DECC Atmospheric Observations Network

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History and background

- Mace Head, Republic of Ireland, has been running since 1978
- DECC (and formally Defra/ DoE) funded since 1980’s
- Expert team: Simon O’Doherty (University of Bristol), Peter Simmonds (independent), Richard Derwent (independent), Alistair Manning (Met Office)
- Support teams (including on-site)
- Uniquely placed location
• Part of the Advanced Global Atmospheric Gases Experiment (AGAGE) network
• Also engaged in European networks, e.g. NitroEurope
Remit of project

- Real-time high frequency, high precision, in-situ atmospheric measurements
- Gases:
  - Carbon dioxide (CO2)
  - Methane (CH4)
  - Nitrous oxides (N2O)
  - F-gases (HFC’s, PFC’s, SF6)
  - Ozone-depleting substances (e.g. HCFC’s, halons)
  - Others (e.g. ethane, benzene)
Observations

1. Carbon Dioxide (CO₂): 1.9 ppm/yr

2. Methane (CH₄): 4 ppb/yr

3. Nitrous Oxide (N₂O): 0.7 ppb/yr
Identifying baseline/ polluted air

Baseline

Polluted

Complicated
Inversion modelling
Identifying deviations from the baseline

Methane (CH4) (GCMD) (ppb) Obs at Mace Head

Baseline  Exc. Baseline  Europe  Local  Southern  Mixed Origin
Estimating emissions

Example: Spatial resolution based on observations at Mace Head (MH) only

Grids = 25 km, 50 km, 100 km, 200 km, 400 km, 800 km
Why is this work important to DECC?

- Calculate the Northern Hemisphere baseline concentrations of gases and regional emissions estimates
  - Top-down check for GHG Inventory verification
  - Gain understanding of global concentrations and how they are changing
  - Inform GHG inventory improvement, e.g. methane (Landfill waste emissions, Coal mines, Agriculture)
- Progress to targets/ policy implications
- International negotiations – Track trends and identify emerging gases
- Important to take account of uncertainties – in the inventory and in the observations
Inventory verification: Nitrous Oxide

Jan 1990-Dec 1990  Map T= 936.7 Kt/y

Jan 2010-Dec 2010  Map T= 572.7 Kt/y

UK Nitrous oxide (N2O) kt/y

Inversion
Inventory
EDGAR

NWEU Nitrous oxide (N2O) kt/y

Inversion
Inventory
EDGAR
Inventory verification: Methane

1990

Jan1990-Dec1990  MapT= 17.7 Mt/y

Maximum value = 2254. ng/m³/s

2010

Jan2010-Dec2010  MapT= 13.0 Mt/y

Maximum value = 991. ng/m³/s
Impact of policy
Reducing emissions

• Emissions of CFC-12 in both the UK and NWEU fell very significantly between 1990 and the late 1990s (Impact of Montreal Protocol)
Impact of policy
Replacement gases

- Emissions of HFC-125 significantly higher recently than in the 1990s

1999-2001 $\text{Map T} = 1238.5$ t/y

2008-2010 $\text{Map T} = 4.5$ Kt/y
Future development

- Network expansion to 3 news sites - improve spatial and temporal resolution
### Expanded monitoring network - gases

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<tr>
<th>Angus</th>
<th>Tacolneston</th>
<th>Ridge Hill</th>
<th>Air Analysis</th>
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<td><strong>CO₂</strong>&lt;br&gt;CH₄</td>
<td><strong>CO₂</strong>&lt;br&gt;CH₄</td>
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<td><strong>N₂O</strong>&lt;br&gt;SF₆</td>
<td><strong>N₂O</strong>&lt;br&gt;SF₆</td>
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<td><strong>H₂</strong>&lt;br&gt;CO</td>
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Interaction with the NERC Programme

- Data validation by AGAGE and CDIAC
- Open to discuss data sharing agreements
- DECC interests:
  - Better informing the magnitude and distribution of emissions
  - Sectoral specific sources (e.g. methane)
  - Identifying success of policy measures
  - Importance/prioritisation of GHG’s (to inform mitigating measures)
Thank you!

Questions?