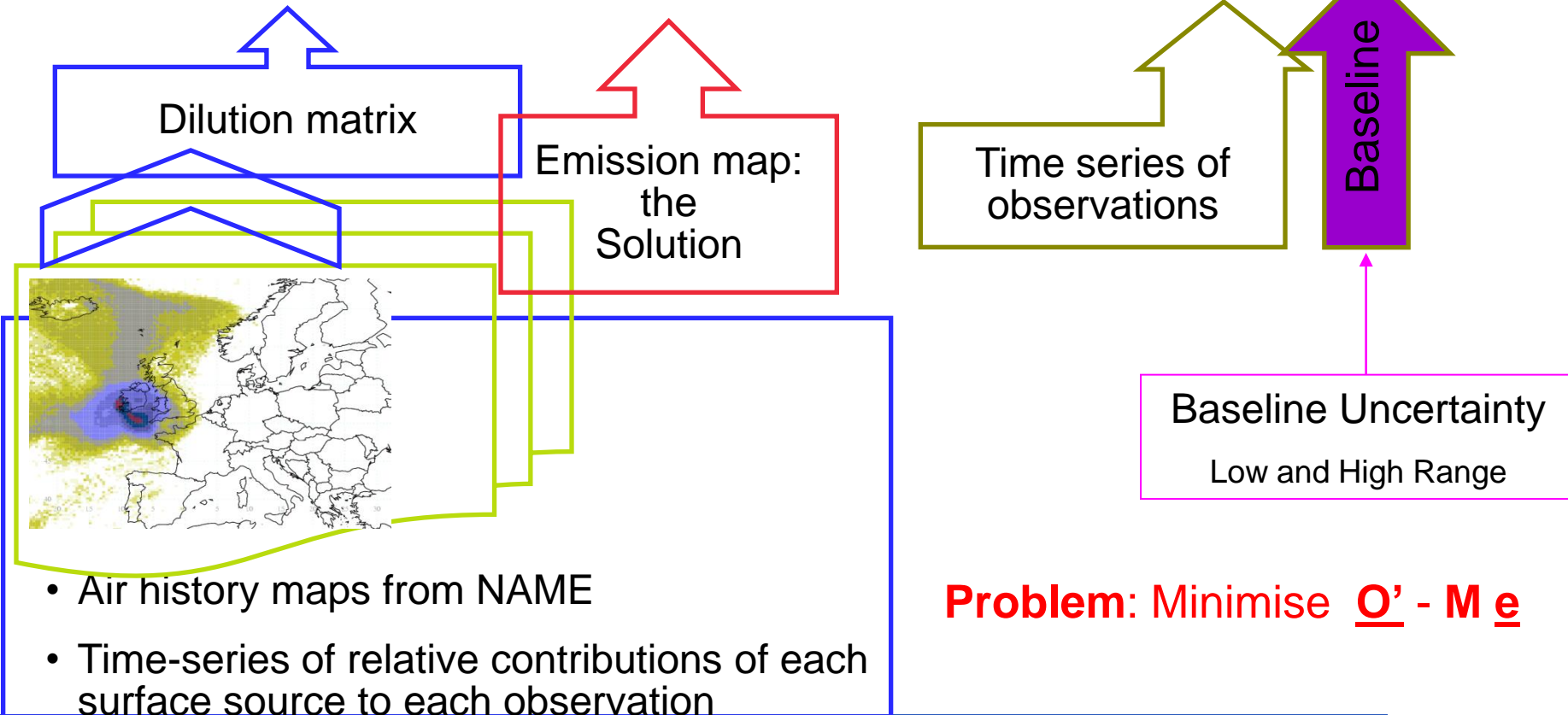
Aim: Generate emission estimates from ‘polluted’ (above baseline) observations.



Step 2: Estimating Emissions **e**

using **InTEM** (Inversion Technique for Emission Modelling)

