

# Indicator and Dioxin-like Polychlorinated Biphenyls in Background Air in China

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## Introduction

Polychlorinated biphenyls (PCBs) are well known persistent organic pollutants (POPs) due to their toxicity, bioaccumulation, and resistance to environmental degradation. They have attained considerable notoriety as ubiquitous environmental contaminants <sup>1</sup>. Because of non-flammable and chemically inert, PCBs were widely used as dielectrics in transformers and large capacitors during 1929-1970 all over the world. Since then, their occurrence has been reported in samples from different animal species, environmental compartments, and geographical regions<sup>2</sup>, confirming large scale dispersion and deposition to areas far from the original sites of industrial application. Due to their persistence, PCBs have remained major global pollutants, with numerous investigations reporting their continued and ubiquitous presence in the global atmosphere<sup>3,4</sup>. Extensive measurements of PCBs in the atmosphere involving multiple sampling sites and multi-year time periods have been performed in the Great Lakes region and the Canadian Arctic <sup>5,6</sup>. However, Relatively little is known about levels and patterns of PCBs in background air in China. In order to know the levels and transport of PCBs in China, the concentrations and distributions of PCBs in eleven background air sampling locations in China were analyzed.

## Materials and methods

Eleven background air Samples were collected in China (Fig.1). High volume samplers (Echo PUF, Italy) have a size-selective inlet for collecting only those particles smaller than 10 micrometers diameter were used to sampling air. Air sampling were dublicately carried out for 3 days and about 900 m<sup>3</sup> volumes of samples were collected in November 2007 to February 2008.

Prior to extraction, PUF spiked with a mixture of internal standards (<sup>13</sup>C<sub>12</sub> PCBs congeners, Cambridge Isotope laboratories). Then PUF and filter were extracted by ASE. After the extracts were rotary evaporated to 0.1 ml, 1 ml hexane were added. Then the samples were cleaned by acid silica gel columns adsorption columns. The columns were prepared by packing a glass column (15mm i.d.) with layers of 10 g of 44 % acidic silica and a thin layer sodium sulfate at the top. The columns were cleaned with 50 ml hexane prior to transfer of sample extracts. Samples were then eluted with 70 ml hexane and rotary evaporated to 5 ml. Further clean-up was completed using a Power Prep instrument (Fluid Management Systems, Waltham, MA, USA) with multiple silica columns, alumina columns and carbon columns. Two fractions were eluted containing co-planar and mono-ortho PCBs congeners, respectively. After concentrating to 10-20ul, the <sup>13</sup>C<sub>12</sub>-labeled injection standard for PCBs was added to the final extract for analysis.

All samples were analyzed by an Agilent 6890GC/5973N MS by using a 60 m DB-5 fused-silica column. The (m/z) recorded in SIM mode. Helium at a flow rate of 1.0 ml/min was used as gas carrier, nitrogen as make-up gas 5.0 ml/min. Oven temperature was programmed according to the following sequence: injection at 75 °C, was steady for 2 min and then was increased from 50 to 150 °C at a rate of 15 °C/min and then was increased from 150 to 270 °C at a rate of 2.2 °C/min. All of the organic solvents used were of pesticide-grade.

## Results and dicussions.

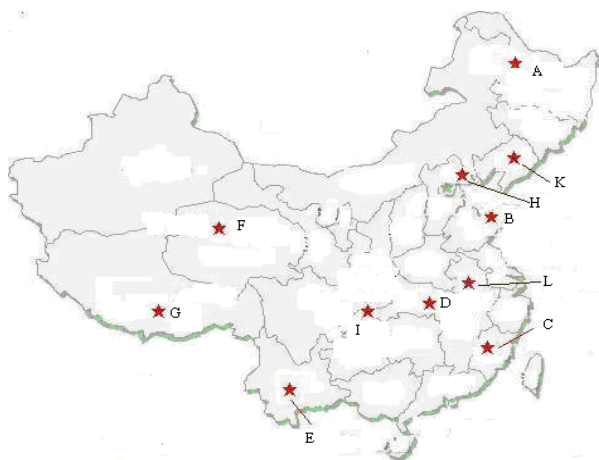
The concentrations of indicator PCBs and dioxin-like PCBs were shown in Fig.2 and Fig.3. The concentrations of dioxin-like PCBs ranged from 0.7 to 7.4 fg WHO-TEQ/m<sup>3</sup>. The highest level was found D at and lowest level was found at F. The concentrations of dioxin-like PCBs were 7.2-42 fg WHO-TEQ/m<sup>3</sup> in air of Korea collected in 2004<sup>7</sup>. So the concentrations of dioxin-like PCBs in China were lower than those in Korea. The levels of indicator PCBs were between 8.8 and 53.2pg/m<sup>3</sup>. CB28 and CB52 were the predominate congeners in all the air samples.

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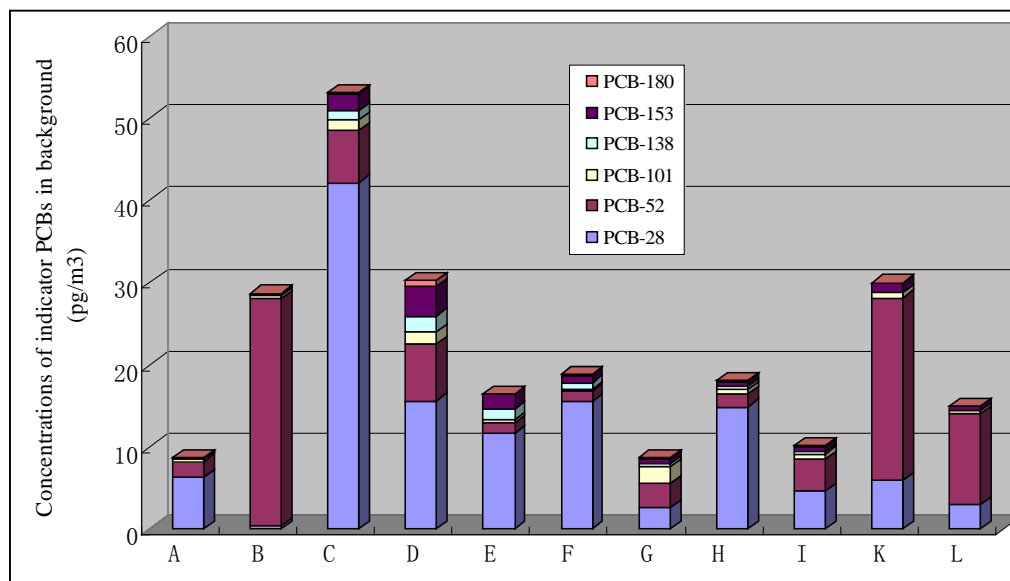
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**Figure.1** Sampling locations of eleven air background monitoring sites



**Figure.2** Air Concentrations ( $\text{pg}/\text{m}^3$ ) of indicator PCBs in background air monitoring sites 2007-2008



**Figure.2 Air Concentrations (fg/m<sup>3</sup>) of dioxin-like PCBs in background air monitoring sites 2007-2008**

