

The presence of the lanthanum anomaly in the Dutch distributaries of the Rhine

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ABSTRACT

The elements lanthanum to lutetium, referred to as rare earth elements (REE), are increasingly used in high technology products and processes. For example, gadolinium chelates are used as contrasting agents in MRI-imaging, and this application causes positive Gd-anomalies in REE-patterns in rivers, surface and ground waters. These anomalies are currently used as a tracer for distinguishing water influenced by WWTPs from natural waters.

Because of the increased use of REE, the monitoring program of the Rhine-Meuse distributaries and the surface water in the area is extended with REE since 2008. In this monitoring program both the total and dissolved ($< 0.45 \mu\text{m}$) fraction are analysed. At the monitoring station Lobith where the River Rhine enters the Netherlands, the REE-patterns show a distinct lanthanum anomaly next to the well-known Gd-anomaly. This positive La-anomaly in the Rhine is recently also reported by Kulaksiz and Bau (2011, sampling was done in 2009) and first appears north of the city of Worms, 400 km upstream of the Dutch-German border. They showed that this anomaly is of anthropogenic origin and can be traced to the effluent from a production plant for catalysts used in petroleum refining. Since 2011, samarium is used in the same process.

The anthropogenic La is mainly present in the total fraction, indicating that the suspended matter is the major carrier of the anthropogenic lanthanum. Changes in the La-anomaly throughout the water system can be used to gain insight in sedimentation processes, and a La- (and Sm-)anomaly in sediments indicates recent sedimentation. More research is recommended to obtain detailed information on the processes taking place on the fresh water-salt water interface in the estuary.

In the poster the load of lanthanum in over the years 2008-2010 in the dissolved and total fraction at Lobith and the distribution of the La-anomaly in the distributaries of the Rhine and influenced surface water will be shown. The results of the monitoring stations in the Meuse will be given for reference.

Kulaksiz, S., Bau, M., 2011. Rare earth elements in the Rhine River, Germany: First case of anthropogenic lanthanum as a dissolved microcontaminant in the hydrosphere. *Environment International*, 37: 973-879.