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Ionic composition and greenhouse gases evaluation in Tietê River sediment and mud landfill

M.A. La-Scalea (1), A. Fornaro (2), E.L. Abreu (2), and C.A. Mendonça (2)

(1) Instituto de Ciências Ambientais, Químicas e Farmacêuticas, Universidade Federal de São Paulo, Diadema, Brasil (mauro.scalea@unifesp.br), (2) Instituto de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de São Paulo, São Paulo, Brasil

There are 39 cities composing the Metropolitan Area of São Paulo (MASP) which has grown seven times during the last sixty years, reaching, in 2011, 19.3 million inhabitants. This fact associated with a strong industrial development provoked, among other consequences, a disordered urbanization along the most important river of the region: Tietê. About 100 Km of its 1,150 Km full extension crosses MASP and, during the 60's, Marginal Tietê roadway was constructed, occupying the river banks as access routes. Tietê River was straightened and several landfills were created with its deposit (sediment and mud). EACH-USP (46.50 W, 23.48 S) lies nowadays in one of these areas, where this work has been developed. Therefore, the goal is to evaluate the chemical composition (ionic and gases) and its variability in function of the depth levels using three wells, from 0.60 to 9.0 m of depth. The wells were perforated in September 2011, end of the dry weather. Each well owns a homemade multiport sampling device (HMSD), being possible to push gas and/or water up from 15 available ports. The gases measurements were carried out using a GEM-2000 plus (Landtec) portable analyzer. Aqueous samples containing solid material were taken at each level depth from ports of the HMSD. However, no water was found in some levels. All samples were kept cooled until analysis procedures. After decantation of the solid material, the supernatant liquid was divided in two portions, being its conductivity (Micronal conductimeter) and pH (pH-meter Metrohm 654 with combined glass electrode) measured with the former and ionic analysis with the latter, in which all samples were filtered (Millex 0.22 micrometer pores) before each ionic chromatographic analysis, using Metrohm 850 System, for the ions: sodium, ammonium, potassium, calcium, magnesium, chloride, nitrate and sulfate. The first sampling stage was carried out during November and December 2011 in the beginning of rainy season in the mid Spring. From all the analysis performed, a large variability of the results may be observed for both gases and ionic composition not only among the wells, but also among the different depth levels. Vertically, one of the wells (W2) showed the same percentage of gases, methane 55% and carbon dioxide 45%, at all depth levels, while the other two wells (W1 and W3) presented these gases percentages only under 5.0 m deep. Concerning oxygen, 25% of this gas was detected at 1.0 m under the surface in W1 and W3. In relation to aqueous samples, the most acidity was observed near the surface (0.60 m deep, W1), pH 4.65, while pH 7.88 was obtained under 5.0 m deep (W3). For ionic concentrations a large range was observed considering all wells, being the lowest values for sulfate, from 0.60 to 20 mg/l, and the highest values for ammonium, between 14 and 53 mg/l. These results variability can be associated to the different soil composition layers, as well as to the biodegradation process and the time confinement of the river material deposit.