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Chemical characteristics of wet precipitation at Peradeniya in Sri Lanka

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Abstract The purpose of this research was to study chemical characteristics of precipitation in Peradeniya (Latitude 6.973701, Longitude 79.915256), Kandy District in Sri Lanka. This study was conducted during 2012 to 2014, and wet precipitation was analyzed for pH, conductivity, Na^+, NH_4^+, K^+, Mg^{2+}, Ca^{2+}, F^-, Cl^-, NO_3^-, SO_4^{2-}, Pb, Cu, Mn, Al, Zn, and Fe for a total of 125 samples. Less than 2% events of acidic precipitation were recorded, and the VWA of the major ionic species present in precipitation samples were in the order of $Ca^{2+} > Na^+ > Cl^- > NH_4^+ > SO_4^{2-} > K^+ > NO_3^- > Mg^{2+}$. Neutralization of acidity of precipitation is much more related to $CaCO_3$ than NH_3, and the presence of high content of Ca^{2+} strongly supports this fact. When considering marine contribution, SO_4^{2-}/Na^+, Ca^{2+}/Na^+, Mg^{2+}/Na^+, and K^+/Na^+ ratios are higher than the reference value suggesting that contribution of sources other than marine. Concentration of Zn is the highest while that of Mn is the lowest. Principal component analysis identified probable sources for major ionic and elemental sources as both natural and anthropogenic sources such as vehicular emission due to heavy traffic, waste incineration, bio mass burning, brass industry, and construction.

Keywords Atmospheric pollution · Chemical composition · Correlation, · Ionic constituents · Neutralization

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Introduction

Atmospheric deposition can be referred to the introduction of different types of pollutants, mainly dust, metal ions and their compounds, anions, nutrients, and volatile organic compounds, generated through various anthropogenic and natural activities, into ecosystems (Yu et al. 2017; Rao et al. 2016; Huang et al. 2019; Sakihama et al. 2008). Among them, burning fossil fuels would probably contribute to significant level toward acid rain owing to the release of sulfur and nitrogen-containing compounds to the atmosphere (Ghorani-Azam et al., 2016). It has also been reported that sulfur concentrations in lake waters began to increase after the industrial revolution, supporting the above fact (Weyhenmeyer and Karlsson, 2009).

It is known that in-cloud scavenging and below-cloud scavenging are the two major types of wet scavenging processes of pollutants present in the atmosphere (Alastuey et al. 2001; Lee et al. 2000; Mahato et al.