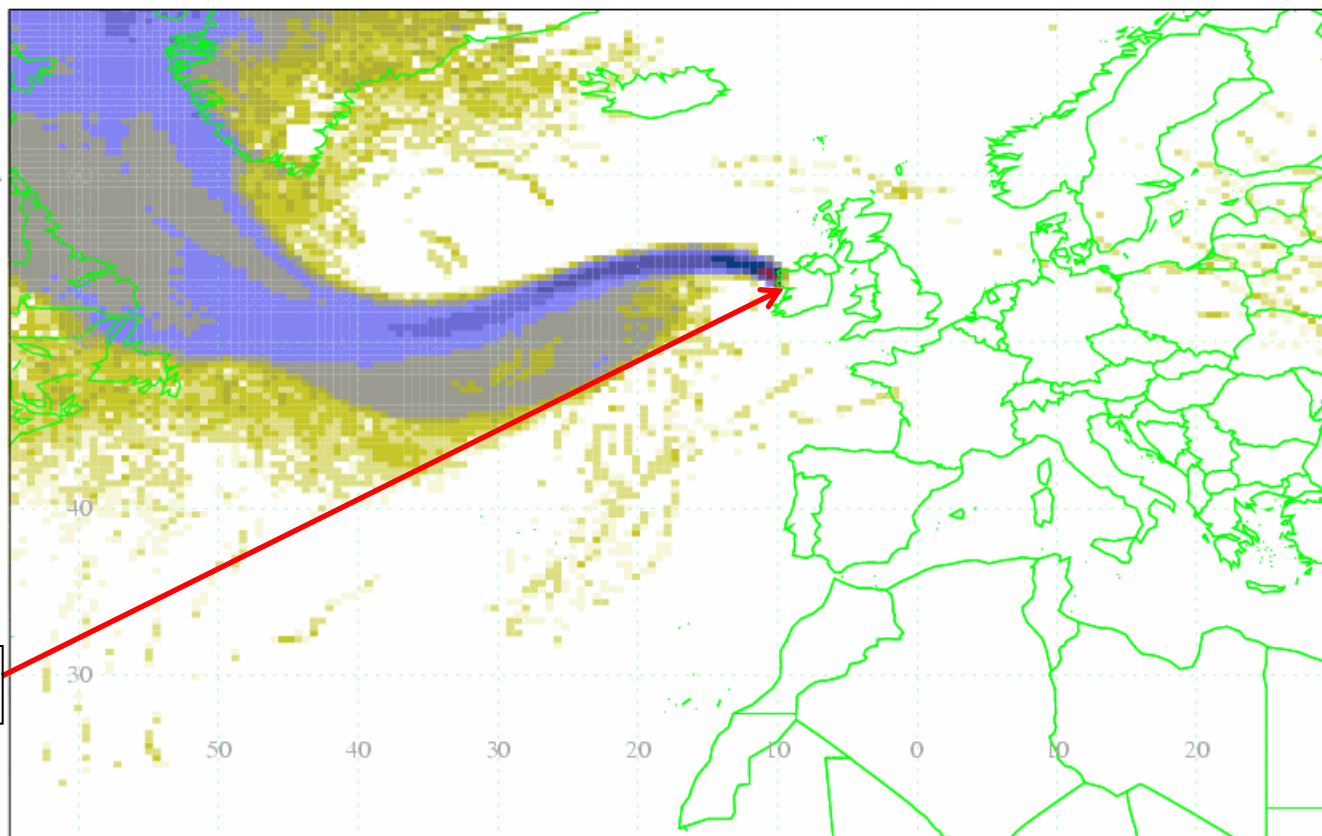
$$M [t \times m] \times e [m \times 1] = O' [t \times 1] = O - b$$



