Geophysical Research Abstracts
Vol. 16, EGU2014-5313, 2014
EGU General Assembly 2014

Satellite-based estimate of direct aerosol radiative effect over the South-East Atlantic

Lorenzo Costantino (1) and François-Marie Bréon (2)

(1) CEA, DAM, DIF, F-91297 Arpajon, France (lore.costantino@gmail.com), (2) Laboratoire des Sciences du Climat et de l'Environnement (LSCE), CEA, Gif sur Yvette, France

The net effect of direct aerosol radiative effect (DARE) is the balance between the scattering effect that reflects solar radiation back to space (cooling), and the absorption that decreases the reflected sunlight (warming). The amplitude of these two effects and their balance depends on the aerosol load, its absorptivity, the cloud fraction that impacts the scene albedo and the respective position of aerosol and cloud layers.
In this study, we use the information provided by CALIPSO and MODIS (AQUA satellite) instruments to constrain a Rapid Radiative Transfer Model (RRTM) and quantify the shortwave (SW) direct aerosol radiative effect, over the South-East Atlantic. The combination of passive and active measurements allows estimates of the horizontal and vertical distributions of the aerosol and cloud parameters. We use a parametrization of the Single Scattering Albedo (SSA) based on the satellite-derived Angstrom coefficient.
South East Atlantic is a particular region, where bright stratocumulus clouds are often topped by absorbing smoke particles. Results confirm the similar amplitude of the cooling (scattering) and warming (absorption) effects. Over six years (2005 – 2010) of retrievals, the mean all-sky SW DARE is -0.03 W/m2, with a spatial standard deviation of 8.03 W/m2. In good agreement with previous estimates, statistics show that a cloud fraction larger than 0.5 is generally associated with positive all-sky DARE. Considering only the case of aerosol above clouds in cloudy-sky condition, a SSA smaller than 0.91 and cloud optical thickness larger than 4 can be considered as threshold values, beyond which the direct aerosol radiative effect becomes positive.