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Optimal interpolation of AERONET AOD observations using output of the GEOS-Chem model

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One of the valuable sources of atmospheric aerosol data is measurements by a ground-based network of sun and sky radiometers AERONET [1]. However, AERONET observations are sparse in space and time. Model simulations can be applied to estimate aerosol characteristics distribution, but models have considerable uncertainty. To obtain the most likely true estimate of aerosol characteristics distribution, the optimal interpolation method [2] can be used. This approach is much less computationally expensive than other data assimilation methods. We developed a spatial-temporal optimal interpolation technique for atmospheric applications with the use of spatial and temporal correlations of aerosol characteristics. We applied the spatial-temporal optimal interpolation to obtain the estimates of daily mean AOD (aerosol optical depth) over Europe combining AERONET AOD data and results of the chemical transport model GEOS-Chem [3] simulation. To validate the results, we compared estimated AOD with independent AERONET observations in Minsk and Lille for three months. The results of the validation show a significant improvement in AOD estimates in comparison with model simulations.

Keywords: aerosol optical depth, data assimilation, optimal interpolation, chemical transport model

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