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## Principal Component Analysis for urban groundwater characterization

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Groundwater for public supply is a usual alternative, which has grown worldwide. However, different land uses, such as urban, agricultural and manufacturing activities, have modified the chemical properties of groundwater. Quality monitoring and preservation of aquifers are indispensable, in order to maintain their sustainability. This work assesses the chemical characteristics variation of groundwater from 27 wells used for public supply located in the northeast of Guarani Aquifer System, in São Carlos (SP), Brazil. Specifically, we aimed to identify parameters affected by human activities. For the chemical characterization, the following parameters were analyzed: pH, electrical conductivity, redox potential, temperature, major ions and metals in groundwater samples collected from pumping wells, according to Standard Methods for the Examination of Water and Wastewater (APHA, AWWA). A set of quantitative analytical data from the Guarani Aquifer System was processed by descriptive statistical analysis and a multivariate statistical method; Principal Component Analysis (PCA), in order to investigate the groundwater composition. The experimental matrix consisted of 25 physical and chemical variables, determined in 27 groundwater samples. PCA allowed finding out associations between variables, thus reducing the dimensionality of the data table in a 2D matrix. The samples were distributed in two main groups in a Principal Component Analysis (PCA) describing 62.7% of the total samples variability. In the first group, 14 groundwater samples were assigned to 38.7% of the variability, related to geochemical evolution processes, which are characterized by: bicarbonate, calcium, dissolved organic carbon, pH, electrical conductivity, sodium, temperature and magnesium. The second group (5 samples) represents 24% of the variability and consists of chloride, nitrate, Eh, potassium, sulfate and fluoride, which may be associated to anthropogenic origins. It was observed nitrate in 6 samples varying from 0.26 to 2.68 mg.L<sup>-1</sup> of N-NO<sub>3</sub>. Although the concentrations are below the maximum value allowed by CONAMA 357/2005 standard (10 mg.L<sup>-1</sup>), it is important to identify their source since groundwater in a confined aquifer should not be in contact with human sources of contamination. This preliminary groundwater characterization may assist the water resources management by the local Water Supply Company and support future studies on the identification of environmental contamination sources.

**Keywords:** Hydrochemistry Water quality conservation PCA Contaminant

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