PCDD/PCDF AND PCB IN SOILS OF AN INDUSTRIALIZED URBAN AREA (LINZ/UPPER AUSTRIA)

RISS A., WEISS P., HARTL W., HAGENMAIER H.*

Federal Environmental Agency,
Spittelauer Lände 5, A-1090 Vienna, Austria
* Institute of Organic Chemistry, Univ. Tübingen,
Auf der Morgenstelle 18, D-7400 Tübingen, FRG

ABSTRACT

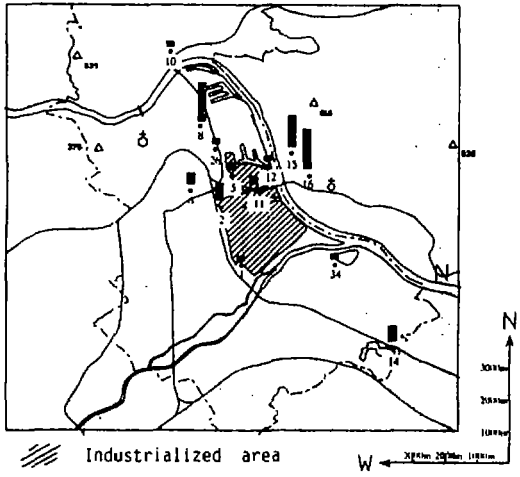
In a densly populated industrial urban area (Linz) soils from grassland and forest areas were investigated for PCDD/PCDF and PCB compounds. The concentrations of these substances were comparitively higher in soils that are in the vicinity of possible emission sites.

MATERIALS AND METHODS

In order to establish the extent of soil pollution caused by PCBs and PCDD/PCDF compounds in the heavily industrialized urban area of Linz/Upper Austria (which includes chemical and steel industries), soil samples from 26 grassland locations and 2 mixed woodland locations were analysed. In addition, mixed samples taken from untilled sampling areas were utilized. At the forest sites six soil columns were each separated into raw humus and 0-5, 5-10, 10-20 and 20-30 cm soil layers. Mixed samples were then formed by combining identical layers from each of the six columns.

Soil samples were dried at 30 C and sifted to a particle size of 2 mm. PCDD/PCDF analyses were carried out at the university of Tübingen. Methods are described in /1/. The PCB analyses were undertaken by the Federal Environmental Agency, Vienna. Samples were extracted with n-hexane - acetone (3 + 1) and analysed according to DIN-51-527 /2/.

Fig. 1: PCDD/PCDF in soils in ng TE(BGA)/kg



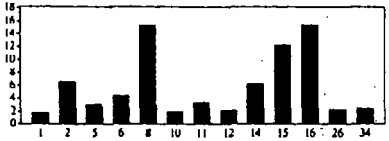
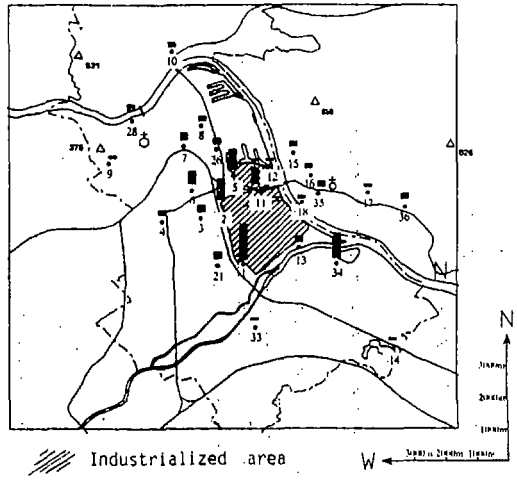
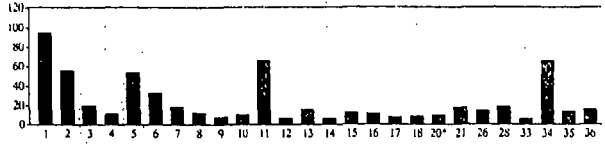


Fig. 2: PCBs in soils in µg/kg





* not in map

RESULTS AND DISCUSSION

The table shows the range and median value of PCDD/PCDF (in ng/kg) in the 13 investigated meadow locations:

	range	med.		range	med.		range	med.
C14DD	nd - 41	6	C14DF	14 - 285	30	PCDD	31 - 432	154
C15DD	2 - 25	10	C15DF	9 - 152	25	PCDF	56 - 703	135
C16DD	6 - 45	12	C16DF	8 - 125	26	PCDD/F	176 - 1074	275
C17DD	17 - 85	24	C17DF	13 - 118	27	TE(BGA)	1,8 - 15,5	3,3
C18DD	14 - 286	100	C18DF	8 - 69	17	TE(I-TEF)	1,6 - 14,4	3,3

The highest PCDD/PCDF concentrations were measured in the vicinity of the hospital refuse incineration plant as well as at two locations on emission-receiving slopes along the prevailing wind direction from the industrial area.

The forest location close to the industrial area had a PCDD/PCDF concentration of 2363 ng/kg PCDD/PCDF (total) or 62 ng TE (BGA)/kg in raw humus, a value clearly higher than that of the reference location which measured 792 ng/kg PCDD/PCDF (total) or 12 TE (BGA)/kg. With a value of 22 ng/kg the proportion of 2,3,7,8-C14DD in soil taken from forest locations close to the industrial area was conspicuously high. The underlying mineral soil layer of both locations indicated similar PCDD/PCDF concentrations as expressed in TE.

In the investigated grassland locations a median value of 15 ug/kg (6-95 ug/kg, n=26) for PCBs was established (total of 6 PCBs according to Ballschmiter). The highest values were recorded at locations in, or close to, the industrial area.

A comparison of the two forest locations revealed that they suffered a contamination approximately 3 times greater than the reference location, with 75 ug/kg (total of the 6 PCBs according to Ballschmiter) in raw humus from the site close to the industrial area. In the underlying mineral soil layers the PCB content diminished with depth, yet even here the industrial location showed a somewhat higher PCB content.

REFERENCES:

/1/ HAGENMAIER H. 1988: Untersuchungen von ausgewählten Böden und Pflanzen auf Dioxine und Furane. Forschungsvorhaben im Auftrag des Umweltbundesamtes Berlin Nr. 10701010

/2/ DIN 51 527 Teil 1 (Mai 1987): Bestimmung polychlorierter Biphenyle