



Canadian Perspective on POPs

Progress in Air Research & Monitoring

***3rd Workshop on Recent Findings
on Air Pollution and Implications
on Policy Making: Air Toxics.
Monterrey, Mexico***

***Tom Harner
Science & Technology Branch
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Acknowledgements:

Jianmin Ma, Hayley Hung, Nick Alexandrou, Liisa Jantunen, Sum Chi Lee, Mahiba Shoeib, Ed Sverko, Fiona Wong, Terry Bidleman.

Overview

Policy Drivers

Chemicals Management Plan (CMP)

& Canadian Environmental Protection Act

Pest Controls Products Act

International Treaties (*e.g. Stockholm Convention on POPs; GLWQA*)

Commission for Environmental Cooperation (*CEC*)

Great Lakes Binational Toxics Strategy (*GLBTS*)

Programs

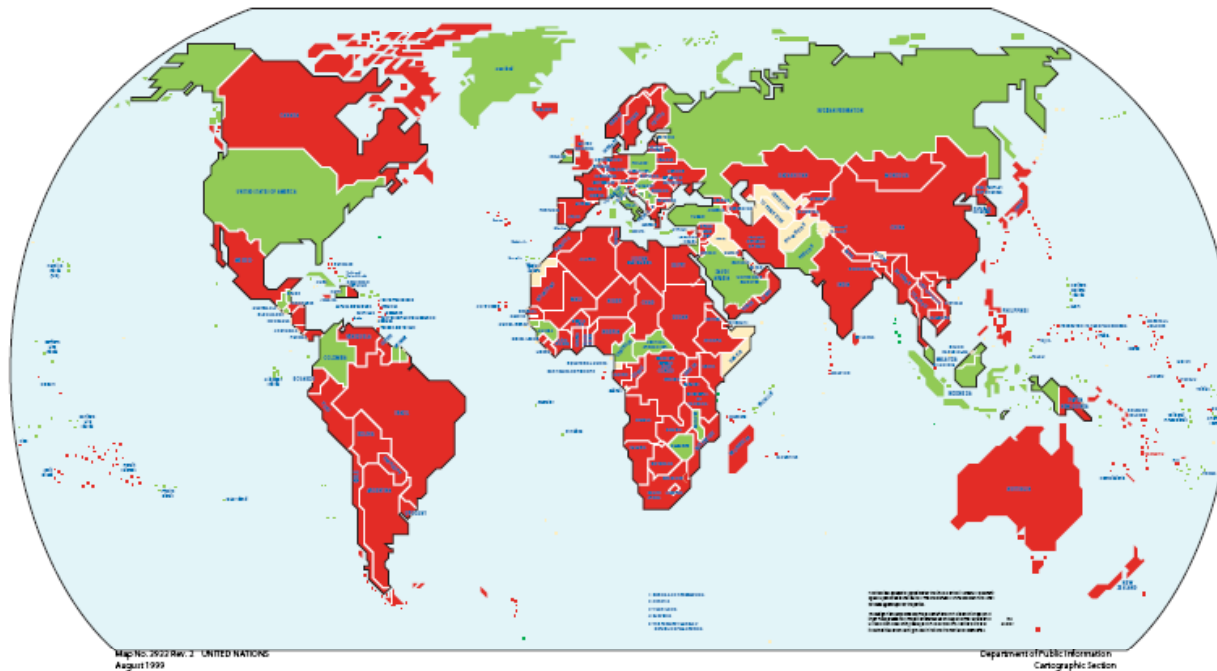
1. Northern Contaminants Program (NCP)
2. Great Lakes Water Quality Program / IADN
3. Global Atmospheric Passive Sampling (GAPS) Network
4. Modeling Efforts on POPs

Chemicals Management Plan (CMP)

- Canada's strategy for protecting human health and the environment.
- includes risk assessment and risk management.
- Environment + Health departments.
- announced in Dec. 2006.
- builds on 'categorisation' process completed in Sept. 2006 that considered 23,000 chemicals on the domestic market.
 - 4300 to undergo further assessment
 - 500 considered high risk

