

Environmental Levels (Air and Soil) of Other Organohalogenes and Dioxins P289

Background Levels of PCDD/F in Soils of Germany

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Introduction

In Germany a soil monitoring network has been installed by the Federal Environmental Agency to monitor the present situation as well as long-term changes in soil quality. All sampling points are located in rural districts of Germany to investigate the influence of the long-range transportation of

- Western Part of Germany Sampling 1989/90 F Forest
- Eastern Part of Germany Sampling 1996/97 G Grassland P Plowland

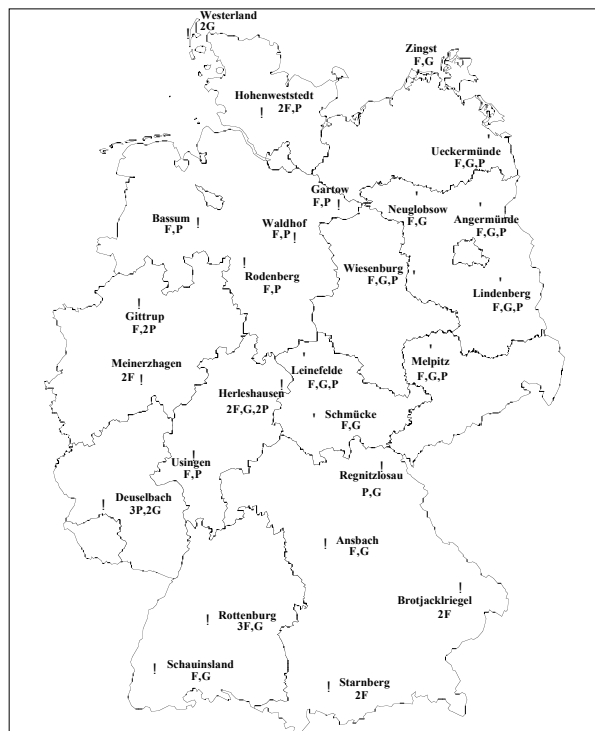


Fig. 1. Soil Monitoring Network in Germany

Environmental Levels (Air and Soil) of Other Organohalogenes and Dioxins P289

air pollutants. During 2 sampling campaigns, 1989/90 in the western and 1996/97 in the eastern part of Germany at each site soil profiles (from soil covering (litter) to subsoil horizons) were taken for three types of cultivation (if existent): Forest, grassland and plowland. – Deposition (bulk) and low volume air samplers (LVAS at 8 sampling sites) were installed for 2 sampling periods of six months. Those results will be presented later (1). – The samples were analysed for PCDD/F, PCB, chlorinated pesticides and VOC.

Keywords: polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/F), international toxic equivalents (I-TEQ), soil, forest, grassland, plowland, background levels, concentration profiles

Material and Methods

Soil profile sampling was carried out according to soil science standard methods (2, 3, 4). The nomenclature of the soil horizons corresponds with (5). The analytical method for the PCDD/F analysis of soil was already published (6, 7) and evaluated in a round robin study (8).

Results and Discussion

Highest PCDD/F values were found in the litter or the top soil horizons of forests ranging from 5.4 to 112 pg I-TEQ/g d.m. (mean 34.6, 50 perc. 23.4, 90 perc. 83.0). In grasslands and plowlands the PCDD/F values are much lower. They range from 0.4 to 4.8 (mean 1.9, 50 perc. 1.7, 90 perc. 3.6) in grasslands and from 0.3 to 3.7 (mean 1.6, 50 perc. 1.4, 90 perc. 2.4) in plowlands. Top grassland values (29.5 and 11.8) were found in the marshlands of Westerland, which turned out to be formerly used as an irrigation field and in grassland samples from Schmücke (22.0), in which combustion residues were detected (Tab. 1). – The PCDD/F values in soil samples from rural districts of the eastern part of Germany do not significantly differ from those found in the western part.

