



**National Centre for
Earth Observation**
NATURAL ENVIRONMENT RESEARCH COUNCIL

NCEO

Earth Observation science for a
changing planet

NCEO is a Natural Environment Research Council (NERC) **research centre** bringing together **over 100 scientists** from across the UK with world-class expertise in the use of **Earth observation data** to address major environmental challenges.



“ We are passionate
about the importance of
our research to society;
EO science is increasingly
valuable for a range of
applications.”

Professor John Remedios,
Director of NCEO

What we do

- World-leading expertise in transforming data from satellites into high-quality geophysical information about components of the Earth system, including fires, surface temperatures, biomass, ocean colour, and atmospheric gases and particulates.
- Internationally-recognised research that includes global and regional carbon cycles, energy and water exchanges, land-atmosphere exchanges in different ecosystems, and climate change.
- Expertise in model evaluation, data-assimilation and developing model-data systems to improve predictions.
- Dedicated infrastructure for processing data; remote-sensing instruments on the ground and on aircraft.
- Training and support in the use of our instruments, data facilities and tools.

The NCEO Ecosystem

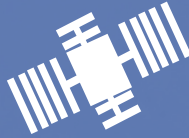
NERC and UKRI –

NCEO's core science is commissioned by NERC, a council within UKRI. NCEO's national capability plays a key role in environmental science in the UK.



UK Space Agency –

NCEO works with the UK Space Agency to ensure the NERC community has access to satellite data and to champion new satellite missions.



Public sector agencies and government –

By participating in advisory boards, joint initiatives and projects using EO, NCEO ensures the latest research supports the public sector.



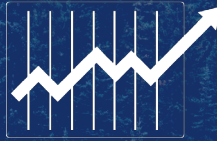
Meteorological agencies –

NCEO collaborates with the Met Office, ECMWF and other NERC Centres to evaluate Earth system and climate models and improve weather forecasts.



Business and innovation –

NCEO supports businesses working with space data and developing new satellite sensors, helping them to accelerate growth.



Major international groupings –

Working with Defra and UK Space Agency, NCEO coordinates UK involvement in the Committee on Earth Observation Satellites and the Group on Earth Observations, and contributes to key science reports and assessments.



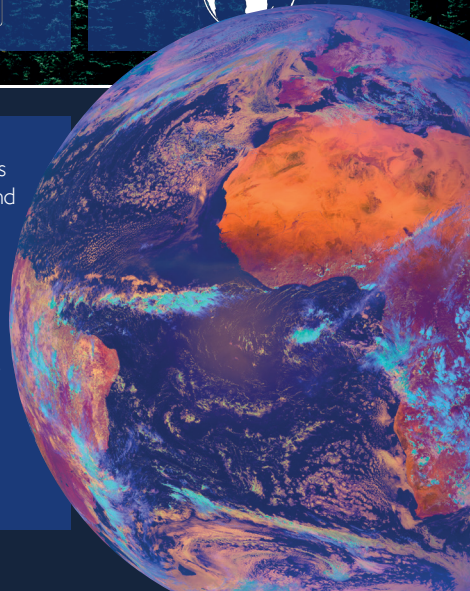
EO space missions and datasets –

NCEO plays important roles in national and European satellite missions and leads the scientific exploitation of data through, for example, the Copernicus services and ESA's Climate Change Initiative.



The international community –

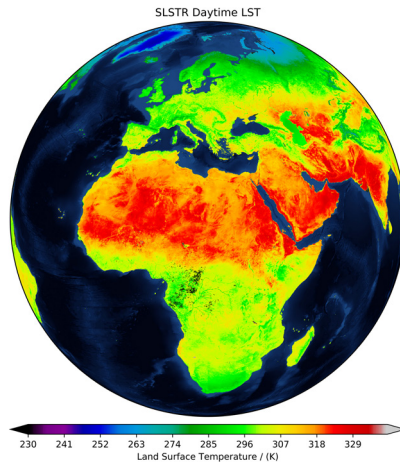
NCEO is involved in international and bilateral science projects, including ODA compliant activities via the Newton fund, UKSA International Partnership Programme, and the Global Challenges Research Fund.



Some of Our Work

Improving Land Surface Temperature Data for Climate Science

NCEO researchers are leading a major new project to accurately measure the temperature of the Earth's land surfaces. They are working with 13 international partners as part of the European Space Agency's Climate Change Initiative - using satellite-based products to monitor climate change.

