NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Fabry-Perot Ground-Based Observations of Comets and the Jupiter Plasma Torus

PERFORMING ORGANIZATION

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INVESTIGATOR'S NAME

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DESCRIPTION *(a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)*

a. Strategy: The Wisconsin 150 mm dual etalon Fabry-Perot spectrometer is a powerful instrument for the study of diffuse emission sources such as cometary atmospheres, the Jupiter plasma torus, and various emission nebulae. Since 1985, we have concentrated our efforts on extensive observations of comet Halley and the analysis of the data.

b. Accomplishments: Images of comet Halley in [OI]6300Å emission were analyzed to obtain the spatial distribution of $O(^1D)$ in the cometary atmosphere. The narrow spectral bandpass of the Fabry-Perot (0.2Å) eliminated contamination from terrestrial airglow [OI]6300 and cometary NH_2 lines in the nearby spectrum. The results were modeled to provide photodestruction lifetimes of cometary H_2O and OH, the predominant parents of $O(^1D)$.

The Fabry-Perot was also used in the scanning mode to obtain measurements of [OI]6300 and Balmer alpha (Hα) emissions which were used to determine the H, $O(^1D)$ and H_2O production rates as a function of heliocentric distance, both pre-perihelion and post-perihelion. We have also analyzed our high resolution spectra of the NH_2 (0,8,0) band in the 6300Å region to obtain preliminary values of the NH_2 production rate. Assuming NH_3 is the major parent of NH_2, we find that the abundance ratio NH_3/H_2O is about $(0.12\pm0.04)\%$, assuming thermal equilibrium for the level populations of NH_2.

Scans of the H_2O^+ (0,8,0) band spin doublet at 6158.64Å and 6158.86Å were used to obtain H_2O^+ emission intensities and ion accelerations in the coma and along the ion tail of the comet. The ion acceleration was approximately constant along the tail on each night, but varied from night to night.

c. Anticipated Accomplishments: Much of the imaging data from comet Halley remains to be analyzed. We are now completing the installation of an image processing system on our computer to facilitate this analysis.

K. Magee-Sauer completed her Ph.D. thesis in May, 1988. We are now preparing several papers for submission to Icarus before she leaves in August 1988 for her new position at Bartol Research Foundation.

We have established a collaboration with W. Smyth of AER, who will use an advanced Monte Carlo model of the cometary atmosphere to analyze our Hα and [OI]6300 data.

We have recently acquired a CCD camera from Photometrics, Ltd. We plan to use the new camera with the 150 mm Fabry-Perot to carry out a new series of observations of the

Jupiter plasma torus at Kitt Peak in November-December, 1988.

d. Publications

Magee-Sauer, K., F. L. Roesler, F. Scherb, J. Harlander, and R. J. Oliversen: Spatial Distribution of $O(^1D)$ from comet Halley. Icarus (in press).