Data assimilation of lidar-derived aerosol extinction coefficients and its application in China

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A three-dimensional variational (3DVAR) assimilation system for lidar-derived aerosol extinction coefficient profiles is developed, with the observational operator for aerosol extinction coefficients based on IMPROVE (The Interagency Monitoring of Protected Visual Environments) equation. Using the 3DVAR system, three experiments are performed by assimilating hourly lidar-derived aerosol extinction coefficient profiles and hourly mass concentrations of PM2.5 of air quality monitoring stations over China. Then, the subsequent 24h forecasts are carried out by using WRF-Chem (Weather Research and Forecasting model coupled to Chemistry) model. The results show that the data assimilation of lidar profiles can improve the skill score of aerosol following forecast with higher correlation coefficient and lower RMSE.

Keywords: data assimilation, lidar, aerosol extinction coefficients, WRF-Chem