Geochemical behaviour of trace metals in soils in the Suape industrial-harbour complex, Pernambuco, Brazil

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The implantation of new industries and infrastructure (roads and piers) in the Suape Industrial Harbour Complex together with the weathering action are responsible for the transportation of particulate matter do the surrounding water bodies. A geochemical behaviour study of trace metals was done in the watershed of the Tatuoca River aiming to show the geochemical affinity among the chemical elements. Thirty six soil samples were collected using a helical auger and four 50 cm long core samples collected at the bottom of the river using a percussion sampler. The soil samples were distributed in grid 100m x 100m and were collected at a 50cm depth. The stream sediment core samples were divided in 5 cm intervals. After the appropriate preparation the samples were analyzed by ICP/AES for: Al, Ba, Be, Cd, Co, Cr, Cu, Fe, La, Li, Mo, Ni, Pb, Sc, Sr, Ti, V, Y, Zn and Zr. Grain size particle distribution were also determined using wet sieving. Principal component analysis and concentration maps were used to interpret the data. The results indicate two groups of soil sample: the first one including molybdenum, zinc and zirconium together with sand particle size fraction, and the second group containing Fe, Cr, V, Ti, Ni, Co, Cd and Sc. The presence of zirconium and sand particle size fraction suggest that zirconium is of geogenic origin. Molybdenum may be related to the fertilizers used in the area, which was used for decades as sugarcane plantation fields. The second group is probably associated to ferrous minerals. They are also associated to the clay and silt particle size fraction. Comparing the soil results to that of stream sediment profiles one can conclude that the stream sediments collected closer to the infrastructure and industrial implementation works are richer in sand fraction, Mo, Zr and Zn. On the other hand, the stream sediment profile further from the construction works is richer in Fe, Cr, V, Ni, Cd and Pb. Therefore, the environmental risk involved in the transport of soil constituents in the watershed of the Tatuoca River is higher for Cr, Cd, Ni and Pb, which can be transported longer distance due to their association to the fine soil fraction than to Zn which is associated to the coarser soil fraction and are not transported long distances. The understanding of the geochemical behaviour of chemical elements present in watershed (geogenic or anthropogenic) is important in land use occupation and also in establishing a local background value to evaluate future environmental impacts due to trace metals present in stream sediments.

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