Monitoring of emerging contaminants (pharmaceuticals, Personal Care Products, surfactants and heavy metals) in a quaternary detritic aquifer

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The presence of 209 emerging compounds, surfactants, priority substances according to the 2008/105/EC Directive, 10 heavy metals and microbiological organisms in blended water and aquifer samples was investigated in a quaternary aquifer. The effects of these compounds over the environment are not clear in many cases, but many of them have been classified as endocrine disruptor compounds, EDC. Their presence in the media is controlled in one hand by their transformation and/or removal rates and, on the other hand, by their continuous release into the media, due to the broad use of these in many human activities (pharmaceuticals, personal care products, pesticides, heavy metals, LAS and others). The attention of this work focusses on the presence and fate of these substances in the vadose zone and the aquifer.

The aquifer catchment (81km2) located in SE Spain presents a high natural salinity (with EC values of $\sim$7,500 μS cm-1, and high concentrations of chloride, sulphate and sodium), making it unsuitable to be used as drinking water or irrigation. Two sampling campaigns (February and June 2011) in wells and springs have been carried out top characterize physic-chemical, microbiological and emerging contaminants presence in the aquifer. A total of 209 emerging pollutants grouped into the following classes were analysed: 125 pharmaceutical compounds (Phs), 20 polyaromatic hydrocarbons (PAHs) and Dioxins, 46 pesticides, 3 volatile priority pollutants as well as the most commonly used anionic surfactants were identified for further analysis. Heavy metals included: Cu, Cd, Pb, Hg, Ni, Zn, Sn, Pt, Pd and Tl.

Results showed that 39 out of all compounds were detected: 11 pharmaceuticals, 9 PAHs, 19 pesticides, 4 surfactants and 4 heavy metals. Two of the compounds, endosulfan-α and Ni, were detected in concentrations above the allowed regulation. Although results are limited to 2 sampling campaigns, it is important to note that surfactants (LAS), pesticides PAHs and Dioxins were detected in most of the water samples, this indicates the presence of wastewater effluents of urban origin and agricultural impacts. The ubiquitous presence of LAS is related to the low-sorption capacity and its wide variety of applications, ranging from cleaning products to pesticide formulation (among others).