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Coupled Surface Observations of Temperature, Pressure, and Humidity with Surface Aerosol Particle Counts for Daytime Sky Radiance Quantification

Scott Wolfmeyer,[a], Grant Thomas,[b] and Steven Fiorino[a]

[a]Department of Engineering Physics, Air Force Institute of Technology, 2950 Hobson Way, Wright-Patterson AFB, OH 45433-7765
[b]Department of Aeronautical and Astronautical Engineering, Air Force Institute of Technology, 2950 Hobson Way, Wright-Patterson AFB, OH 45433-7765

Abstract

In some areas of space research such as space situational awareness, it is advantageous to know whether it is feasible to evaluate daytime satellite detection and tracking. For this, it is extremely important to be able to quantify the background noise of the daytime sky in the ultraviolet to near infrared range of the electromagnetic spectrum. Daytime sky radiance can be characterized using the Laser Environmental Effects Definition and Reference (LEEDR) code in any direction at any time as long as there is enough realtime observed information provided. The important questions to answer is how much realtime information is needed, how difficult is it to obtain, and would it be worthwhile to even try to measure or diagnose some of the inputs. The realtime information in question would include temperature, pressure, humidity, and aerosol content and type that is present throughout the atmospheric path. LEEDR is able to assume all of this by default and/or climatology, however, it can also be informed about the realtime information. LEEDR can utilize realtime observations such as radiosondes, satellites, surface weather stations, etc., as well as numerical weather prediction, aerosol optical depths from sunphotometers, aerosol particle counts, and some combination of observed plus climatology. It is anticipated that the easiest and nearly most accurate method for LEEDR to diagnose sky radiance for any viewing angle is to combine surface observations of temperature, pressure, and humidity with surface aerosol particle counts. It would be crucial to evaluate what is optimal in terms of ease of obtaining the necessary data as well as the accuracy and speed of the analysis. In order to accomplish the necessary factors of this issue, it would be beneficial to obtain sky radiance measurements from a telescope and UV to Near IR spectro-radiometers. With those measurements along with locally observed atmospheric and environmental observations, it would be possible to make model comparisons with LEEDR to determine what is necessary to properly quantify the background sky radiance during daylight.