🌅 Air history of Mace Head



00-03z
16/04/2007



Mace Head



University of
BRISTOL

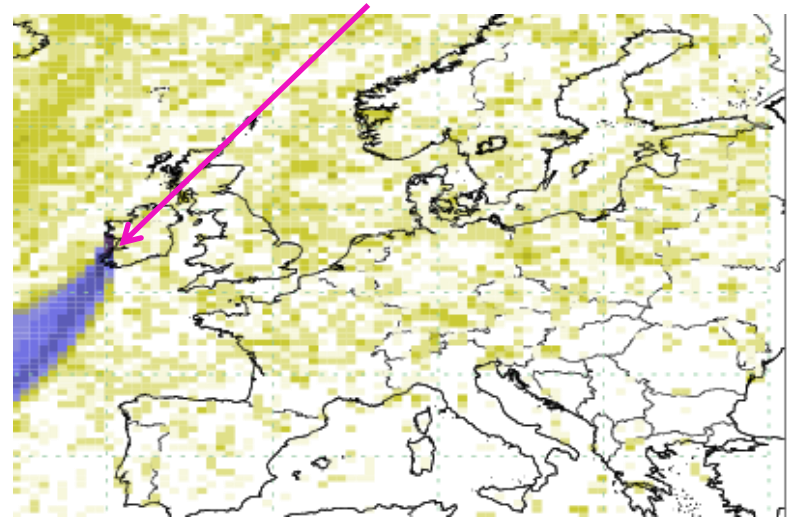
www.metoffice.gov.uk/atmospheric-trends



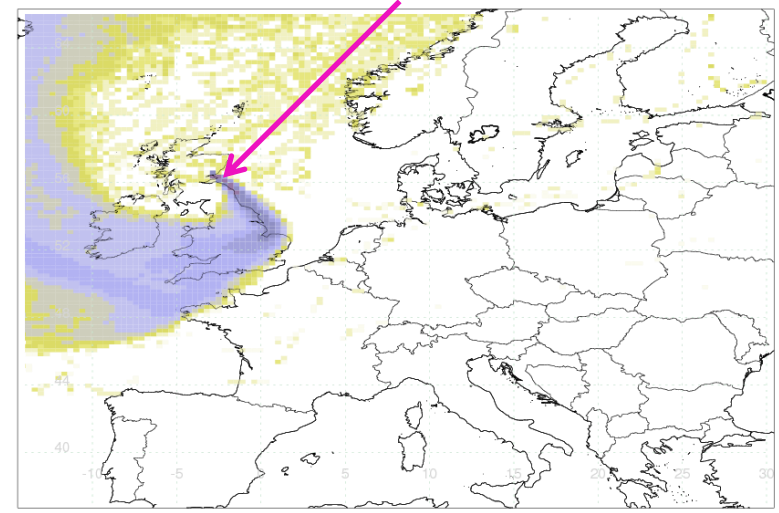
Met Office

🌟 Air History Maps for all stations in network

