Ongoing regional POPs monitoring activities: African region

RESEARCH CENTRE FOR TOXIC COMPOUNDS IN THE ENVIRONMENT (RECETOX)
Masaryk University, Brno, Czech Republic
Stockholm Convention Regional Centre in the Czech Republic (SCRC)

Kateřina Šebková, Director of the SCRC, sebkova@recetox.muni.cz

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

Midtermn regional workshop for GMP2 project in Africa 2018, Lusaka, Zambia, 23-25 July 2018

Outline

- Scene setting for Africa
- Regional networks for air - MONET and GAPS
- Other activities by RECETOX - water

- OBJECTIVE: provide additional information on ongoing activities in African region regarding monitoring of POPs but organized OUTSIDE of GMP2 project (except active air sampling)

UNEP

capacity building project on POPs monitoring (GMP2)

GLOBAL ENVIRONMENT FACILITY gef INVESTING IN OUR PLANET

Research Centre for Toxic Compounds in the Environment

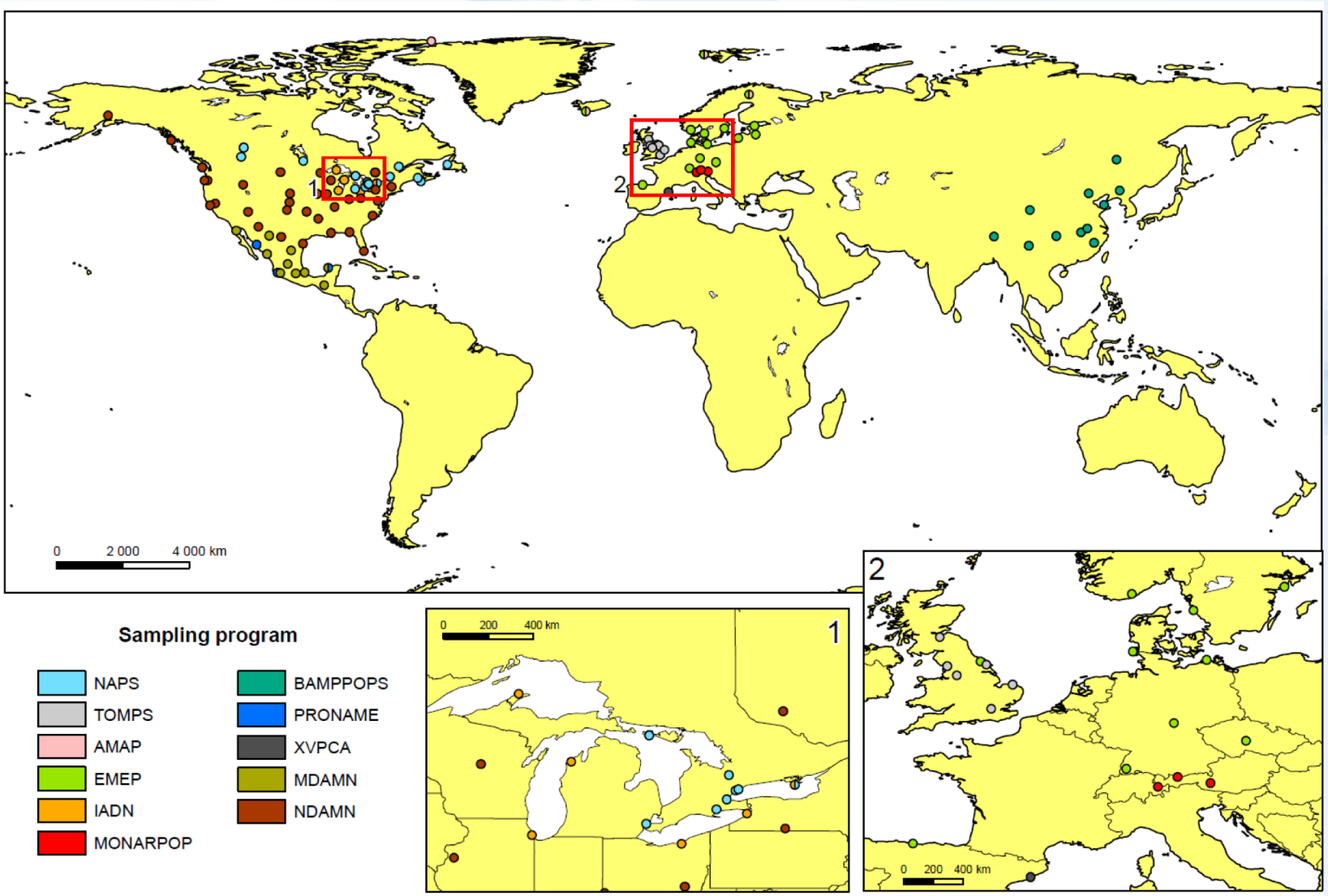
OVERVIEW OF THE STATUS OF POPs MONITORING DATA IN AFRICA as of 2014 regional report

	Central Africa	East Africa	North Africa	West Africa	Southern Africa	Island states
Ambient air						
Mothers' milk						
Water/PFOS						

