EMS7/ECAM8 Abstracts,
Vol. 4, EMS2007-A-00429, 2007
7th EMS Annual Meeting / 8th ECAM

The Aerosol Direct Radiative Effect in the Eastern Mediterranean based on satellite observations, reanalysis datasets, and spectral aerosol optical properties from GADS

A Fotiadi (1,2), N. Hatzianastassiou (3,1), C. Matsoukas (4,1), I. Vardavas (1,2)

(1) Foundation for Research and Thechnology-Hellas (FORTH), 71110 Heraklion, Crete, Greece, (2) Department of Physics, University of Crete, 71110 Heraklion, Crete, Greece (3) Laboratory of Meteorology, Department of Physics, University of Ioannina, 45110 Ioannina, Greece, (4) Department of Environment, University of the Aegean, 81110 Mytilene, Greece, (afotiadi@cc.uoi.gr / Fax: ++30 26510 98699)

Aerosols play an important role in the Earth's radiation budget and hence affect its climate and hydrological cycle. Mediterranean is a climatically sensitive region threatened by desertification associated with possible climatic changes. Determining the aerosol Direct Radiative Effect (DRE) for the Mediterranean Basin is of great importance since aerosol loads there are among the highest over the globe. Moreover, in this region co-exist various aerosol types such as maritime, anthropogenic and mineral dust converging from surrounding areas. In this study, for the first time, the DRE of natural plus anthropogenic aerosols is estimated for the broader area of the Eastern Mediterranean basin, using a detailed spectral radiative transfer model along with comprehensive climatological data. The necessary for computations spectral aerosol optical properties are taken from the Global Aerosol Data Set (GADS) whereas data for clouds, water vapour, ozone, carbon dioxide, methane, meteorological parameters and surface albedo are taken from various satellite and reanalysis datasets. Model computations are performed on a daily basis, and they are provided here as monthly means of total aerosol DRE in the ultraviolet-visible and near-infrared wavelengths covering the spectral range 0.2–10 μm, for all-sky conditions. The DREs are given at 1°x1° latitude-longitude spatial resolution, for the top of atmosphere (TOA, ΔF_{TOA}), in the atmosphere (atmospheric absorption of solar radiation, ΔF_{atmab}), and at the Earth's

surface (surface downward and absorbed solar radiation, ΔF_{surf} and $\Delta F_{surfnet}$, respectively), for the 12-year period 1984-1995. The average regional annual mean DRE on the outgoing SW radiation at the top of atmosphere (ΔF_{TOA}) is about 2.7 Wm^{-2} (with a range of –7.7 to 13.1 Wm^{-2}, positive values implying cooling of the earth-atmosphere system), the effect on the atmospheric absorption of SW radiation (ΔF_{atmab}) is $\sim$7 Wm^{-2} (values up to 24.1 Wm^{-2}, corresponding to atmospheric warming), and the effect on the net surface downward SW radiation ($\Delta F_{surfnet}$) is –9.7 Wm^{-2} (values up to –28.7 Wm^{-2}, corresponding to surface cooling). Given that GADS does not provide complete interannual variability of aerosol properties, monthly mean Aerosol Optical Thickness (AOT) data from TOMS (Total Ozone Mapping Spectrometer) are also used for the periods 1984–1993 (Nimbus-7) and 1996–2000 (EP-TOMS). The available AOT information from TOMS was used in combination with GADS spectral aerosol properties, in order to provide more realistic spatial patterns and magnitudes of the aerosol direct radiative effect in the study region, for example associated with seasonal cycles of dust aerosols transported from Africa deserts.