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A STUDY OF THE ATMOSPHERE AND IONOSPHERE USING SATELLITE OBSERVATIONS OF 300-1400 Å AIRGLOW

NAGW-370

Final Report

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The stated objective of this grant was to obtain O^+ ion distribution using simultaneous AE-E measurements and OII 834 Å emissions obtained by the EUV spectrometer on board the STP78-1 satellite. We have performed the task successfully. Initial results of our investigations were reported at the 1983 AGU spring meeting and a detailed description of the results can be found in an upcoming publication in the journal of Geophysical Research. We were also able to carry out a second task with the support of this grant: the analysis of the 300 - 900 Å spectrum of a nightside Aurora. These two works are summarized in the following paragraphs. The publications resulting from this grant listed at the end of this report.

Equally important, perhaps, was the effect that this finding had in allowing us to begin the analysis of our unique data set from our EUV airglow spectrometer. With concrete results to present to our scientific colleagues, we generate a substantial amount of interest in this work. As a result, we have over 10 papers in various stages of completion with other workers in the field. None of this would have been possible without the initial impetus of this grant.

In regard to the study of the O^+ ion distribution, we found that the OII 834 Å emission can be used to infer the O^+ density as a function of altitude. We also obtained the ion temperature from these measurements. Moreover, since the STP78-1 was a polar-orbitting satellite, we obtained the variations of the ion density distributions as a function of latitude. Our daytime observations showed that the OII 834 Å emissions contain the signature of the Appleton anomary. This is the first such optical observation, during the day.

In regard to the 300 - 900 Å auroral spectra, we found that our aurora displays a large number of OII features. We have used several pairs OII

features having a common upper state to obtain their branching ratios and compared those with laboratory observations and theoretical calculations. Such studies followed by a detailed theoretical calculation will lead to a better understanding of the energetics of auroras. We have also found evidence for OIII emissions in the aurora. This was another first since no OIII emissions had been observed in an aurora.

Publications resulting from this grant:

1. Kumar, S., Chakrabarti, S., Paresce, F., and Bowyer, S. "Satellite Observations of O^+ 834 Å Dayglow," EOS, 64, 466, 1983a.

2. Kumar, S., Chakrabarti, S., Paresce, F., and Bowyer, S. "The O^+ 834 Å Dayglow: Satellite Observations and Interpretation with a Radiation Transfer Model," J. Geophys. Res., in press (1983b).

3. Paresce, F., Chakrabarti, S., Kimble, R., and Bowyer, S. "The 300 - 900 Å Spectrum of a Nightside Aurora," J. Geophys. Res., in press (1983a).

4. Paresce, F., Chakrabarti, S., Kimble, R., and Bowyer, S. "Observations of an EUV (300 - 900 Å) Aurora from the STP78-1 Satellite," paper to be given at the December 1983 meeting of American Geophysical Union, 1983b.