

Application of Solar Aureole for Atmospheric Monitoring

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A study of the application of solar aureole for atmospheric monitoring is carried out with the main focus on determining atmospheric aerosols size distribution (ASD). The application primarily includes aerosol scattering involved in atmospheric Almuantar and limb scattering processes related to solar aureole phenomena. The details of the study are documented in a book entitled "SOLAR AUREOLE METHOD: Atmospheric Almuantar and Limb Scattering Remote Sensing", briefly referred to as SAM, to be published in 2019. The study treats the spherical Earth-atmosphere system, and analyzes the atmospheric radiative transfer in it, to include carrying out the interaction between incoming solar radiation and atmospheric constituents for all possible sun-zenith angles. In addition, detailed formulation is developed for studying the atmospheric constant-altitude multiangle, limb-scattering radiance during sunrise and sunset events. An example of Almuantar scanning radiance at six large sun-zenith angles between 89 and 94 degrees for a sensor at 25-km altitude is presented (see Figure 1). An example of a set of simulated vertical profiles of constant-altitude, multiangle, limb-scattering radiance is provided in Figure 2. In this SAM study, the investigation of ASD retrievals from a simulated set of scattering radiance data is also described. Finally, the development of the constant-altitude, multiangle atmospheric, limb-scattering methodology, in combination with the solar occultation technique, facilitates monitoring of the tropospheric and stratospheric aerosols by fully utilizing the atmospheric limb-sounding opportunity during sunrises and sunsets.

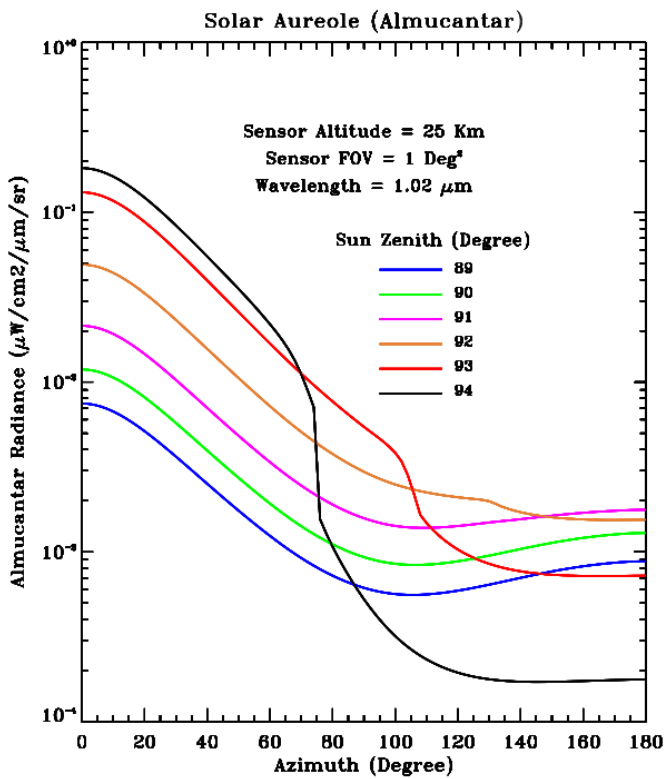


Figure 1. Almuantar radiance vs. azimuth at 6 sun zeniths between 89 and 94 degrees.

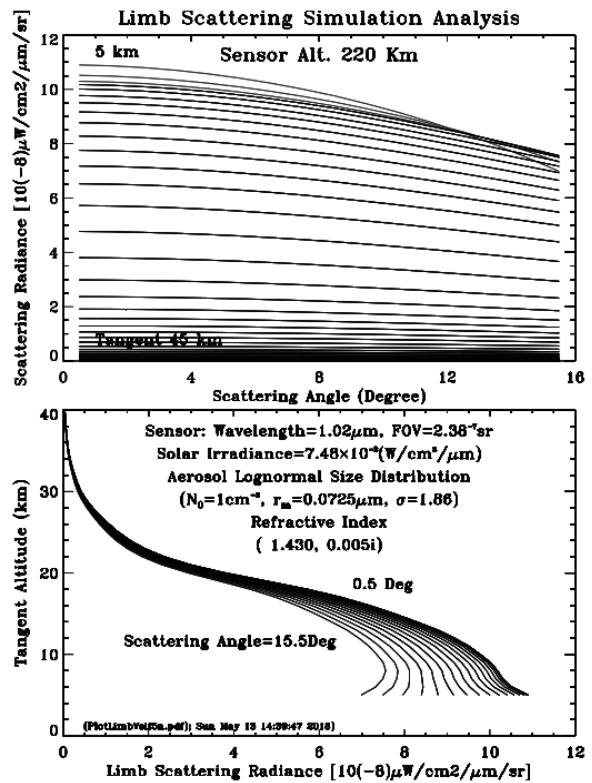


Figure 2. Limb-scattering radiance for sensor at 220 km.