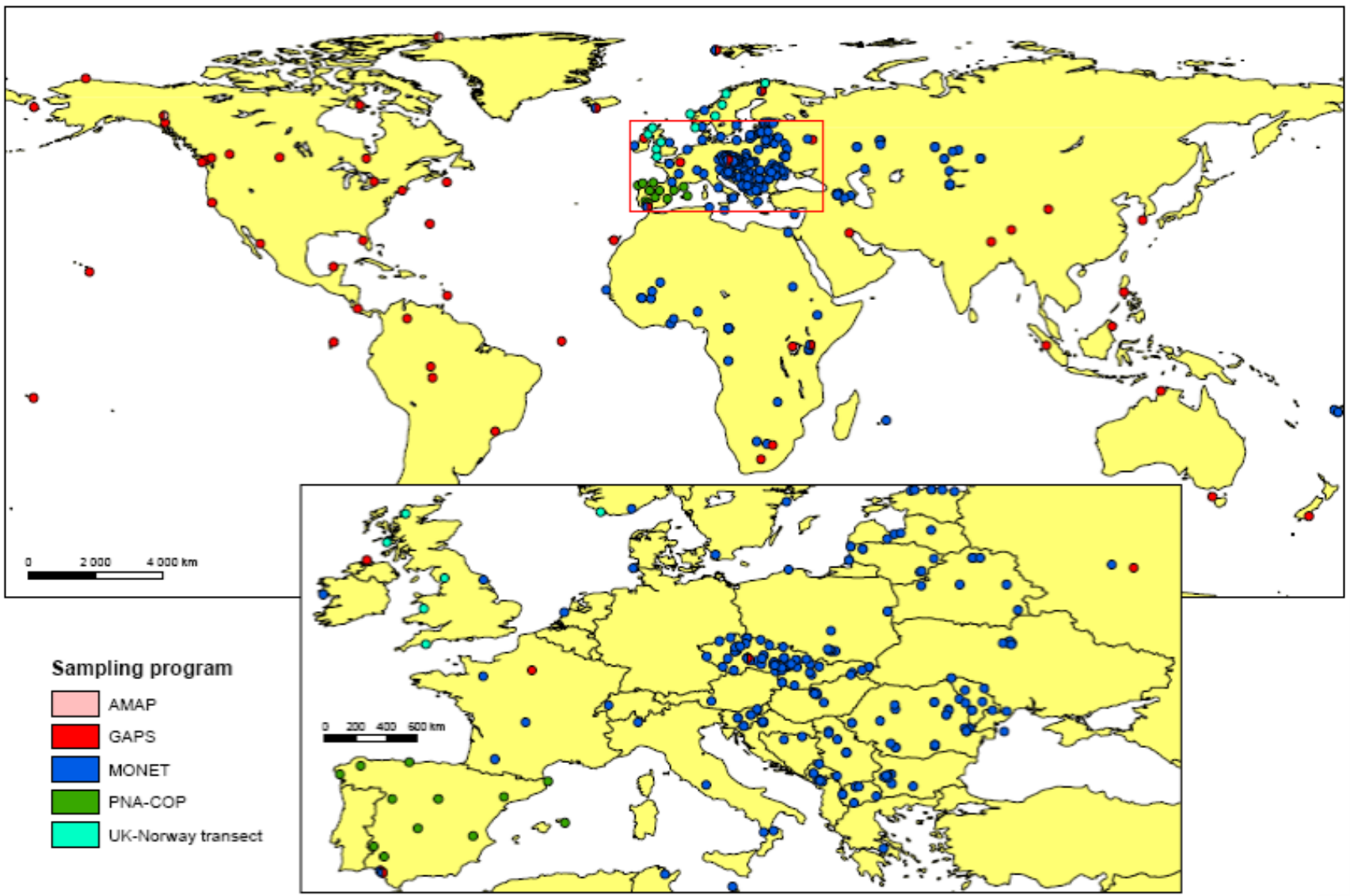
	Adequate information on baselines /With trends data
	Limited information on baselines /No trends
	No information on baselines /No data

courtesy Dr. Vincent Madadi, African coordinator and ROG and GCG member

Atmospheric POPs monitoring BEFORE 2008



and AFTER (incl. passive sampling networks)



RECETOX monitoring activities – overview

- **Integrated monitoring at Košetice sampling site, Czech Republic** (air, soil, sediment, water, needles of coniferous trees - spruce and pine) - first activities started in 1988, range continuously increases over time.
- **MONET networks** - ambient air monitoring for POPs and PAHs and some other emerging chemicals
- (Czech Republic, Europe, Africa, Asia)
- indoor environment - passive and active sampling
- products and articles - combination of approaches
- longitudinal cohort studies - **ELSPAC and TNG (biomonitoring)**
- pilot studies
- **GMP guidance update**
- **SOP for sampling development + training videos (passive sampling for air, water sampling - grab samples, XAD samplers and silicone rubber)**

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

AIR – MONET

Monitoring networks – MONET Programme

www.monet.recetox.muni.cz

MONET, MOnitoring NETwork, is a monitoring program operated by the Research Centre for Toxic Compounds in the Environment (RECETOX) of the Masaryk University in Brno, Czech Republic.

aims at detection of environmental contaminants (toxic chemicals)
spreads over the three continents - Europe, Africa and Asia.
Ambient air sampling is done by **passive samplers with PUF disks**

Chemicals covered in MONET

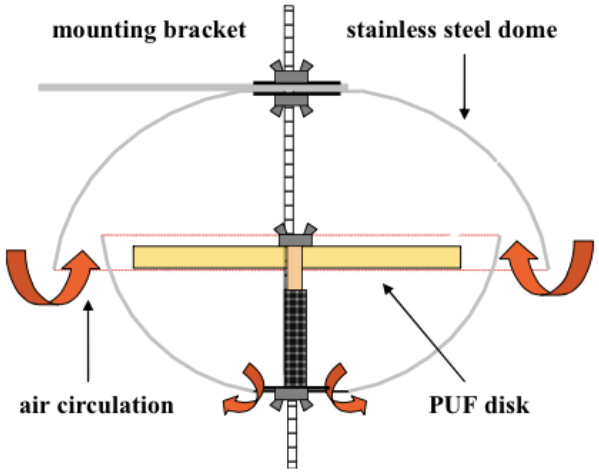
The MONET programme targets:
persistent organic pollutants,
polyaromatic hydrocarbons,
some endocrine disrupting chemicals and
other toxic compounds including currently used pesticides,

however the **range of chemicals analyzed differs** between the individual MONET networks.

All generated information is stored online in the GENASIS, environment data repository and portal at www.genasis.cz

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

All MONET (air) sampling sites worldwide



Settings & Legend

ASIA

AFRICA

AUSTRALIA

Esri, FAO, NOAA

sampling records (protocols) and SOP provided to partners with sampling materials
training video for sample preparation + sampler handling - shown at COP2015, used si

MONET Africa

= ambient air passive sampling monitoring programme supported by RECETOX in cooperation with local partners in Africa - and we are very grateful for their support in performing the sampling on the SOP provided

- **pilot**: 2008 (testing passive samplers)
- **stage 1** : 2010-2011… in 15 countries (23 sites)
- **stage 1.5** : sampling interval prolonged to 3 months (mid 2011)
- **stage 2**: continues in 13 countries (13 sites), but countries gradually drop out (lower return of samples).
- **stage 3** …. new tools introduced in Ghana and Kenya (active samplers, 2014 - 2017 revision/decline in MONET Africa participation

CURRENTLY: 8 countries continue (R.of Congo, Ethiopia, Ghana, Kenya, Mali, Mauritius, Morocco, and Nigeria)

MONET sampling sites in Africa

scope:
always OCPs, indicator PCBs and PAHs
but since 2011-mid 2014 all POPs on all sites,
mid 2016 onwards - broader range of POPs including fluorinated ones only by active samplers,
OCPs and some brominated on PAS

