

Introduction

The delivery of climate targets represents one of the biggest challenges for all areas of industry and society. Valid knowledge of GHG emissions will be a crucial element in targeting emission reduction actions, in demonstrating progress towards these targets and determining the effectiveness of emission reduction technologies and interventions.

Emissions metrology at NPL

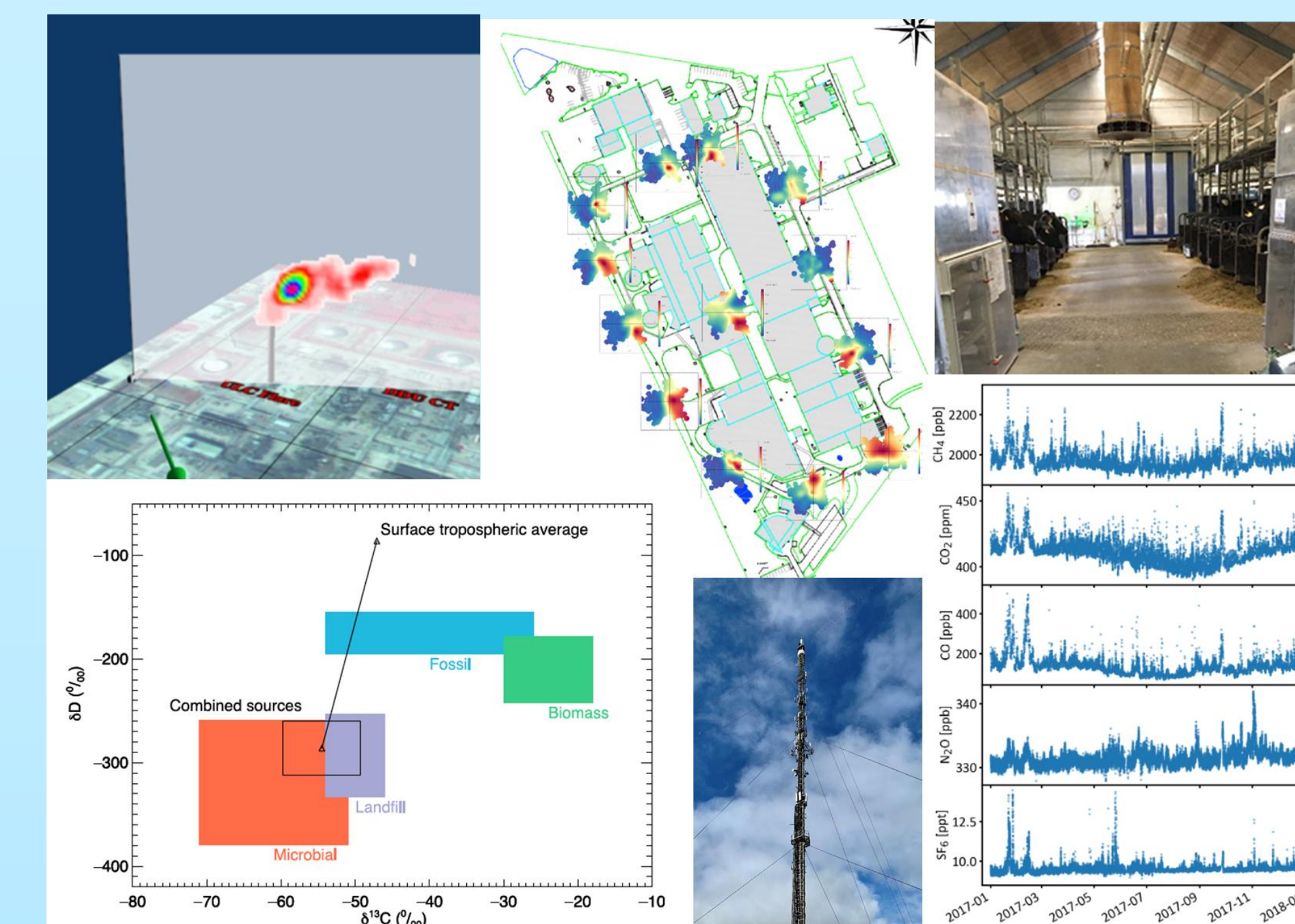
NPL have developed a unique set of capabilities and expertise in GHG emission measurements that are demonstrating impact across multiple sectors and scales. The work includes:

- Development and application of GHG emission measurement methods, including differential absorption lidar (DIAL);
- testing and validation of new emission measurement technologies;
- taking a leading role in international standardisation activities.

Impact Case Studies

A primary focus for this work has been methane, as it is a potent GHG with direct economic value and significant uncertainty in its emission levels. The work has had impact across a wide range of sectors, e.g.:

- **Waste treatment** DIAL measurements from 30+ landfills identified potential under-reporting of methane by a third and led to direct reduction of emissions e.g. measurement targeted maintenance at a single site led to an estimated reduction of 145,000 tonnes CO₂e p.a.
- **Agriculture** NPL validation of the primary measurement method for methane emissions from livestock (respiration chambers) reduced the variability across UK research facilities from 25.7% to 2.1%.
- **Natural Gas Industry** Enabled NG facilities to monitor fugitive leaks and move to reactive maintenance programmes that directly reduce emissions e.g. showing the potential for reducing emissions from compressor stations by over 7,500 tonnes CO₂e p.a.
- **Liquefied Natural Gas** First direct measurements of emissions from LNG liquefaction and regassification plants as part of the Climate and Clean Air Coalition and UN global methane emission studies.
- **Regulators** Large-scale demonstrator projects for three US regulatory authorities led to re-evaluation of the efficiency of flares and a change in the US flare rules, as well as the acceptance of DIAL by the EPA as a regulatory tool.
- **National Inventories** Tall-tower measurements for the UK GHG Inventory Verification programme and development of real-time isotopic measurement capabilities to enable emission source apportionment.



Conclusions

There is an increasing requirement for validated GHG emission measurements which NPL has developed a suite of capabilities to address.

These capabilities provide identification and quantification of GHG emissions from the component through facilities to the national scale, testing and validation of new emission measurement technologies, and standardisation of GHG measurement methods.

Recommendations for next steps

- Further develop the tools to provide measurement-based information on GHG emissions with comparability across the full range of spatial and temporal scales, supported by the underpinning metrology to ensure the traceability and validity of the data.
- This integrated systems approach needs to include the definition of measurement performance requirements and quality and uncertainty assessments to ensure the results are fit for the wide range of user purposes.
- Internationally standardized methods are needed to ensure global comparability of GHG emissions data.