Mace Head

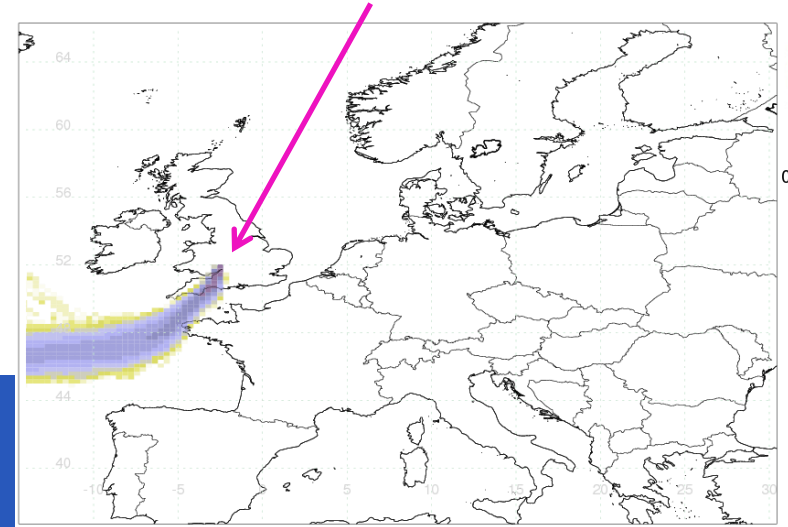


Angus



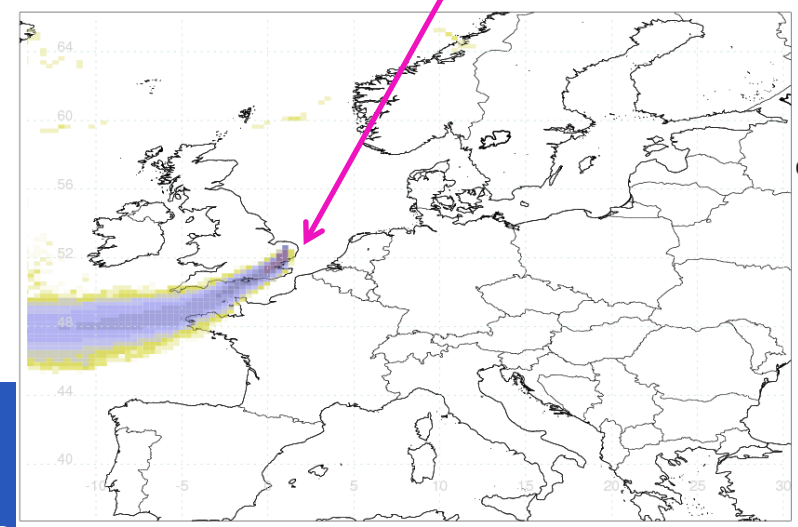
Met Office
00-02z
01/08/2012

Ridge Hill



Met Office
00-02z
01/08/2012

Tacolneston

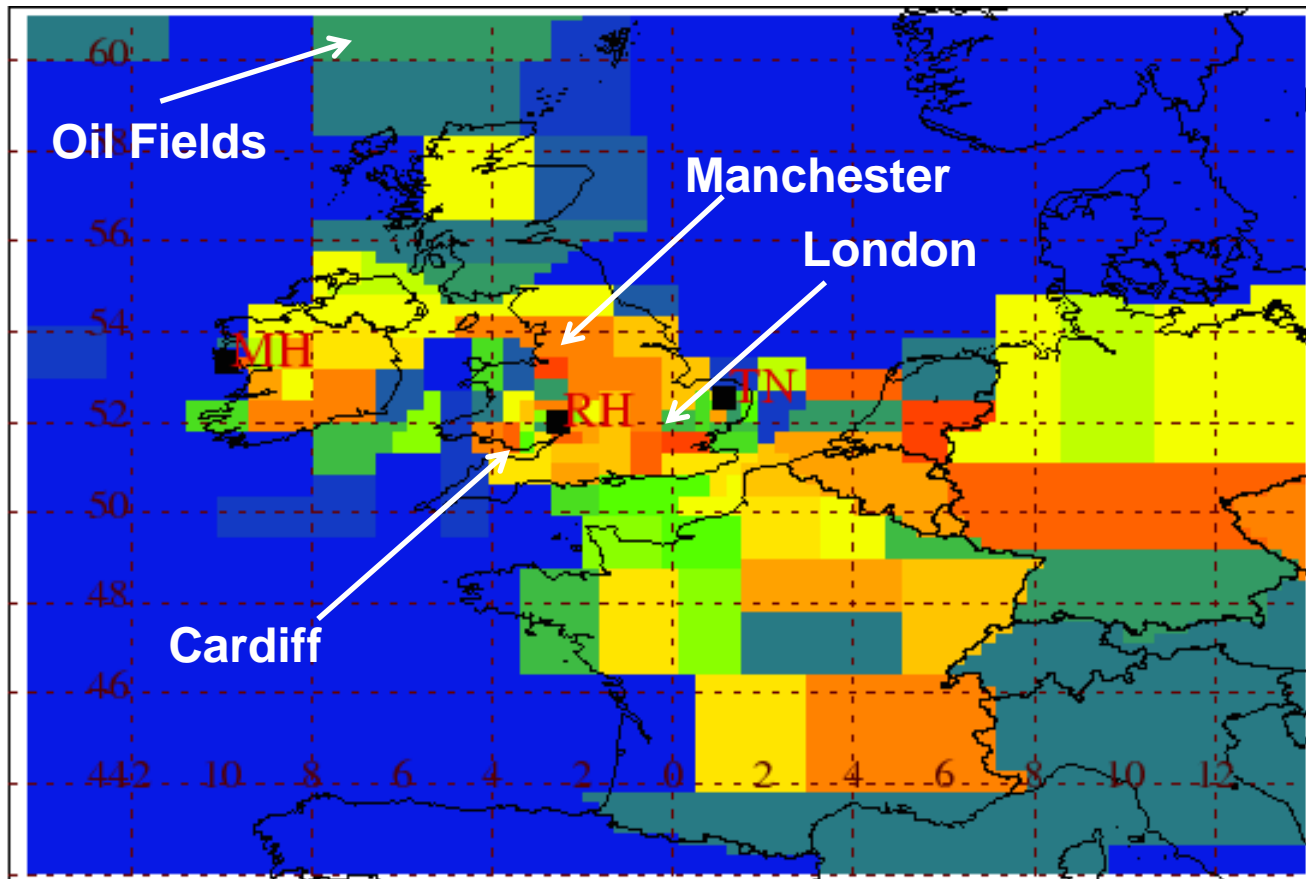


