



Aerosol Optical Depth over Boreal Forests using AATSR: seasonal variation

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Climate is significantly influenced by the distribution of aerosol particles in the atmosphere. The characteristics which influence climate must be considered on a global scale. Satellites provide a way to obtain information on atmospheric composition on regional and global scales. In particular the spatial distribution of aerosol parameters such as aerosol optical depth (AOD) at several wavelength as well as some of the microphysical parameters can be retrieved from satellite observations. Satellite data are complementary to ground-based measurements which have a local character with the advantage of high accuracy.

The retrieval of aerosol properties can only be applied to cloud-free pixels is based on the comparison of the measured and modeled reflectance at the top of the atmosphere (TOA). The AATSR dual view (ADV) algorithm for application over land uses the AATSR IR and visible wavebands for cloud detection and the visible wavebands (0.555, 0.659, and 1.6 μm) for aerosol retrieval. The resolution of these instruments is 1*1 km² at nadir view and the swath width is 512 km, resulting in a return time of three days at mid-latitudes.

The retrieval is based on minimizing the error function between modeled and measured TOA reflectances, using all available wavelengths. The algorithm uses look-up-tables (LUTs) to compute the modeled TOA reflectance.

For AOD retrieval, an aerosol in the atmosphere is assumed to be an external mixture of fine and coarse mode particles. The two aerosol types are mixed such that the spectral behavior of the reflectance due to aerosol best fits the measurements.

Here the ADV is applied to investigate the AOD seasonal distribution over the boreal forest in North America, Europe and Siberia. The results are evaluated by comparison with ground-based AOD measurements using data from the AERONET (Aerosol Robotic NETWORK), network of ground-based sun photometers.

The results show the low (0.05-0.15) AOD over the boreal forest with somewhat higher (up to 0.2-0.4) AOD for the high populated areas and during the biomass burning seasons.