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Inversion of aerosol sources over the Sahara desert using satellite observations

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In this study we present estimates of dust emission fluxes over the Sahara desert from an inversion system which combines aerosol optical depth (AOD) retrievals from satellite-borne instruments and aerosol modeling for a one-year period. We use the atmospheric model LMDZ coupled to an aerosol model with a regional focus on the Sahara desert. An existing inversion system is improved in order to take advantage of the zoom capability of the LMDZ model and its current developments in boundary layer, convective transport and convective scavenging parameterizations. The dust emission model from CHIMERE-DUST is implemented and tested in the coupled aerosol and atmospheric model, improving the spatial distribution of AOD over the Sahara desert. We assimilate aerosol optical depth retrievals from the MODIS Collection 6 daily combined product, and we estimate dust emission fluxes over a dozen of regions in a monthly basis. These regions are defined by combining clustering analysis of the model emission fluxes and a priori knowledge of the major dust sources regions over the desert. In this work we show the performance of the model against ground-based AOD measurements, the impacts of the choice of the dust emission model in the simulated aerosol optical depth for the forward model, and preliminary estimates of dust emission fluxes over the Sahara desert from the inversion system.