

Heterogeneous Chemistry Important in the Lower Stratosphere

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Abstract

Heterogeneous chemistry has been proven beyond any reasonable doubt to be of importance in the global ozone depletion of the lower stratosphere. In this paper we will summarize the studies of several heterogeneous reactions recently carried out at the Jet Propulsion Laboratory using a fast flow-tube reactor. The reactor was coupled to either an electron-impact ionization mass spectrometer or a chemical ionization mass spectrometer for analysis of trace gas species. These heterogeneous processes include: (1) hydrolysis of ClONO_2 and N_2O_5 in the ternary $\text{HNO}_3/\text{H}_2\text{SO}_4/\text{H}_2\text{O}$ solution, (2) reactions of HCl with HOCl and ClONO_2 in the same ternary solution, (3) freezing points and melting points of sulfuric acid, (4) hydrolysis of N_2O_5 on the surfaces of sulfuric acid monohydrate (SAM), (5) uptakes of HO_2NO_2 and HONO in liquid H_2SO_4 , and (6) heterogeneous reactions of NaCl particles with HNO_3 , N_2O_5 , and ClONO_2 . The substrates, such as liquid sulfuric acid, SAM, or salt particles, used in these studies were prepared on the wall of the reactor. The results will be summarized and the possible impact of these heterogeneous processes on stratospheric chemistry will be discussed in the conference.