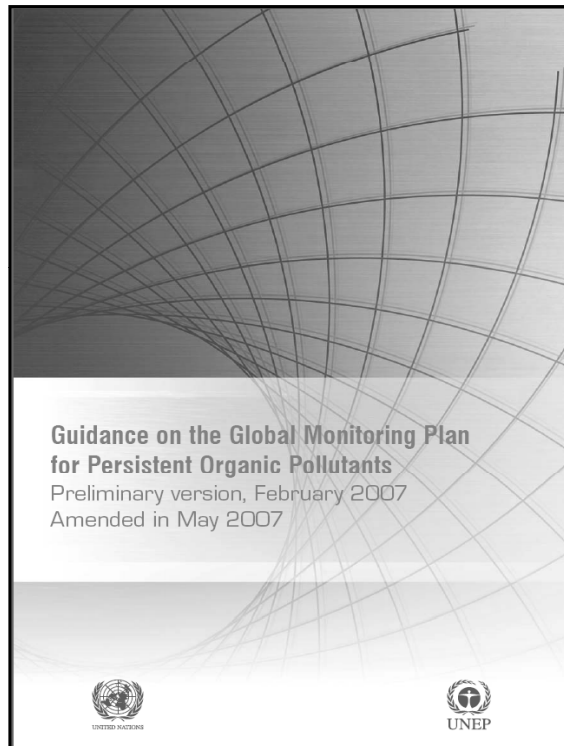
Stockholm Convention on POPs

- United Nations Environment Program (UNEP)
- into force May 2004; 160+ member countries so far
- **12 chemicals** (+9 new chemicals added at COP4, May 2009)



- a-HCH
- b-HCH
- lindane
- chlordecone
- HBB
- PeCB
- PFOS and salts, and PFOSF
- Penta-BDE
- Octa-BDE

Core Media for the GMP *(Global Monitoring Plan)*



- **Air**
- **Human Tissues**

(...other media if available)

