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Water soluble ions in aerosols (TSP) : Characteristics, sources and seasonal variation over the central Himalayas, Nepal

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Atmspheric pollutants transported from South Asia could have adverse impact on the Himalayan ecosystems. Investigation of aerosol chemistry in the Himalayan region in Nepal has been limited on a temporal and spatial scale to date. Therefore, the water-soluble ionic composition of aerosol using TSP sampler was investigated for a year period from April 2013 to March 2014 at four sites Bode, Dhunche, Lumbini and Jomsom characterized as an urban, rural, semi-urban and remote sites in Nepal. During the study period, the highest concentration of major cation was Ca2+ with an average concentration of 8.91, 2.17, 7.85 and 6.42 μg m-3 and the highest concentration of major anion was SO42- with an average of 10.96, 4.06, 6.85 and 3.30 μg m-3 at Bode, Dhunche, Lumbini and Jomsom respectively. The soluble ions showed the decrease in concentrations from urban to the rural site. Correlations and PCA analysis suggested that that SO42-, NO_3- and NH4+ were derived from the anthropogenic sources where as the Ca2+ and Mg2+ were from crustal sources. Our results also suggest that the largest acid neutralizing agent at our sampling sites in the central Himalayas are Ca2+ followed by NH4+. Seasonal variations of soluble ions in aerosols showed higher concentrations during pre-monsoon and winter (dry-periods) due to limited precipitation amount and lower concentrations during the monsoon which can be explained by the dilution effect, higher the precipitation lower the concentration. K+ which is regarded as the tracer of biomss burning had a significant peaks during pre-monsoon season when the forest fires are active around the regions. In general, the results of this study suggests that the atmospheric chemistry is influenced by natural and anthropogenic sources. Thus, soluble ionic concentrations in aerosols from central Himalayas, Nepal can provide a useful database to assess atmospheric environment and its impacts on human health and ecosystem in the southern side of central Himalayas, Nepal.

Key words: TSP; Aerosol; Seasonal variation ; Monsoon ; Himalayas, Nepal