Geophysical Research Abstracts
Vol. 15, EGU2013-705, 2013
EGU General Assembly 2013

Inter-annual variability of aerosol optical depth over the tropical Atlantic Ocean based on MODIS-Aqua observations over the period 2002-2012

Antonis Gkikas and Nikolaos Hatzianastassiou
Laboratory of Meteorology, Physics Department, University of Ioannina, Ioannina, Greece (agkikas@cc.uoi.gr)

The tropical Atlantic Ocean is affected by dust and biomass burning aerosol loads transported from the western parts of the Saharan desert and the sub-Sahel regions, respectively. The spatial and temporal patterns of this transport are determined by the aerosol emission rates, their deposition (wet and dry), by the latitudinal shift of the Intertropical Convergence Zone (ITCZ) and the prevailing wind fields. More specifically, in summer, Saharan dust aerosols are transported towards the Atlantic Ocean, even reaching the Gulf of Mexico, while in winter the Atlantic Ocean transport takes place in more southern latitudes, near the equator, sometimes reaching the northern parts of South America. In the later case, dust is mixed with biomass burning aerosols originating from agricultural activities in the sub-Sahel, associated with prevailing north-easterly airflow (Harmattan winds).
Satellite observations are the appropriate tool for describing this African aerosol export, which is important to atmospheric, oceanic and climate processes, offering the advantage of complete spatial coverage. In the present study, we use satellite measurements of aerosol optical depth at 550nm (AOD550nm), on a daily and monthly basis, derived from MODIS-Aqua platform, at 1ox1o spatial resolution (Level 3), for the period 2002-2012. The primary objective is to determine the pixel-level and regional mean anomalies of AOD550nm over the entire study period. The regime of the anomalies of African export is interpreted in relation to the aerosol source areas, precipitation, wind patterns and temporal variability of the North Atlantic Oscillation Index (NAOI). In order to ensure availability of AOD over the Sahara desert, MODIS-Aqua Deep Blue products are also used. As for precipitation, Global Precipitation Climatology Project (GPCP) data at 2.5ox2.5o are used. The wind fields are taken from the National Center for Environmental Prediction (NCEP). Apart from the regime of African aerosol export in the northern tropical Atlantic Ocean, it is also attempted to examine possible relationships between African dust export and NAO, with emphasis on identifying possible effects of the former to the later. This might be possible since aerosols through their radiative effects are known to affect atmospheric dynamics, for example modifying precipitation or the tracks and intensity of cyclones. Of course, such aerosol feedbacks on atmospheric dynamics and teleconnections are certainly complex and difficult to study, requiring the use of climate models, which is planned in a next step of the study.