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Simulation of LIDAR-based aerosol measurements and their evaluation for a Saharan dust event in spring 2018

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The amount of aerosols in the atmosphere significantly increases during hazardous events such as volcanic eruptions, forest fires, and sandstorms. Since those events are serious hazards for health, environment, and economy, detailed understanding of the dispersion of aerosols during these episodes is fundamental. At present, there is limited information regarding the vertical distribution of aerosols because aerosol observations are mainly surface-based in-situ measurements, or vertically integrated measurements such as aerosol optical depth (AOD). Ground-based light detection and ranging (LIDAR) measurements and LIDAR measurements from satellites can be used to close this gap.
In this study we use the WRF-Chem (weather research and forecasting model coupled with chemistry) model and simulate the transport of Saharan dust from northern Africa towards Europe in spring 2018. This event caused highly elevated surface dust concentrations and severely degraded visibility in southern Europe. LIDAR-based measurements (aerosol extinction and backscattering coefficient profiles) are computed from simulated aerosol concentrations using the CRTM (community radiative transfer model) and MOPSMAP (modeled optical properties of ensembles of aerosol particles) models. We will discuss and evaluate simulated LIDAR-based aerosol optical properties and show results of model-to-model comparisons as well as validations against observations.