**Anthropogenic influences on dissolved organic matter from drinking water reservoirs in Central Germany**

Julia Raeke1, Marieke Oosterwoud1, Bettina Seiwert1, Katrin Bornmann2, Peter Herzsprung1, Oliver Lechtenfeld1, Thorsten Reemtsma1

1 Helmholtz Centre for Environmental Research GmbH, Permoserstrasse 15, D-04318 Leipzig, julia.raeke@ufz.de

2 Water Technology Center Dresden, Wasserwerkstrasse 2, D-03126 Dresden, katrin.bornmann@tzw.de

Dissolved organic matter (DOM) plays an important role in biogeochemical processes in natural waters. It can interact with trace metals and anthropogenic organic compounds affecting their solubility and availability. Apart from biotic processes leading to the formation and modifications of DOM, also abiotic processes, for example photolysis, play an important role in the transformation of DOM ([Mesfioui et al. 2015](#_ENREF_2)). The formation of bound residues with DOM is an important aspect concerning the fate of organic contaminants ([Barraclough et al. 2005](#_ENREF_1))

Three drinking water reservoirs in the Harz Mountains and in the Ore Mountains (Germany) with different anthropogenic impact were examined over a period of two years. Samples were taken at different hydrological events and at several sites for each catchment area and compared to the treated sample from the waterworks. Fourier Transform Ion Cyclotron Resonance Mass Spectrometry (FT‑ICR-MS) was used for the molecular characterization of the dissolved organic matter.

We found that the amount of nitrogen and sulfur containing molecules was significantly higher in regions of agricultural activity and anthropogenic impact through settlements than in undisturbed areas.

Several ways of inclusion of heteroatoms like N and S into DOM have been previously proposed, such as the photochemical inclusion of inorganic nitrogen ([Mesfioui et al. 2015](#_ENREF_2)) or reactions with abiotic sulfur ([Sleighter et al. 2014](#_ENREF_4)). Degradation products of anionic surfactants may also be found in areas influenced by wastewater discharges.

In addition we could recently show in laboratory experiments that DOM reacts with photolysis products of benzotriazole to form nitrogen-containing bound residues. Benzotriazole is a corrosion inhibitor omnipresent in surface waters ([Reemtsma et al. 2010](#_ENREF_3)). The same molecular formulae were observed in the natural samples with high nitrogen content. Aniline is a degradation product of many chemicals and is well-known to from bound residues with DOM ([Weber et al. 1996](#_ENREF_5)), but the reaction with other degradation products is also possible. This study outlines that anthropogenic activity may affect surface water quality not only by the discharge of inorganic and organic contaminants or their transformation products from point sources (e.g. wastewater) and diffuse sources (e.g. agriculture) but also by altering the quality of dissolved organic matter.

Such quality changes may also have an impact on drinking water quality: in further experiments we could show that nitrogen and sulfur containing molecules were less efficiently removed through flocculation with polyaluminium chloride (PACl) compared to the molecules containing only C, H and O.

Bibliography

D. Barraclough, T. Kearney and A. Croxford, 2005. Bound residues: environmental solution or future problem? Environmental Pollution, 133, 85-90

R. Mesfioui, H. A. N. Abdulla and P. G. Hatcher, 2015. Photochemical Alterations of Natural and Anthropogenic Dissolved Organic Nitrogen in the York River. Environmental Science & Technology, 49, 159-167

T. Reemtsma, U. Miehe, U. Duennbier and M. Jekel, 2010. Polar pollutants in municipal wastewater and the water cycle: Occurrence and removal of benzotriazoles. Water Research, 44, 596-604

R. L. Sleighter, Y. P. Chin, W. A. Arnold, P. G. Hatcher, A. J. McCabe, B. C. McAdams and G. C. Wallace, 2014. Evidence of Incorporation of Abiotic S and N into Prairie Wetland Dissolved Organic Matter. Environmental Science & Technology Letters, 1, 345-350

E. J. Weber, D. L. Spidle and K. A. Thorn, 1996. Covalent binding of aniline to humic substances .1. Kinetic studies. Environmental Science & Technology, 30, 2755-2763