Composition of Aerosols over Indian Landmass and Adjoining Oceans: Source Characteristics and Evolution of Chemical Models

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Knowledge on chemical composition of aerosols is essential in assessing their radiative/climatic, environmental as well as biological impacts. The large spatial and temporal heterogeneity in sources/sinks of aerosols demands characterization of aerosol properties on regional basis. However, wide gaps exist in the database on aerosols properties, in particular, on their chemical characteristics. In view of the scarcity of data on chemical composition of aerosols over Indian region, Geosphere Biosphere programme of Indian Space Research Organisation has envisaged several projects and campaigns covering Indian land mass and adjoining oceanic environments. Aerosol samples were collected from the various locations using a single stage high volume sampler loaded with quartz fibre filter. The water soluble anions like SO_4, NO_3, Cl, PO_4, F, Br, and cations of Na, K, Mg, Ca and NH_4 samples were analysed using Ion Chromatography. Metallic components viz Na, K, Al, Fe, Ca, Mg, Cu, Zn, Mn, Pb were quantified using Atomic Absorption Spectroscopy and Inductively Coupled Plasma – Atomic Emission Spectroscopy. This paper presents the chemical nature of aerosols at geographically different regions like coastal, inland, high altitude canopy, Indo Gangetic Plains and Oceanic environments of Bay of Bengal and Arabian Sea. These data have been used to identify the source characteristics of aerosols over these regions, the role of transport and also to evolve realistic chemical models over these regions. The major aerosol components viz. water soluble, seasalt, mineral dust and organic matter have been estimated and the first-cut models for chemical composition of aerosols for different geographic environments have been evolved. The models indicate significant region-specific differences in the chemical nature of aerosols. Apart from this, synoptic meteorological features also induce seasonal variations in aerosol chemical composition.

Keywords: atmospheric aerosols; aerosol chemistry; chemical model; aerosol sources/sinks.