

Environmental geochemistry of persistent organic pollutants in the Pearl River Delta

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Although ambient concentrations of persistent organic compounds (POPs) in water and air present little direct hazard via inhalation and ingestion respectively, their propensity for transfer through the food chain indicates that species at the top of the ecological pyramid-including humans-can be exposed to concentrations of concern via their diet. In recent years POPs receive increasing concern amongst the public, as well as the scientific and regulatory cycles. The long-range transport of POPs may also lead to cross-boundary problems that need international efforts for the control of them. The fate and behavior of POPs, especially their sources, bioaccumulation through food chains and their long-rang transport, are new issues in the field of environment geochemistry.

POPs in the sediments in the Pearl River Delta

Polycyclic aromatic hydrocarbons (PAHs), PCB and chlorinated pesticides (DDT, HCH) present widely in the river and marine sediments around Pear River Delta (Fig 1). The concentration of these POPs in the sediments is fairly higher in

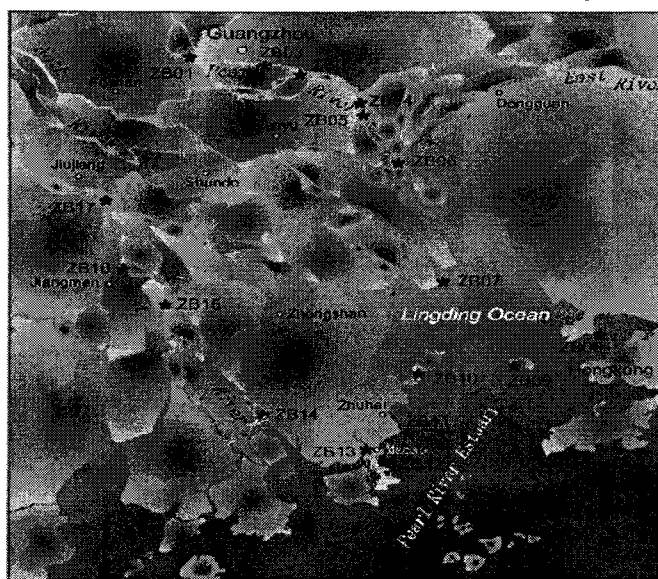


Fig 1 The locations of sediment samples in Pear River Delta.

Comparison with the counterpart river in the world. Employing Logan's procedure to assess the Ecological risk of sediments in Pear River Delta, we found that the most sites lie at the mediate risk and two sites Fancun (Guangzhou), Neigan (Macau) are at high risk.

The isomer patterns of PCB in Guangzhou and Macau seem to be very different, implying the users used different sources of PCB. PCB in Guangzhou mainly synthesized in mainland whilst PCBs in Macau possibly imported from the European.

POPs in the soil in the Pearl River Delta

The most POPs in the sediments were transported from the soil by river and runoff. Therefore, 81 soils from Pear River Delta contain high content of POPs with a broad concentration range. The average DDT, HCH in the samples are 68.5ng/g and 16.5ng/g respectively, this level of pollution is comparable with Core Belt in USA.

A lognormal distribution of concentration in the samples possibly reflects difference in application and dissipation history of DDT and HCH (Fig 2). However, broad POPs concentration range indicates the exchange processes of DDT and HCH in air-soil system is far to reach the equilibrium.

The isomer patterns of DDT and HCH in four soils crop, rice, rotated and original are quite distinguishable. Rice soil covers with the water in most time of the year, therefore, it shows high content of DDT because of anoxic condition. In contrast, rice soil degraded the HCH very fast by the hydrolysis; HCH in the rice soil is at low concentration in comparison with the other soil.

