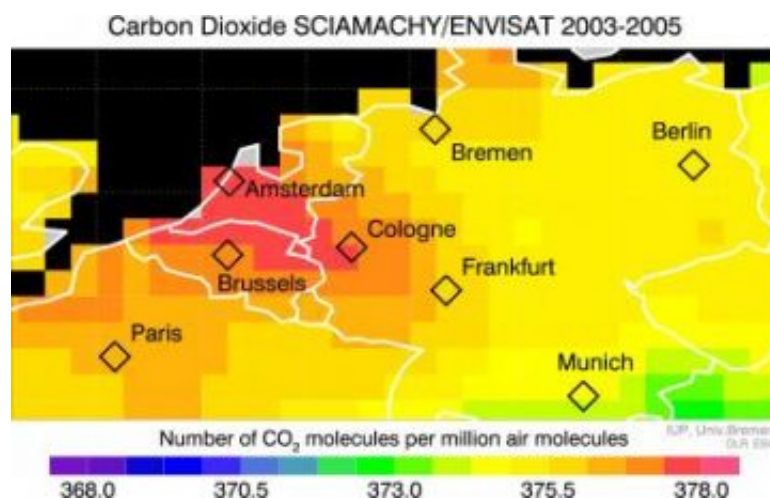


Envisat makes first ever observation of regionally elevated CO₂ from manmade emissions

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Using data acquired from 2003-2005 by the SCIAMACHY instrument aboard ESA's Envisat environmental satellite, scientists have for the first time detected regionally elevated atmospheric carbon dioxide -- the most important greenhouse gas that contributes to global warming -- originating from manmade emissions. the findings show an extended plume over Europe's most populated area, the region from Amsterdam in the Netherlands to Frankfurt, Germany. Credit: ESA - DLR - IUP, Univ.Bremen

Using data from the SCIAMACHY instrument aboard ESA's Envisat environmental satellite, scientists have for the first time detected regionally elevated atmospheric carbon dioxide – the most important greenhouse gas that contributes to global warming – originating from

manmade emissions.

More than 30 billion tonnes of extra carbon dioxide (CO₂) is released into the atmosphere annually by human activities, mainly through the burning of fossil fuels.

According to the latest report by the Intergovernmental Panel on Climate Change (IPCC), this increase is predicted to result in a warmer climate with rising sea levels and an increase of extreme weather conditions. Predicting future atmospheric CO₂ levels requires an increase in our understanding of carbon fluxes.

Dr Michael Buchwitz from the Institute of Environmental Physics (IUP) at the University of Bremen in Germany and his colleagues detected the relatively weak atmospheric CO₂ signal arising from regional ‘anthropogenic’, or manmade, CO₂ emissions over Europe by processing and analysing SCIAMACHY data from 2003 to 2005.

As illustrated in the image, the findings show an extended plume over Europe’s most populated area, the region from Amsterdam in the Netherlands to Frankfurt, Germany.

Carbon dioxide emissions occur naturally as well as being created through human activities, like the burning of fossil fuels (oil, coal, gas) for power generation, industry and traffic.

"The natural CO₂ fluxes between the atmosphere and the Earth’s surface are typically much larger than the CO₂ fluxes arising from manmade CO₂ emissions, making the detection of regional anthropogenic CO₂ emission signals quite difficult," Buchwitz explained.

"This does not mean, however, that the anthropogenic fluxes are of minor importance. In fact, the opposite is true because the manmade

fluxes are only going in one direction whereas the natural fluxes operate in both directions, taking up atmospheric CO₂ when plants grow, but releasing most or all of it again later when the plants decay. This results in higher atmospheric CO₂ concentrations in the first half of a year followed by lower CO₂ during the second half of a year with a minimum around August.

"That we are able to detect regionally elevated CO₂ over Europe shows the high quality of the SCIAMACHY CO₂ measurements."

Buchwitz says further analysis is required in order to draw quantitative conclusions in terms of CO₂ emissions. "We verified that the CO₂ spatial pattern that we measure correlates well with current CO₂ emission databases and population density but more studies are needed before definitive quantitative conclusions concerning CO₂ emissions can be drawn."

Significant gaps remain in the knowledge of carbon dioxide's sources, such as fires, volcanic activity and the respiration of living organisms, and its natural sinks, such as the land and ocean.

"We know that about half of the CO₂ emitted by mankind each year is taken up by natural sinks on land and in the oceans. We do not know, however, where exactly these important sinks are and to what extent they take up the CO₂ we are emitting, i.e., how strong they are.

"We also don't know how these sinks will respond to a changing climate. It is even possible that some of these sinks will saturate or turn into a CO₂ source in the future. With our satellite measurements we hope to be able to provide answers to questions like this in order to make reliable predictions," Buchwitz said.

By better understanding all of the parameters involved in the carbon

cycle, scientists can better predict climate change as well as better monitor international treaties aimed at reducing greenhouse gas emissions, such as the Kyoto Protocol which addresses the reduction of six greenhouse gases.

Last year, European Union leaders highlighted the importance of cutting emissions from these manmade gases by endorsing binding targets to cut greenhouse gases by at least 20 percent from 1990 levels by 2020.

Source: European Space Agency

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