**1st GMP report presented at
COP4 in May 2009!**

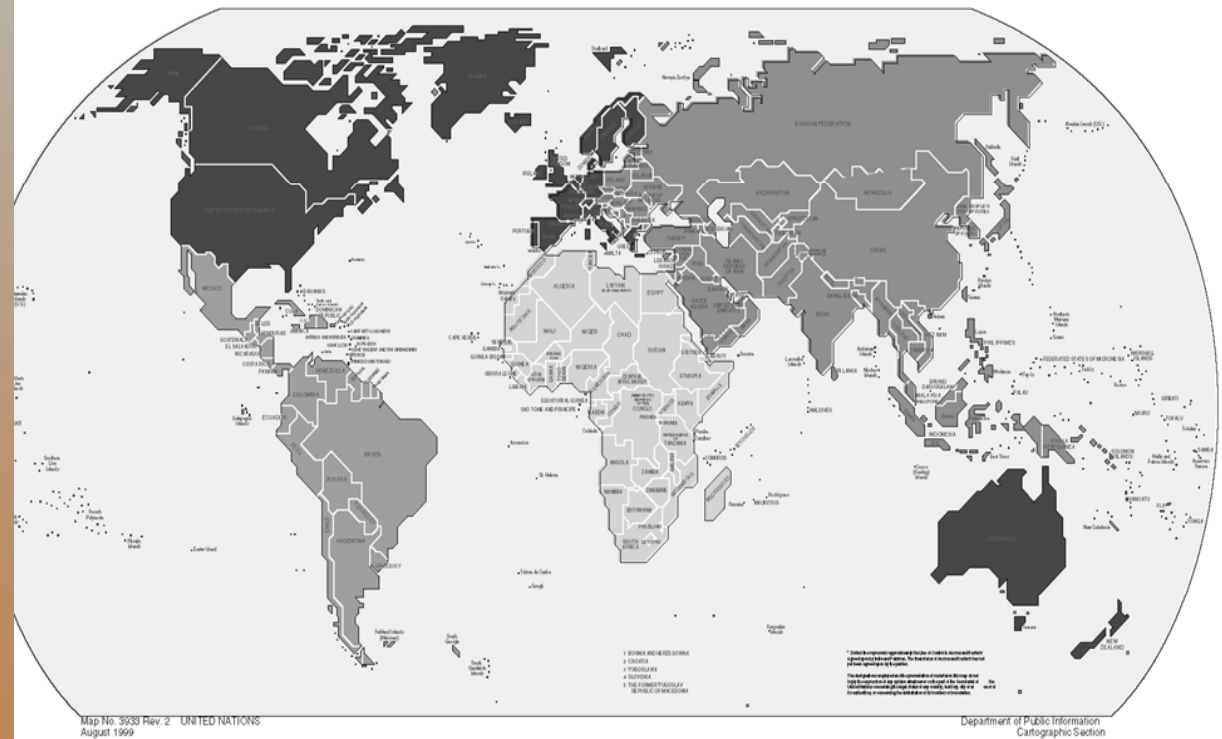
...and every 6 years thereafter

Regional Structure for the GMP



**GLOBAL MONITORING PLAN
FOR PERSISTENT ORGANIC POLLUTANTS**
UNDER THE STOCKHOLM CONVENTION ARTICLE 16 ON EFFECTIVENESS EVALUATION

**FIRST REGIONAL MONITORING REPORT
WESTERN EUROPE AND OTHER GROUPS (WEOG) REGION
2008**



GMP on 'New POPs'

Excerpt from Co-chairs Report, GMP Report for Effectiveness Evaluation – Conclusions and Recommendations. *

New POPs

32. *When the Conference of the Parties decides to add new substances to the Annexes of the Convention, it would be necessary to include those new POPs into the effectiveness evaluations and **monitoring of those {new} POPs would have to be initiated as soon as possible so that effective baselines could be established.