Met Office
00-02z
01/08/2012

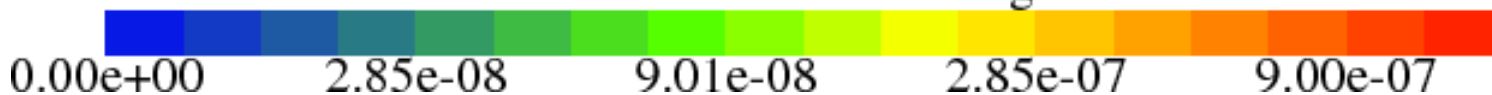
2012

 CH₄

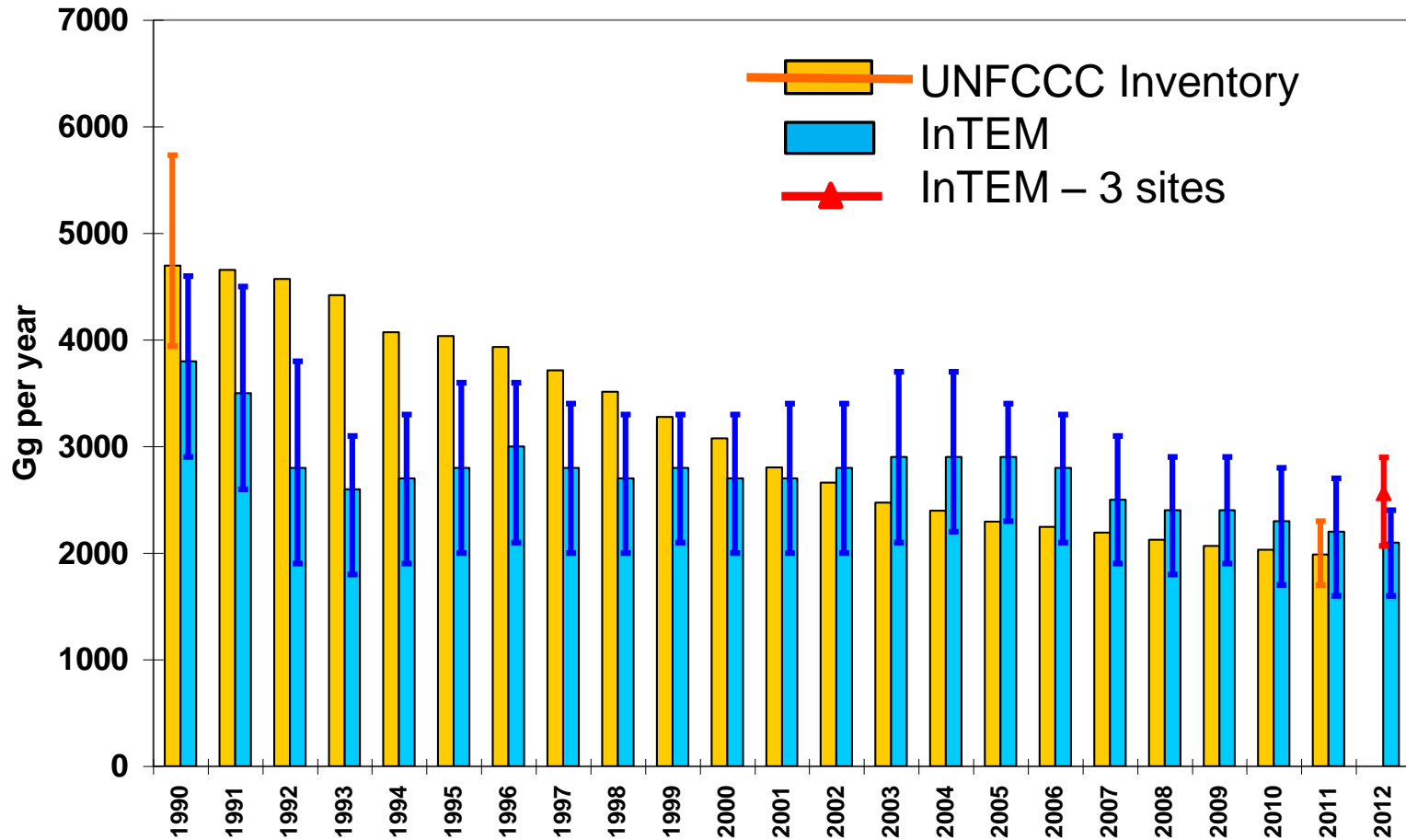
MHD
TAC
RGL



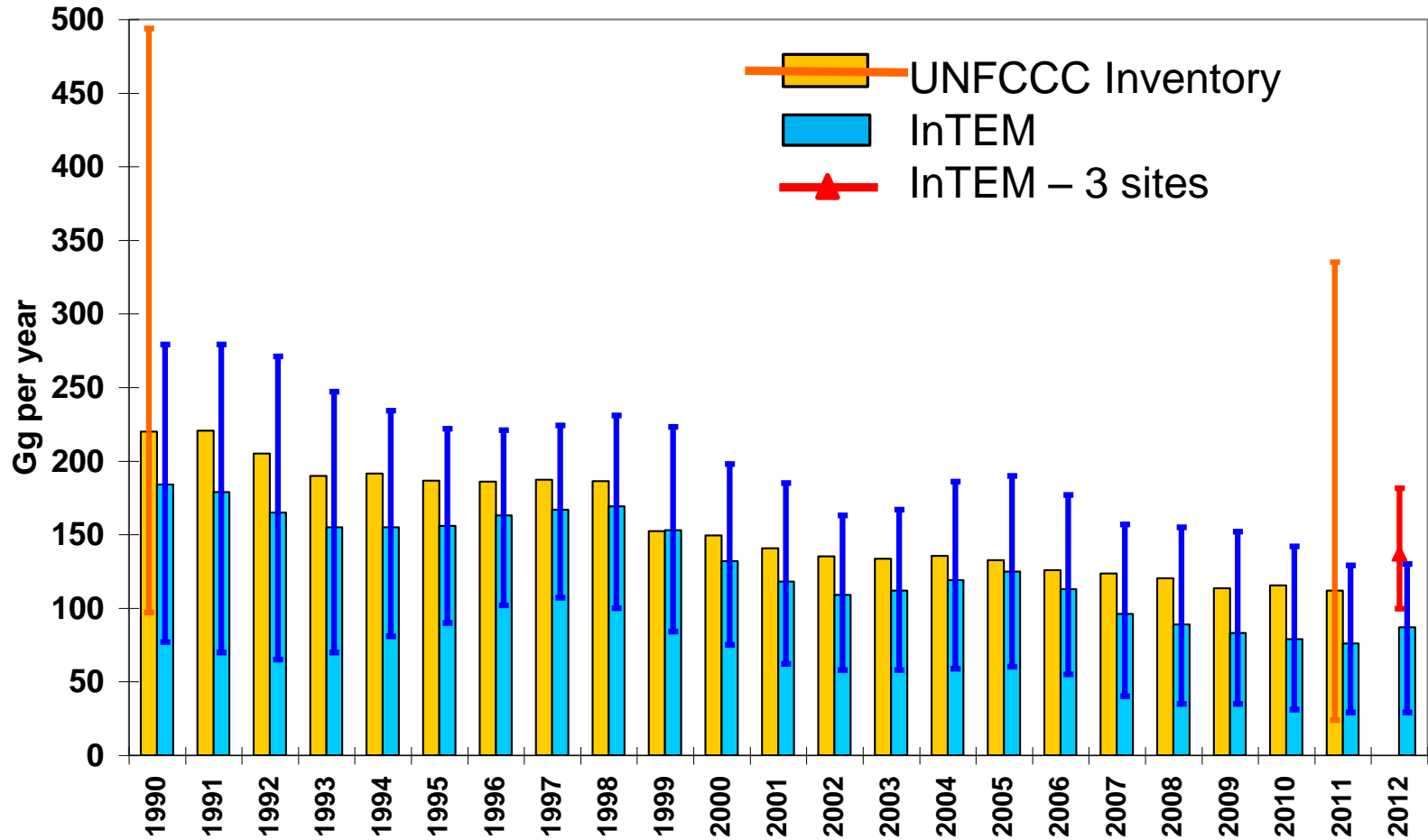
Maximum value = $1.07 \times 10^{-6} \text{ g/m}^2/\text{s}$



