Geophysical Research Abstracts
Vol. 12, EGU2010-15563, 2010
EGU General Assembly 2010

Stimulation of reductive dechlorination of hexachlorobenzene in soil by inducing the native microbial activity

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The reductive dechlorination and degradation of ^{14}C-hexachlorobenzene (HCB) was investigated in an agricultural soil. The activity of the native anaerobic microbial community could be induced by saturating the soil with water. Under these conditions high rates of dechlorination were observed. After 20 weeks of incubation only 1% of the applied ^{14}C-HCB could be detected in the fraction of extractable residues. Additionally organic substances, like wheat straw and lucerne straw, however considerably delayed and reduced the dechlorination process in soil. The decline of HCB was not only caused by dechlorination but also by the formation of non-extractable residues, whereby their amounts varied with time depending on the experimental conditions. Several dechlorination products were detected, indicating the following main HCB transformation pathway: HCB → PCB → 1,2,3,5-TeCB → 1,3,5-TCB → 1,3-DCB, with 1,3,5-TCB as main intermediate dechlorination product. The other TeCB-, TCB- and DCB-isomers were also detected in low amount, showing the presence of more than one dechlorination pathway. Since the methane production rates were lowest when the dechlorination rates were highest, it can be assumed that methanogenic bacteria were not involved in the dechlorination process of HCB. The established ^{14}C-mass balance show, that with increasing dechlorination and incubation times, the ^{14}C-recoveries decreased, which is a indication that highly volatile metabolites where formed in an increasing amount..