Antarctic Polar Stratospheric Aerosols: The Roles of Nitrates, Chlorides and Sulfates.

R.F. Pueschel (1), K.G. Snetsinger (1), J.K. Goodman (2), G.V. Ferry (1), V.R. Oberbeck (1), S. Verma (3), W. Fong (4).

(1) NASA Ames Research Center, Moffett Field, CA 94035.
(2) San Jose State University, San Jose, CA 95192.
(3) Thermo Analytical Systems Inc., Richmond, CA 94804.
(4) Information Management Inc., Palo Alto, CA 94303.

Nitric and hydrochloric acids have been postulated to condense in the winter polar stratosphere to become an important component of polar stratospheric clouds. One implication is that the removal of NOy from the gas phase by this mechanism allows high Clx concentrations to react with O_3, because the formation of $ClNO_3$ is inhibited.

Contributions of NO_3 and Cl to the stratospheric aerosol were determined during the 1987 Airborne Antarctic Ozone Experiment by testing for the presence of nitrates and chlorides in the condensed phase. Aerosol particles were collected on four 500 um diameter gold wires, each pretreated differently to give results that were specific to certain physical and chemical aerosol properties. One wire was carbon-coated for concentration and size analyses by scanning electron microscopy; X-ray energy dispersive analyses permitted the detection of S and Cl in individual particles. Three more wires were coated with Nitron, barium chloride and silver nitrate, respectively, to detect nitrate, sulfate and chloride in aerosol particles.

All three ions, viz., sulfates, nitrates and chlorides were detected in the Antarctic stratospheric aerosol. In terms of number concentrations, the aerosol was dominated by sulfates, followed by chlorides and nitrates. An inverse linear regression can be established between nitrate concentrations and ozone mixing ratio, and between temperature and nitrates.