Step 3: Compare UK Emission Estimates to inventory - CH₄



Step 3: Compare UK Emission Estimates to inventory – N₂O



Summary

- A tall tower network of greenhouse gas measurements across the UK has been established - spring/summer 2012
- Measurements enable constraint of regional level emissions of greenhouse gases across the UK using inversion methodology InTEM
www.metoffice.gov.uk/atmospheric-trends/

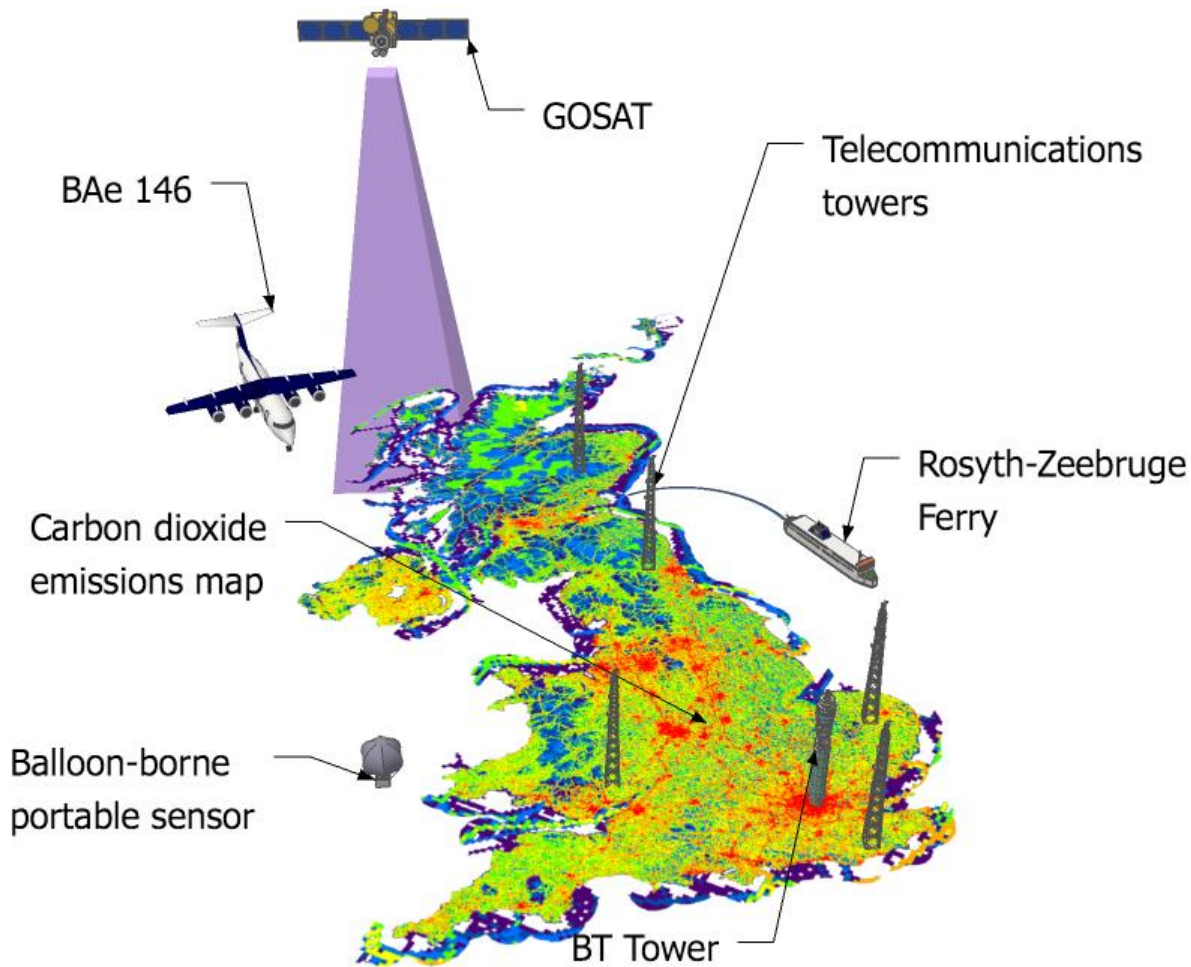
Future Developments

- Angus is being reequipped with same instrumentation as other UK DECC Network sites
- New GAUGE project: Setting up two extra tall tower GHG sites in the UK & Post-doctoral position in Bristol

Acknowledgments:


AJ Manning; S O'Doherty; TDS Young; PG Simmonds; R Derwent; J. Moncrieff, WT Sturges; D Oram.

