N75 17250

A. Lyle Broadfoot

THE MARINER JUPITER/SATURN ULTRAVIOLET EXPERIMENT

The ultraviolet spectrometer on the MJS spacecraft is designed to detect and measure atmospheric properties. We record the spectrum from 400 Å to 1600 Å. We use two modes of operation—an airglow mode and an occultation mode. In the airglow mode, we measure the radiation from the planetary atmosphere, which will be predominantly solar radiation, resonance scattered by the atomic or molecular constituents such as hydrogen Lyman-α at 1216, or the helium 584 Å line. In the occultation mode, sunlight is reflected into the spectrometer, and the solar spectrum is recorded. As the atmosphere moves between the spacecraft and the Sun, the absorption characteristics of the atmosphere are measured over the full wavelength region. The nature of the absorption through the spectrum can be used to identify the absorber as well as to measure the abundance in the line of sight to the Sun. We can interpret the thermal structure down to and through the turbopause, a range of about 1000 km. The atmospheric constituents common to the outer planets are H, He, H_2, NH_3, and CH_4.

Apparently Saturn's rings are composed of particulate matter. If this is so, the solar spectrum in the occultation mode will be uniformly attenuated. If there is a gaseous component, we will be able to detect it in either mode. However, we do not have a prime experiment associated with the rings. The whole planet and ring system will be mapped in emission as we approach, and we will have good sensitivity because the length of time available for observing is a matter of days.

DISCUSSION

James Pollack What is the lower limit to the flux you can detect from hydrogen airglow?

Lyle Broadfoot As we approach the planet, I would say 10 Rayleighs would be easily detectable.

Kitt Peak National Observatory.

Pollack So you could detect the amount of hydrogen Jacques Blamont has spoken about (see contribution by Blamont).

Broadfoot Yes, I suspect that we could get even lower than 10 Rayleighs, considering the amount of time that would be available to observe.

Jacques Blamont The difficulty isn't with the instrument sensitivity, it is with the interplanetary Lyman-α background, which is about 250 Rayleighs.

Broadfoot That is correct. The background is substantial and would be troublesome, but observations of the planet would not contain the background component unless the planet were smaller than the field of view. The background would cause some confusion when we look at the rings unless we are careful to make the ring observations against the planetary background.