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Title: (OA5) Regional Scale Differences in Aerosol Direct Radiative Forcing: Role of Surface Albedo

Abstract: The direct aerosol radiative forcing is defined as the change in the surface reaching solar flux or the radiation flux leaving the earth-atmosphere due to the presence of aerosols. The intensity of the absorption and scattering of the electromagnetic radiation by aerosols depend on the refractive index of the particles which is determined by the chemical constituents present within the particle. We present here the typical aerosol optical depth (AOD) spectra measured over different regions within the Indian sub-continent as well as over the surrounding ocean regions such as the Arabian Sea, Bay of Bengal and the tropical Indian Ocean and during one of the expeditions to Antarctic. Using Mie Scattering code we fit the observed AOD spectra by selecting an appropriate mixture of the aerosol components such as sulphate, soot, sea salt, mineral dust etc. Wherever applicable we use additional information on measured aerosol size distribution and aerosol single scattering albedo to constrain the model fitting. The aerosol characteristics are further used in standard radiative codes to calculate the short and long-wave radiative fluxes at the earth surface and the top of the atmosphere (TOA). The model computed fluxes are compared with actual measurements whenever available. The differences in the flux values computed with and without the aerosols are used to compute the direct radiative forcing by aerosols. We also show that realistic prescription of the surface albedo is very essential in computing the radiative forcing over a particular site. For example we reported1 that the aerosol radiative forcing for the scattering type aerosols observed over Antarctic exerted a positive forcing of about 1 W/m2 at the TOA while the same aerosols if present over a dark ocean surface could have produced a negative forcing of about -4 W/m2. The change in the magnitude and direction put further constrain on prescribing the regional scale differences in aerosol forcing. Over the Indian subcontinent a large spatial variation exists in the aerosol concentration as well as in their chemical properties, owing to the competing natural and anthropogenic processes responsible for the production of aerosol particles. The increased concentration of the absorbing aerosols and the high reflective surfaces such as over Himalayas further imposes a strong north south gradient in the aerosol forcing over the Indian subcontinent. Results from a detailed case study is presented and discussed. Reference [1] H. Gadhavi and A. Jayaraman, Current Science 86, 296 (2004).

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