Geophysical Research Abstracts
Vol. 14, EGU2012-6515, 2012
EGU General Assembly 2012
© Author(s) 2012

Aerosol Radiative Forcing and Regional Climate Impact over Middle East and North Africa

H. K. Bangalth (1), G. Stenchikov (1), M. Zampieri (1), R. Bantges (2), and H. Brindley (2)

(1) King Abdullah University of Science and Technology (georgiy.stenchikov@kaust.edu.sa), (2) Imperial College London (h.brindley@imperial.ac.uk)

Middle East and North Africa (MENA) is a unique region due in part to the abundance of atmospheric aerosols and their significant contribution to the energy balance of the region. Mineral dust plays a leading role in this process. In this study we evaluate the radiative forcing of dust aerosols in the MENA region and their impact on the regional circulation and temperature distribution using a global high-resolution atmospheric model HIRAM developed at the NOAA Geophysical Fluid Dynamics Laboratory. We found that dust aerosols reduce downward radiative fluxes at surface up to 30 W/m2 and warm by about this amount the lower five-km-deep atmospheric layer. To better quantify radiative impact of aerosols we have employed the available aerosol satellite observations that primarily provide column integral aerosol optical depth (AOD), as a measure of aerosol burden. Climatology of AOD from different satellites (MODIS, MISR, SEVIRI and CALIPSO) over MENA and their inter comparison is made to have a comprehension of the discrepancies and agreement between them. Though the observed AODs vary among the different instruments spatially and temporally, the difference falls within a factor of less than two. We implement these observed aerosols in HIRAM. The radiative forcing corresponding to the satellite aerosol observation and the sensitivity of regional climate to this forcing are analyzed. The analysis shows that the differential heating in the vertical and the corresponding response of the vertical temperature profile have a profound impact on the tropospheric dynamics and the structure of the boundary layer.