On the Unexpected Increase in CFC-11 Emissions, Are They Still on the Rise?

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In May 2018, we published results showing that emissions of CFC-11 have increased since 2012 despite production of this controlled ozone-depleting substance (ODS) being reportedly phased out in 2010. The results are not likely explained by increases in releases of CFC-11 from old insulating foams and chillers, suggesting production after the reported phaseout and a contravention of the Montreal Protocol on Substances that Deplete the Ozone Layer. While we determined that some of the emission increase arises from eastern Asia, emissions trends in many regions of the globe are poorly determined. In separate work by us and others, it appears that emissions have not increased from the U.S., Europe, and Australia. Since publication of our paper, the Parties to the Montreal Protocol have formally asked scientists and industry for further information so that they might consider an effective and informed response and even amendments to the Protocol itself. Ultimately, they are hoping to rapidly identify the underlying causes of the renewed production and increased emission so that they can be stopped before substantial damage to the ozone layer ensues. Meetings in China and Vienna were recently convened to assess the available information and provide feedback to the Parties working to resolve the issue. In this talk, I will discuss this issue and its implications for the ozone layer. In particular, I will explore updated measurements, which preliminarily suggest that that global and eastern Asian emissions may have declined slightly during the latter half of 2018. While these hints are encouraging, delay in ozone-layer recovery will likely be determined by the cumulative amount of post-2010 production, which is a quantity that is poorly constrained.

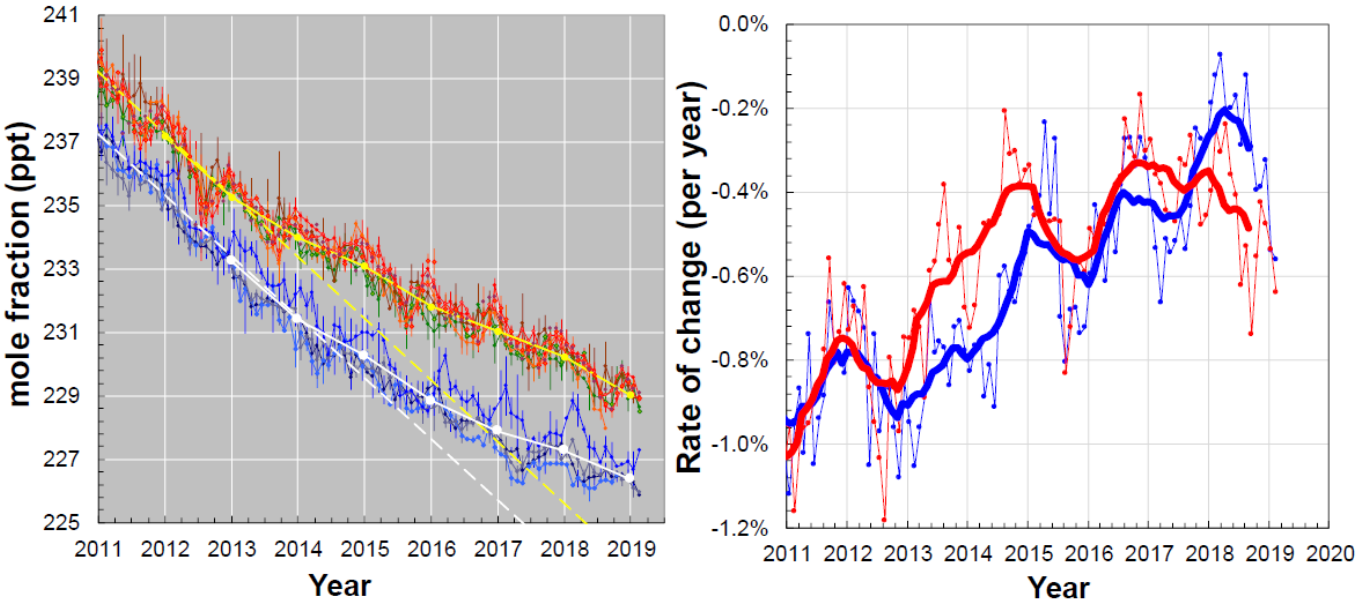

Figure 1. Left: CFC-11 atmospheric mole fraction over time measured at Northern Hemisphere sites (red and green points) and Southern Hemisphere sites (blue points). Fits to hemispheric mean data during 2002 to 2012 are extrapolated to 2018 (yellow- and white-dashed lines). Right: Hemispheric rates of change determined from the observations for the Northern Hemisphere (red) and Southern Hemisphere (blue). Rates are from monthly mean mole fraction differences [e.g., ln(jan2018/jan2017)] and are also shown as annually smoothed quantities (bold lines).