Geophysical Research Abstracts, Vol. 5, 02719, 2003

INTERACTIONS BETWEEN THE ITCZ AND AEROSOLS DURING INDOEX

C. Andronache (1), L. J. Donner (2), C. J. Seman (2), and R. S. Hemler (2)

(1) Boston College, Chestnut Hill, Massachusetts, USA (2) Geophysical Fluid Dynamics Laboratory, NOAA, Princeton University, Princeton, New Jersey, USA (andronac@bc.edu/Fax:1-617-552-2836)

We report model simulations of the effect of deep convection on aerosol under typical Intertropical Convergence Zone (ITCZ) conditions in the tropical Indian Ocean as encountered during the Indian Ocean Experiment (INDOEX). Measurements taken during various phases of INDOEX showed significant aerosol mass concentrations of nss-sulfate, carbonaceous, and mineral dust over the northern Indian Ocean. During the winter dry season these aerosol species accumulate and are transported long distances to the tropical regions. In contrast, aerosol measurements south of the ITCZ exhibit significantly lower aerosol concentrations, and the convective activity, mixing, and wet removal in the ITCZ are responsible for their depletion. Our results, based on a cloud-resolving model, show that convection and precipitation can remove significant amounts of aerosol, as observed in the Indian Ocean ITCZ. The aerosol lifetime in the boundary layer (BL) is of the order of hours in intense convection with precipitation, but on average is between 1 and 3 days for the case studied here. Since the convective events occur in a small fraction of the ITCZ area, the aerosol lifetime can vary significantly due to variability of precipitation. Our results show that the decay in concentration of various species of aerosols is comparable with in situ measurements and that the ITCZ can act to reduce the transport of polluted air masses into the Southern Hemisphere especially in cases with significant precipitation. Another finding is that aerosol loading typical to north of ITCZ tends to induce changes in cloud microphysical properties. We found that a difference between clean air masses as those encountered south of the ITCZ to aerosol polluted air masses as encountered north of the ITCZ is associated with a slight decrease of the cloud droplet effective radius (average changes of about 2 μm) and an increase in cloud droplet number con-

centration (average changes by about 40 to 100 cm^{-3}) consistent with several in situ measurements. Thus, polluted air masses from the northern Indian Ocean are associated with altered microphysics, and the extent of these effects is dependent on the efficiency of aerosol removal by ITCZ precipitation and dilution by mixing with pristine air masses from the Southern Hemisphere. The study illustrates the importance of aerosol removal by precipitation and consequences for aerosol effects on environment.