Results from the flight of the Atmospheric Trace Molecule Spectroscopy on the ATLAS-1 Space Shuttle Mission

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Abstract Measurements of atmospheric composition by the Atmospheric Trace Molecule Spectroscopy (ATMOS) experiment flown on the ATLAS-1 Space Shuttle mission of March 24 to April 2, 1992, will be presented.

Summary

During the ATLAS-1 space shuttle mission, the ATMOS experiment, a Fourier transform infrared spectrometer operating in solar occultation mode from on-orbit *(Farmer, 1987),* collected data through more than 90 orbital sunrises and sunsets at latitudes between 30°N and 55°S. The resulting high-resolution infrared solar absorption spectra from these observations have so far been analyzed for the vertical profiles of several species (O_3, HNO_3, $ClNO_3$, HC1, HF, N_2O, CH_4, and H_2O) of immediate importance as correlative measurements for other satellite instruments, such as those carried on the Upper Atmospheric Research Satellite. Results for these gases together with those of other species measured by ATMOS, such as the more abundant man-made chlorofluorocarbons (CFC- 11, CFC-12, HCFC-22) are compared with similar measurements made by this instrument from data acquired during its first flight in April, 1985. In the period between these two flights, the halogenated gases are expected to have increased measurably in concentration due to the continued release of the halogenated source gases. These ATMOS data provide a simultaneous measurement of the increase in the tropospheric source gases as well as the halogen sink species, HC1 and HF.

The residual stratospheric aerosol layer created by the 1991 Mt. Pinatubo volcanic eruption resulted in a loss of instrument suntracking capability at heights below 28 km in a large number of occultations. By comparison to spectra obtained in the first flight of the instrument on board the shuttle in 1985, several broad spectral features can be assigned in the 600 to 4800 cm-l interval as arising from this stratospheric aerosol. These are observed in spectra with tangent

heights as high as 35 km. The vertical profiles of HC1, $ClNO_3$, and HNO_3 have been obtained through the lower stratosphere, and can be used as a test of the chemical effect due to the presence of this aerosol.

References

C. B. Farmer, "High resolution infrared spectroscopy of the sun and the earth's atmosphere from space," Mikrochim. Acts (Wien), III, 189-214, 1987.