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Impact of different aerosol types on the spectral solar radiation at different heights over the Mediterranean using the CALIPSO aerosol product

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Aerosols influence the radiative energy budget directly by scattering and absorbingsolar radiation (direct effect), and indirectly by altering cloud droplet size distributionand concentration (Indirect effect).Depending ontheirtype, aerosols exert acooling or warming influence on climate.Estimates of aerosol forcing can be made using models or directly from observations such as the Cloud-Aerosol Lidarand Infrared Pathfinder Satellite Observations (CALIPSO) mission, that provides a two-wavelength and depolarization aerosol profiles. We have used the LIVAS CALIPSO database developed within the scopes of the ESA project: Lidar Climatology of Vertical Aerosol Structure for Space-Based Lidar Simulation Studies) and the radiative transfer model LibRadTran, in order to study the radiative effects of aerosols in the Mediterranean region. The CALIPSO product determines the locations of aerosol layers within the atmosphere, discriminates aerosols from clouds, categorizes aerosol layers as one of six subtypes (dust, marine, smoke, polluted dust, polluted continental, and clean continental), and provides the optical depth of each detected aerosol layer. Using this information we have studied the effect of different aerosol types, on different wavelength bands, of various radiation quantities (total radiation, direct radiation and actinic flux), in three dimensions covering different heights over the Mediterranean region. The results of this study provide spatial and vertical information of the contribution of each aerosol type to the total aerosol attenuation of different spectral radiation quantities.