Transport of Aerosols Over the Bay of Bengal During Winter-ICARB

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Aerosol observations by MODIS during Winter-ICARB (Integrated campaign for Aerosol, Gases and Radiation Budget)[27 Dec 2008 to 29 Jan 2009] displayed a discernible trend in the spatial distribution of AOD over the Bay of Bengal (BoB) within the period of the campaign. This study explores the physical mechanism of the transport of aerosols from the Indian land mass towards the Bay of Bengal (BoB) that caused this variation. In order to bring out clearly the changes that occurred in atmospheric circulation which affected transport of aerosols, the campaign period was divided into two halves; the first half from 25 Dec, 2008 to 12 Jan, 2009 (FH) and the second half (SH) from 13 Jan, 2009 – 31 Jan, 2009. NCEP reanalysis winds and the convergence and vorticity computed from the winds at different atmospheric altitudes were examined to find out their influence on the aerosol distribution. A prominent feature observed in the aerosol distribution was the increase in AOD in the central and southern regions of the BoB in the SH. Similarity of surface winds over these oceanic regions in both the halves ruled out any possibility of increased production of marine aerosols during the SH. An inspection of the upper level (~700 hPa) wind field, however, revealed that the westerly winds from the Indian land mass at the Head BoB during the FH had turned northerly in the SH, thereby providing a transport channel for aerosols to the central/southern BoB. Over the Indian land mass, the positive vorticity in the north western region had intensified leading to more updraft of particles in the SH. These particles along with the anthropogenic particles over the Indo Gangetic Plain were carried by the stronger upper level winds associated with the negative vorticity in the south central Indian peninsula which provided the channel towards central BoB where the aerosols converged and descended to lower altitudes. The ensuing enhancement of aerosol concentration in the upper levels in the central BoB during the SH was supported by the extinction profiles from CALIPSO.