# MERLIN

The Franco-German satellite mission

## Brief description

From 2024, the Franco-German climate mission MERLIN (MEthane Remote sensing LIdar missioN) will use Lidar technology to detct the greenhouse gas Methane. Germany contributes the payload, managed by DLR Space Administration. France contributes the platform, managed by CNES. Two Co-Principal Investigators from Germany (DLR-IPA) and France (LSCE) lead the scientific activities.

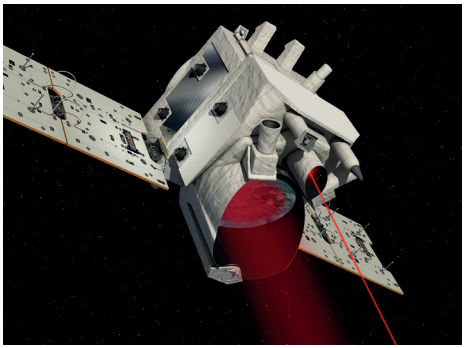

Image: David Ducros, CNES

## Aims

Methane is one of the most effective greenhouse gases and is partially responsible for climate change. This three-year mission is aimed at producing a global map of atmospheric methane concentrations. Among other things, it will provide information on the main regional sources of methane and the areas in which the greenhouse gas is removed from the atmosphere (sinks).

## Parties involved

DLR, CNES, European space industry led by Airbus in Ottobrunn and Toulouse

## Applications

- Earth observation satellite for research into the causes of climate change
- Innovative measurement methods and thus better quality data for documenting and creating a catalogue of global methane concentrations and the natural and anthropogenic emissions on Earth's surface

## Outlook

- Development of systems expertise and know-how relating to global methane observation
- Contribution towards the implementation of the Paris Climate Agreement targets
- Demonstration of new, highly accurate satellite-based measurement methods to determine methane concentrations

## Facts and figures

**Launch:** scheduled for 2024 with Vega-C or Ariane 62 from the European Spaceport in French Guyana
**Satellite platform:** Myriade Evolutions
**Satellite dimensions:** approx. 1.60 x 4.50 x 1.60 m with extended solar panels
**Satellite mass:** approx. 430 kg
**Instrument mass/power requirement:** approx. 150 kg / 150 W

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The Franco-German climate mission **MERLIN** (MErlin Remote sensing LIdar missioN) is expected to measure **methane levels in the Earth's atmosphere** from 2024 with unprecedented accuracy. Missions such as MERLIN help to gain a deeper insight into the mechanisms that influence Earth's climate. Data from the mission are processed and evaluated jointly and in close collaboration with various research laboratories. MERLIN is set to orbit the Earth at an altitude of approximately 500 kilometres and will operate for at least three years.

Methane is a particularly potent greenhouse gas. The climate impact of methane is 28 times greater on a 100-year time scale than that of carbon dioxide. Although the concentration of methane is significantly lower than that of carbon dioxide, it is responsible for approximately 20 percent of global warming.

MERLIN will be installed on the new '**Myriade Evolutions' satellite bus**, developed by CNES together with the French space industry. The satellite's **payload**, an active **Lidar** (Light Detection and Ranging) instrument that can measure even at night-time and through thin clouds. This instrument is being developed and built in Germany by Airbus Ottobrunn on behalf of the DLR Space Administration with funds from the German Federal Ministry for Economic Affairs and Energy (BMWi). The methane Lidar includes a laser that can emit light in two different wavelengths, enabling it to conduct highly precise measurements of methane concentrations at all latitudes, regardless of sunlight. The wavelengths are in the near-infrared spectral range (1.6 micrometres) and have been chosen because one is absorbed by methane, while the other is not. MERLIN sends two pulses towards the same location on the ground in quick succession. The small satellite captures and registers the reflected pulses with a telescope. The presence of methane in the atmosphere weakens one of the pulses, but not the other. This difference allows scientists to determine the amount of methane between the satellite and the Earth's surface. The science activities involve an international team led by two Co-Principal Investigators from the German DLR Institute of Atmospheric Physics (DLR-IPA) and the French Laboratory of Climate and Environmental Sciences (LSCE).

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