** It was stressed that the inclusion of additional POPs would be likely to require modification or amendments to the current guidelines for global monitoring and the implementation plan. It was confirmed that existing monitoring programmes that have monitored the core media would be able to provide useful data, however some new requirements might need to be added to the guidelines. Meeting such requirements would undoubtedly increase the cost of the monitoring programmes.*

** (adopted at COP4, Geneva, May 2009)*

Program overviews

1. Northern Contaminants Program – Regional *Monitoring for Emerging Chemicals in Arctic Air*



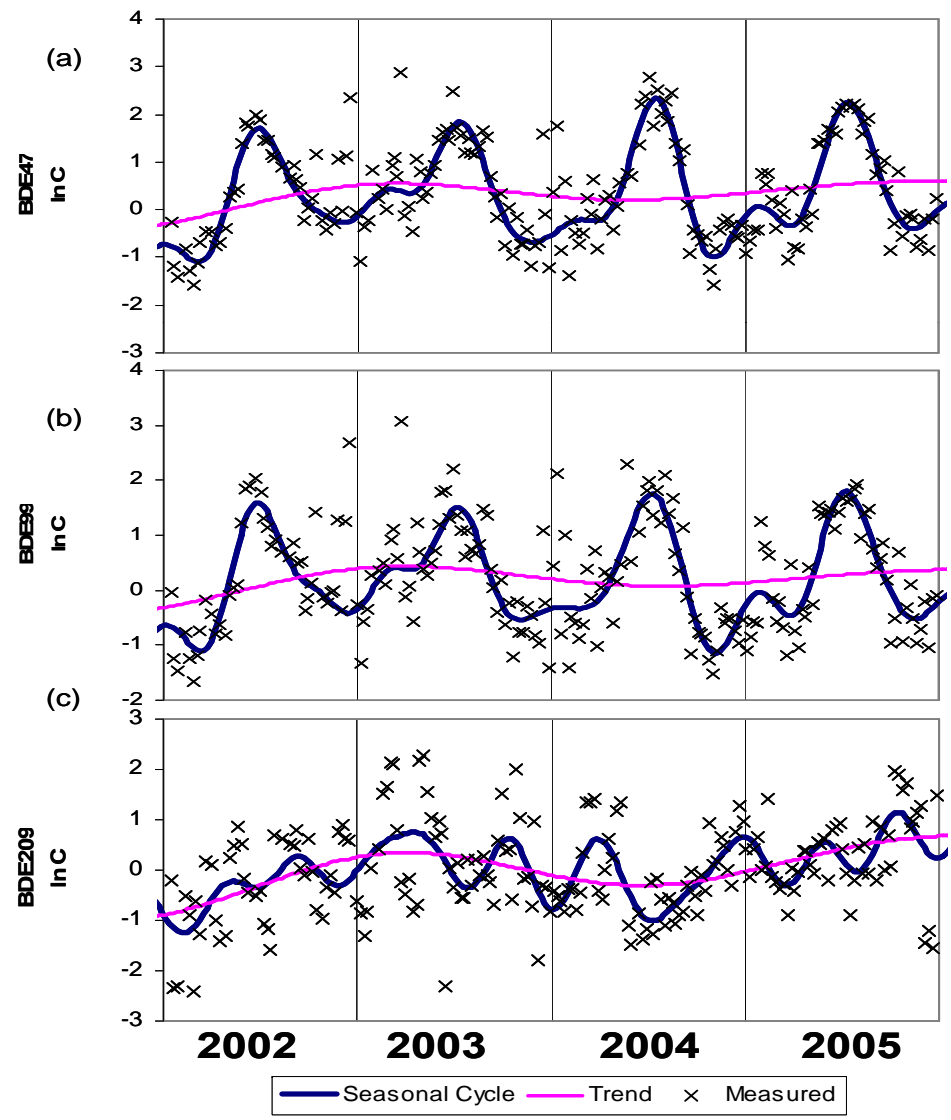
Alert Global Atmospheric Watch (GAW) Station, Nunavut