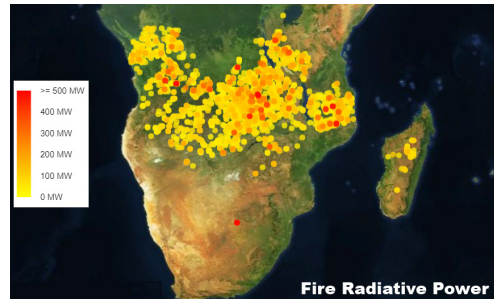


Using Machine Learning to Understand Tropical Forest Regrowth

Secondary tropical forests can establish themselves on land abandoned after mature forest has been destroyed. These regenerating forests play an important role in restoring carbon and biodiversity but we don't know much about their extent and growth. NCEO researchers have used machine learning to mine optical satellite data to map these forests by age, and improve understanding of their variability.

Monitoring Fires from Space

NCEO staff are part of the EUMETSAT Land Surface Analysis Satellite Application project team and have responsibility for the real-time data on fire radiative power that it supplies. The success of this work has led to the team specifying the scientific characteristics for fire measurement on the forthcoming Meteosat Third Generation series of satellites. The improved temporal, spatial, and spectral resolution, together with the increased dynamic range, will allow better fire detection and more precise measurements of fire emissions.



Monitoring Oxygen Deficiency in Europe's Crucial Shelf Sea Fishing Areas

NCEO research has confirmed that large areas of the shallow shelf seas around Europe are vulnerable to oxygen deficiency, and that there is more variability.

Shelf-sea ecosystems provide about 90% of global fish catches. Worryingly, rising water

temperatures and eutrophication in these areas can reduce the amount of dissolved oxygen and trigger sudden and massive death of marine species.

NCEO carried out the first decade-long reanalysis of the biogeochemistry, quantifying levels for ten key indicators in the northwest European shelf including chlorophyll, dissolved oxygen and nutrients, and confidence levels for the indicators. These help

policy-makers quantify the margins of error for avoiding unsafe levels of pollutants in coastal waters.



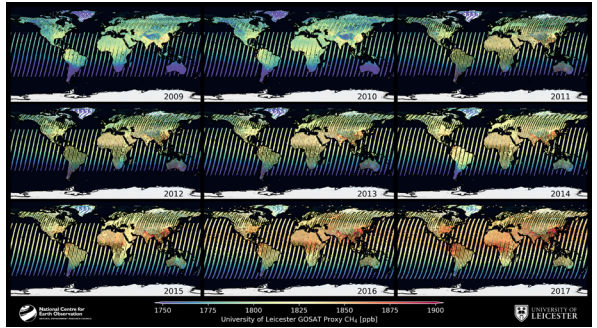
Atlantic mackerel feeding in shallow coastal waters. Image credit: Jacek Lesniowski

Solving the Methane Mystery

Methane (CH_4) is an important greenhouse gas, emitted from natural and man-made sources, including wetlands, rice cultivation, fossil fuel production, livestock and biomass burning.

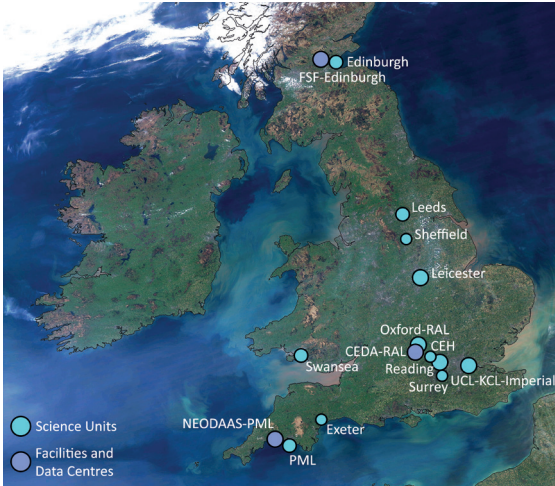
Global atmospheric CH_4 levels are now more than double the pre-industrial levels. The growth rate had been declining over the last three decades, dropping to almost zero in the early 2000s. This suggested a change in the balance between the various sources and sinks. A sudden and unexpected renewed growth from 2007 highlighted significant gaps in our knowledge.

NCEO analysis of data from the Japanese GOSAT satellite is revealing detailed regional patterns in CH_4 emissions. For example, the high CH_4 values over Asia in autumn are indicative of emissions from rice growing and wetlands. Investigations will continue with the recently launched European Sentinel 5P satellite, which provides data at much improved spatial resolution.



Our Vision

To be a globally outstanding UK scientific institution dedicated to leading EO research and its applications, encouraging, collaborating with, and building the EO community to serve science and society.



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