

The MicroCarb satellite

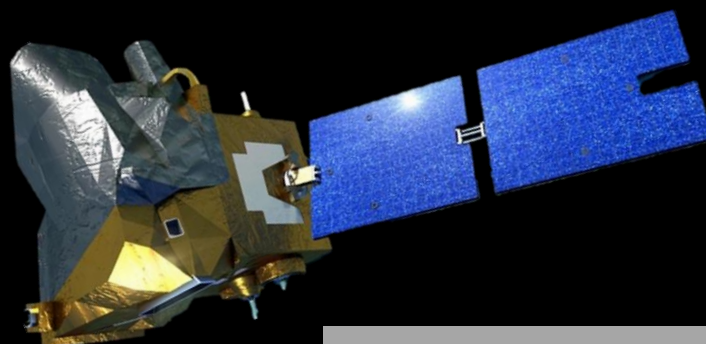


Image credit: CNES

A joint venture by the UK and French space agencies, the MicroCarb satellite will be the first European satellite dedicated to measuring atmospheric Carbon Dioxide (CO₂), determining emissions of carbon across the globe with extreme precision.

Opportunities the MicroCarb mission will offer

Following on from other CO₂ monitoring missions, MicroCarb will become part of the international greenhouse gas virtual constellation of satellites, collecting data to enable higher resolution estimates of CO₂ emissions than ever before. This will fundamentally improve understanding of the carbon cycle, and facilitate a measurement verification system to monitor carbon emissions from human activities and natural processes.

MicroCarb will monitor international progress towards meeting the Paris Agreement to limit global surface warming, and will allow us to determine how much carbon is being absorbed and emitted by natural processes and how much is emitted by human activities - data essential for the global stocktake.

The city-scan observing mode will map out atmospheric CO₂ over cities the size of London and Paris (or larger), providing key new information to help cities implement strategies that support sustainable urban development.

Mission Partners

- [Centre National D'Etudes Spatiales \(CNES\)](#)
- [UK Space Agency](#)

UK Expertise

The UK Space Agency invested £13.9million in the mission, securing the following UK expertise.

- [The National Physical Laboratory \(NPL\)](#) has provided the SI-traceable ground calibration facility, to test its performance pre-launch. Paul Green of [NPL](#) is developing algorithms and quality metrics with the MicroCarb team.
- [Thales Alenia Space](#) is completing the assembly, integration and testing at STFC RAL Space in Harwell, Oxfordshire.
- [STFC RAL Space](#) has designed the pointing and calibration system, enabling MicroCarb to take measurements at specific locations.
- [GMV UK](#) are designing, implementing and quality assuring algorithms and operational processors for several CO₂ data products.
- [Prof Paul Palmer](#) of the [National Centre for Earth Observation \(NCEO\)](#) and the [University of Edinburgh](#) will translate MicroCarb's CO₂ observations into maps that show carbon absorption and emissions.
- [Dr Rob Parker](#) is part of the NCEO team delivering the mission's Solar Induced Fluorescence retrieval algorithm, based on expertise from the [University of Leicester](#).

"Achieving Net Zero is one of the most pressing challenges we currently face, and a vital part in reaching our collective goal is to develop systems that can accurately and reliably monitor carbon emissions" – Dr Sarah Beardsley, Director of STFC RAL Space, UK

Mission Timeline

Dec 2022

MicroCarb arrives at Harwell, UK for Thales Alenia Space will complete assembly integration and testing.

2023

MicroCarb will return to France and be stored until launch date.

May 2024

Expected launch of MicroCarb on the [Vega C](#) rocket in [French Guinea](#).

Launch +6 months

Data from MicroCarb will be available 6 months after launch, at the earliest.

Instrumentation

- MicroCarb will be launched into a 650km altitude orbit, with a repeat cycle of 21 days. Local standard time of observations will be at 10:30am.
- MicroCarb will carry one instrument: an infrared spectrometer, which will measure oxygen and carbon dioxide concentrations at four different spectral bands (0.76µm and 1.27µm and 1.6µm and 2µm respectively) in sunlight reflected off the Earth.
- The MicroCarb instrument offers an extremely high degree of precision of carbon dioxide concentrations, in the order of one part per million, with a pixel size of 4.5x9km.
- A special city-scanning observing mode will allow the creation of CO₂ emissions maps across cities, with a resolution of 2x2km².
- MicroCarb will also retrieve Solar Induced Fluorescence (SIF), which is a proxy for photosynthetic activity and can provide key information on the carbon cycle, complementing that from CO₂ observations.



Further Information

- Arianespace, Jan 2022: [Arianespace to launch MicroCarb on Vega C](#).
- CNES, accessed Apr 2023: [MicroCarb](#).
- ESA, Apr 2023: [eoPortal: MicroCarb](#).
- NPL, Nov 2021: [The next phase in the UK/France partnership in ...](#)
- UK Space Agency and The Rt Hon Jo Johnson, Nov 2017: [Thales...](#)
- UK Space Agency, May 2021: [Case Study: MicroCarb](#).
- UK Space Agency, Dec 2022: [Climate change instrument arrives ...](#)

"Data from MicroCarb will play a crucial role in extending our current ability to verify reductions in global and national emissions of CO₂ in response to the demands of the Paris Agreement" – Prof Paul Palmer, Lead UK MicroCarb Scientist and NCEO Science Director

Watch the
MicroCarb
video



Download this
explainer

