

Riverine organic matter characterization using sterols as biomarkers in two Brazilian small watershed, Macacu and Caceribu rivers, RJ, Brazil

^aBernardes M C, ^aWasserman J C F A, ^bWasserman M A V, ^bCunha T S, ^aVieira-Filho E

The analysis of sterols in sediments of rivers aims to identify possible sources of organic material coming from the drainage basin as well as infer the diagenetic processes suffered by these materials during transport and deposition. Added to those sources, changes in land cover by human activities have introduced large amounts of anthropogenic organic compounds. This work presents results on the following sterols: coprostanol, cholesterol, cholestanol, colestano, campesterol, stigmasterol, β -sitosterol, ergosterol and stigmasterol in ten sampling stations of river sediments spread in Macacu and Caceribus river basins during the rainy and dry seasons of the year 2010. Spatial and seasonal distributions of sterol concentrations in Caceribus and Macacu rivers showed the predominance of sitosterol and estigmasterol. Both come from plant debris carried from the watershed soils to the main rivers through runoff. In the dry season, samples from the final stretch of the drainage basin present markers of faecal origin (coprostanol) and decomposition processes from bacteria (cholestanol) and fungi (ergosterol) microorganism. These occurrences indicated an increased organic load with simultaneous increase in decomposition activity. Using Principal Component Analysis (PCA), we can show that the first axis is controlled by the parameters related to

processes while the second axis is related to distinct sources. A polar projection of the samples showed scores ordination in four groups. The first group contain the largest number of samples with low sterols concentrations, indicating an environment with high hydrodynamic and transport. A second group represented by higher values of sterols can be characterized by depositional environments. Both groups have a predominance of terrigenous plant sterols. A third group is characterized by sterols under domestic sewage influence, distinguishing samples with high faecal contamination with those just under of low influence. A fourth group displays high values of ergosterol, a compound present in the fungi biomass, tracing organic matter decomposition. Using this approach we conclude that stations along the main channel of Caceribu River were characterized by seasonal variability, alternating terrigenous sources predominance, from plant material during rainy season, with a more faecal influence during the dry period. The Macacu River presented higher transport characteristics and a mix of terrigenous material and waste sources, despite of low faecal sterols concentrations. It is noteworthy that faecal contamination was observed mainly during the dry period and low values of bacterial sterol (cholestanol) indicate recent contamination by sewage.

^a Universidade Federal Fluminense, Departamento de Geoquímica, Instituto de Química 5 andar, Campus Valonguinho, Niterói, RJ, Brasil, CEP:24020-141 (bernardes@geoq.uff.br)

^b Instituto de Engenharia Nuclear (IEN), Laboratório de Impactos Ambientais (LIMA), Ilha do Fundão, Rio de Janeiro, RJ, CEP:21941-972