STAR Seminar

CENTER FOR SATELLITE APPLICATIONS AND RESEARCH

Presents

Development of High-resolution surface albedo correlation maps for improved resolution and retrieval of aerosols over urban scenes

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ABSTRACT:

Determination of Aerosol Optical Depth (AOD) by satellite remote sensing measurements over land is complicated by the fact that the Top of Atmosphere (TOA) reflectance is a combination of the desired atmospheric path reflectance as well as the ground reflectance. Unfortunately, inaccurate surface modeling results in inaccurate AOD retrieval as well as reducing spatial resolution. In this presentation, we primarily focus on the use of simultaneous MODIS and AERONET sky radiometer data to refine the surface albedo models regionally and improve on the current AOD operational retrieval. In particular, we show that the correlation coefficient assumption used in the MODIS Collection (5) model between the VIS and MIR channels used for surface reflection parameterization in urban areas such as New York and Mexico City is severely underestimated. This is demonstrated both directly using high spatial imagery data from Hyperion and indirectly by constraining MODIS TOA reflection data with Aeronet Sky radiometer AOD retrievals. In particular, we find that combining the satellite and radiometer measurements allows us to generate a regional VIS/MIR surface reflectance correlation coefficient map at spatial resolutions up to 1.5km. Application of the regional VIS/MIR surface reflectance ratio model is shown to completely remove the bias and reduce uncertainty at the operational resolution of 10km as well as at higher resolutions to 1.5km resolution. Furthermore, the regional surface albedo model results in reduction of artificial AOD hotspots which often are seen in the operational retrieval.

In exploring angular albedo effects, we first verify that the correlation coefficients are insensitive to scattering angle as expected. On the other hand, the individual channel reflectences show clear angular dependences which we fit to the operational Kernal Model. However, we find that errors resulting from lambertian assumption are shown to within the errors that can be associated with albedo variability. Conversely, we also explore the MISR retrieved AOD product with AERONET derived AOD over urban areas and show that due to an overestimate of the surface by MISR, the AOD retrieval is underestimated. Finally, we apply the modified surface models data to GOES satellite observations and show that AOD retrieval from GOES using the modified regional model is in better agreement to Aeronet.

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