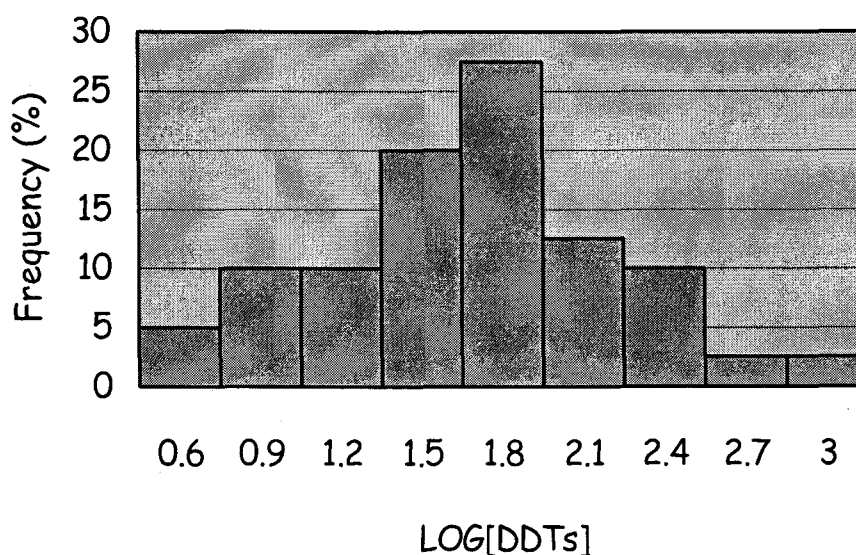


Fig 2 Logarithmic distribution of DDTs in crop and paddy soils

POPs in the air in the Pearl River Delta

PCB concentration in the air in Guangzhou and Shenzhen is around 500ng/m^3 (Fig 3). As the discovery before, the most of PCB in air presents in the phase of air, but particulate still contains substantial amount of PCB in comparison with PCB in other cities of the world.

PAHs in the air of Guangzhou beyond 50ng/m^3 . PAHs decrease from 200 to 50ng/m^3 during recent four years. This change coincides with the energy structure alteration from coal to the electricity in this area.

From air to the surface: PAHs and organic chlorinated pollutants

In the rain season, the precipitation of PAHs and organic chlorinated pollutants via particulates is high in northern city of Guangzhou. This is consistent with the rainfall amount in this area, indicating the weather controls precipitation of POPs in area.

Summary

POPs in sediments and soil in the PRD are comparable to or much higher than those reported in other regions. Some sites may be classified as POPs-polluted with high ecological risks. Large-scale land transform in the process of regional urbanization may facilitate the transfer of POPs in the soil to the sedimentary system by enhancing the soil run-off.

Urban atmospheric PCBs in PRD are found to be less than some of the North American or European urbans, but PAHs are significantly higher. The center of the PRD has been the major source area of PAHs and organochlorine pesticides in the PRD. The northern part of the PRD serves as a regional sink for the air particulates and affiliated POPs.

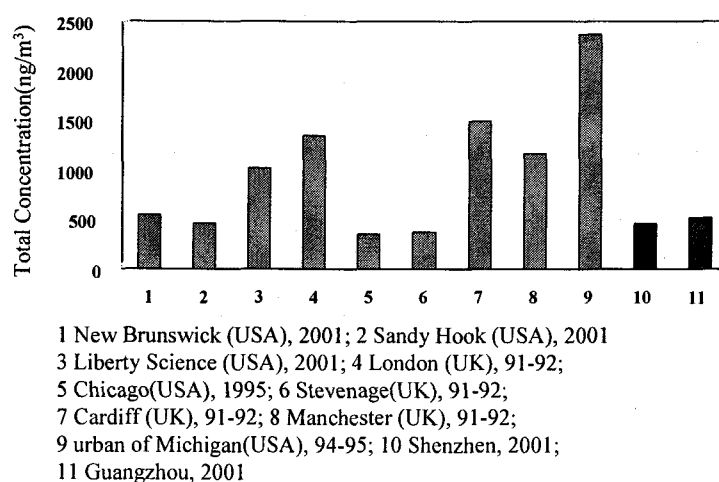


Fig 3 A comparison of total PCBs in the air