
JOURNAL CLUB

Satellite observations and model predictions of Rayleigh scattered UV radiance

by

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ABSTRACT

The Student Nitric Oxide Explorer satellite (SNOE) is a spinning satellite which uses a limb directed Ultraviolet Spectrometer (UVS) perpendicular to the satellites axis of rotation. The instrument has two detectors which are positioned to observe at 215 nm and 237 nm. The purpose of the UVS is to measure NO densities in the Thermosphere. Although NO dominates the signal in the altitude region near its average peak at 106 km, at lower altitudes the signal is dominated by Rayleigh scattered solar radiance from N₂ and O₂.

We have developed a model of the Rayleigh scattered emissions observed by the UVS. In addition to answering many interesting geophysical questions, the model accomplishes two important tasks. Our determination of the tangent altitude of the UVS line of sight is subject to large uncertainties due to the spinning of the satellite. By aligning consistent identifiable features in the modeled Rayleigh scattering altitude profile with the corresponding features in the UVS data we are able to significantly reduce these uncertainties. Also, we use the model to study the instrument calibration as its sensitivity degrades. The model takes into account all of the important factors contributing to the observed signal. The most important factors are the single scattered volume emission rates along the instruments line of sight and the radiations extinction on its path to the detector. Ozone is the dominant contributor to absorption of the light and the model shows a significant sensitivity to its presence. The model also takes into account the polarization of the scattered radiation and the sensitivity of the UVS to polarization. The model predictions are in excellent agreement with the UVS data. This agreement adds confidence to our understanding of the physical processes involved and allows us to utilize the model for the tasks described above.

This presentation will cover the model development and how it is used to accomplish the altitude registration of the UVS and the sensitivity studies. We will also discuss the comparison of the model results to the UVS observations.

Friday, November 21, 2003
Elvey Bldg. Globe Room
3:45 pm