

Distribution of Current Emerging Contaminants in South Africa Surface and Groundwater

Authors : Jou-An Chen, Julio Castillo, Errol Duncan Cason, Gabre Kemp, Leana Esterhuizen, Angel Valverde Portal, Esta Van Heerden

Abstract : Emerging contaminants (EC) such as pharmaceutical and personal care products have been accumulating for years in water bodies all over the world. However, very little is known about the occurrences, levels, and effects of ECs in South African water resources. This study provides an initial assessment of the distribution of eight ECs (Acetaminophen, Atrazine, Terbutylazine, Carbamazepine, Phenyton, Sulfmethoxazole, Nevirapine and Fluconazole) in fifteen water sources from the Free State and Easter Cape provinces of South Africa. Overall, the physiochemical conditions were different in surface and groundwater samples, with concentrations of several elements such as B, Ca, Mg, Na, NO₃, and TDS been statistically higher in groundwater. In contrast, ECs levels, quantified at ng/mL using the LC/MS/ESI, were much lower in groundwater samples. The ECs with higher contamination levels were Carbamazepine, Sulfmethoxazole, Nevirapine, and Terbutylazine, while the most widespread were Sulfmethoxazole and Fluconazole, detected in all surface and groundwater samples. Fecal and E. coli tests indicated that surface water was more contaminated than groundwater. Microbial communities, assessed using NGS, were dominated by the phyla Proteobacteria and Bacteroidetes, in both surface and groundwater. Actinobacteria, Planctomycetes, and Cyanobacteria, were more dominant in surface water, while Verrucomicrobia were overrepresented in groundwater. In conclusion, ECs contamination is closely associated with human activities (human wastes). The microbial diversity identified can suggest possible biodegradation processes.

Keywords : emerging contaminants, EC, personal care products, pharmaceuticals, natural attenuation process

Conference Title : ICEWRM 2018 : International Conference on Environment and Water Resource Management

Conference Location : Tokyo, Japan

Conference Dates : May 28-29, 2018