German Aerospace Center

News Archive

World map of methane concentrations

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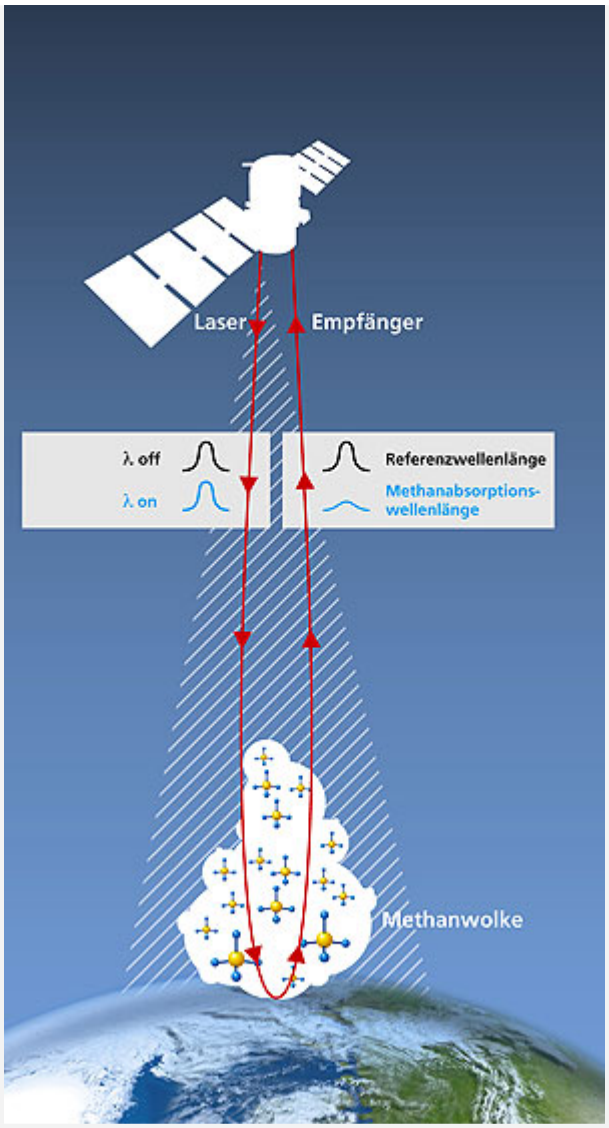
Franco-German climate satellite scheduled for launch in 2014

Methane in the atmosphere contributes significantly to global warming

What works on a small scale also works on a large scale. For the last several years, a helicopter-mounted measuring instrument developed by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) has been hard at work detecting methane leaks from natural gas pipelines. From 2014, a similar instrument will be used on a German/French satellite orbiting Earth at an altitude of 650 kilometres. The climate mission Merlin (Methane Remote Sensing Lidar Mission) will track down the greenhouse gas methane around the globe.

This Franco-German collaborative venture has one principal objective – to obtain more and higher-precision data on methane emissions. Methane and carbon dioxide both cause global warming, although the impact of methane is 25 times more powerful than of carbon dioxide. Now, at a time when there is much discussion about mankind being directly responsible for the rise in the emission of greenhouse gases, methane emission levels already far outstrip carbon dioxide. Since pre-industrial times, the amount of methane in the atmosphere has more than doubled, whereas the growth in carbon dioxide levels during the same period has been 'only' thirty percent. Alongside carbon dioxide, methane is one of those gases for which the Kyoto Protocol stipulates that cuts must be achieved.

Tried and tested measuring principle



The instrument sends and receives laser light

Methane LIDAR (Light Detection and Ranging, sometimes referred to as 'light radar') works from space in exactly the same way as its helicopter-mounted counterpart. The instrument, developed jointly by DLR, ADLARES GmbH and E.ON Ruhrgas AG, transmits pulses of light towards Earth, and then receives the radiation that is reflected back from Earth's surface, again in pulse form. Whenever one of these pulses encounters methane, its signal strength is reduced and the instrument detects this reduction. This is how the LIDAR on a helicopter is able to detect methane leaks from natural gas pipelines. Now, instead of testing a mere eight kilometres of pipeline per day, the CHARM system (CH4 Airborne Remote Monitoring) is able to inspect 50 kilometres an hour. "The measurement principle has already been tried and tested," emphasises Peter Schaadt of the DLR Space Agency.

Instead of inspecting natural gas pipelines, the space-borne instrument will seek out both natural methane sources and those due to human activities at a speed of 25,000 kilometres an hour. It will send its laser beam to and from Earth 50 times a second. "With the measured values, we can produce a world map showing atmospheric methane concentrations and also highlighting regional differences," says Gerhard Ehret from the DLR Institute of Atmospheric Physics.

Conclusions drawn about methane sources

About 70 percent of global methane emissions are caused by humanity – for example, from rice paddies, animal husbandry, biomass decomposition, landfill sites or energy generation. Natural sources include swamps and marshlands as well as thawing permafrost. However, data collected so far have not provided much information regarding the contribution of each source to overall emission levels. The data that the German/French climate satellite will gather from orbit will enable scientists in both countries to draw conclusions about the various different sources of methane emissions. What is the impact of rising levels of energy production? What are the implications when tracts of permafrost release methane as they start to thaw? Above all, what are the implications for our climate?

"The data obtained are so precise that you could even, for example, use the satellite to monitor compliance with conventions such as the Kyoto Protocol," says Dr Ehret. For three years, the satellite equipped with this methane LIDAR system will scan the atmosphere for methane content, day and night, and even in the presence of light cloud cover. The costs of this mission are expected to amount to Euro 120 million, to be shared between the two project partners, Germany and France.

Merlin is a joint mission by DLR and the French space agency CNES. DLR is developing and building the methane LIDAR instrument. France is providing the satellite platform and mission control.

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