

Saying NO to Occultation Anomalies in the Twilight Zone

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The SOLar Stellar Irradiance Comparison Experiment (SOLSTICE) on the Solar Radiation and Climate Experiment (SORCE) measures stars in the ultraviolet (250 nm) via stellar occultation. While the satellite observes these stars, the line-of-sight towards the star passes through the Earth's atmosphere and the signal from the star decreases due to Ozone absorption, however, some of these signals actually become stronger. My goal was to determine the source of this extra signal and to correlate these peculiar signal counts with observing geometry, geomagnetic activity, or some other space weather effect. Data from the Spectroscopy for Investigation of Characteristics of the Atmosphere of Mars (SPICAM) suggests that NO can emit ultraviolet in the nighttime as a result of chemiluminescence. After comparing the data against indices that measure geomagnetic activity and finding no obvious correlation, I looked to other explanations. Another idea is that this extra signal is a result of a photoluminescent emission in the ultraviolet from nitric oxide (NO). Since the satellite is only scheduled to observe stars in the nighttime and away from solar light, perhaps the line-of-sight unintentionally passes through the sunlit part of the Earth's atmosphere where the instrument can still see NO emission. This observing geometry can only explain some of the anomalous observations.