AN INDUSTRIAL CHAIR FOR THE MONITORING OF GREENHOUSE GAS EMISSIONS

The Trace industrial chair is a new four-year research programme which was officially launched on Tuesday 16 January 2018. This programme, selected by the French National Research Agency (ANR), aims to develop better monitoring methodologies of greenhouse gas emissions (carbon dioxide and methane) by satellite and with the help of new sensors deployed close to methane-emitting sites.

Coordinated by Philippe Ciais at the French Laboratory for Sciences of Climate and Environment (LSCE, CEA / CNRS / UVSQ) and co-financed by Suez, Thales Alenia Space and Total, this chair - with a budget of 1.5M Euros - is managed by the University of Versailles Saint-Quentin-en-Yvelines. The French Dynamic Meteorology Laboratory (LMD, CNRS / ENS / École Polytechnique/Sorbonne University) which, like the LSCE, is part of the Institute Pierre-Simon Laplace, is also involved in this programme.

Objectives

The historic Paris climate agreement defines an international objective to limit global warming to well below 2°C. In order to reach this objective, greenhouse gas emissions must be reduced by half every 10 years. To achieve these reductions, there is first of all a need to know current emissions, reliably and with independent data, both for carbon dioxide (CO2) and methane (CH4), whose 'fugitive' emissions are currently difficult to estimate. This is the purpose of this chair.

With regard to carbon dioxide - for which the increase in the atmosphere is the main cause of climate change - emission inventories rely on statistical data on energy consumption, and in particular on the quantities of coal, oil and gas used each year on a national level. These inventories are very uncertain in some countries and are not currently verified with independent data. Satellite measurements, as well as ground-based measurement networks, will enable an increase in the reliability of the estimations and will provide their support to the voluntarist inventory of the states.
As far as methane - a powerful greenhouse gas of which the concentration in the atmosphere has tripled since the beginning of the industrial era - is concerned, emissions are particularly difficult to estimate since they result from leaks during the extraction and distribution of hydrocarbons and coal, and from complex processes linked to the decomposition of organic matter by microbes in the absence of oxygen.
The development of the scientific proposals will be followed with interest by the industry:

Suez for more accurate CO2 and CH4 measurements at its waste water and waste treatment sites as well as in the areas and local communities supported by the company.
Total for measurements on its fossil energy mining or storage sites.
Thales Alenia Space for the definition of the future greenhouse gas monitoring space missions to supplement ground-based measurement networks.
The existing satellites dedicated to the monitoring of greenhouse gases and the instruments used today on the ground do not properly meet the need for a concentrated and accurate sampling of the atmosphere close to the emissions. In close collaboration

with the industry partners, the Trace chair researchers will assess a new generation of measurement instruments with the help of simulations and field tests. They also intend to develop and test measurement operating protocols on the basis of very fine-scale atmospheric transport models and advanced data processing in order to enable the implementation of operational platforms for monitoring emissions.

Trace will lean on the modelling of the dispersion and transport of CO2 and CH4 in the atmosphere, whether on the scale of continents or an industrial site, on models of the transfer of near-infrared solar light in the atmosphere and its absorption by greenhouse gases. The research will also focus on the development of new, compact and relatively low-cost sensors for the monitoring of local emissions of methane and carbon dioxide.

The so-called 'inversion' statistical techniques will be used to find which emission maps or localised sources can explain increases in the measured concentrations.

It will also consist in having a concentrated space cover and very high temporal cover of the atmospheric concentrations, in order to enable the localisation and precise quantification of the sources. This responds to the commitments of the signatory states of the Paris agreement and makes it possible to identify the actions to be implemented as a priority in order to reduce emissions.

Training and handover

Throughout its training programme, the Trace chair will be able to transfer its expertise to the industry partners in order to facilitate their ownership of the innovative tools it will develop. It will also train students who could continue the development of such systems in the research environment or use them in an operational way within partner companies or other emission-monitoring stakeholders.

The LSCE and LMD teams of researchers associated with the Trace chair have world-renowned expertise in the field of the atmospheric monitoring of concentrations and flows of greenhouse gases. This partnership should reinforce the impact of their research and the action of the partner companies in the fight against climate change and emissions reduction. It will be combined with several international initiatives, including the World Meteorological Organisation's IG3IS programme.

Photos of the launch of the Trace Chair:

ADDITIONAL INFORMATION

More information on the LSCE website: http://trace.lsce.ipsl.fr