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Study of chemical composition of atmospheric bulk deposition in an industrialized area in the Western Province

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The chemical composition of the atmospheric bulk deposition was studied at three monitoring stations in the Western province. Dalugama, Thambiligasmulla and Sedawatta were chosen as the monitoring stations which are considered to be highly polluted areas in Sri Lanka, influenced by heavy road traffic on the A1 road, the Sapugaskanda oil refinery and the Kelanithissa power plant. The samples were collected weekly from February to June 2010. Conductivity, pH, and concentrations of NH_4^+, NO_3^-, SO_4^{2-}, Na, Mg, Ca and Pb were determined for each bulk sample. The concentrations of NH_4^+, NO_3^- and SO_4^{2-} were determined colorimetrically, while the concentrations of metals Na, Mg, Ca and Pb were determined using Atomic Absorption Spectroscopy (AAS). Meteorological data, i.e., wind direction, rain fall, air temperature and atmospheric pressure were also collected during the study period in order to determine any influence on bulk deposition. Pearson's correlations were determined using the statistical package (SPSS 16.0 for windows).

The study indicated that the acidity of rain water varied from low pH (5.41) to high pH (9.56). One incident of an acid rain condition has been reported at each sampling site during the study period indicating a rare occurrence of pH of the bulk sample below 5.60. As expected, both sulphate and nitrate concentrations were negatively correlated with pH at each site. Both calcium and magnesium concentrations showed positive correlations with pH at each site. Strong positive correlations were observed between ammonium, nitrate, sulphate, magnesium, calcium and sodium concentrations with concentration of lead, at each site. Although the nitrate and sulphate concentrations show high values in rain water, the pH was balanced by the buffering action of ammonium, calcium and magnesium. This buffering action was frequently seen in all sampling sites throughout the study period.

Both the rainfall and the wind direction influenced the dispersing and scavenging of air pollutants. Vehicular emissions, the influence of Kelanithissa power plant and the Sapugaskanda oil refinery could have been the major sources for the reported composition. But, for precise identification of the source and to design an atmospheric model, continuous investigation for a prolonged period is essential.

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