

PREFACE

The concept of using lifetimes to relate atmospheric burdens to emissions has proven useful for quantifying the effects of ozone depleting substances and their replacements on ozone and climate. While the issue was addressed in each of the WMO Ozone Assessment Reports, there has not been a focused effort since the last report was published in 1994 (Kaye and Penkett, 1994). In the interim, we learned that the lifetime of a species in the atmosphere is not only defined by the chemical reactivity of the species but also by the physical and chemical state of the surrounding atmosphere and the emission history.

This reevaluation is the first attempt in nearly two decades to estimate atmospheric lifetimes of these substances using state-of-the art analysis techniques. It was motivated by findings that the lifetimes of some of the ODSs (i.e., CFC-11 and CCl₄) could be longer than previously accepted and because some of the replacement compounds were not yet in use at the time of the last evaluation in the 1990s. In addition, a new evaluation is warranted because of tremendous advancements in the abilities of models used to derive atmospheric lifetimes and the availability of a wealth of additional measurement data not only from ground-based stations but also from high-altitude sampling and satellite observations.

At the 2011 SPARC Scientific Steering Group meeting (Pune, India), the WCRP launched the activity “Lifetime of halogen source gases” as one of the SPARC core projects. This report was prepared by an international team of scientists comprising of 4 coordinating lead authors, 10 lead authors, and approximately 40 co-authors and contributors. In addition, 10 principal reviewers worked with the lead authors to respond to mail review comments provided by over 30 reviewers. The final draft of the report was discussed at the Review Meeting in Zürich (Switzerland) in January 2013. The financial, personnel, and in-kind support provided by SPARC, WCRP, and the U. S. National Aeronautics and Space Administration (NASA) was crucial to the success of this report.

The estimated lifetimes and their uncertainties presented in this report were obtained using the best available data and methods at the time of the final preparation of the report. Nevertheless, this report is only a snapshot of our current understanding. As mentioned above, atmospheric lifetimes are not fixed constants and depending on new findings and atmospheric changes, will change in the future.

