

Scientists in first global study of 'poison' gas in the atmosphere

September 19 2007

It was used as a chemical weapon in the trenches in the First World War, but nearly a century later, new research by an international team of scientists has discovered that phosgene is present in significant quantities in the atmosphere.

Phosgene was still stockpiled in military arsenals well after the Second World War, but its continued presence in the atmosphere today is due to man-made chlorinated hydrocarbons used in the chemical industry.

A team, including Professor Peter Bernath, of the Department of Chemistry at the University of York, has carried out the first study of the global distribution of the gas. The team also involved scientists from the Universities of Waterloo and Toronto in Canada, NASA's Jet Propulsion Laboratory and the New Mexico Institute of Mining and Technology in the USA.

Between February 2004 and May 2006, they used the Canadian Atmospheric Chemistry Experiment (ACE) satellite to measure the incidence of the gas. The research, which was financed by the Canada Space Agency (CSA) and the Natural Sciences and Engineering Research Council of Canada, is published in the latest edition of Geophysical Research Letters.

The scientists discovered that the main atmospheric concentration of the gas was above the Equator, though it was present in some quantity in all latitudes. They found that levels of phosgene in the atmosphere had



reduced since previous studies in the 1980s and 1990s, though its continued presence is a contributor to ozone depletion.

Phosgene plays a major role in the preparation of pharmaceuticals, herbicides, insecticides, synthetic foams, resins and polymers, though its use is being reduced.

Professor Bernath said: "There is a small, but not negligible, concentration of phosgene in the troposphere. Chlorinated hydrocarbons don't occur in nature but as chlorinated solvents they are used by industry. They are short-lived and they decay rapidly, but they decay into phosgene.

"It's very toxic and pretty nasty stuff - its reputation is well deserved. Considering the health hazards associated with phosgene, the chemical industry is trying to find substitutes to eliminate its use. But the use of chlorinated hydrocarbons is being reduced because of the legal restrictions of the Montreal Protocol, so phosgene is also decreasing."

Higher up in the atmosphere phosgene can be slowly oxidized by ultraviolet rays, and so it continues to play a role in the depletion of the ozone layer.

Source: University of York

Citation: Scientists in first global study of 'poison' gas in the atmosphere (2007, September 19) retrieved 28 April 2024 from https://phys.org/news/2007-09-scientists-global-poison-gas-atmosphere.html

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