



Retrieval and spatial-temporal analysis of aerosol in Sichuan province based on multi-source remote sensing

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Sichuan Basin is one of the serious haze regions in China. It has great significance to monitor the atmospheric haze in Sichuan Basin. In this study, MOD04 product, OMI-NO₂ product and OMI-SO₂ product were used to analysis the spatial and temporal distribution characteristic of atmospheric pollutants in Sichuan from year 2008 to 2012. Micro pulse lidar (MPL) and HJ-1 satellites were used to retrieve the aerosol extinction coefficient and aerosol optical depth (AOD). Also we established a linear relationship between the AOD and PM10.

The MOD04 data showed that the AOD in west Sichuan plateau was relatively low. The annual AOD-average in the regions such as Kangding, Maerkang, Xichang and Yaan was about 0.2. The Sichuan Basin such as Chengdu, Deyang, Mianyang has relatively higher annual AOD-average which was about 0.8 to 1.0, and it had obvious seasonal change feature. The spatial and temporal distribution of aerosol optical depth in Chendu showed obvious urban characteristics. These characteristics are related to the industrial situation, the location and the climate condition of Sichuan. Year 2011 has this highest annual AOD-average value.

The OMI-NO₂ product showed that the distribution characteristic of NO₂ in Sichuan was similar with aerosol. The NO₂ concentration was about 0.7 molec/cm² in west Sichuan plateau and greater than 4.2 molec/cm² in Chengdu, Deyang, Mianyang. However, the SO₂ distribution characteristic was slightly different. The SO₂ concentration was low in west Sichuan plateau with an annual average concentration of 0.2 DU. Zigong, Yibin, Luzhou were the main high value areas with an annual average concentration of 1.1 DU.

Fernald method was used to retrieve the aerosol extinction coefficient based on the MPL. The result showed that the daily maximum was appeared about 07:00 am and the highest aerosol extinction coefficient season was winter. The aerosol extinction coefficient was higher below the altitude of 300 m.

Based on the data of HJ-1 satellites, this study retrieved the Aerosol Optical Depth (AOD), proposed a method that used the EVI vegetation index to determine dark pixel to inverse AOD. This method can eliminate part of the atmospheric influence in determining the dark pixels. A comparison of the inversion results with CE318 measured data produced a correlation of 0.957. The inversion result can meet the requirement of refinement.

The MODIS AOD has a good positive correlation with PM10 mass (R²=0.62). The R² rose to 0.70 when the relative humidity was added to rectify the model.