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Aircraft (ER-2) and balloon in-situ measurements of HCl, NO₂, HNO₃, N₂O, and CH₄ for testing heterogeneous chemistry on PSC's and sulfate aerosols in the 1991/2 Arctic Winter and the 1994 Antarctic Winter.

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Concentrations of HCl measured in the 1991/3 northern hemisphere lower stratosphere from the ER-2 aircraft are significantly lower than model predictions using both gas phase and heterogeneous chemistry, but are in much better agreement with model predictions for the 1994 southern hemisphere.

New in-situ measurements of HCl from the Aircraft Laser Infrared Absorption Spectrometer (ALIAS) on the ER-2 and the Balloon-borne Laser In-Situ Sensor (BLISS) will be presented and intercompared with satellite (UARS), Shuttle (ATMOS), and balloon (MARKIV) data sets. In conjunction with other in-situ measurements from the ER-2, details of the observed HCl losses from PSC chemistry during the ASHOF/MAESA southern hemisphere campaign of 1994 will be described with respect to the stoichiometry of the heterogeneous reactions responsible for the observed HCl losses and ClO production, including a comparison with the results from the 1991/2 northern hemisphere.

In addition, measurements of NO₂ and HNO₃ from both balloon and aircraft (ER-2) showing low NO₂ and high HNO₃ levels will be presented as strong evidence of the role of the heterogeneous hydrolysis of N₂O₅ on sulfate aerosols at mid-latitudes.