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Free troposphere Saharan dust outbreak: optical properties and microphysics characterization from co-located observations at the Jungfraujoch station

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Both the sign and magnitude of the direct and indirect mineral dust effects on the global radiative balance are poorly understood and various observations are used to reduce this lack of information. Within this general research effort, this study presents results concerning the optical properties of long-range transported mineral dust during Saharan dust outbreaks (SDO), which are often noticed over Western Europe. This work focuses on an SDO event on August 2, 2001 in which a dust plume was observed above the Swiss Alps in the upper troposphere. Co-located *in situ*, lidar, sun photometer, nephelometer and aethalometer measurements at the JFJ station were conducted on August 1 and 2, 2001 during three different sub-periods: (a) no dust occurrence (b) dust plume, and (c) cloud-dust mixture. The measurements are comparatively analyzed. Lidar range corrected signals (RCS), elastic to molecular backscatter ratio, backscatter (β_a) and extinction (α_a) coefficients at 355, 532 and 1064 nm as well as the depolarization ratio at 532 nm are discussed. Simultaneous aerosol *in situ* measurements and aerosol optical depth (AOD) from a precision filter radiometer (PFR) sun photometer are presented. The aerosol Angstrom coefficients determined from *in situ* measurements, the sun-photometer instrument and lidar observations are used to link and compare the above mentioned co-located observations. Dust microphysical

properties, initially calculated as a spherical approximation of the dust particle shape, are also presented as a preliminary result.