In addition to a series of printed reports, data from all MONETs are shared publicly online through portals

www.genasis.cz = primary data (as soon as available) and

www.pops-gmp.org = yearly aggregated concentration values, available until 2014

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

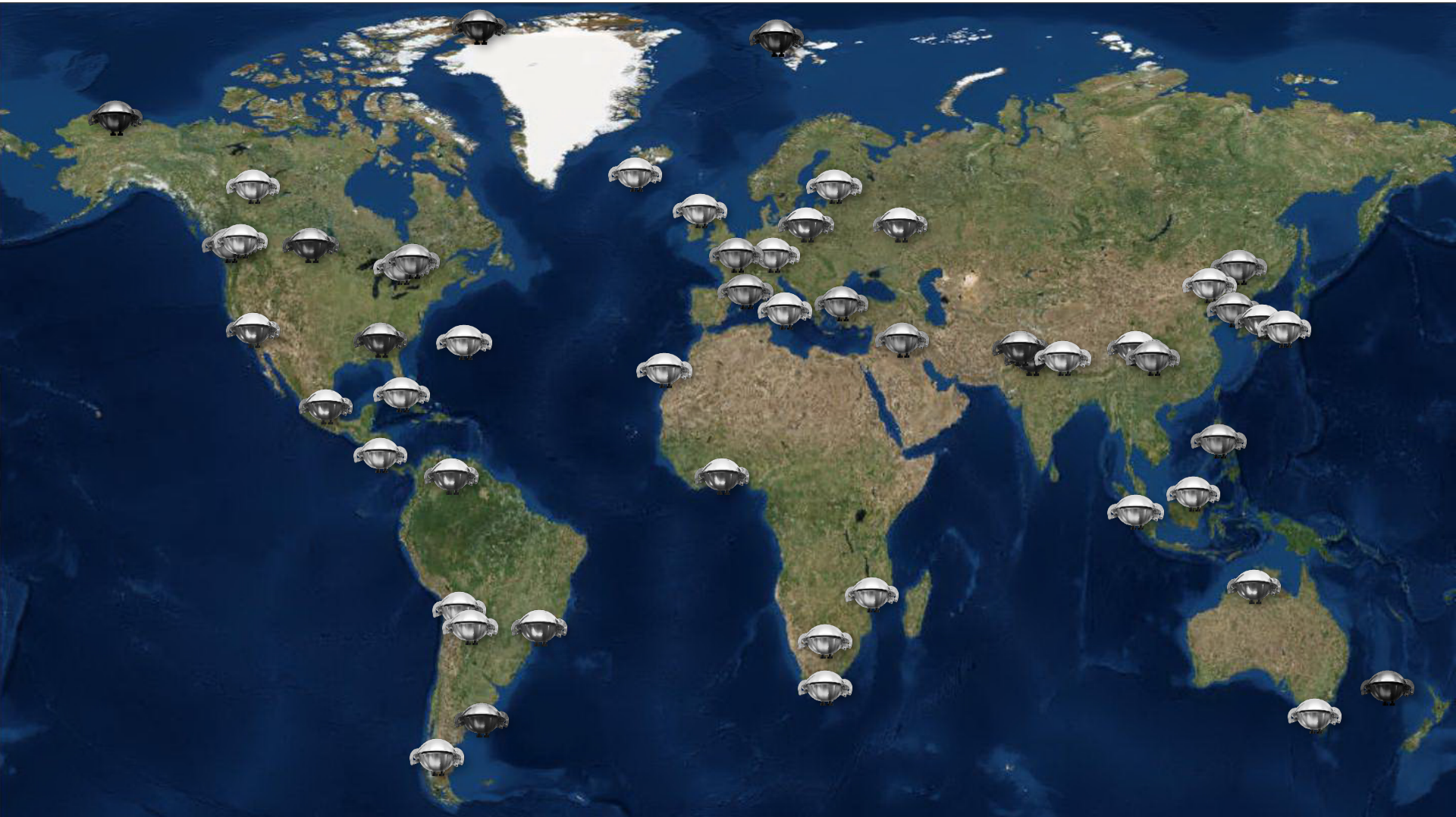
Environment and Climate Change Canada
Environnement et Changement climatique Canada
Canada

AIR – GAPS programme

courtesy of Tom Harner et al.

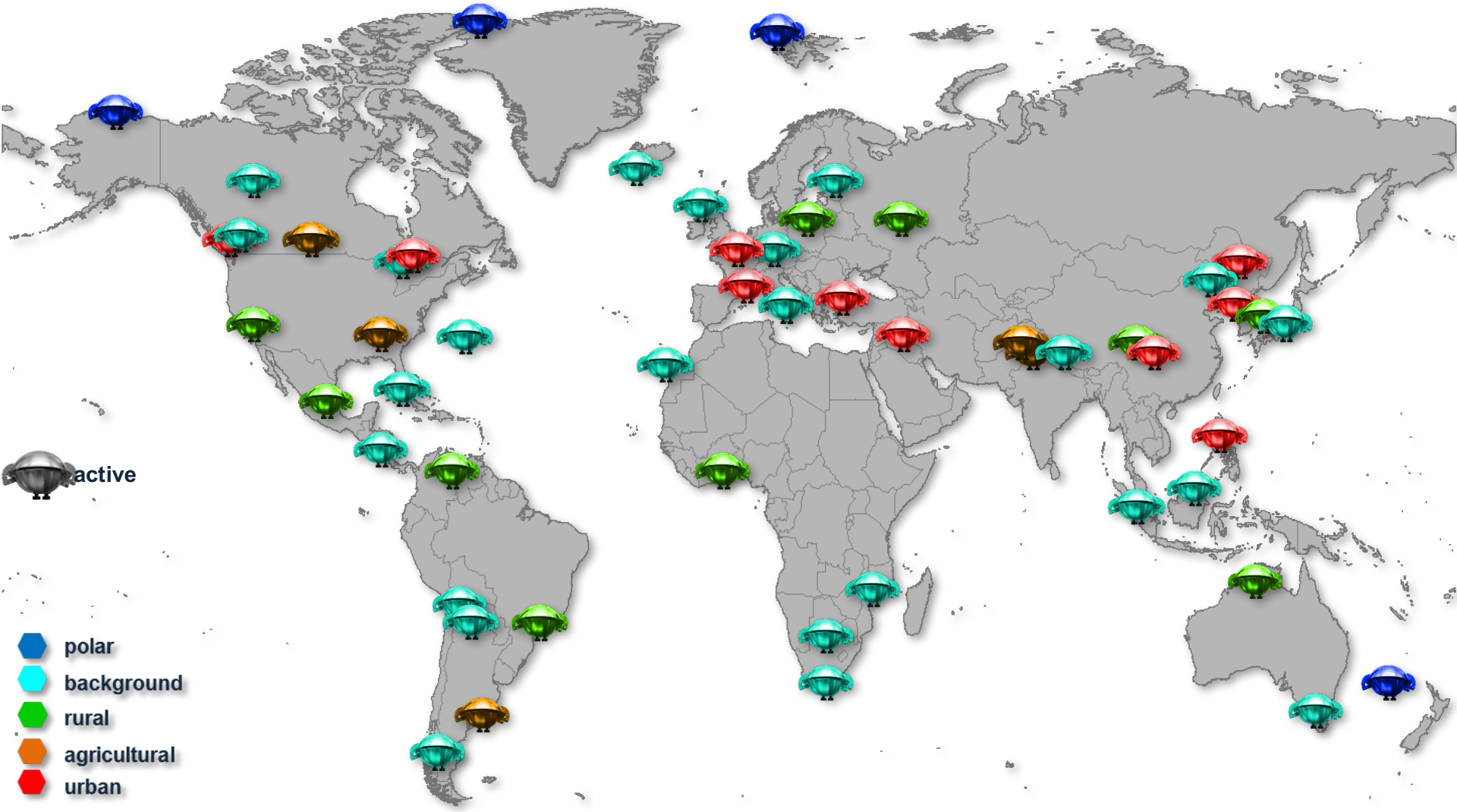
GAPS network - sites

Established 2005
Targeting POPs listed under the Stockholm Convention for Persistent Organic Pollutants