- Legacy POPs (1992-present)
- PBDEs (2002-present)
- Perfluorinated Compounds & Current-use Pesticides (CUPs) (2006 - present)

Little Fox Lake, Yukon

- PBDEs (Summer 2007 – Summer 2009)

PBDE Increasing Tendency in Air at Alert



BDE 47

Doubling time: 6.4 y

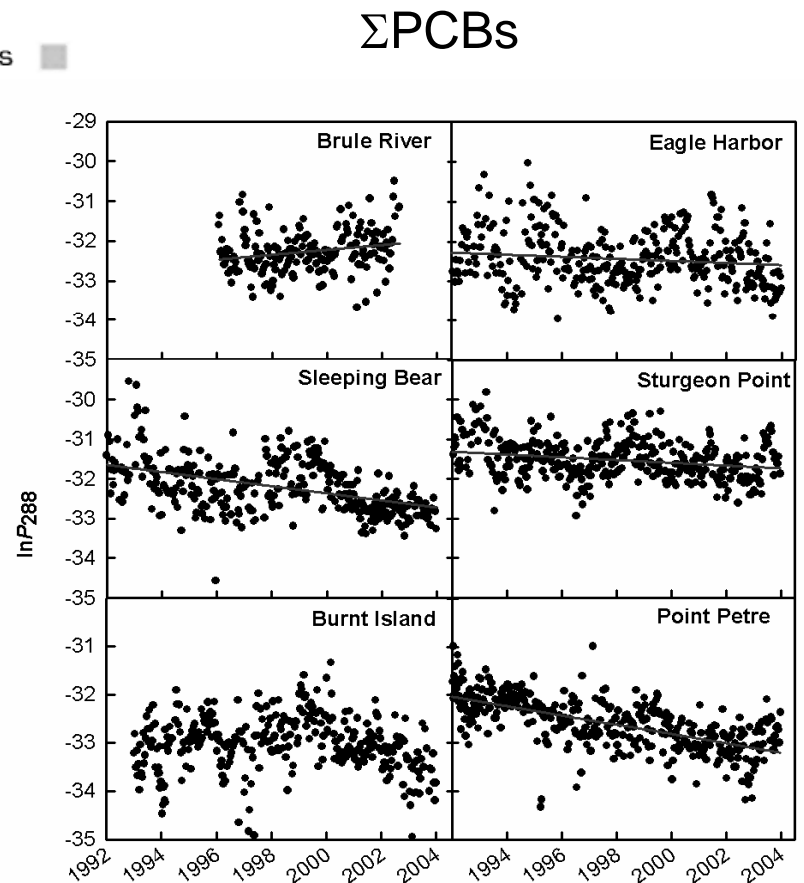
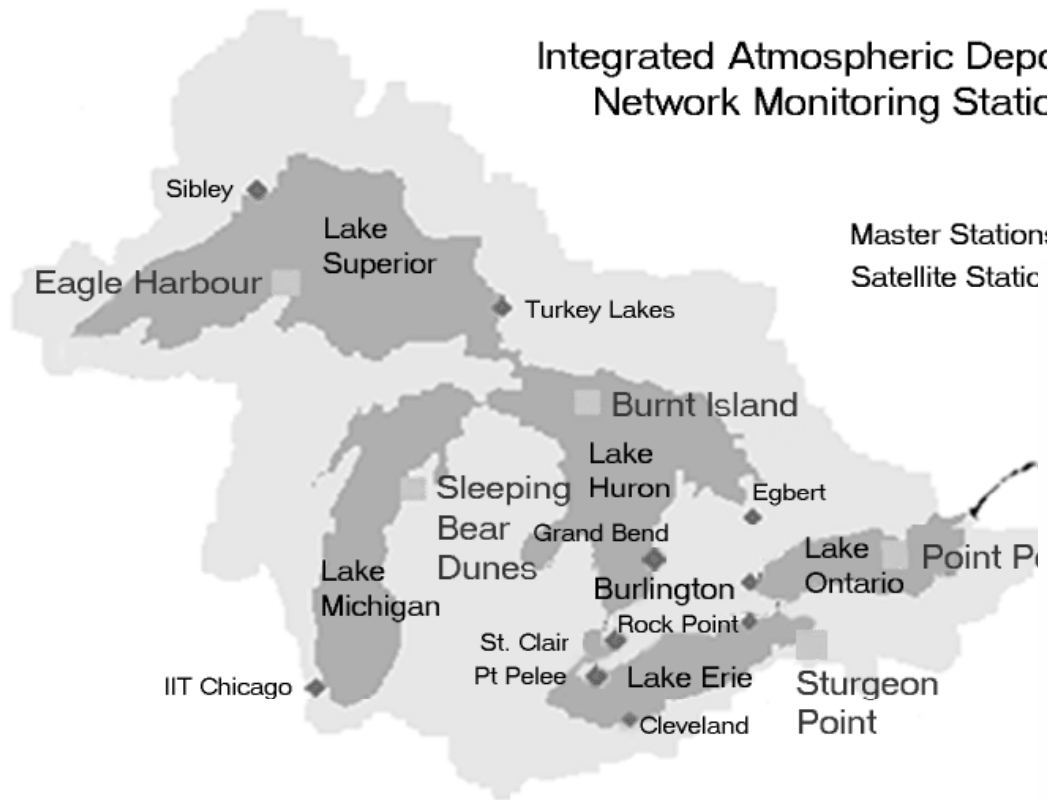
BDE 99

