A KINETIC AND MECHANISTIC STUDY OF THE ClO+OH AND Cl+HO_2 REACTIONS IN RELATION TO CHLORINE PARTITIONING AND OZONE BUDGET IN THE STRATOSPHERE

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Chlorine is recognized to be an effective ozone destroyer. The efficiency of chlorine in depleting ozone strongly depends on the chlorine partitioning between its active forms and reservoir species (e.g. HCl). Current models calculate HCl concentrations in the stratosphere lower than those recently measured. The disagreement between model calculations and observations may result from uncertainties in reaction rates for HCl formation or from the existence of additional sources of HCl not considered in the models. In this respect, the kinetics and mechanism of the following reactions have been investigated at 1 Torr total pressure and in the temperature range 230-360K using the discharge flow mass spectrometric technique: OH + ClO $\rightarrow$ HO_2 + Cl (1a), OH + ClO $\rightarrow$ HCl + O_2 (1b), HO_2 + Cl $\rightarrow$ HCl + O_2 (2a), HO_2 + Cl $\rightarrow$ ClO + OH (2b). The data to be reported include in particular the branching ratios of reactions 1b and 2b, and temperature dependence of the rate constants of reactions (1) and (2). Atmospheric implications of these experimental data will be discussed.