



Levels and Seasonal Variability of Persistent Organic Pollutants in Rural and Urban Atmosphere of Southern Ghana

Sam Adu-Kumi (1), Jana Klanova (2), and Ivan Holoubek (2)

(1) Chemicals Control and Management Centre, Environmental Protection Agency, P. O. Box MB 326, Accra, Ghana(adukumisam@yahoo.com), (2) RECETOX, Faculty of Science, Masaryk University, Kamenice 126/3, 625 00 Brno, Czech Republic

Concentrations of persistent organic pollutants (POPs) in air are reported from the first full year of the RECETOX-Africa Air Monitoring (MONET_AFRICA) Project. Passive air samplers composed of polyurethane foam disks (PUF-disk samplers) were deployed for sampling background air concentrations from January-December 2008 at two urban sites in Ghana, namely, Ghana Atomic Energy Commission (Biotechnology and Nuclear Agricultural Research Institute, Kwabenya); and Ghana Meteorological Agency (East Legon). Another set of PUF-disk samplers were deployed at a rural/agricultural location (Lake Bosumtwi) from July-November 2008. For the purposes of this study, 28 days was the sampling period for polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs); and 3 months for OCPs (Drins) and dioxins/furans (PCDD/Fs) respectively. MONET_AFRICA constituted part of the activities under the Global Monitoring Plan (GMP) for the effectiveness evaluation (Article 16) of the Stockholm Convention on POPs and the air sampling survey was conducted at 26 sites across the African continent with the aim to establish baseline information on contamination of ambient air with persistent organic pollutants (POPs) as a reference for future monitoring programmes in the region.

For the pesticides, endosulfans constituted the highest contaminants measured followed by HCHs and DDTs in that order. The large temporal variability in the pesticide concentrations suggested seasonal application of endosulfans and -HCH. Levels of endosulfans were initially found to be below detection limit during the first sampling period (January – March 2008) but recorded the highest concentration than any other pesticide from all 16 sites in the African region during the second sampling period (April – June 2008). Concentrations of DDTs and HCHs were generally low throughout the sampling periods. p,p'-DDE/p,p'-DDT ratio in ambient air showed that the metabolite DDE was the most abundant and the concentrations of sums of DDTs were in tens of pg m⁻³. This suggests that the main source of DDTs was possibly due to past agricultural and public health usage. The soil concentrations of DDTs at the various sites were however negligible (approx. 1 ng g⁻¹). The highest levels of HCHs were recorded in November and December 2008. HCB and PeCB concentrations in air were low and uniform and soil levels of HCB and PeCB were negligible. Only traces of aldrin, dieldrin, heptachlor and mirex were detected from both sites. PCBs were found at levels typical for the urban sites and the levels at the Kwabenya site were slightly lower than those measured at the East Legon site. Levels of PCBs at the rural/agricultural site (Lake Bosumtwi) were relatively lower than those measured at the urban sites. The levels of PAHs in ambient air were quite high at all sites with phenanthrene being the most abundant. Benzo(a)pyrene (a known carcinogen) levels in ambient air were however very low. The highest levels of PAHs were detected in January 2008, February 2008 and July/August 2008 at Kwabenya, East Legon, and Lake Bosumtwi, respectively. PCDD/F levels were also quite high, maximal I-TEQ was the third highest in the African region (after Egypt and Senegal).

Keywords: Persistent Organic Pollutants; Background Concentrations; Ghana; PUF-disk sampler