Doubling time: 12 y

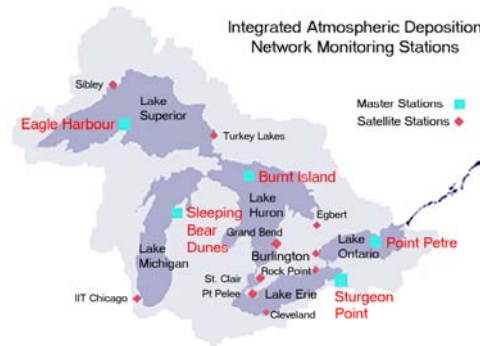
BDE 209

Doubling time: 3.5 y

2. Great Lakes Water Quality Program - Regional



Emerging Chemicals at Canadian IADN Sites



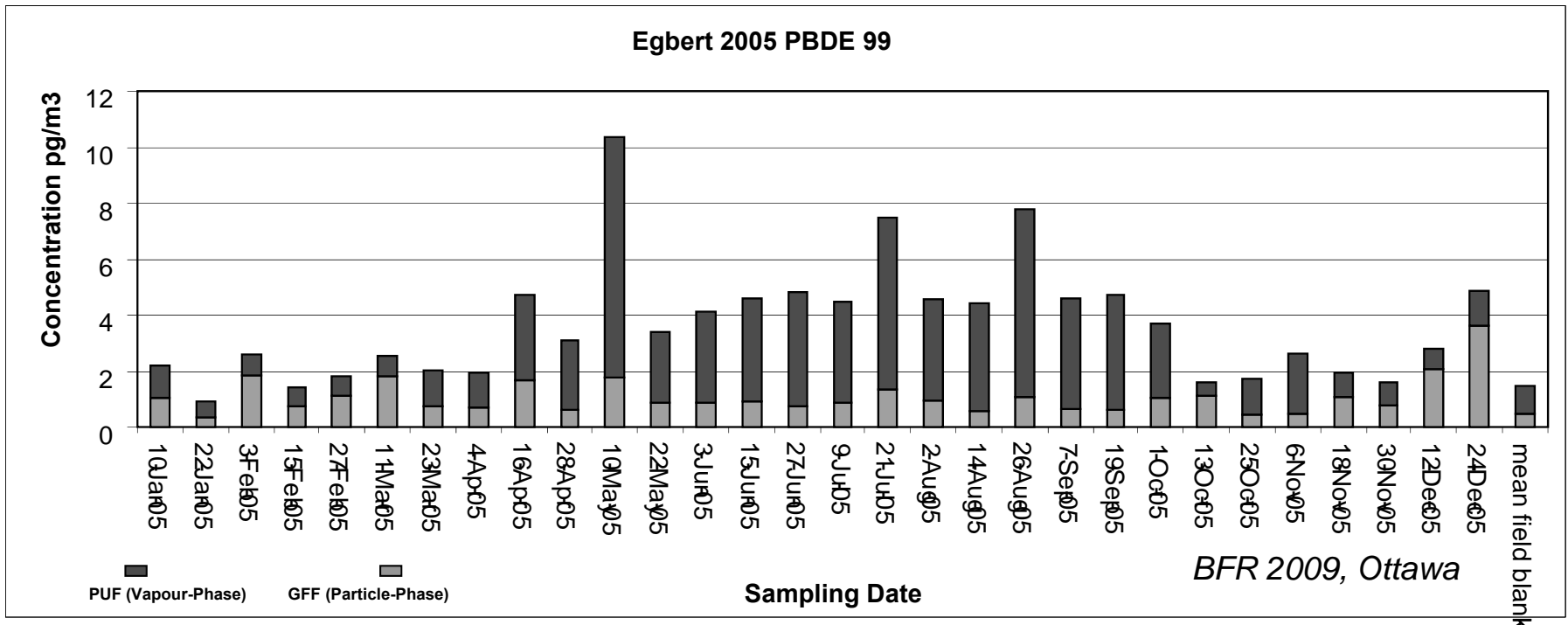
Burnt Island, Point Petre, Egbert

Legacy POPs: 1992-present

PBDEs: 2005, 2006, 2007...

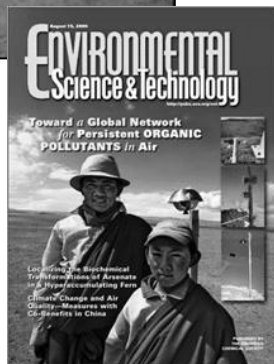
Future target analytes:

