

The Distribution of Geogenic and Anthropogenic Rare Earth Elements and Yttrium in Major European Rivers: The PANORAMA River Monitoring

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Rare earth elements and yttrium (REY) are vital components in numerous high-technology products and processes. Hence, they are increasingly released into the environment from various point and diffuse sources. By now, they have become emerging micro-contaminants in natural waters. The presence of anthropogenic Gd results from the release of Gd-based MRI contrast agents via the effluents from wastewater treatment plants. This is well-documented from all populated continents and is an example of REY microcontamination from a diffuse source. Contamination with anthropogenic La so far appears to be confined to Germany where it has been reported for the lower reaches of the Rhine River. It originates from an industrial point source and is related to the production (not the application) of La-doped zeolithes used as fluid catalytic cracking catalysts in refineries. Whether fertilizer production and/or application is an anthropogenic REY source to the environment is not yet clear. However, in spite of these observations of anthropogenic REY in the environment, a data base proving a systematic overview on the distribution of all naturally occurring geogenic and anthropogenic REY in the major European rivers and lakes is still lacking. To fill this gap, waters (and organisms with a focus on mussels) from rivers and lakes in the European Union are studied as part of the EU-ITN “PANORAMA”.

We will report results from various sampling campaigns, including samples from the Danube River and its major tributaries between its headwaters in southwestern Germany and just downstream of Belgrade, Serbia, from major rivers in Sweden and Norway, from the Seine River in the vicinity of Paris, France, from major rivers on the Iberian Peninsula in Portugal and in southern Spain, western Ireland, the United Kingdom (including the Thames River upstream and downstream of London), and Italy. These will be compared to published data for rivers in the North German Basin (Ems, Weser, Elbe, Havel), and the Rhine River and its tributaries between Lake Constance and the German-Dutch border.