Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Experimental Characterization of Radiation Forcing due to Atmospheric Aerosols K.R. SREENIVAS, D.K. SINGH, V.K. PONNULAKSHMI, G. SUBRAMANIAN, Engineering Mechanics Unit, JNCASR, Bangalore — Micrometeorological processes in the nocturnal atmospheric boundary layer (NBL) including the formation of radiation-fog and the development of inversion layers are controlled by heat transfer and the vertical temperature distribution close to the ground. In a recent study, it has been shown that the temperature profile close to the ground in stably-stratified, NBL is controlled by the radiative forcing due to suspended aerosols. Estimating aerosol forcing is also important in geo-engineering applications to evaluate the use of aerosols to mitigate greenhouse effects. Modeling capability in the above scenarios is limited by our knowledge of this forcing. Here, the design of an experimental setup is presented which can be used for evaluating the IR-radiation forcing on aerosols under either Rayleigh-Benard condition or under conditions corresponding to the NBL. We present results indicating the effect of surface emissivities of the top and bottom boundaries and the aerosol concentration on the temperature profiles. In order to understand the observed enhancement of the convection-threshold, we have determined the conduction-radiation time constant of an aerosol laden air layer. Our results help to explain observed temperature profiles in the NBL, the apparent stability of such profiles and indicate the need to account for the effect of aerosols in climatic/weather models.

K. R. Sreenivas
Engineering Mechanics Unit, JNCASR, Bangalore

Date submitted: 11 Aug 2011 Electronic form version 1.4