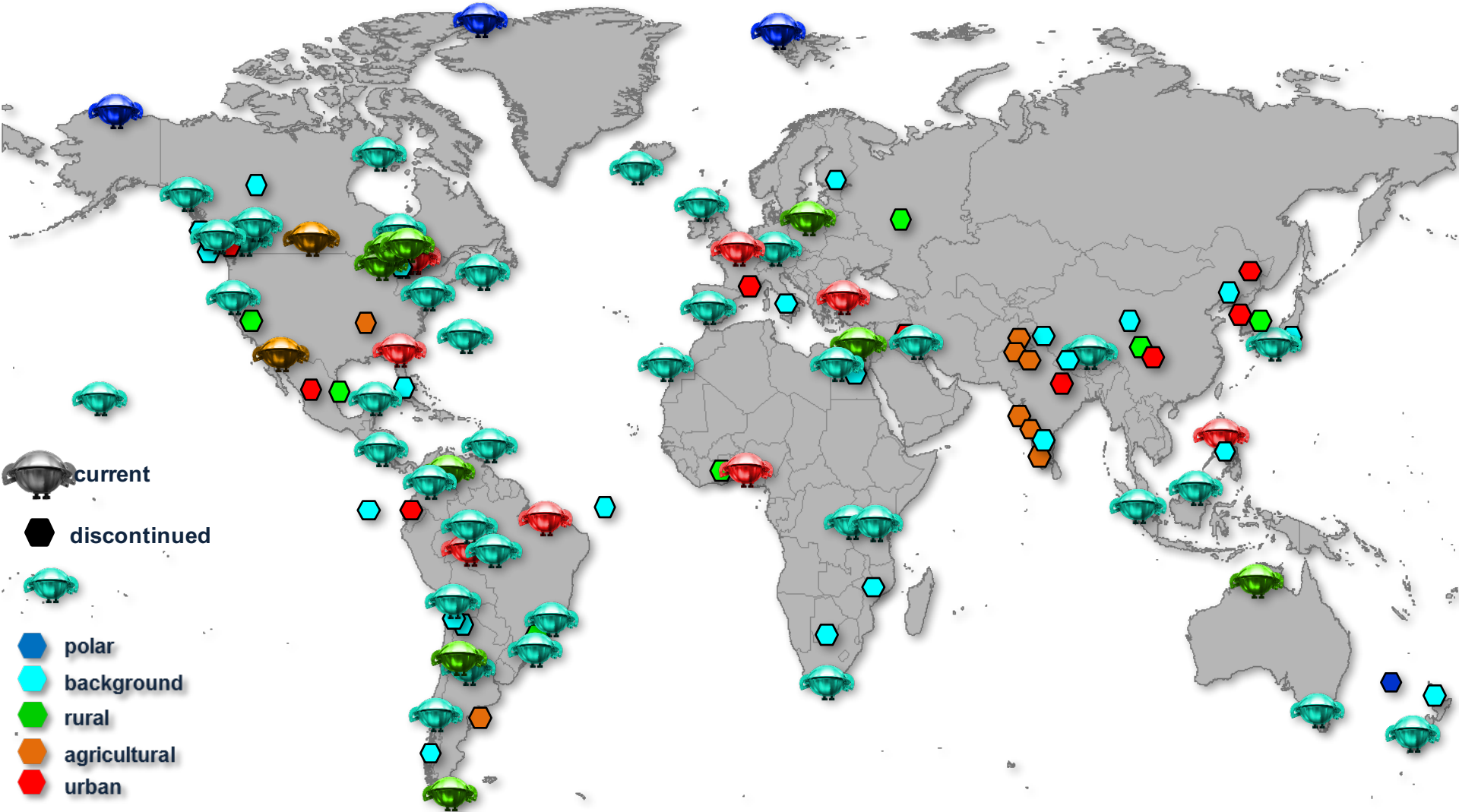
GAPS network - sites

Established 2005
Targeting POPs listed under the Stockholm Convention for Persistent Organic Pollutants
54 original sites classified as urban, rural, agricultural, background and polar



GAPS network - sites

Established 2005
Targeting POPs listed under the Stockholm Convention for Persistent Organic Pollutants
54 original sites classified as urban, rural, agricultural, background and polar
As of 2018 21 of the original sites are still active



