MONET
Monitoring of persistent organic pollutants (POPs) in ambient air using the passive air sampling technique
Pilot projects in the Central and Eastern Europe, Africa and Pacific Islands
MONET-EUROPE

Ivan Holoubek, Jana Klánová, Pavel Čupr

TF HTAP Workshop: Focusing on Eastern Europe, Central Asia and the Arctic
01 – 04/04/2009, Saint-Petersburg, Russian Federation
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**RECETOX/MONET activities – overview**

**RECETOX/MONET – Focusing on Central, Southern and Eastern Europe and Central Asia**

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**MONET-Europe – new campaign 2009-2010**

**And what the next ??**
RECETOX/MONET activities – overview
Stockholm Convention on POP – Effectiveness evaluation

Article 16 – ‘effectiveness’ shall be evaluated after 4 years:

- Monitoring data
- Regional and global environmental transport

Core matrices:
- Air
- Human Milk
PUF-Disk PAS – Field Deployment

- mounting bracket
- stainless steel dome
- PUF disk
- air circulation
- sunlight
- precipitation
- wind effects
- particles
Passive samplers for POPs sampling

RECETOX Conceptual approach:

1) Applicability for monitoring on the global, regional, local scales

2) Influence of environmental variables

3) Study of local effects

4) Development of the monitoring network in the Czech Republic, Central and Eastern Europe, Africa, Pacific Islands in the co-operation with the SCC, Environment Canada, Lancaster University and some others

5) Study of temporal and spatial trends

6) Application for toxicological testing, risk assessment
Passive samplers for POPs sampling – influence of environmental variables

- Effects of meteorological conditions ??
- Correlation of $V_{EQ} \ (m^3)$ with temperature ($^\circ$C) and wind speed (m s$^{-1}$) for various gas phase associated compounds.


- Can passive samplers estimate the atmospheric concentrations of particle bound compounds ??
Passive sampling – RECETOX Network

What is it a MONET ???

MONET = MONitoring NETwork

<table>
<thead>
<tr>
<th>MONET_CZ = Czech Republic</th>
<th>MONET_PIs = Pacific Islands - Fiji</th>
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<tbody>
<tr>
<td>MONET_CEECs = 22 countries of the CEE + 5 countries of the CA</td>
<td>MONET_Africa = selected sites round Africa</td>
</tr>
</tbody>
</table>
MONET_CZ - POPs Monitoring in ambient air
POPs Monitoring in ambient air – selected POPs sources

Municipal waste incinerator
Spolana Neratovice
DEZA Valašské Meziříčí
CMC a.s.
Application of Passive Sampler for Monitoring of POPs in Ambient Air

Part I: Model monitoring network in the Czech Republic, (MONET_CZ), 2006

Jana Klánová, Pavel Čupr, Jiří Kohoutek, Ivan Holoubek
MONET-CZ - Monitoring of POPs in ambient air – passive sampling - Σ 16 PAHs [ng/filtr], January - December 2006

+PCBs, DDTs, HCHs, HCB, PeCB
MONET-CZ - Seasonal variations of PAHs in ambient air, Košetice observatory – PAS - 2003-2008

PAS - PAHs

Sampling period

PAHs [ng.m\(^{-3}\)]

Σ PAHs (Aerosol)
Σ PAHs (Gas Phase)

Sampling Date

Benzo(ghi)perylene
Dibenz(ah)anthracene
Indeno(123cd)pyrene
Benzo(a)pyrene
Benzo(k)fluoranthene
Benzo(b)fluoranthene
Chrysene
Benzo(a)anthracene
Pyrene
Fluoranthene
Anthracene
Phenanthrene
Fluorene
Acenapthene
Acenaphtylene
Naphthalene
MONET-CZ - Temporal and spatial variations of HCB in ambient air of the CR - passive sampling 2006-2008
Superstation concept - Observatory Košetice, CR