Acknowledgement

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Environmental Levels (Air and Soil) of Other Organohalogenes and Dioxins P289

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Environmental Levels (Air and Soil) of Other Organohalogen and Dioxins P289

Tab 1. PCDD/F Concentration Profiles in Soils of Different Kind of Utilisation from Rural Districts of Germany in pg/g d.m., Thickness in cm

Sampling Site	Utilisation	Horizon	Thick-ness	I-TEQ	Sampling Site	Utilisation	Horizon	Thick-ness	I-TEQ
Angermünde	Forest	O _L +O _F	4.6	12.3	Herleshausen	Forest	LO _F	2	6.1
		O _H	2.8	22.1			Ah	6	10.3
		Aeh	2	2.2			Bv11	14	<0.1
		Ah(p)Bv	12.1	0.3		Forest	L	1	5.9
Bv	25	<0.1	Ah1	5	3.8				
			Ah2	10	0.4				
	Grassland	Ah	5	0.5		Grassland	Ah11	2	4.8
		Ap	25	0.6			Ah12	8	4.5
		Bv	15	0.1			Ah13	10	<0.1
	Plowland	Ap	30	0.7		Plowland	Ap	30	3.7
Ansbach	Forest	CBv	30	0.1			CvT11	10	<0.1
		L	1	2.0	Plowland	ApSw	28	1.9	
		OfOh	3	13.2		PSw11	7	0.1	
		Ah	2	8.5					
		Sw11	8	<0.1	Hohenwestedt	Forest	L	2	9.9
	Grassland	Ah(Ap)11	2	0.8			Of	6	47.8
		Ah(Ap)12	3	0.8			Aeh	5	7.2
		Ah(Ap)13	7	0.3			Aeh1	7	1.1
Bassum	Forest	L	2	4.0			Aeh2	10	0.1
		OfOh	3	13.6	Forest	L	2	6.6	
		Ah	4	12.5		Of	5	24.0	
		Bsh11	6	1.3		Aeh1	5	12.2	
		Bsh12	8	0.1			Aeh2	10	0.1
	Plowland	Ap	25	1.3		Plowland	Ap	25	1.3
		Bv	20	0.1			Aeh	8	0.2
Brotjacklriegel	Forest	LOfOh	3	48.9	Leinefelde	Forest	O _L +O _F	2	24.1
		Aeh	2	102			O _H	2.7	46.3
		Bsh	3	2.0			Aih	1.8	7.0
		Bv11	10	0.1			Bv	14	0.3
	Forest	LOf	3	30.6			BvC	15	0.1
Ah11		2	16.3	Grassland	O _F	2	2.8		
Ah12		8	7.1		Ah1	5	2.1		
Ah13		10	3.4		Ah2	5	1.6		
Bv11	10	<0.1	Bv		30	1.3			
Deuselbach	Grassland	rGoAh1	2	1.8		Plowland	MAp	25	1.7
		rGoAh2	8	1.0			MBv	30	<0.1
		rGoAh3	10	<0.1	Linden-berg	Forest	O _L	2.3	3.2
Ah1	2	1.7	O _F	2			5.2		
Ah2	8	0.6	O _H +Alh	2.9			5.9		
M11	15	0.5	Alh	5.6			2.0		
	Plowland	Ap	20	1.7			Bvt	23.9	0.2
M11		10	1.8			BvC	20	0.1	
M12		10	0.6	Grassland	Alh	5	1.3		
	Plowland	Ap	30		1.5	Bv(Alp)	22.8	1.3	
		II(Bv)Cv	10		0.4	Btv	27.2	0.1	
	Plowland	Ap	30	1.2		Plowland	Ap	30	1.2
		Bv11	20	0.1			Sbv	30	0.1
Gartow	Forest	L	2	4.9	Meinerzhagen	Forest	L, Of	2	20.8
		Of	2	11.1			Ah	2	112
		Ae11	10	0.9			Ah	3	74.5
		Ae12	10	<0.1			Bv11	15	2.2
	Plowland	Ap	30	1.4			Bv12	15	0.1
Sw		10	<0.1	Forest	L	1	16.8		
Gittrup	Forest	LOfOh	3		10.9	OfOh	1	29.8	
		Ae	10		2.3	Ah	2	95.5	
		Bhs	15		<0.1	Sw	13	3.3	
	Plowland	EAp1	18	2.2			SwSd11	11	1.6
		EAp2	17	0.2			SwSd12	10	0.3
	Plowland	Ap11	22	1.4					
		Ap12	8	0.8					
		Bv11	11	<0.1					

Environmental Levels (Air and Soil) of Other Organohalogen and Dioxins P289

**Tab. 1 Continued. PCDD/F Concentration Profiles in Soils of Different Kind of Utilisation
from Rural Districts of Germany in pg/g d.m., Thickness in cm**

