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Observation and simulation of dust aerosol cycle and impact on radiative fluxes during the FENNEC campaign in summer 2011

Fanny Minvielle (1), Yevgeny Derimian (1), Jean-Christophe Pere (1), Cyrille Flamant (2), and Gérard Brogniez (1)

(1) LOA, CNRS-USTL, Lille, France (fanny.minvielle@univ-lille1.fr), (2) LATMOS, CNRS-UPMC-UVSQ, Paris, France (cyrille.flamant@latmos.ipsl.fr)

The Sahara desert is one of the principal worldwide sources of dust aerosol emissions that play significant role in the climatic system. In the framework of the FENNEC campaign, conducted during the summer 2011, we focus on dust radiative effect and impact on the atmospheric dynamics and profile structure. We study the variability of the measured radiative parameters and model atmospheric dynamics during dust plume observations at the FENNEC sites, therefore, trying to understand the link between the Saharan heat low system and dust aerosols. Due to its large size the airborne dust can absorb and scatter not only solar, but also thermal infrared radiation, which requires consideration of both spectral ranges. Analysis of AERONET and other optical observations during the period of intensive campaign in summer 2011 provides information on variability of aerosol optical characteristics and perturbation of solar and TIR flux. We use these observations in conjunction with the meso-scale model RAMS to understand the impact of the dust plumes on the atmospheric dynamics. We also simulate the dust cycle in order to find the contribution of the different emission sources and identify structure of transport over an extended domain. Then, coupling the radiative code (GAME) we calculate the radiative forcing of dust and compare it to the radiative flux observed and computed based on the AERONET observations. Validation of simulations is made using measurements from space-borne CALIOP lidar, SEVIRI and OMI satellites, AERONET ground-based stations and observations acquired onboard the SAFIRE Falcon 20 research aircraft.