Geophysical Research Abstracts
Vol. 16, EGU2014-10940, 2014
EGU General Assembly 2014

Optical, physical and chemical properties of transported African mineral dust aerosols in the Mediterranean region

Cyrielle Denjean (a,h), Claudia Di Biagio (a), Servanne Chevaillier (a), Cécile Gaimoz (a), Noel Grand (a), Rodrigue Loisil (b,d), Sylvain Triquet (a), Pascal Zapf (a), Greg Roberts (c), Thierry Bourrianne (c), Benjamin Torres (d), Luc Blarel (d), Karine Sellegri (e), Evelyn Freney (e), Alfons Schwarzenbock (e), François Ravetta (f), Benoit Laurent (a), Marc Mallet (g), and Paola Formenti (a)

(a) Laboratoire Interuniversitaire des Systèmes Atmosphèriques (LISA), Paris, France (paola.formenti@lisa.u-pec.fr), (b) CNRS, DT-INSU, Meudon, France (Rodrigue.Loisil@univ-lille1.fr), (c) CNRM, MétéoFrance, Toulouse, France, (d) Laboratoire d'Optique Atmosphérique (LOA), Lille, France, (e) Laboratoire de Météorologie Physique (LaMP), Clermont-Ferrand, France , (f) Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS), Paris, France, (g) Laboratoire d'Aérologie (LA), Toulouse, France , (h) Leibniz Institute for Tropospheric Research (IfT), Leipzig, Germany

The transport of mineral dust aerosols is a global phenomenon with strong climate implications. Depending on the travel distance over source regions, the atmospheric conditions and the residence time in the atmosphere, various transformation processes (size-selective sedimentation, mixing, condensation of gaseous species, and weathering) can modify the physical and chemical properties of mineral dust, which, in turn, can change the dust's optical properties. The model predictions of the radiative effect by mineral dust still suffer of the lack of certainty of these properties, and their temporal evolution with transport time.

Within the frame of the ChArMex project (Chemistry-Aerosol Mediterranean experiment, http://charmex.lsce.ipsl.fr/), two intensive airborne campaigns (TRAQA, TRansport and Air QuAlity, 18 June – 11 July 2012, and ADRIMED, Aerosol Direct Radiative Impact in the regional climate in the MEDiterranean region, 06 June – 08 July 2013) have been performed over the Central and Western Mediterranean, one of the two major transport pathways of African mineral dust. In this study we have set up a systematic strategy to determine the optical, physical and optical properties of mineral dust to be compared to an equivalent dataset for dust close to source regions in Africa.

This study is based on airborne observations onboard the SAFIRE ATR-42 aircraft, equipped with state of the art in situ instrumentation to measure the particle scattering and backscattering coefficients (nephelometer at 450, 550, and 700 nm), the absorption coefficient (PSAP at 467, 530, and 660 nm), the extinction coefficient (CAPS at 530 nm), the aerosol optical depth (PLASMA at 340 to 1640 nm), the size distribution in the extended range 40 nm – 30 μm by the combination of different particle counters (SMPS, USHAS, FSSP, GRIMM) and the chemical composition obtained by filter sampling. The chemistry and transport model CHIMERE-Dust have been used to classify the air masses according to the dust origin and transport.

Case studies of dust transport from known but differing origins (source regions in Tunisia, Algeria, and Mauritania) and at different times after transport, will be presented. Results will be compared to equivalent measurements over source regions interpreted in terms of the evolution of the particle size distribution, chemical composition and optical properties.