



The Brenner Moor – A saline bog as a source for halogenated and non-halogenated volatile compounds

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The Brenner Moor is a small bog in the catchment area of the river Trave located in Schleswig-Holstein, North Germany, between Baltic and North Sea. The bog is fed by several saline springs with chloride concentrations up to 15 g/L. The high chloride concentrations and the high organic content of the peat make the Brenner Moor an ideal source for the abiotic formation of volatile organic halogenated compounds (VOX). VOX play an important role in the photochemical processes of the lower atmosphere and information on the atmospheric input from saline soils like the Brenner Moor will help to understand the global fluxes of VOX.

Soil samples were taken in spring 2011 from several locations and depths in the vicinity of the Brenner Moor. The samples were freeze-dried, ground and incubated in water emphasising an abiotic character for the formation of volatile organic compounds.

1,2-dichloroethane and trichloromethane are the main halogenated compounds emitted from soils of the Brenner Moor. The abiotic formation of trichloromethane as well as other trihalomethanes has been part of intensive studies. A well known source is the decarboxylation of trichloroacetic acid and trichloroacetyl-containing compounds to trichloromethane [1]. Huber et al. discovered another pathway in which catechol, as a model compound for organic substances, is oxidised under Fenton-like conditions with iron(III), hydrogen peroxide and halides to form trihalomethanes [2].

Besides the halogenated compounds, the formation of sulphur compounds such as dimethyl sulfide and dimethyl disulfide and several furan derivatives could be detected which also have an impact on atmospheric chemistry, especially particle formation of clouds. Furan, methylfuran and dimethylfuran are compounds that can be obtained under Fenton-like oxidation from catechol, methyl- and dimethylcatechol and are known to be produced in natural soils [3]. A novel class of furan derivatives that are formed under abiotic conditions from the soils of the Brenner Moor contain an extended alkane chain at the number 2' position of the furan ring, namely the ethyl-, propyl-, and butylfurans.

High concentrations of oxalic acid in the soil samples verify the oxidative character of the abiotic formation of the here named compounds.

This study shows that atmospherically relevant organic compounds such as 1,2-dichloroethane, trichloromethane and the furan derivatives do not always have an anthropogenic origin but can be formed under natural oxidative conditions.

[1] Laturnus et al., 2005, *Environ. Sci. Pollut. Res.*, 12, 1-2.

[2] Huber et al., 2009, *Environ. Sci. Technol.*, 43 (13), 4934–4939.

[3] Huber et al., 2010, *Environ. Sci. Technol.*, 44 (15), 5799–5804.