

Impact of Dust Direct Radiative Effect on African Easterly Waves

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The effects of dust on African Easterly Waves (AEWs) has caught scientific attention for the last few decades, primarily because of close proximity of dust sources and AEW' s pathways. Being the predominant synoptic-scale disturbances over tropical Africa and Atlantic during summer, AEWs act as the major weather-producing mechanism over tropical Africa and often could play a role of precursors for Atlantic tropical cyclones. Dust radiative effect can potentially influence the structure, dynamics and the periodicity by altering the temperature profile, stability, CAPE and by modifying the environmental wind shear. However, studies in the past suggest a contrasting response of AEW to dust direct radiative effect. The present study investigates the role of dust direct radiative effect on AEWs and their sensitivity to the dust induced heating as an effort to demystify the contrasting results in the past. Ensembles of high resolution global simulations have been conducted at a spatial resolution of ~25 km, using High Resolution Atmospheric Model (HiRAM) developed at GFDL, with and without dust radiative effect. To elucidate the sensitivity of AEW to shortwave heating by dust, the experiments with dust assumes three different hematite contents (Balkanski et al., 2007), 0.9%, 1.5% and 2.7% by volume, which corresponds to inefficient, standard, and very efficient dust shortwave absorption, respectively. Comparisons among various simulations suggest that the dust radiative effect enhances the AEWs intensity and changes their periodicity. It has also been shown that AEWs strength and periodicity is sensitive to shortwave absorption by dust.

Reference: Balkanski, Y., M. Schulz, T. Claquin, and S. Guibert (2007), Reevaluation of mineral aerosol radiative forcings suggests a better agreement with satellite and AERONET data, *Atmos. Chem. Phys.*, 7, 81 - 95.

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