POPs ACCUMULATED IN THE SURFACE SOIL AND A SOIL-CORE IN A NATIONAL NATURAL RESERVATION, TIANBAO ROCK, SOUTHEASTERN CHINA

Wang QQ, Liu ZK, Yang, LM

Department of Chemistry & the Key Laboratory of Analytical Sciences, College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, Fujian, China. E-mail: qqwang@xmu.edu.cn

Introduction

Persistent organic pollutants (POPs) have attracted much attention in recent years because of their increasing levels in the environment and health risk to human beings. As a result, POPs monitoring in different environmental compartments and their transportation evaluation have been considered being important and basic issues. We have used tree bark and tree bark pocket as passive sampling media of atmospheric POPs for screening current atmospheric POPs pollution status across mainland China and historical evolution trends of atmospheric PAHs in Tianbao Rock area, a National Natural Reservation located in southeastern China.[1-3] In this presentation, we will talk the current contamination status and vertical distribution of POPs in the surface soil and a soil-core sampled in Tianbao Rock, expecting to trace the possible sources of POPs in the background area via fugacity fraction (*ff*) and similarity coefficient ($\cos\theta$) analysis together with some typical congener ratios; moreover, the reserved POPs vertical migration in the soil-core were discussed considering the possible factors including soil organic matter (SOM) content, soil pH and the POPs' physicochemical properties.

Materials and methods

Typical POPs including HCB, HCHs, DDTs, PCBs and PBDEs as well as PAHs were studied. ^{13}C-labeled or perdeuterated internal standards [^{13}C-HCB and α-HCH-d_6 (Dr. Ehrenstorfer GmbH, Augsburg, Germany), ^{13}C-PCB-77, 101, 141, 178, and ^{13}C-BDE-77, 126，209 (CIL, Andover, MA)] were used when the POPs were analyzed using GC-MS QP2010 (Shimadzu, Japan) equipped with electron impact ionization source (EI) and a separation column of DB-5MS (30 m × 0.25 mm × 0.25 μm, Agilent) for PAHs, election capture negative ionization source (ECNI) via a pulsed large volume (120 μL) programmed temperature injection technique and a DB-17MS (30 m × 0.25 mm × 0.25 μm, Agilent) column for the halogenated POPs (H-POPs) except for BED-209 using a short column of DB-XLB (15 m × 0.25 mm × 0.25 μm, Agilent).[4] Detail procedures of soil sample pretreatment and cleanup can be found in our previous study (reference 4).

Results and discussion

POPs levels in the surface soil of Tianbao Rock were determined. Among the target POPs, concentrations of HCB (C_{HCB}), 4 HCHs ($C_{\sum 4HCHs}$), 4 DDTs ($C_{\sum 4DDTs}$), 10 PCBs ($C_{\sum 10PCBs}$), 15 PBDEs ($C_{\sum 15PBDEs}$) and 18 PAHs ($C_{\sum 18PAHs}$) in the surface soil are 0.038 ± 0.003 ng/g, 0.39 ± 0.02 ng/g, 0.34 ± 0.05 ng/g, 0.085 ± 0.014 ng/g, 0.12 ± 0.02 ng/g and 141.3 ± 10.5 ng/g, respectively. The POPs' concentrations determined were much lower than those reported in most other places in the word, thus we could consider POPs levels in the surface soil of Tianbao Rock being the background.

As a background area, it is reasonable to consider that most POPs in the surface soil in Tianbao Rock are from the atmospheric input via long range atmospheric transport (LRAT), and Tianbao Rock is only one station of the LRAT process. POPs tracing through *ff*, $\cos\theta$ and typical congener ratio analysis suggested that the surface soil in Tianbao Rock serves as either a sink or a secondary source of atmospheric POPs mainly depended on their $\log K_{OA}$ and current and historical usage of POPs in China even in the world.

Variations of POPs concentrations in the soil-core indicated that general increasing trends for POPs along with decrease of the depth. $C_{\Sigma 9OCPs}$, $C_{\Sigma 10PCBs}$, $C_{\Sigma 15PBDEs}$ and $C_{\Sigma 18PAHs}$ increased from 0.036 in the depth of 78-89 cm to 0.70 ng/g in the top 3 cm, 0.015 to 0.085 ng/g, 0.011 to 0.12 ng/g and 65.56 to 141.3 ng/g, respectively. However, $C_{\Sigma 9OCPs}$ reached its peak value (0.83 ng/g) in the depth of 3-8 cm and decreased afterwards. Detailed discussion will be given based on the LRAT input, SOM, soil pH and the POPs' $\log K_{OW}$.

Acknowledgements

This study is financially supported by the National Basic Research Program of China (No.2009CB421605).

References:

1. Wang QQ, Zhao YL, Yan D, Yang LM, Li ZJ, Huang BL (2004). *Environ Sci Technol.* 38: 18: 4739-4744
2. Zhao YL, Wang QQ, Yang LM, Li ZJ, Satake K, Tsunoda, K (2006). *Environ Sci Technol.* 40: 19: 5853-5859
3. Zhao YL, Yang LM, Wang QQ (2008). *Environ Sci Technol.* 42: 16: 6046-6051
4. Zhao YL, Yang LM, Wang QQ (2008). *J Am Soc Mass Spectrom.* 18: 8: 1375-1386