🔥 Greenhouse gAs UK and Global Emissions Project



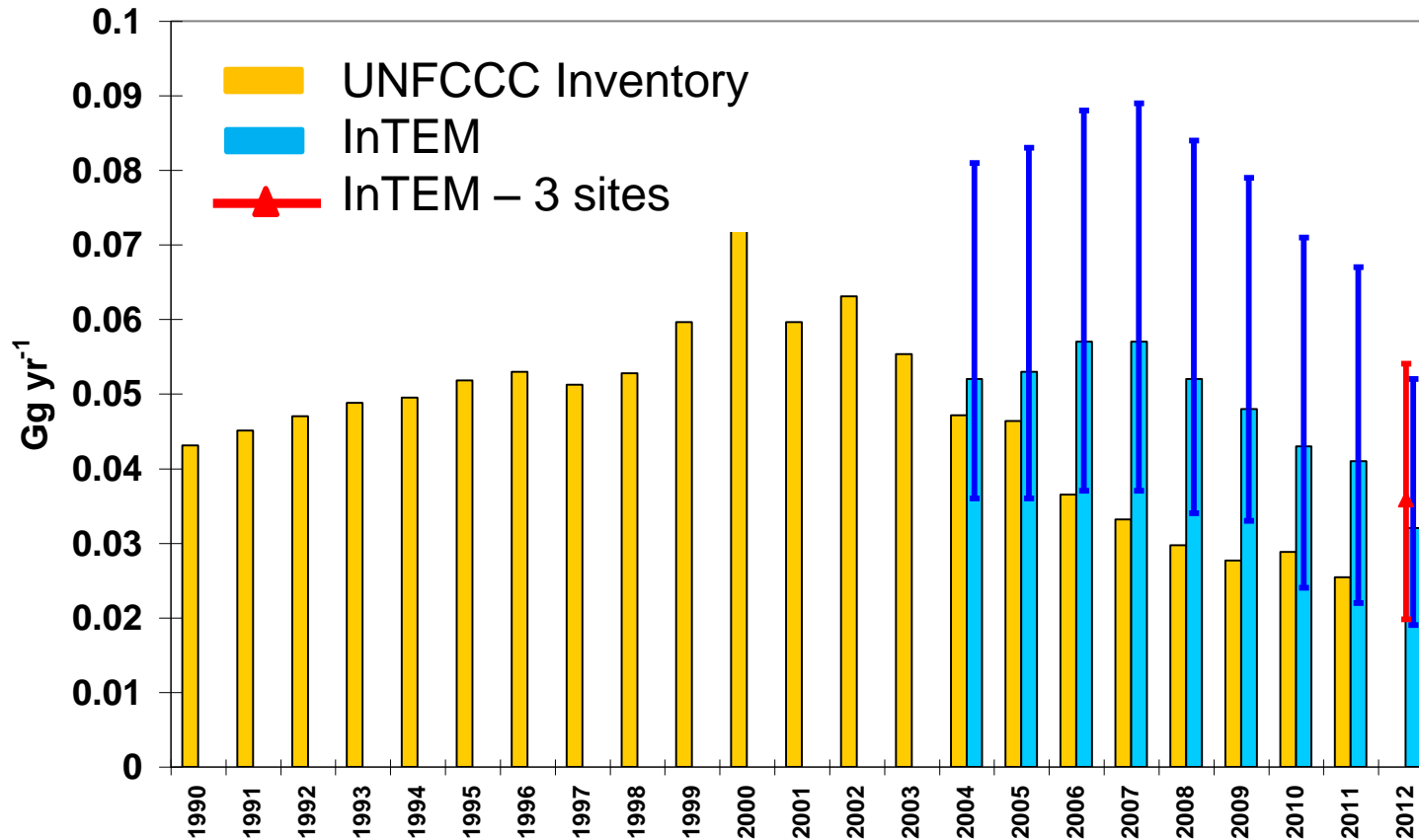
aoife.grant@bristol.ac.uk

CO₂
CH₄
N₂O
HFC'S
SE₆



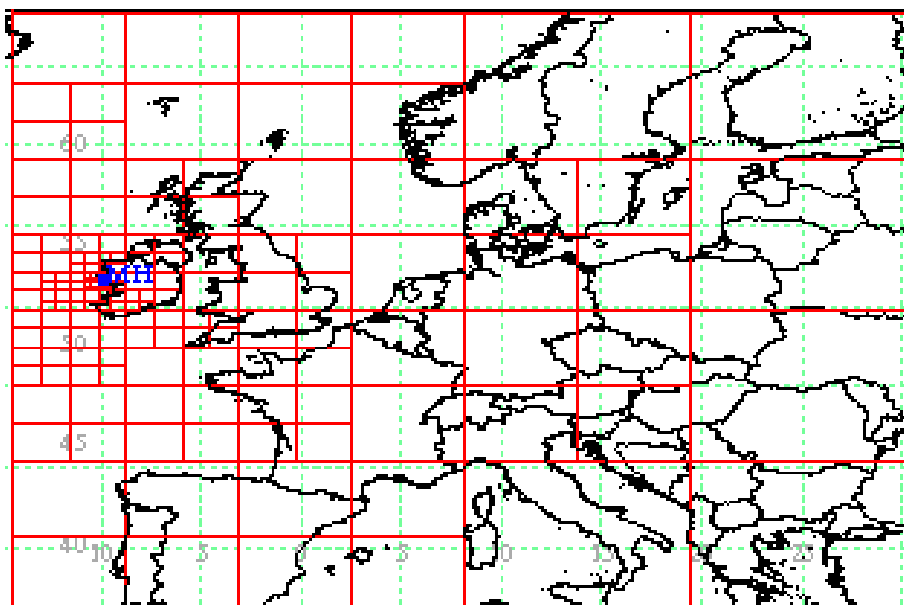
Any Questions?

🌿 UK Emission Estimates: SF₆

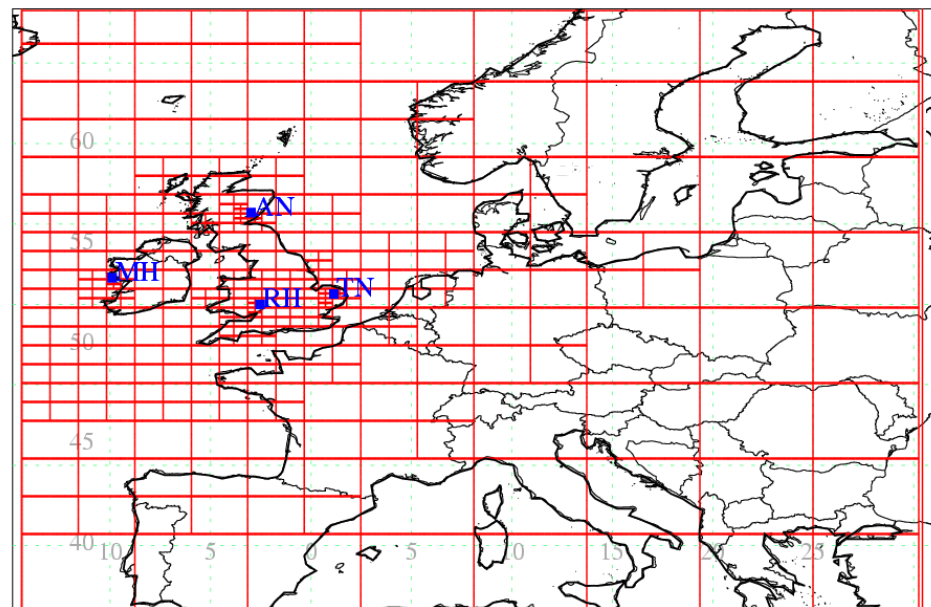


Improved resolution

- Mace Head + 3 new sites – Emission grid squares reduced in size >> enable distinction between DA emissions



1 site



4 sites

Calibration

CO₂ & CH₄	N₂O & SF₆
