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Halogenated hydrocarbons: accuracy of photochemical data for the atmospheric lifetime, GWP, and ODP estimations.

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The emissions of halogenated (Cl, Br, I containing) organics of both natural and anthropogenic origin contribute to the balance of and changes in the stratospheric ozone concentration. The associated chemical cycles are initiated by the photochemical decomposition of the portion of source gases that reaches the stratosphere. Reactions with hydroxyl radicals and photolysis are the main processes dictating the compound lifetime in the troposphere and release of active halogen in the stratosphere for a majority of halogen source gases. Therefore, the accuracy of photochemical data is of primary importance for the purpose of comprehensive atmospheric modeling and for simplified kinetic estimations of global impacts on the atmosphere, such as in ozone depletion (i.e., the Ozone Depletion Potential, ODP) and climate change (i.e., the Global Warming Potential, GWP).

The results of experimental kinetic investigations of a number of halogenated alkanes, alkenes, and ethers over the temperature range of atmospheric interest will be presented to illustrate various complications in the accurate determination of OH reaction rate constants leading to uncertainties in the estimation of atmospheric lifetimes. The accuracy of present day laboratory measurements and the problems associated with the evaluation of kinetic data for use in atmospheric modeling will be discussed.

Similarly, the accuracy of UV and IR absorption measurements will be highlighted to provide an improved basis for atmospheric modeling. Finally, simple kinetic approaches for estimating the ODP and GWP of halogenated organics will be presented.