New ozone-destroying gases on the rise

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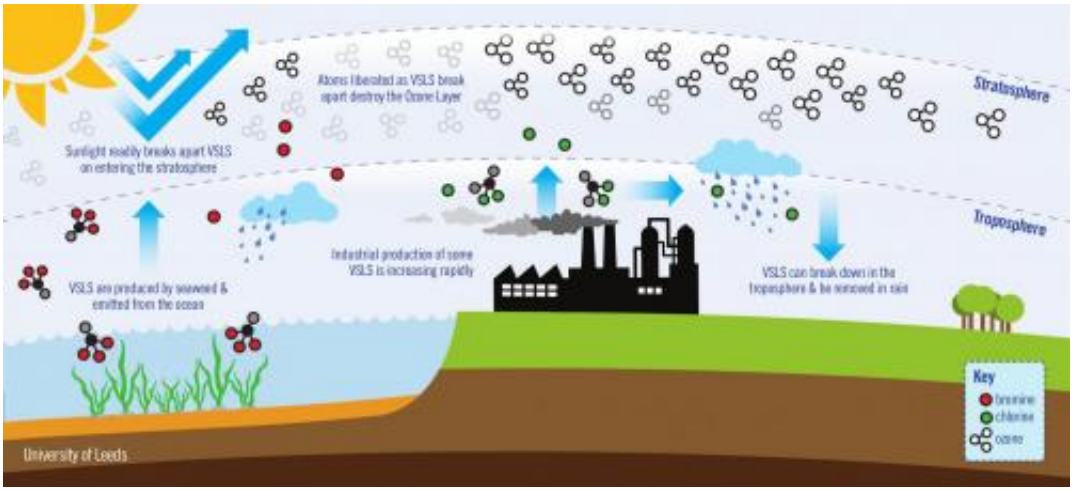

An infographic showing how VSLS deplete ozone. Credit: University of Leeds

Scientists report that chemicals that are not controlled by a United Nations treaty designed to protect the Ozone Layer are contributing to ozone depletion.

In the new study, published today in *Nature Geoscience*, the scientists also report the atmospheric abundance of one of these 'very short-lived substances' (VSLS) is growing rapidly.

Study lead author Dr Ryan Hossaini, from the School of Earth and Environment at the University of Leeds, said: "VSLS can have both natural and industrial sources. Industrial production of VSLS is not controlled by the United Nations Montreal Protocol because historically

these chemicals have contributed little to ozone depletion.

"But we have identified now that one of these chemicals is increasing rapidly and, if this increase is allowed to continue, it could offset some of the benefits to the Ozone Layer provided by the Montreal Protocol."

In the study, the researchers used a 3D computer model of the atmosphere to determine the impact of VSLS on ozone and climate.

Measurements of VSLS in the atmosphere over the past two decades, provided by collaborators from the National Oceanic and Atmospheric Administration (NOAA) in the United States, were also analysed. These measurements revealed a rapid increase in atmospheric concentrations of dichloromethane, a man-made VSLS used in a range of industrial processes.

Study co-author Professor Martyn Chipperfield, from Leeds' School of Earth and Environment, said: "We need to continue monitoring the atmospheric abundance of these gases and determine their sources. At present, the long-term recovery of the Ozone Layer from the effects of CFCs is still on track, but the presence of increasing dichloromethane will lead to uncertainty in our future predictions of ozone and climate."

The researchers found that while the amount of ozone depletion arising from VSLS in the atmosphere today is small compared to that caused by longer-lived gases, such as CFCs, VSLS-driven ozone depletion was found to be almost four times more efficient at influencing climate.

Dr Hossaini explained: "Due to their short atmospheric lifetimes, VSLS break down and destroy ozone in the lowermost part of the stratosphere. This is important, as a molecule of ozone lost in this region has a far larger impact on climate than a molecule destroyed at higher altitudes by longer-lived gases."

The researchers also separated out natural sources of VSLS - such as seaweed in the ocean - and those released due to human activity - such as industrial processes - in order to determine the relative importance of each.

At present, naturally-emitted VSLS account for around 90% of the total ozone loss caused by VSLS in the lower stratosphere. However, the contribution from man-made VSLS compounds is increasing and appears set to increase further in coming years.

Study co-author Dr Stephen Montzka from the NOAA added: "The increases observed for dichloromethane are striking and unexpected; concentrations had been decreasing slowly in the late 1990s, but since then have increased by about a factor of two at sites throughout the globe."

Dr Hossaini said: "It is uncertain what is driving this growth. However, it could be partly due to the fact that dichloromethane is used in the manufacturing process of some HFCs, the 'ozone-friendly' gases which were developed to replace CFCs. This would mean, ironically, that production of ozone-friendly chemicals is actually releasing some ozone-destroying gases into the atmosphere."

More information: Efficiency of short-lived halogens at influencing climate through depletion of stratospheric ozone, *Nature Geoscience* , 16 February 2015: dx.doi.org/10.1038/ngeo2363

Provided by University of Leeds