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Occurrence of organohalogens at the Dead Sea Basin

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Most arid and semi-arid regions are characterized by evaporites, which are assured sources for volatile organohalogens (VOX) [1]. These compounds play an important role in tropospheric and stratospheric chemistry.
The Dead Sea between Israel and Jordan is the world's most famous and biggest all-season water covered salt lake. In both countries chemical plants like the Dead Sea Works and the Arab Potash Company are located at the southern part of the Dead Sea and mine various elements such as bromine and magnesium. Conveying sea water through constructed evaporation pans multifarious salts are enriched and precipitated.
In contrast, the Northern basin and main part of the Dead Sea has remained almost untouched by industrial salt production. Its fresh water supply from the Jordan River is constantly decreasing, leading to further increased salinity.
During a HALOPROC campaign (Natural Halogenation Processes in the Environment) we collected various samples including air, soils, sediments, halophytic plants, ground- and seawater from the Northern and Southern basin of the Israeli side of the Dead Sea. These samples were investigated for the occurrence of halocarbons using different analytical techniques. Most samples were analyzed for volatile organohalogens such as haloalkanes using gas chromatography- mass spectrometry (GC-MS). Interestingly, there is a strong enrichment of trihalomethanes (THM), especially all chlorinated and brominated ones and also the iodinated compound dichloroiodomethane were found in the Southern basin.
In addition, volatile organic carbons (VOC) such as ethene and some other alkenes were analyzed by a gas chromatography-flame ionisation detector (GC-FID) to obtain further information about potential precursors of halogenated compounds.
Halophytic plants were investigated for their potential to release chloromethane and bromomethane but also for their stable carbon and hydrogen isotope composition. For this purpose, a plant chamber was constructed to encase branches of halophytic plants to estimate their organohalogen emissions using adsorbent tubes or vacuum cans, respectively.
Our results show that several halocarbons are ubiquitous at the Dead Sea basin and their formation depends on environmental factors such as salinity and vegetation.

[1] Kotte et al., 2012, Biogeosciences, 9, 1225–1235