Chemical characterization of rainwater from a sugar cane site of São Paulo State, Brazil

[a]Oliveira P L, [a]Figueiredo B R, [c]Cardoso A A

The purpose of this study was to assess the composition of rainwater in Araraquara, São Paulo State, Brazil. The region is strongly influenced by pre-harvest burning of sugar cane crops. Variables such as pH, ions (soluble fraction) and trace elements (soluble and insoluble fractions) were measured in rainwater collected during harvest, dry period of 2009 and non-harvest, wet period of 2010. Additionally, supplementary information on the insoluble fraction was assessed by scanning electron microscopy and energy dispersive X-ray (SEM/EDX). This insoluble fraction was shown to contain mainly quartz, feldspar, kaolinite, zircon and oxides as well as loads of amorphous and biogenic particles. The rainwater pH ranged from 4.7 to 6.7 with volume weighted mean (VWM) at 5.5. VWM concentrations of Ca^{2+} and NH_4^+ were responsible for 55% of cations and VWM concentrations of NO_3^- were responsible for 45% of anions in rainwater. Al and Fe were found to be the most abundant among trace elements in both soluble and insoluble fraction of rainwater. Temporal variation was observed for both ions and trace element concentrations. High VWM concentrations for most of analyzed species were observed in harvest period, mainly due to agricultural activities and meteorological conditions. Similar temporal variation was also observed in other sites in the "sugar cane belt" of São Paulo State. According to neutralization tests, 78% of all nitrates, sulphates and chlorides were neutralized by calcium and ammonium. Three factors obtained from the principal component analysis (PCA) explained 79.7% of total variance. Factor 1 had highly positive loaded for Na^+, K^+, NH_4^+, NO_3^-, Cl^-, SO_4^{2-}, indicating mainly agricultural activities, factor 2 included Cu, Mn, Ni and V indicating mainly vehicular emissions and factor 3 showed high correlations with soil/dust sources, since Al and Fe were present in this factor.

[a] Institute of Geosciences/UNICAMP – Campinas, SP –Brazil (patricialopes@ige.unicamp.br)
[b] Institute of Chemistry /UNESP – Araraquara, SP – Brazil