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Editorial

Several Ozone-Depleting Chemicals Produced in an Unforeseen, Unethical Way in Recent Years

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EDITORIAL

Scientists have discovered that ozone-depleting chlorofluorocarbons, or CFCs, spend less time in the atmosphere than previously thought. CFCs, which were phased out internationally in 2010, should be circulating at far lower concentrations than what has just been observed, according to their research. The latest findings suggest that additional, illegal CFC manufacture has happened in recent years. The research specifically identifies new CFC-11, CFC-12, and CFC-113 emissions. The Montreal Protocol, an international deal aimed at phasing out the production and consumption of CFCs and other ozone-depleting chemicals, would be violated by these emissions. The latest study's estimations for fresh global CFC-11 emissions are larger than those reported in prior research. This is also the first study to calculate current global CFC-12 and CFC-113 emissions. According to the senior scientist, "total emissions from new products are on the order of 20 gigagrams per year for each of these compounds." "This is higher than prior estimates for CFC-11 emissions, and it also finds possible new emissions of CFC-12 and 113, which had previously been neglected."

CFCs were frequently utilized in the manufacturing of refrigerants, aerosol sprays, chemical solvents, and building insulation prior to their global phaseout. A study released last year calculated the number of CFCs that remained in banks by building a model that analyses industry CFC output over time, as well as how quickly different equipment types release CFCs over time. The concentrations of bank-derived CFCs that should be in the atmosphere throughout time were then calculated using current guideline levels for the chemicals' lives. The researchers wanted to enhance the estimations of CFC lifetimes in their recent publication. The best estimates of atmospheric lifetimes currently available have enormous uncertainty, implying that global emissions have huge uncertainties as well.

Rather than looking at each gas's lifetimes and emissions independently, as most models do, the researchers looked at CFC-11, 12, and 113 as a group to account for common atmospheric processes that influence their lifetimes. Seven distinct chemistry-climate models have been used to mimic these processes, each of which yields an estimate of the gas atmospheric lifespan through time. They started by assuming that all of the models are equally likely, and then update how likely each of them is based on how well they fit CFC concentration observations from 1979 to 2016. The researchers were able to reduce the uncertainty in their lifetime predictions by incorporating these chemistry-climate modelled lives into a Bayesian simulation model of production and emissions. CFC-11, 12, and 113 have been calculated to have lives of 49, 85, and 80 years, respectively, compared to existing best estimates of 52, 100, and 85 years. Because their estimations are lower than current best-recommended values, emissions are anticipated to be greater than current best estimates.

To put this theory to the test, the researchers looked at how shorter CFC lifetimes affected estimates of unexpected emissions, especially between 2014 and 2016. Researchers have previously found a surge in CFC-11 emissions during this time period, with half of these emissions being connected to eastern China. The findings show that there was new, illegal CFC-11 production during this time period that was larger than prior estimates, as well as a new production of CFC-12 and 113 that had not been detected before. The study estimates that the entire annual greenhouse gas emissions released by the United Kingdom are equal to these increased CFC emissions. It's not surprising to find unexpected CFC-12 emissions because the chemical is frequently co-produced in manufacturing operations that also produce CFC-11. However, the team estimates that the unexpected CFC-113 emissions are nearly ten times higher than what the treaty currently allows. Emissions of all three gases are significantly lower than they were at their height, but they are still very powerful greenhouse gases. And we are currently in the midst of a climate crisis, in which any reduction in emissions will have a long-term influence on the climate system.

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