GAPS network - sample archive

Passive air sampler
3 months deployment
Polyurethane foam (PUF) disk

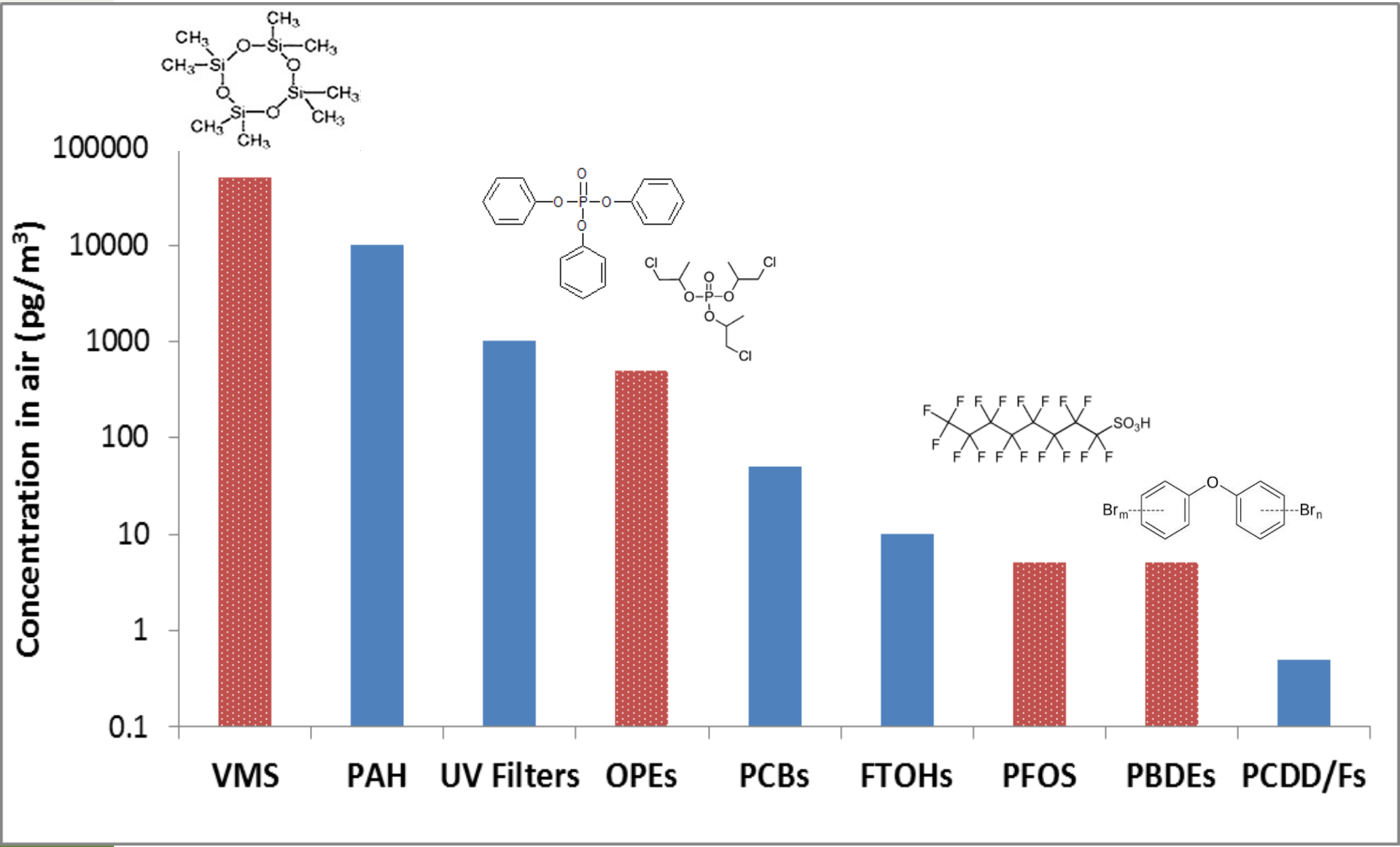
PUF disk

Extraction PE/Ac
minimal clean-up
Minimal changes in method

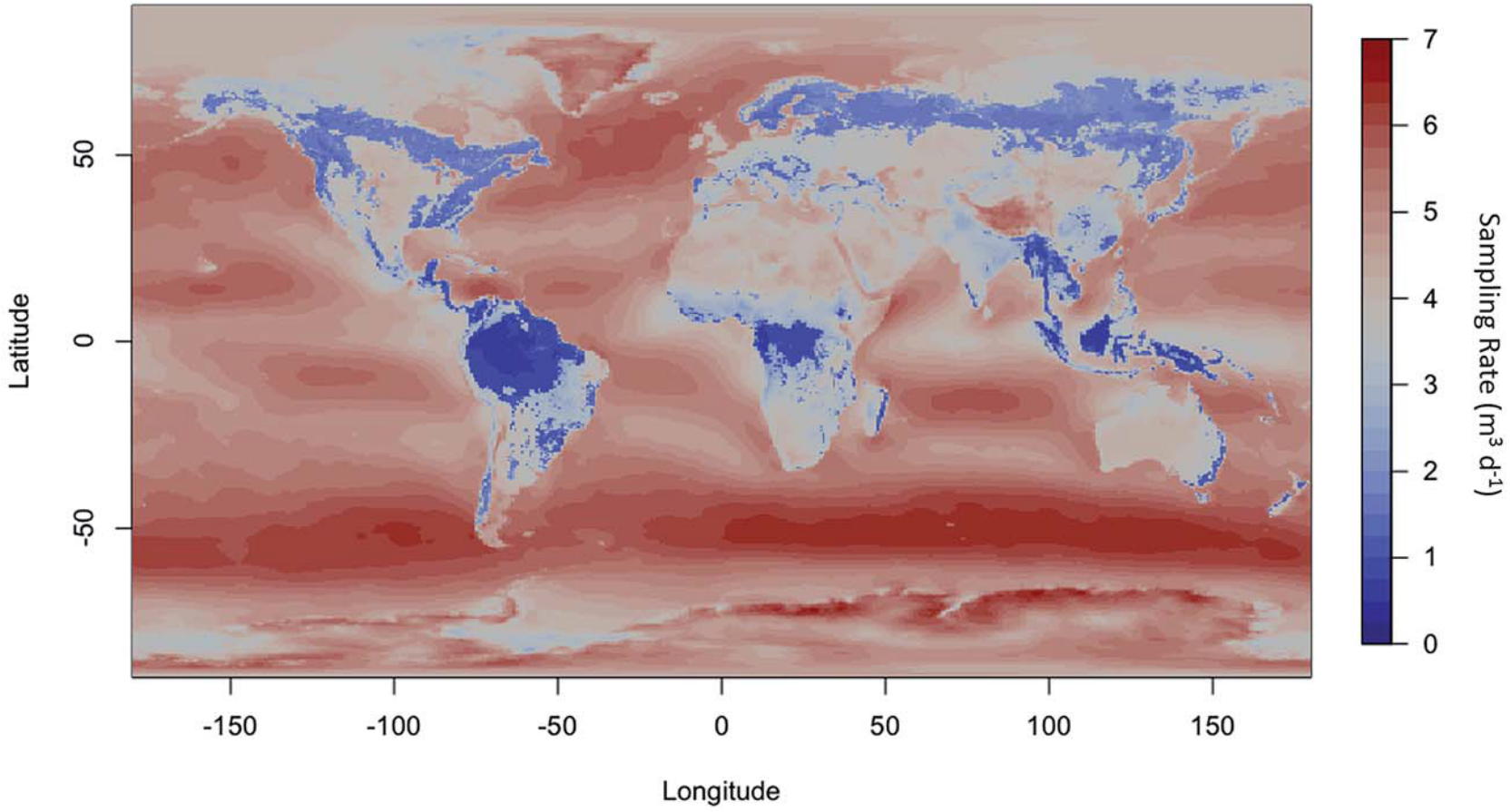
Archived PUF disks

Archived extracts

Atmospheric concentrations of Chemicals of Concern



PUF Disk Sampling – Tools and Insights



Herkert et al., 2018, Environ. Science: Processes and Impacts; http://s-iihr41.iihr.uiowa.edu/pufpas_model/

GAPS Template: https://www.researchgate.net/publication/319764519_2017_v1_5_Template_for_calculating_Effective_Air_Sample_Volumes_for_PUF_and_SIP_Disk_Samplers_Sept_15

