INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

India, the 2nd most populous country, is identified as the 11th mega biodiversity center in the world and 3rd in Asia. However, the increasing anthropogenic activities like expansion of industries, urbanization and huge consumption of fossil fuels led to detrimental effects on varieties of ecosystems and deterioration of air quality. According to world health organization (WHO, 2016) report, out of world's 20 most polluted cities, 14 cities belonging to India pose major environmental risk due to air pollution to human health. Numerous epidemiological and toxicological studies have insisted an association between particulate matter (PM) and reduced life expectancy, high mortality and morbidity rates. Eventhough studies related to total mass of PM are increasing, there are very few studies in India focusing on the size segregated PM. Also, in countries like India, having the world's highly polluted cities, wet deposition can provide great relief in subsiding the air pollution. However, the chemical composition, especially Sulfur and Nitrogen compounds of the rain water could be of particular concern. Thus, a combined analysis of both wet and dry depositions and the systematic mechanism of these processes should be of prime focus. Therefore, the present study was conducted in Assam, which is identified as one of the 200 eco-regions in the world and the most populous state of northeast India. A total of five locations (three urban (S1, S2, S3) and two rural (S4, S5)) for size resolved aerosol dry deposition and one urban location for wet deposition were considered for the study. Laboratory testing techniques were adopted to comprehensively characterize the samples collected. The regional deposition of these measured elements of size resolved PM was evaluated in order to understand their effects on human respiratory tract. In addition, source apportionment analysis using the US EPA's Positive Matrix Factorization (PMF) model was performed to assess the dominant sources and their contributions for both wet and dry depositions. Results obtained from each of these deposition mechanisms were analyzed independently and discussions were presented for both wet and dry separately. Out of 40 rain events sampled, 31 were acid rain events with pH <5.6. The occurrence of acid rain events in this region, was elaborately discussed in terms of chemical characterization and neutralization factor. The size segregated samples collected in the selected locations were carefully analyzed and discussed in terms of regional deposition in human respiratory tract using inhalation and deposition curves. PMF revealed five to eight factors at each individual site in NOPL, TB and P regions: biomass burning (accounting for 7-32% of PM), coal combustion (14-27%), construction dust (9-25%), dust emissions (17-28%), industrial emissions (12-26%), oil refinery (18%), secondary aerosols (17-33%) and vehicular emissions (12-39%). Clear distinction between urban and rural environments was observed with dominant sources as vehicular emissions in urban and biomass burning and dust emissions in rural areas. Therefore, this combined approach of both wet and dry depositions forms a basis upon which the future air quality studies can be formulated in this region and also facilitates the findings to be utilized to design better air pollution mitigation strategies in this region.