Atmos. Chem. Phys. Discuss., 14, C8271–C8273, 2014
www.atmos-chem-phys-discuss.net/14/C8271/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Meridional distribution of aerosol optical thickness over the tropical Atlantic Ocean" *by* P. Kishcha et al.

P. Kishcha et al.

pavel@cyclone.tau.ac.il

Received and published: 20 October 2014

Effective particle radius (Reff) for liquid water clouds and the physical mechanism for the formation of cloud cover below the SAL base.

In accordance with our previously-described most likely physical mechanism for the formation of significant cloud cover below the SAL base, the number of settling dust particles decreases with the distance from the Sahara (Kishcha et al., interactive comment of October 15, 2014, www.atmos-chem-phys-discuss.net/14/C8046/2014/). Settling dust particles penetrate below the temperature inversion. Being below the temperature inversion and acting as efficient CCN, Saharan dust particles coated with soluble material contribute to the formation of cloud cover. This physical mechanism, based

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

on the indirect effect of Saharan dust on stratocumulus clouds below the temperature inversion, could explain the observed significant cloud cover (CF up to 0.8 – 0.9) along the Saharan Air Layer. It is reasonable to suggest that over zone 1 (which is closest to the Sahara), where the number of settling dust particles is maximal, the effective particle radius for liquid water clouds should be minimal. We analyzed available effective particle radius (Reff) for liquid water clouds, based on MODIS-Terra L3 gridded quality-assured monthly data over the four zones 1 – 4 (specified in acp-2014-540 by Kishcha et al.), where shallow stratocumulus clouds located under the temperature inversion. This was carried out for July 2010: it was chosen because AOT, averaged over the tropical North Atlantic, was maximal compared to AOT in other July months, during the 10-year study period. Figure C1 (see below) represents histograms of Reff over each of these four zones. One can see that the average Reff ($\pm$ standard deviation) increases with the distance from the Sahara: from 14.4 $\pm$ 1.3 μm in zone 1 to 17.8 $\pm$ 0.9 μm in zone 4. Therefore, over zones 1 – 4, there is a negative correlation between the number of settling dust particles and the average Reff\: the higher the number of settling dust particles, the lower the average Reff. This result supports the suggested physical mechanism for the formation of significant cloud cover below the SAL base.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 23309, 2014.

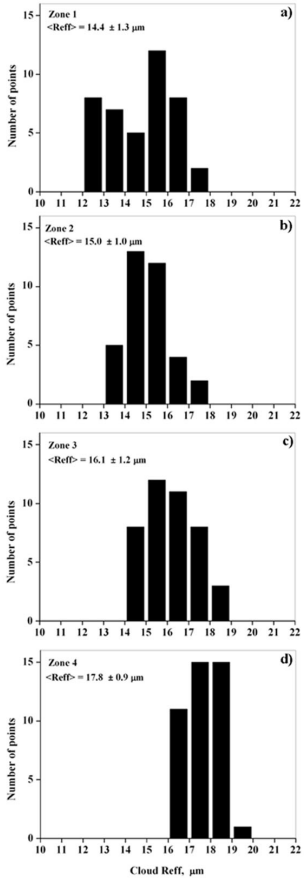

Fig. 1. The histograms of effective particle radius (Reff) for liquid water clouds in the specified zones 1 – 4 along SAL, based on MODIS Level 3 gridded monthly data with resolution 1x1 degr. in July 2010.

ACPD
14, C8271–C8273, 2014