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Improved characterisation of the impact of chlorinated VSLSs on atmospheric chemistry and climate: past, present and future

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The emissions of most long-lived halogenated ozone-depleting substances (ODSs) are now decreasing, owing to controls on their production introduced by Montreal Protocol and its amendments. However, short-lived halogenated compounds can also have substantial impact on atmospheric chemistry, including stratospheric ozone, particularly if emitted near climatological uplift regions. It has recently become evident that emissions of some chlorinated very short-lived species (VSLSs), such as chloroform ($CHCl_3$) and dichloromethane (CH_2Cl_2), could be larger than previously believed and increasing, particularly in Asia. While these may exert a significant influence on atmospheric chemistry and climate, their impacts remain poorly characterised.

We address this issue using the UM-UKCA chemistry-climate model. We use a newly developed Double-Extended Stratospheric-Tropospheric (DEST) chemistry scheme, which includes emissions of all major chlorinated and brominated VSLSs alongside an extended treatment of long-lived ODSs. Employing novel estimates of Cl-VSLS emissions we show model results regarding the atmospheric impacts of chlorinated VSLSs over the recent past (2000-present), with a focus on stratospheric ozone and HCl trends. Finally, we introduce our plans regarding examining the impacts of chlorinated VSLSs under a range of potential future emissions scenarios; the results of which will be directly relevant for the next WMO/UNEP assessment.