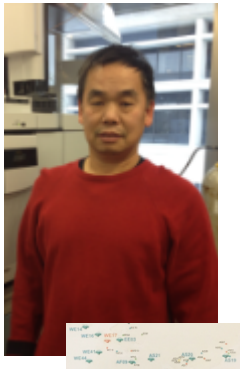
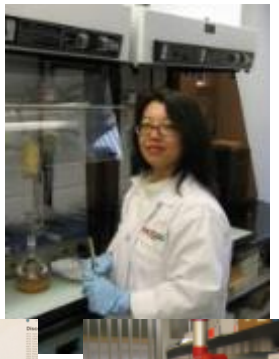
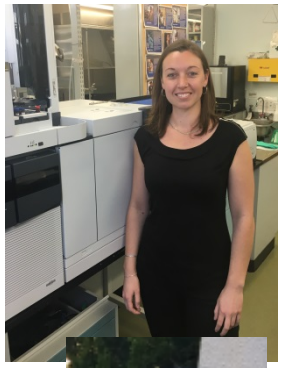
GMP Guidance Document, Air Chapter (revision in progress)

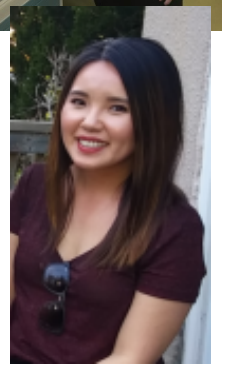
GAPS Team:

Environment and Climate Change Canada

Jasmin Schuster
Cassie Rauert
Anita Eng
Phoebe Tung
Sum Chi Lee
Mahiba Shoeib
Derek Muir
Ky Su
Narumol Jariyasopit

CMP - Chemicals Management Plan
NCP - Northern Contaminants Program

International

Karla Pozo - Universidad San Sebastián, Concepción / Masaryk Univ.
Jana Klanova – RECETOX, Masaryk University, Brno
Kevin Jones et al. - Lancaster University
Frank Wania et al. – University of Toronto
Leonard Barrie – WMO, GAW Network
UNEP - Stockholm Convention Secretariat

…and 100+ "GAPS partners" assisting with sampler deployment

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

AIR – ACTIVE – GMP2 project RELEVANT

Active sampling in Africa 2

Leckel MVS-6 (Sven Leckel, Germany) - low volume active sampler

parameters: **polyurethane foam disks** (4.4 cm diameter, 10 cm thick, density 0.030 g/cm3, type N 3038; Gumotex Breclav, Czech Republic) and **sampling head devices for PM10** equipped by Quartz Microfibre Filters (4.7 cm diametre, QM-A, Whatman, UK)

Continuous sampling cca 7 days (130-166 hrs), air volume collected: approx. 350 m3 per run, amount of air carefully recorded in the sampling record (protocol)

SOP available - provided to partners including training (in 2013 and 2016 repeated)

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

Active sampling of AIR – Kenya

low volume active sampler, MVS-6 (Sven-Leckel)

- active sampling in Africa - Nairobi - Chiromo, Kenya since 2014
- THANK YOU to Dr. Madadi and his team!

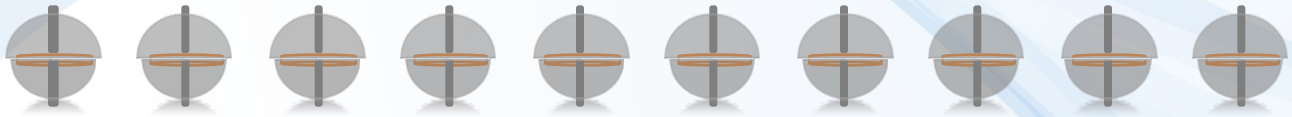
Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

Active sampling of AIR in Ghana

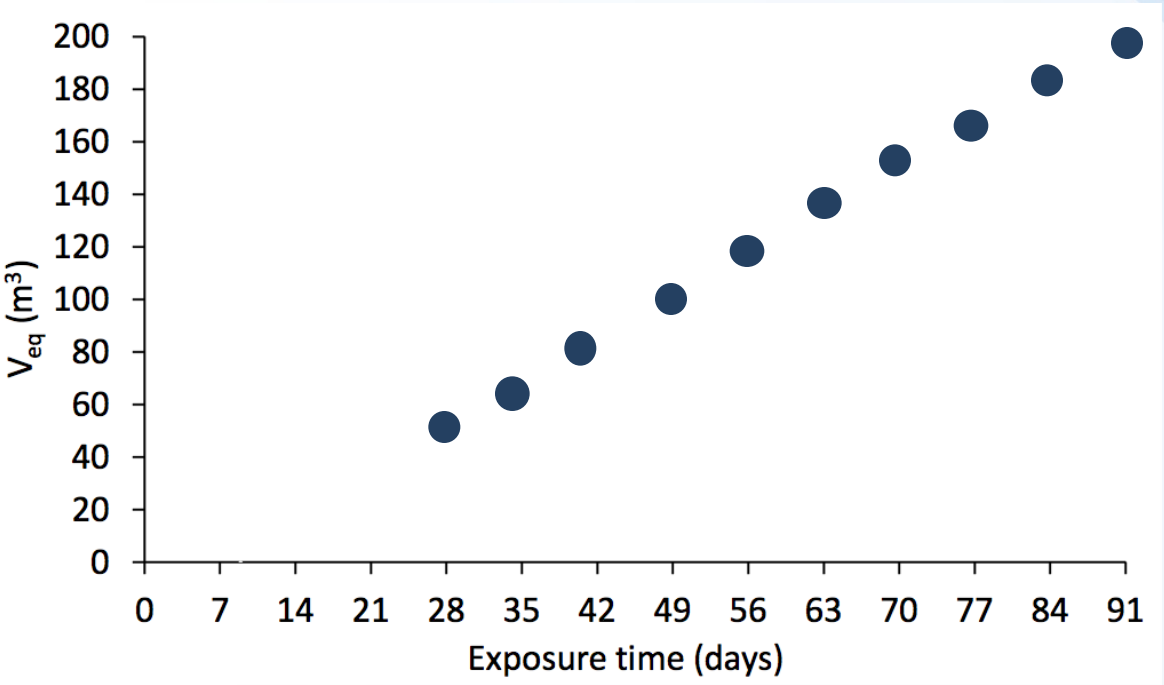
low volume active sampler, MVS-6 (Sven-Leckel)

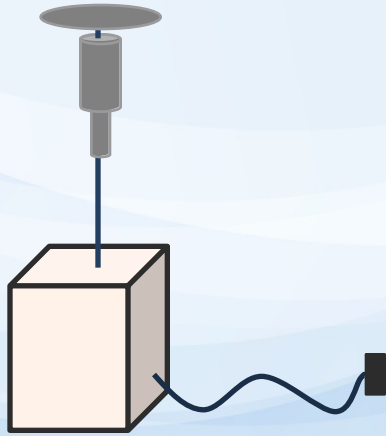
- active sampling in GAEC-East Legon, Accra, Ghana since 2014
- THANK YOU to Dr. Bempah and his team!

