

Changes of PCB pattern during long-range transport in the troposphere

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The global distribution of organic chemicals depends on the physical transportation and chemical transformation. Both processes are strongly related to the physico-chemical properties of the compounds, e.g. vapour pressure, water solubility, octanol-water-partition coefficient, photo-degradability.

In a complex mixture like polychlorobiphenyls these properties cover a relative wide range, depending on the number and the position of the chloro-substituents of the biphenyl-moiety. During the long range transport of such a mixture from its source to a remote area the relative composition of the mixture, the so called pattern, will change due to the different individual congener-specific properties.

Our study reports on the occurrence of specific PCB-congeners in the troposphere of the Atlantic Ocean from 50°N to 50°S. Sampling was done on the German research vessel "Polarstern" during a cruise through the Atlantic from Germany to Chile in November 1990. Sampling of the substances in air was carried out by adsorption on silicagel using a method evaluated in our institute¹.

We quantified seven major indicator congeners (PCBs 28,52,101,118,138,153,180) by HRGC/ECD, which are dominant in technical mixtures and covering a wide range of physical properties. These data were compared with the PCB-patterns of further air samples of continental and marine origin using the similarity index approach².

The results prove that there exists a typically clean air marine pattern, which doesn't change from the North- to the South Atlantic. In contrast to this we found marine air samples with patterns which were influenced by continental air masses. These patterns differ clearly in the similarity index from the clean air marine pattern and are more similar to a continental PCB-pattern, as found in Central Europe near the City of Ulm.

The continental patterns are more similar to the technical mixture Arochlor 1260 while the marine pattern itself is more similar to Arochlor 1242. This change in similarity does not represent a change in input but is the result, that the higher chlorinated congeners are decreased in marine air masses.

The index of similarity is a very helpful tool in comparing complex mixtures in environmental samples. In varying the kind of congeners that are taken into account, it is possible to compare different samples in regard to any other problem of interest, e.g. photodegradation, biodegradation, in a relative simple and rapid way.

- 1 Wittlinger R., Ballschmiter K., *Chemosphere*, 1987;16: 2497-2513
- 2 Bacher R., Schreitmüller J., Ballschmiter K., 1992; submitted to *Int. J. Environ. Anal. Chem.*

