SIMULATION OF AEROSOL TRANSPORT AND RADIATIVE EFFECTS IN LMD-GCM DURING INDOEX-IFP 1999

M. S. Reddy (1), O. Boucher (1), J.-F. Léon (1), C. Venkataraman (2) and M. Pham (3)

(1) Laboratoire d'Optique Atmosphrique, CNRS / Université des Sciences et Technologies de Lille, Villeneuve d'Ascq, France, (2) CESE, Indian Institute of Technology, Bombay, India, (3) Service d'Aéronomie, CNRS / Université P. et M. Curie, Paris, France

During the January-March 1999, an international collaborative field experiment, Indian Ocean Experiment (INDOEX) was carried out to understand the anthropogenic aerosol effects on radiative forcing (Ramanathan, 2001). In the present work we simulated the cycle of the multi-component aerosol (sulphate, black carbon, organic carbon, dust, sea-salt and fly-ash) in the Laboratoire de Météorologie Dynamique General Circulation Model (LMD GCM) and estimated the consequent radiative forcing. Simulations are carried out in the zoomed version of the model focusing on the Indian subcontinent and Indian Ocean regions, for January-April 1999. To account correctly for the aerosol emissions in the source regions (Indian subcontinent) we have integrated newly developed SO_2 and aerosol emission inventory for India for 1999 (Reddy and Venkataraman, 2002a and b) into the global emission data set input to model.

Model performance is evaluated by comparing the simulated aerosol concentration fields against measurements over continental and oceanic stations. Model predicted concentrations agree well in the oceanic stations but are in the lower end of measurements in the continental stations. A large plume of sulphate and other aerosols extended from the Indian sub-continent into the Indian Ocean, from surface and elevated flows, extending down to 5°S in the pristine southern Indian Ocean. Predicted spectrally resolved aerosol optical depths (AOD) will be compared with sun-photometer measurements in the region. We also present a comparison of model predicted aerosol optical depths with satellite (Meteosat) derived AOD for the same period. An assessment of the multi-component aerosol radiative forcing will be made and results will be discussed in the context of the possible climate effects over the region. Finally, the regional source contributions to sulphate and carbonaceous aerosol loadings in the Indian Ocean will be presented.