2014 - Calibration study structure



PUF disks deployed in passive samplers: double-dome chambers





Low volume active air sampler (GFF+PUFs)

Target compounds: indicator and dioxin-like PCBs, OCPs, PAHs, PCDD/Fs, PBDEs, novel FRs, drin pesticides*

(*not detected)

Calibration study - conclusions

Good characterization of PAS in tropical climate, linear uptake

PAS sampling rates in tropical and temperate regions are comparable (factor of two)

Well characterized sites (and recalculation data) from the intercalibration study in Africa

= for trends, it is well advisable that these two well characterized sites continue sampling on a regular and long term basis (GMP guidelines + GMP DWH data structure)

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

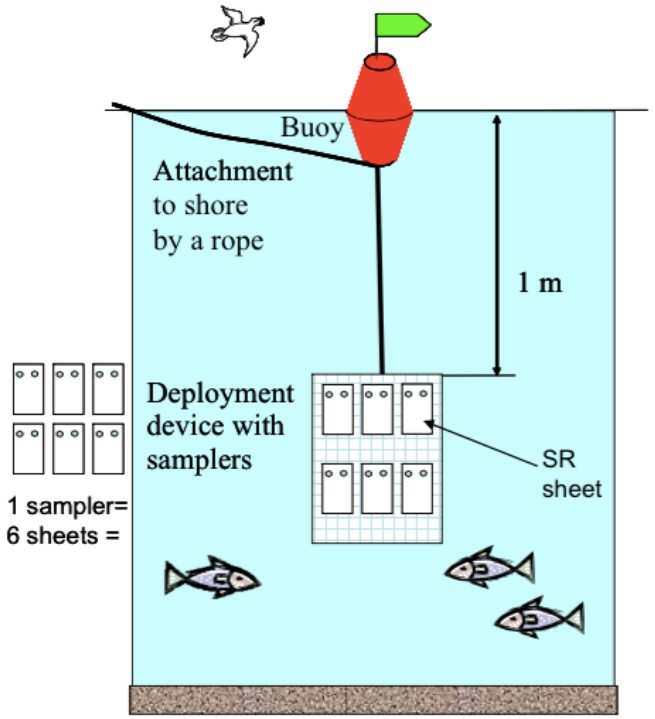
WATER

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

WATER pilot in Africa

passive water sampling 2014, 2015/2016 in MONET countries

Samples analysed by RECETOX



sampling with XAD polymer raisin

sillicone rubber sampling

training video for water sampling in 2017 - available in EN/FR!

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

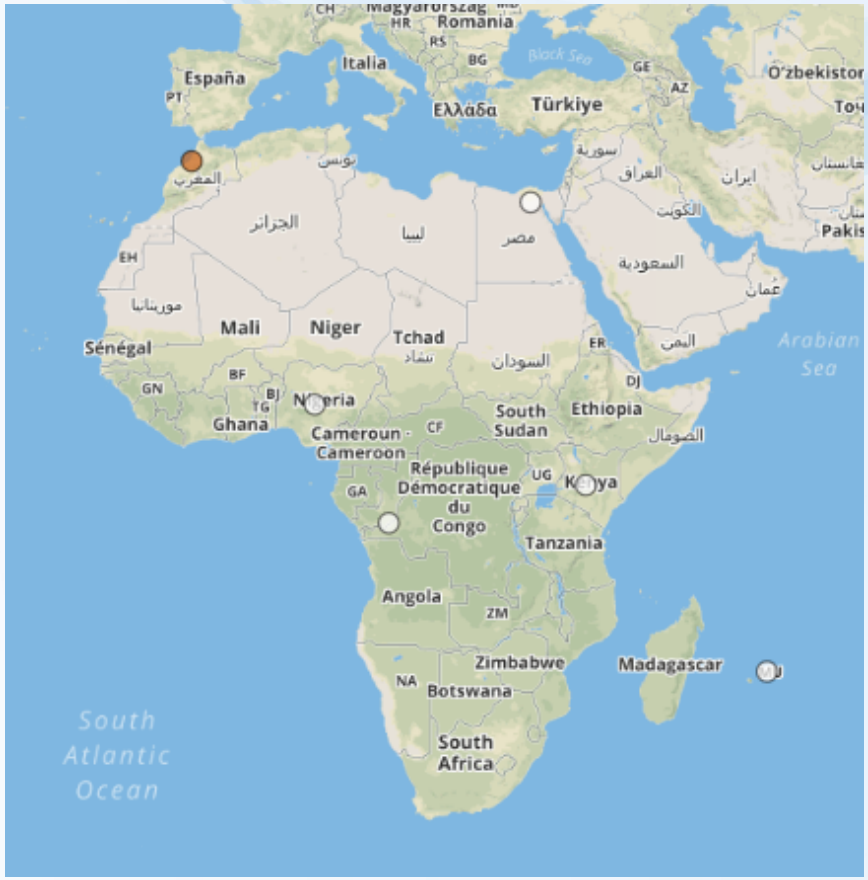
WATER pilot in Africa

passive water sampling 2014, 2015/2016 in MONET countries

Samples analysed by RECETOX, data available in www.genasis.cz for 2014

Countries participating (delivering samples)
R.of Congo 2014, 2015/6
Egypt (2013 only)
Ethiopia 2015/6
Ghana 2014, 2015/6
Kenya 2014, 2015/6 2017
Maroco 2014/5 and 2015/6
Mauritius 2014, 2015/2016, 2017
Nigeria 2014, 2015/6

data available: range 0.004-1 ng/l for various PFC compounds and alternatives



New global network - Aquagaps - pilot

ENVIRONMENTAL Science & Technology

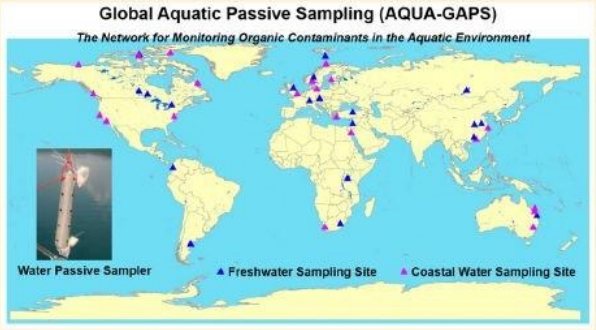
Feature

pubs.acs.org/est

Aquatic Global Passive Sampling (AQUA-GAPS) Revisited: First Steps toward a Network of Networks for Monitoring Organic Contaminants in the Aquatic Environment

Rainer Lohmann,[*,†] Derek Muir,[‡,§] Eddy Y. Zeng,[§] Lian-Jun Bao,[§] Ian J. Allan,[∥] Kenneth Arinaitwe,[⊥] Kees Booij,[#] Paul Helm,[▽] Sarit Kaserzon,[¶] Jochen F. Mueller,[¶] Yasuyuki Shibata,[○] Foppe Smedes,[∞] Manolis Tsapakis,[⊗] Charles S. Wong,[§,▲] and Jing You[§]

