Understanding and quantifying greenhouse gases (GHG) emissions: The UK GHG Emissions and Feedback Programme

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Overview

We give an overview over the structure, objectives, and methods of the UK-based Greenhouse Gases Emissions and Feedback Programme. The overarching objective of this research programme is to deliver improved GHG inventories and predictions for the UK, and for the globe at a regional scale.

To address this objective, the Programme has developed a comprehensive, multi-year and interlinked measurement and data analysis programme, focussing on the major GHGs carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).

The Programme integrates three UK research consortia with complementary objectives, focussing on observation and modelling in the atmosphere, the oceans, and the terrestrial biosphere.

Atmosphere GAUGE

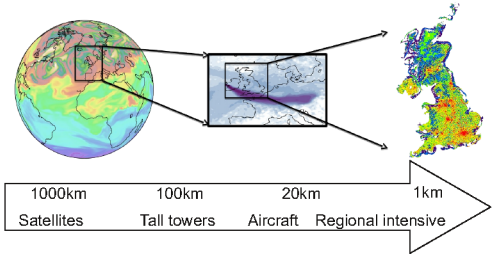
Greenhouse gAs UK and Global Emissions

GAUGE will produce robust estimates of the UK GHG budget, using new and existing atmospheric measurement networks and modelling activities at a range of scales. It integrates inter-calibrated information from ground-based, airborne, ferry-borne, balloon-borne, and space-borne sensors, including new sensor technology.

DECC and GAUGE tall towers
CO_2, CH_4, N_2O
and additional tracers

Producing robust emissions estimates

GAUGE uses different models to address different scales.

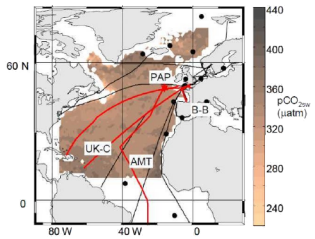


Ocean RAGNARoCC

Radiatively Active Gases from the North Atlantic Region and Climate Change

RAGNARoCC is an oceanographic project to investigate the air-sea fluxes of GHGs in the North Atlantic region. Through dedicated research cruises as well as data collection from ships of opportunity, it develops a comprehensive budget of natural and anthropogenic components of the carbon cycle in the North Atlantic and a better understanding of why the air-sea fluxes of CO_2 vary regionally, seasonally and multi-annually.

Surface observations



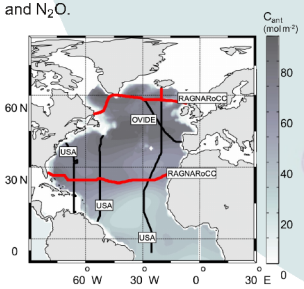
Porcupine Abyssal Plain Sustained Observatory (PAP-SO)

Buoy since 2003
30m depth: T, S, O_2 NO_3, PO_4, pH, CO_2 light, Chl_a

Ships of opportunity

Interior observations

Repeat sections boxing in the North Atlantic C_{ant} maxima with observations of physical oceanography, inorganic carbon parameters, transient tracers, and CH_4 and N_2O.



Understanding via models

Models will be used to adress questions like:

- What physical and biogeochemical processes drive surface flux variability?
- How much uncertainty stems from limited observations?
- What ist the "optimal" sampling network?

Integration

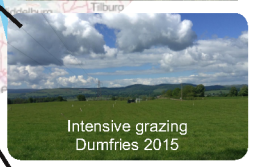
Integration activities link these three projects to foster knowledge exchange across different scales, methods and sub-disciplines, both within the Programme and with the wider research community.

Terrestrial biosphere GREENHOUSE

Generating Regional Emissions Estimates with a Novel Hierarchy of Observations and Upscaled Simulation Experiments

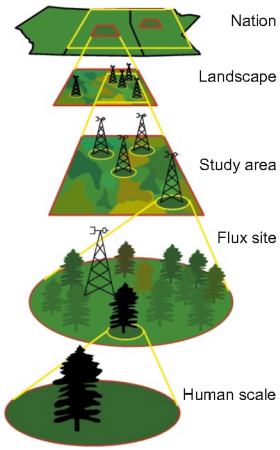
The GREENHOUSE project aims to understand the spatio-temporal patterns of biogenic GHG emissions in the UK's landscape of managed and semi-managed ecosystems. It uses existing UK field data and several targeted new measurement campaigns to build regional GHG inventories and improve the capabilities of land surface models.

Intense field campaigns



Research Basis: The scaling paradigm

GREENHOUSE uses multi-scale observational campaigns.



http://www.greenhouse-gases.org.uk

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