Sampling Site	Utilisation	Horizon	Thick-ness	I-TEQ	Sampling Site	Utilisation	Horizon	Thick-ness	I-TEQ
Melpitz	Forest	OL	2	1.5	Starnberg	Forest	L	2	8.5
		OF	5.1	24.4			Of	2	38.5
		OH	3.4	35.3			Ah11	2	8.0
		Aeh	5	2.5			Ah12	3	5.0
		AhBv	11.7	0.2			A111	5	0.3
		Bv	23	0.1			A112	10	<0.1
	Grassland	Ah	5			Forest	L	3	3.1
		GoAh	10.7	6.7			Of	3	22.4
		Go	6.3				nH11	2	19.4
		Gor	30				nH12	8	4.0
	Plowland	Ap	30	2.0		nH21	10	0.3	
		Gro	30	0.3	Uecker- münde	Forest	OL	1.2	2.1
Neu- globsow	Forest	OL+OF	3.1	6.9		OF	6.9	17.6	
		OH	2.1	17.9		OH+Ah	4.7	7.2	
		Ah	9	4.7		Aeh	15	0.5	
		Bv	17.5	<0.1		CBv(s)	24	0.1	
	Grassland	MAh1	5	1.7		nHv	5	1.6	
		MAh2	25	0.4		nH	12	1.7	
		Bv	30	<0.1		nHo	25	1.1	
Regnitz- losau	Grassland	Ah(Ap)	2	2.6		Plowland	Ap	30	1.1
		Ah(Ap)	25	2.6		Bvs/BsC	30	0.1	
		Bv	13	2.0	Usingen	Forest	L	1	17.3
		BvCv	12	0.2		Of	2	24.2	
	Plowland	Ap	26	0.8		OhAh	2	47.5	
		lISd11	10	<0.1		AhBv	13	2.5	
Roden- berg	Forest	L	3	6.1		Bv	15	0.2	
		OfOh	4	15.9		Plowland	Ap	27	2.7
		Aeh	2	49.2		M	13	<0.1	
		Bs	5	0.9	Waldhof	Forest	L	2	5.1
	Plowland	Ap	24	2.4		Of	5	45.3	
SwP		5	2.3		Ah	5	2.1		
SdSw1		6	2.1		Aep	16	<0.1		
SdSw2		12	0.5		Plowland	Ap	36	0.3	
Rotten- burg	Forest	L	1	1.6		Bv1	14	<0.1	
		OfOh	6	38.3	Wester- land	Grassland§	HA	2	29.5
		Ahe	5	0.2		Go11	8	7.1	
		Bsv	10	<0.1		Go12	10	0.2	
	Forest	LOf	2	14.1		Grassland§	Y11	2	3.8
Aeh		3	0.3		Y11	3	7.1		
A111		10	<0.1		Y12	8	11.8		
	Forest	LOf	2	5.4		fAh	6	0.3	
Ah		5	1.1	Wiesen- burg	Forest	OL	2	4.8	
P		10	<0.1		OF	3	26.2		
	Grassland	Ah11	2	0.1		OH	4.6	34.2	
		Ah12	11	0.4		Alh	2.6	8.2	
		lIP11	10	<0.1		Bvt	21	0.1	
						Bv	25	0.3	
Schauins- land	Forest	Of	2	15.9		Grassland	Ah1	5	1.3
		Ah11	2	8.9		Ah21	5	1.7	
		Ah12	5	2.5		Ah22	20	0.5	
		Ah13	10	1.0		Go1	13	<0.1	
		Bv11	13	1.1		Plowland	Ap	30	1.4
		Bv12	10	<0.1		Bvt	21	0.1	
	Grassland	Ah11	2	2.5	Zingst	Forest	OL	2	4.4
		Ah12	7	3.9		OF	6.3	15.3	
		M11	11	0.2		OH	2.1	22.8	
Schmücke	Forest	OL	1.4	15.9		Aha	1.2	15.1	
		OF	2.1	81.6		Ae/Bhv	7	1.8	
		OH	8.1	39.2		C	30	<0.1	
		MBvAh	19	0.6		Grassland	Ahp	5	0.7
		Bv	9.7	0.1		Ap	28	<0.1	
	Grassland*	aAah	2	22.0					
		aMAah1	5	8.3					
		aMAah2	15	2.9					
		(aM)Bv	20	0.3					

*contains combustion residues

§former irrigation field

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