MODIS C6 dark target and deep blue aerosol product fusion with a generalized regression neural network

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MODerate resolution Imaging Spectroradiometer (MODIS) on board the Terra and Aqua satellites provides aerosol optical depth (AOD) products over land at both local and global scales based on dark target (DT) algorithm and deep blue (DB) algorithm. Distinctions in these two retrieve methods can lead to different surface coverage. With a solution based on MODIS- derived Normalized Difference Vegetation Index (NDVI) product (MYD13C2), DB&DT combined product (DTDB) was appended in the collection 6 (C6) to increase the surface coverage. However, merely taking NDVI as the auxiliary data is regarded deficient obviously, and multivariate auxiliary data should be indispensable. A neural network called generalized regression neural network (GRNN) meets our need to synthesize multiple data completely. In this study, a multi-data fusion framework with GRNN is employed to generate fire-new DB&DT combined product (DTDBG), which improves the surface coverage and reduces the error. The training datasets contain some data collections, i.e., input: DT AOD, DB AOD, NDVI, season, auxiliary data from satellite; output: AERONET AOD, collocated at one AERONET site (Beijing, 2002-2012). The performance of the DTDBG is validated at two sites (Beijing, 2013-2016; Beijing-CAMS, 2012-2016) using AERONET AOD field-measurements. Compared to the DTDB, results show that the percentage of retrievals within the EE is increased by 26.94% and 25.46%, the RMSE is decreased by 30% and 34.78%. The correlation coefficient R is increased from 0.945 to 0.956 at Beijing and from 0.934 to 0.954 at Beijing-CAMS. Form 2007-2016, considering Beijing area as the research object, the number of total pixels available is rising from 281600 of DTDB to 312058 of $DTDB_G$. The surface coverage for each pixel is increased by up to 10.82% on average and 25.86% on max. The MODIS Adaptive Processing System (MODAPS) is currently generating an improved Collection 6.1 (C6.1) AOD products. It's foreseeable that the fusion framework will yield brilliant results in C6.1 product.