4 calibrated tanks – conc. range 1 target	std-air-air-air-std..
Tanks filled & calibrated at MPI- Jena under ICOS	std = air calibrated at Mace Head under AGAGE network
CO ₂ – NOAA x2007 scale	N ₂ O – SIO-98 scale
CH ₄ – NOAA 2004 scale	SF ₆ – SIO-95 scale

Ridge Hill μ ECD



- Constructed July-Sept 2011



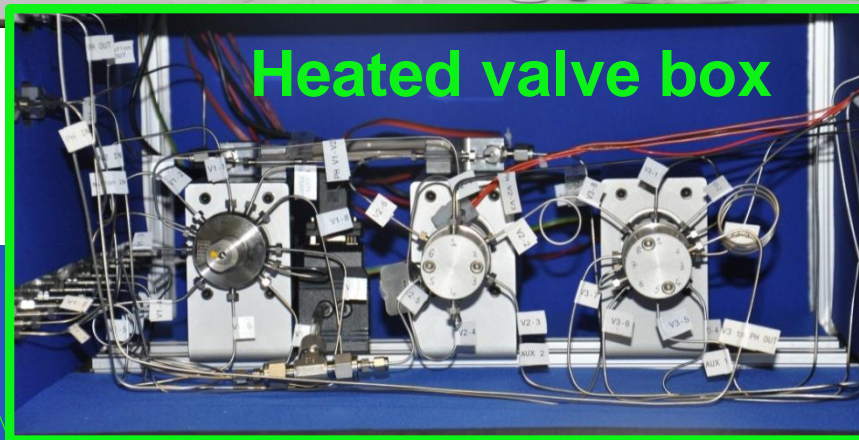
Flow meters

Inlet Bulkheads



Electronics & Red-y inside

GC-7890



Heated valve box

🔥 Sampling Line Set-up