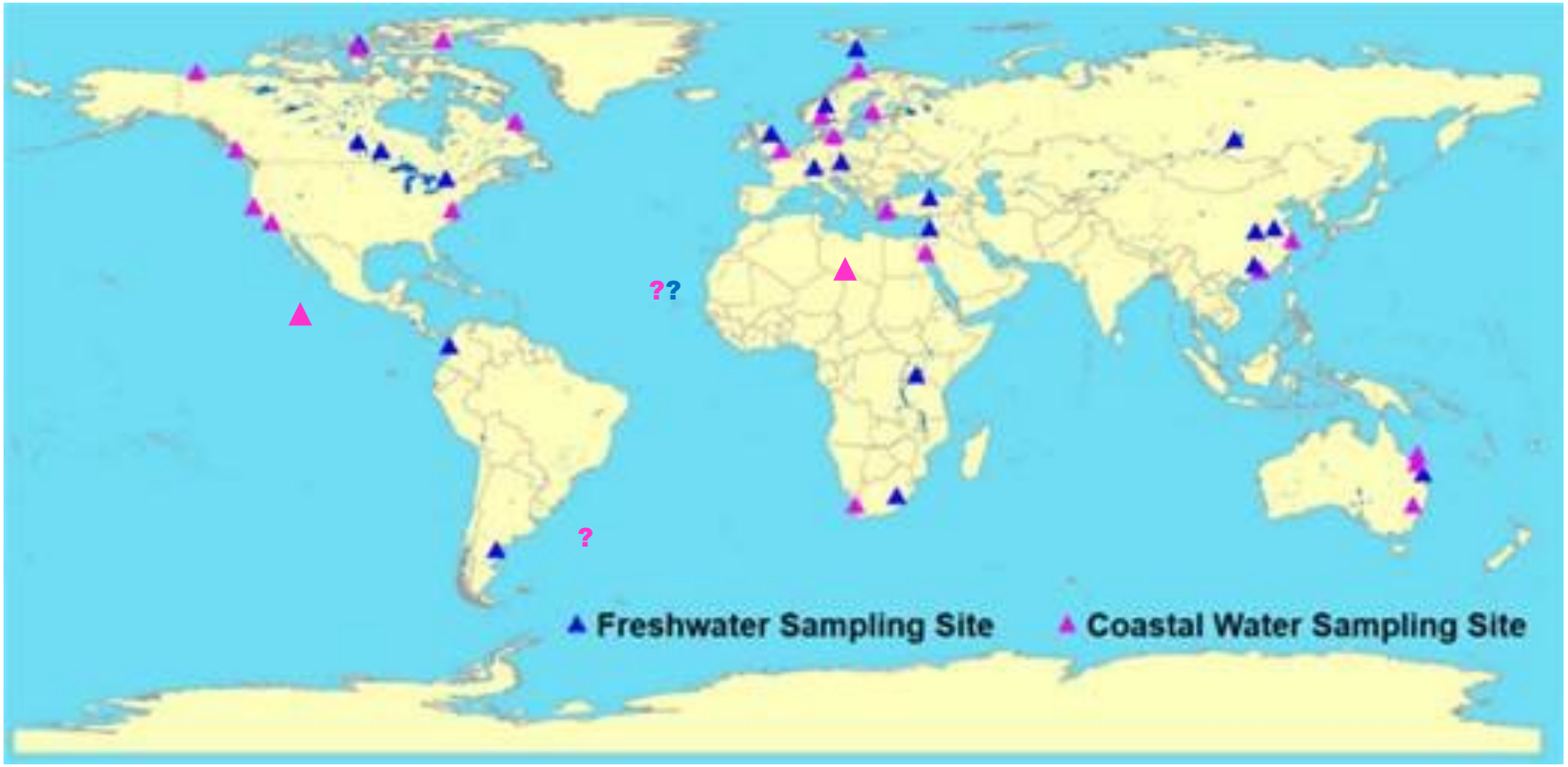
ABSTRACT: Organic contaminants, in particular persistent organic pollutants (POPs), adversely affect water quality and aquatic food webs across the globe. As of now, there is no globally consistent information available on concentrations of dissolved POPs in water bodies. The advance of passive sampling techniques has made it possible to establish a global monitoring program for these compounds in the waters of the world, which we call the Aquatic Global Passive Sampling (AQUA-GAPS) network. A recent expert meeting discussed the background, motivations, and strategic approaches of AQUA-GAPS, and its implementation as a network of networks for monitoring organic contaminants (e.g., POPs and others contaminants of concern). Initially, AQUA-GAPS will demonstrate its operating principle via two proof-of-concept studies focused on the detection of legacy and emerging POPs in freshwater and coastal marine sites using both polyethylene and silicone passive samplers. AQUA-GAPS is set up as a decentralized network, which is open to other participants from around the world to participate in deployments and to initiate new studies. In particular, participants are sought to initiate deployments and studies investigating the presence of legacy and emerging POPs in Africa, Central, and South America.



- Proof of concept in 2016/2017
- Freshwater is sampled 2016 – analysis from July 2017
- Fresh-and coastal-water sampling from June 2017
- Learning by doing → logistics and practicalities

Research Centre for Toxic Compounds in the Environment

Present sampling sites in Aquagaps (pilot)



Research Centre
for Toxic Compounds
in the Environment

Aqua gaps

Future issues in Aquagaps

- Balance the coverage
- Include Ferry – box approach?
- QA/QC
  - Prepare reference material
  - Collaborate with QUASIMEME
- Capacity building →→ ultimately to have all work done locally
  - Provide samplers to participants for local analysis
  - Training, tips, tricks, etc
  - Intercalibrating the sampling/analysis
- Specimen banking of samplers/storage for retroactive analysis

Acknowledgements

- University of Rhode Island, Narragansett, RI, USA;
- Environment and Climate Change, Canada
- School of Environment, Jinan University, Guangzhou, China
- Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology (SCRC), hosted by RECETOX, Masaryk University, Czech Republic
- To all participants voluntary contributing by deployment of samplers

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

Acknowledgements

RECETOX reserach infrastructure for running MONET and supporting GMP2 project and

We are also grateful to the Czech Ministry of Environment, UNEP and the Czech Ministry of Education, Youth and Sports (LM2015051) and UNEP for their support to RECETOX research infrastructure.

Tom Harner for information on GAPS program
Vincent Madadi (African regional coordinator for POPs monitoring)
UNEP BRS for kind support of MONET, GAPS and other POPs monitoring activities
and last but not least - many MONET partners present in the meeting!

Stockholm Convention
Regional Centre for Capacity Building
and the Transfer of Technology

Thank you for your kind attention