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Lidar signal simulation for the evaluation of aerosols in chemistry transport models

S. Stromatas et al.

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Abstract. We present an adaptable tool, the OPTSIM (OPTical properties SIMulation) software, for the simulation of optical properties and lidar attenuated backscattered profiles (β') from aerosol concentrations calculated by chemistry transport models (CTM). It was developed to model both Level 1 observations and Level 2 aerosol lidar retrievals in order to compare model results to measurements: the level 2 enables to estimate the main properties of aerosols plume structures, but may be limited due to specific assumptions. The level 1, originally developed for this tool, gives access to more information about aerosols properties (β') requiring, at the same time, less hypothesis on aerosols types. In addition to an evaluation of the aerosol loading and optical properties, active remote sensing allows the analysis of aerosols' vertical structures. An academic case study for two different species (black carbon and dust) is presented and shows the consistency of the simulator. Illustrations are then given through the analysis of dust events in the Mediterranean region during the summer 2007. These are based on simulations by the CHIMERE regional CTM and observations from the CALIOP space-based lidar, and highlight the potential of this approach to evaluate the concentration, size and vertical structure of the aerosol plumes.

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