

co-ordinated with the Director of the Institute / Research Unit

## Analytical BioGeoChemistry

**PSP-Element:**

G-504800-001

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**Title of the highlight:**

Bromination of Marine Dissolved Organic Matter Following Full Scale Electrochemical Ballast Water Disinfection

**Keywords:**

FT-ICR/MS, Natural organic matter, non-targeted environmental metabolomics, Disinfection byproducts (DBPs)

**Central statement of the highlight in one sentence:**

Our results clearly demonstrate that electrochemical and potentially direct chlorination/bromination of ballast water in estuarine and marine systems should be approached with caution and the concentrations, fate, and toxicity of DBP need to be further characterized.

**Text of the highlight:**

As a result of the increasing dissemination of goods around the world, a growing number of ever-larger ships are being used. These vessels take on correspondingly large and increasing amounts of ballast water in order to stabilize their position in the water and to balance out any changes in the weight of goods or fuel during the journey. Experts worldwide are now discussing ways of dealing with this water, as discharging untreated ballast water will be prohibited in the future. The alternative method of choice at present is electrochemical disinfection. However, electrochemical disinfection creates numerous so-called disinfection by-products (DBPs) such as described by the same team of Helmholtz Zentrum Muenchen and University of Maryland's Center for Environmental Science in the chlorination processes during the production of drinking water. Using high-resolution mass spectrometry, the formation of 450 new, diverse halogenated compounds were described, some of which had not previously been described as disinfection products or been structurally

categorized. This first in-depth analysis of DBPs in ballast water – first and foremost revealed the high degree of complexity of the resulting products.

**Publication:**

Gonsior, M., C.L. Mitchelmore, A. Heyes, M. Harir, S. Richardson, W. T. Petty, D.A Wright, **Ph. Schmitt-Kopplin**, Bromination of Marine Dissolved Organic Matter Following Full Scale Electrochemical Ballast Water Disinfection, Environmental science & technology, 49 (15), 9048-9055 (2015)

**Taking account of the HMGU mission:**

The unique analytical possibilities at Helmholtz Muenchen enabled to profile the process of electrochemical ballast water disinfection for halogenated organic compounds (DBPs). Hundreds of novel compounds were detected of unknown ecotoxicology and their mechanism of formation suggests high similarity to previous results we found in studying the formation of DBPs in drinking water preparation making these compounds of high importance in human health.

**The internal HMGU co-operation partners with whom the highlight was compiled, if appropriate:**

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