Abstract No: MR-21

Comparison of rainwater quality of three areas located in the vicinity of an oil refinery and thermal power plant in Sri Lanka

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The chemical composition of rainwater, a form of wet deposition, differs over time due to a broad range of physical, chemical, and biological factors. The purpose of this analysis was to establish and compare the key ionic composition and water quality parameters of bulk deposition samples considering rainfall patterns, rainfall rates and pollutant sources. Three sampling sites were selected for the study in the Gampaha District in Sri Lanka which were separated by 7 km from each other. The first site was in the Makola South (MS) which represented an area in the vicinity of an oil refinery and thermal power plants; the second and third sites were in the University of Kelaniya (UOK) and Orugodawatta (OW) respectively, representing urban environments. Bulk depositions were collected after the container was almost filled avoiding any overflow. The chemical analyses of anions (F^-, Cl^-, NO_3^-, SO_4^{2-}) in bulk depositions were carried out using the Dionex ICS-900 ion chromatography system and metals (V, Cr, Mn, Fe, Ni, Cu, Zn, As, Cd, Pb) were analyzed using the ICP-MS 7800-Agilent system. The average pH in MS, UOK and OW sites was 6.70, 7.15 and 7.31 respectively, and it was almost neutral due to atmospheric neutralization. The average conductivity values of MS, UOK and OW sites were 40.96 μScm^{-1}, 35.63 μScm^{-1} and 38.93 μScm^{-1}, respectively. The average values of other water quality parameters (salinity, TDS) were higher in the MS site than the other sites. The dominant metals were Na, Cr, Fe, Cu, As, and SO_4^{2-} was the dominant anion in the MS site than the other two sites showing the pollution may be due to the influence of oil refinery and the thermal power plants situated near the MS site. The results indicated that the metal concentrations, anion concentrations and the water quality parameters from the rainwater collected among the MS, UOK and OW sites, the MS site has higher concentrations and higher pollution due to its location being in the vicinity of the oil refinery and thermal power plant. According to the results obtained it can be stated that rainwater analysis can be used as an indirect method to determine ambient air quality.

Keywords: Anion concentration, Bulk deposition, Heavy metals