# AEROSOL OPTICAL THICKNESS RETRIEVAL BASED ON HJ-CCD SUPPORTED BY MODIS SURFACE REFLECTANCE PRODUCTION

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**ABSTRACTS**

HJ-CCD is a key instrument aboard the HJ satellite, launched in September, 2008, with a spatial resolution of 30 meters, and viewing the entire Earth's surface every 4 days, acquiring data in 4 spectral bands. These data will help us know the environment land and atmosphere clearly in a high spatial resolution. Aerosol optical thickness (AOT) retrieval is one of the main tasks of the HJ-CCD sensor. For lack of 2.1um band, it is difficult to determine the surface reflectance of visible bands even in dense dark vegetation areas[4,6,7], so the AOT retrieval faces a lot of problem. This paper mainly studies the methods of retrieving aerosols from HJ-CCD data.

Because of the difficulty of determine surface reflectance even in dense vegetation areas, the method of surface reflectance database are used to retrieve the aerosol optical depth in Beijing. This method is established on the basis of historical surface reflectance data of MODIS, which is synthesized using the minimum data of the adjacent 8 days as the ultimate pixel value to reduce the cloud influence to the largest extent. The product of MODIS, named MOD09, has 7 different spectral bands, spectral coverage from visible to near-infrared bands, The first two band have a spatial resolution of 250 meters, and the others are 500 meters[3]. In the process of determine surface reflectance, both the surface types and ground-based observations of reflectivity are considered, thus it has a high accuracy in determining surface reflectance.

Using the method of threshold process clouds and using control point correct the images, which were acquired from HJ-CCD. These processing accuracy affect the final precision directly.

MODIS sensor and HJ-CCD one have different observations and different spatial resolutions. It is necessary to convert the two different data to the same scale. The author used Geometric Optical Model and Spectral revised technology to solve the problem of different observations, and considered the scale effect and

scaling to solve the problem of different spatial resolutions. Because of having different Spectral response function, ground truth spectral data are used to determine the corresponding surface reflectance between the two different sensors. Finding the corresponding pixels from the two different images is important. This article solved this problem by using geographical coordinates.

The method of surface reflectance database used the look up table of aerosol optical thickness to achieve aerosol optical thickness retrieval. In this paper, use 6s Radiative Transfer Model to build mid-latitude summer and mid-latitude winter aerosol optical depth look up table respectively. Considered the geometrical conditions of observation of HJ satellite and the actual measurement of spectral reflectance, 31 different surface reflectance data among 0 to 0.31, 7 different sensor zenith angles among 0 to 30, 10 different solar zenith angles, and 19 different relative azimuth angles are used in the building process of the aerosol optical depth look up table.

Inversing the aerosol optical thickness in blue band and red one respectively based on the above method. The observation data of AERONET sites in Beijing and Xianghe is used to verify the precision of AOT. From its absolute error, minimum error, and its correlative index, we can believe that HJ-CCD data can be used to retrieve aerosol optical thickness based on the support of MODIS surface reflectance production (MOD09).

**KEY WORDS:** HJ-CCD, AOT, Geometric Optical Model, Spectral response function, 6s, Spectral revise, Radiometric Calibration.

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