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Corresponding Author : Dr. K.KRISHNA MOORTHY (krishnamoorthy_k@vssc.org)

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Title: Characteristics of Aerosol Black Carbon over West Coastal India and Arabian Sea

Abstract: Radiative forcing due to atmospheric aerosols is one of major uncertainties in the accurate assessment of regional and global climate perturbations due to natural and anthropogenic activities. This uncertainty arises mainly due to large spatial and temporal heterogeneity in aerosol properties on the one hand and the large uncertainties in modeling the scattering and absorbing properties of aerosols. Of the various species that constitute the composite atmospheric aerosols, the Black Carbon (BC) is the principal light-absorbing constituent, which offsets partly and at times even reverses the well-known white house effect due to aerosol scattering. In spite of being mostly of anthropogenic origin and a by-product of all combustion activities, systematic characterization of BC aerosols with adequate accuracy for impact assessment are still in the infant stage globally and almost non-existent over India. As such a comprehensive characterization of BC was initiated under the ISRO Geosphere Biosphere Program over the Indian landmass. Extensive and near-real measurements of BC were made over a period of nearly two years from the coastal station Trivandrum (TVM; 8.55N, 77E) situated at the south west coast of India. In addition, as a part of Arabian Sea Monsoon Experiment extensive measurement of BC were made over the Arabian Sea, onboard Sagar Kanya, during intermonsoon (March-April) and summer monsoon (May-June) seasons of 2003. These data were used to characterize the temporal features of BC between the two distinct environments and to assess the role of change in synoptic conditions as well as airmass types in modifying the abundance of BC and its spatial pattern. The absolute concentrations as well as the temporal variations of BC observed over Arabian Sea were distinctively different from those observed over the land. The diurnal variations were quite weaker over the ocean compared to the landmass, where BC exhibits peak values in the nighttime and early morning, decreasing gradually towards the daytime and reaching the diurnal low in the afternoon hours. However, in contrast, the diurnal variation is discernible over ocean, even if weakly, only during periods when the airmass has a continental history. As the airmass changes to marine, the diurnal variations vanish completely over the ocean, even though it still persists, though weaker, over the landmass The comparison of the values observed over Arabian Sea with those reported in literature for several oceanic environments shows that the values seen over the Arabian Sea are much higher than the values reported over remote Pacific; but are comparable to those over more polluted regions of the Atlantic and near East China Sea on western Pacific and less than that observed in winter season over northern Indian Ocean. Nevertheless, they are quite smaller than the average values observed over the adjoining coastal location, during the same period, showing large spatial and temporal heterogeneity. Such large seasonal changes in BC concentration and its heterogeneity even over short spatial scales in a given season would significantly influence the regional radiative forcing. The results will be presented and impact on radiative forcing will be discussed

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Co-Authors

No.	Title	First Name	Family Name	Organization
1	Mr.	Suresh	Babu S	Space Physics Laboratory