EMEP POPs Network

Integrated POPs monitoring - Observatory Košetice

Comparison of existing programmes (EMEP, GAPS, MONET) and approaches (active vs. passive)

Research Centre for Environmental Chemistry and Ecotoxicology

http://recetox.muni.cz
RECETOX/MONET – Focusing on Central, Southern and Eastern Europe and Central Asia
Central and Eastern European Regional POPs Centre +
Central Asia

Regional POPs Centre

Source: ESRI Data & Maps CD
Goals:

- Application of the polyurethane foam based passive air samplers as a tool for determination of the effectiveness of the measures of international POPs conventions
- Filling the informational gap about the POPs ambient air levels in the CEE countries where the regular monitoring programs are missing
- Evaluation of the temporal and spatial trends in the POPs ambient air concentrations in the countries of the Central and Eastern European region
- Establishment of the long-term PAS monitoring program in this region – MONET-CEECs
Selection of sampling sites:

- Country background
- Country pollution gradient

MONET_CEEC I. PHASE
50 + 58 sampling sites
MONET_CEEC II. PHASE
37 - 68 sampling sites

MONET_CEEC III. PHASE
37 + 36 sampling sites
Application of Passive Sampler for Monitoring of POPs in Ambient Air

Part II: Pilot study for development of the monitoring network in the Central and Eastern Europe, (MONET_CEEEC), 2006

Jana Klánová, Pavel Čupr, Ivan Holoubek
HCH levels ($\Sigma \alpha, \beta, \gamma, \delta$-HCH) in the ambient air (ng filter$^{-1}$) in Central, Eastern and Southern Europe

March - August, 2006 + April – September, 2007
PeCB levels in the ambient air (ng filter\(^{-3}\)) in Central, Eastern and Southern Europe

March - August, 2006 + April – September, 2007
MONET-CEECs - Central and Eastern European Network - 2006-2008 – comparison of background sites

Legend

PCBs

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<thead>
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<tbody>
<tr>
<td>BA</td>
<td>Ivan Sedlo</td>
<td>Bosnia and Herzegovina</td>
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<tr>
<td>LV_01</td>
<td>Rucova, EMEP station</td>
<td>Latvia</td>
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<td>LT_02</td>
<td>Plateliai</td>
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<td>Rigonce</td>
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<td>SM_05</td>
<td>Fruška Gora</td>
<td>Serbia</td>
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<td>SK_07</td>
<td>Starina, dam, EMEP</td>
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<tr>
<td>BG_06</td>
<td>Sofia, NBMS Bojana</td>
<td>Bulgaria</td>
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<td>HR_04</td>
<td>Sisak</td>
<td>Croatia</td>
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<td>EE_03</td>
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<td>Budapest, II.</td>
<td>Hungary</td>
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<td>Lazaropole</td>
<td>Macedonia</td>
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<td>Moldova</td>
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<td>MNE_01</td>
<td>Center of Podgorica</td>
<td>Montenegro</td>
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<td>PL_06</td>
<td>Zabierzów</td>
<td>Poland</td>
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<tr>
<td>RU_02</td>
<td>Lifa – background</td>
<td>Russia</td>
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<tr>
<td>SLO_01</td>
<td>Iskra</td>
<td>Slovenia</td>
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<tr>
<td>CZ_08</td>
<td>Košetice, EMEP station</td>
<td>Czech Republic</td>
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<td>AR_01</td>
<td>Sevan, Tsovagyn village</td>
<td>Armenia</td>
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<tr>
<td>BE_01</td>
<td>Berezinsky nature reserve</td>
<td>Belarus</td>
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<tr>
<td>KA_09</td>
<td>Borovoe</td>
<td>Kazakhstan</td>
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<tr>
<td>KY_01</td>
<td>Kol-Djar village</td>
<td>Kyrgyzstan</td>
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<tr>
<td>UA_04</td>
<td>Oseshdyna</td>
<td>Ukraine</td>
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RECETOX/MONET – activities in other regions – Africa, Pacific Islands
Application of passive air samplers – Pacific Islands
MONET_PIs – 2006/7

