

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
RESEARCH AND TECHNOLOGY RESUME

## TITLE

Studies of Extended Planetary Atmospheres (NAGW-596)

## PERFORMING ORGANIZATION

Lunar and Planetary Laboratory  
The University of Arizona  
Tucson, AZ 85721

## 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. Spectroscopic observations of gases and plasmas in the Jupiter system, and related phenomena such as the recently-discovered sodium atmospheres of Mercury and the Moon. Observations of other planets as opportunities arise.

b. Cunningham's work on Jupiter spectroscopy is complete. The optical thickness of the ammonia cloud increases from about 3 in the morning to 6 at sunset. This effect seems to be due to the combination of internal heat flow and a convective region heated at the top, giving strong convection at night and none during the day. Near-simultaneous methane data are of poor quality, but are consistent with this picture.

Schneider's work on the sodium environment of Io is also complete. The eclipse data extend to nearly 10 Io radii and nicely match the densities in the outer regions (to ~100 Io radii) obtained from the intensity scattered in the D lines. Another data set shows very fast jets of sodium (up to 100 km/sec), frequently tilted out of the orbital plane. We seem to be seeing neutralized ions, not from the torus itself but from atmospheric sodium ionized and then quickly neutralized.

The data set on Mercurian sodium has been augmented, and supplemented by IR reflectance spectra obtained at the IRTF. They show Christiansen peaks that are diagnostic of surface composition.

Lunar sodium has been observed; the scale height is around 60 km, as expected, but the density is very small, 1% of the Mercury value.

Data have been taken of the night side of Venus, searching for auroral emission at 6300 A and for lightning flashes at 7774 A. The extensive data processing needed to remove scattered light from the day side is about to begin.

Water vapor on Mars has been mapped in a collaborative program with a group at GSFC observing ozone by heterodyne spectroscopy.

c. Analysis (A. Tyler) of the accumulated data on Mercurian sodium, seeking evidence of spatial and temporal variations with due account for seeing quality.

Further work on sodium far from Io is planned, in collaboration with R.A. Brown and N. Schneider.

Further observations of lunar sodium, mainly in connection with other observations.

Analysis of the existing data on Venus aurora and lightning, and Mars water vapor (B. Rizk). Possible survey of Venus water vapor.

Occultations will be observed as opportunities arise.

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