



Nitrogen-isotopes and multi-parameter sewage water test for identification of nitrate sources: Groundwater body Marchfeld East of Vienna

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The application of nitrogen and oxygen isotopes in nitrate allows, under favourable circumstances, to identify potential sources such as precipitation, chemical fertilisers and manure or sewage water. Without any additional tracer, the source distinction of nitrate from manure or sewage water is still difficult. Even the application of boron isotopes can in some cases not avoid ambiguous interpretation.

Therefore, the Environment Agency Austria developed a new multi parametrical indicator test to allow the identification and quantification of pollution by domestic sewage water. The test analyses 8 substances well known to occur in sewage water: Acesulfame and sucralose (two artificial, calorie-free sweeteners), benzotriazole and tolyltriazole (two industrial chemicals/corrosion inhibitors), metoprolol, sotalol, carbamazepine and the metabolite 10,11-Dihydro-10,11-dihydroxycarbamazepine (pharmaceuticals) [1]. These substances are polar and degradation in the aquatic system by microbiological processes is not documented. These 8 Substances do not occur naturally which make them ideal tracers. The test can detect wastewater in the analysed water sample down to 0.1 %.

This ideal coupling of these analytic tests helps to identify the nitrogen sources in the groundwater body Marchfeld East of Vienna to a high confidence level. In addition, the results allow a reasonable quantification of nitrogen sources from different types of fertilizers as well as sewage water contributions close to villages and in wells recharged by bank filtration.

Recent investigations of groundwater in selected wells in Marchfeld [2] indicated a clear nitrogen contribution by wastewater leakages (sewers or septic tanks) to the total nitrogen budget. However, this contribution is shrinking and the main source comes still from agricultural activities.

[1] Humer, F.; Weiss, S.; Reinnicke, S.; Clara, M.; Grath, J.; Windhofer, G. (2013): Multi parametrical indicator test for urban wastewater influence. EGU General Assembly 2013, held 7-12 April, 2013 in Vienna, Austria, id. EGU2013-5332, EGU2013-5332.

[2] Kralik, M.; Humer, F. & Grath, J. (2008): Pilotprojekt Grundwasseralters: Herkunftsanalyse von Nitrat mittels Stickstoff-, Sauerstoff-, Schwefel und Kohlenstoffisotopen. 57 S.2, Environment Agency Austria/Ministry of Agriculture, Forestry, Environment and Water Management, Vienna.