DDTs, FIJI 2006 - 2007
ng/filter
© RECETOX 2007

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MONET Africa 2008 – Pilot phase – sampling sites

Project is covered by the Swedish Chemical Agency (KEML) and partly by RECETOX
MONET - 2006-2008 – comparison of background sites – Central, southern, eastern Europe, Africa, Fiji

Legend
- 55
- DDT
MONET-Europe – new campaign 2009 - 2010
Passive sampling European network

MONET-EUROPE
Co-operation of MONET, SSC, EMEP, MSC East, GAPS

Focused on the EMEP station as follow up of the EMEP passive sampling campaign and MONET-CZ and MONET-CEECs

28 days exposure time, 13 sampling periods, from 30 March 2009 to the end of March 2010

Temporal, seasonal and spatial trends of POPs in ambient air over the Europe

PAHs, PCBs, DDTs, HCHs, HCB, PeCB
MONET_EUROPE – 2009 - 2010 – 55 sampling sites
And what the next ??
Future development

Measurements – monitoring – modelling

Basic information concerning to levels and distribution

Tools for effects, impacts and risk assessment
Launching analytical tools of the GENESIS system

Analytical tools

Interactive selection of data

Alternative selection in table
Alternative map selection

Box models – direct access to analytical tool
Comparison of compounds – direct access to analytical tool
Acknowledgements for the support of our work:

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- MoEdu CR – project INCHEMBIOL MSM002162
- MoE CR
- CHMI

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Thank you very much for your kind attention

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FUTURE OF THE GLOBAL AIR MONITORING WORKSHOP

Hotel Pulkovskaya, Red conference room, St. Petersburg, Russian Federation
31 March, 2009

CONCLUSIONS
Expert Advice on Future of Global Air Monitoring
Results of „Future Global Air Monitoring“ Workshop

Key issues:

1. Comparability
   • within program comparability is crucial for producing reliable temporal trends for effectiveness evaluation of SC measures
   • comparability between programs is needed in order to produce a common database
   • program overlaps at selected stations should be encouraged for this purpose
   • further strategies should strive to collocate passive/active at one site in each region
   • harmonized approach to data reporting should be adopted
2. Particle-bound compounds
   • more research is needed in the field of interpretation of passive sampler data for chemicals that partition between gas and particles (PAHs, PCDDs, BFRs)

3. New POPs
   • there is a need to include new POPs and relevant precursors into target analytes investigated under existing monitoring programs
   • some studies have demonstrated the PUF disk samplers were effective at capturing several new POPs classes (e.g. chlorinated paraffins)
   • proof of concept of SIP disk sampler has shown that it can be used to capture new POPs
Expert Advice on Future of Global Air Monitoring
Results of „Future Global Air Monitoring“ Workshop

4. LRT, climate and meteorological variability

- we need to go beyond reporting data, understanding the datasets is crucial
- using the sampling sites with the support of the meteorological service is advisable
- it is important to develop tools (e.g. back trajectory techniques, multimedia and transport models) to better interpret monitoring data
5. Existing and new air programs

- for comparability and long-term sustainability of results it is recommended that new programs grow from strategic partnerships with existing programs, and benefit from their experience
- newly established passive air sampling programs should overlap at at least one station with an existing program to demonstrate comparability
- existing tools for capacity building should be used whenever possible
6. Data Availability

- existing and new programs are strongly encouraged to incorporate data management in their programs
- consideration should be given to the most suitable format and interface for end users of the data e.g. modelers
- data management tools offering multiple ways of data interpretation and presentation beside the data storage are needed

7. Cooperation and coordination

- future meetings of the program representatives are required to further develop a comprehensive global air monitoring strategy