

## Sources, transport and fate of chemicals

maturity. Similar predominance of C<sub>29</sub> diasteranes in oils G, C and F; higher proportions of C<sub>27</sub> diasteranes in oils A and F; and a relatively constant C<sub>28</sub> diasterane contribution suggest to oils G and C the same sources by a dominant higher plant material contribution. PAHs show presence of methylnaphthalenes (DMN, TMN e TeMN); methylphenanthrene (MP, DMP and TMP) and tricyclic aromatic steranes. By aromatic parameters the crude oils A, C, D and G show the same maturation. Alkylphenoles, especially phenol and cresols, showed the same distribution, but different concentration to *o*-, *m*- and *p*-isomers to the oil studied. The differences on distribution and concentrations of alkylphenols in oils A, C and F result from different migration distances and/or different adsorption onto mineral/organic surfaces and/or partition into water in the carrier beds during petroleum migration. The differences in the ratios (a)/(c) and (a)/(a)+(c) found these four oils can be attributed to migration distances.

## GEOSTATÍSTICAL MAPPING OF THE CONCENTRATION OF Zn IN THE BAY OF SEPETIBA IN RIO DE JANEIRO, BRAZIL

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In general, the growth of the economical activities in a country is directly correlated to the increase of pressure on natural systems, leading several authorities and specialists to the discussion of the impacts generated and the main actions to minimize them. Over the

last years, such discussions have established new paradigms in the means of production in terms of sustainable growth and preservation of natural resources for future generations. In particular, the concern with the water systems has been great, since those are the ones that are most affected by industrial and domestic activities. Within this context, this study will approach the contamination with *Zn* of the Bay of Sepetiba, located in the state of Rio de Janeiro, in the southwest region of Brazil. As a result of the industrial and urban expansion over the last three decades, the region has been rather impacted, particularly with the contamination with *Zn*, as it has been recorded by several authors. With the purpose of assessing precisely the human action concerning the *Zn* in the region, the concentrations of this metal were determined by instrumental neutron activation analysis (INAA) in 60 samples geographically referred in a regular network. The distribution and evaluation of the risks due to the contamination with *Zn* in Sepetiba were investigated through classic statistical techniques and geostatistics. In order to limit the effects of discrepant values and later geostatistical analysis, the data were normalized through a Box-Cox transformation. The parameters of the spatial distribution of the concentrations of *Zn* were estimated through the adjustment from the theoretical to the experimental variogram via method of the minimum pondered squares. The mapping of the concentrations of the metal studied in this work was carried out through ordinary kriging. In order to evaluate the quality of the geostatistical analysis, the prection variances maps was designed and the cross-validation was carried out. Aiming at identifying the most critical areas with regards to the contamination with *Zn*, it was constructed the map of probability of concentration that exceed the contents found in the regions that did not undergo human influence. The results obtained in this study provide precise information to evaluate the risks posed by high concentrations

of Zn in the Bay of Sepetiba, with the purpose of aiding the authorities in their decisions to effectively control the problem.

### STUDY OF BIOAVAILABILITY OF ARSENIC AND LEAD IN STREAM SEDIMENTS AT VALE DO RIBEIRA

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The area of Alto Vale do Ribeira, in the states of São Paulo and Paraná, has been considered as the main source of contamination by heavy metals, mainly lead and arsenic, due to large mining activity in the past decades. In its medium course, the Ribeira river crosses the areas of Piririca and São Pedro, where gold mineralization in quartz veins and sulfides are found. In the areas of Piririca and São Pedro, recent studies report concentration from < 2 to 137  $\mu\text{g/g}$  of arsenic and 6.6 to 916  $\mu\text{g/g}$  of lead in samples of stream sediments. These results of a study of bioavailability of lead and arsenic was done in stream sediments of those areas, looking for a better association between the anomalies found and the risk to health of people who live in those areas. The bioavailability of metals in the biota depends basically on three chemical formulas in which the element is found, and that is possible to be absorbed by organisms. The pure presence of highly concentration of