- alternative flame retardants



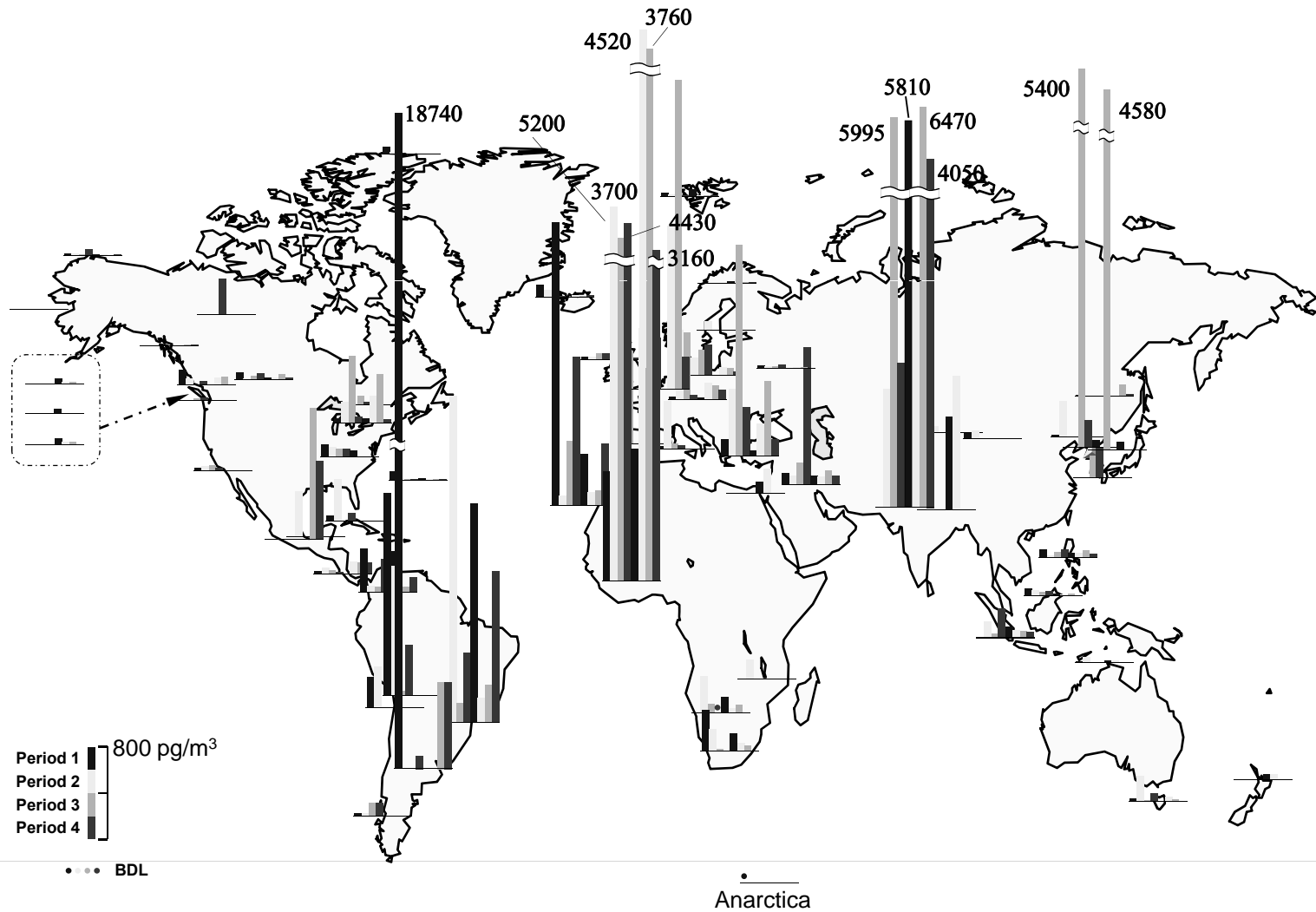
3. Canada in context of global levels

- GAPS originated in Canada in 2004/05; 50+ sites; capacity building
- GAPS is the only global-scale program reporting to the Global Monitoring Plan (GMP) of the Stockholm Convention on POPs.
- Quarterly (PUF-disk) and yearly (XAD) integrated air sampling.
- Target analytes: legacy POPs and emerging chemicals (endosulfan and other CUPs; PCNs; PFASs; PBDEs; DPlus; alternative FRs)
- GAPS data integrated with global transport models to assess LRT.



Σ Endosulfans (2005/06)

Range: 0.2 to 25940 pg/m^3

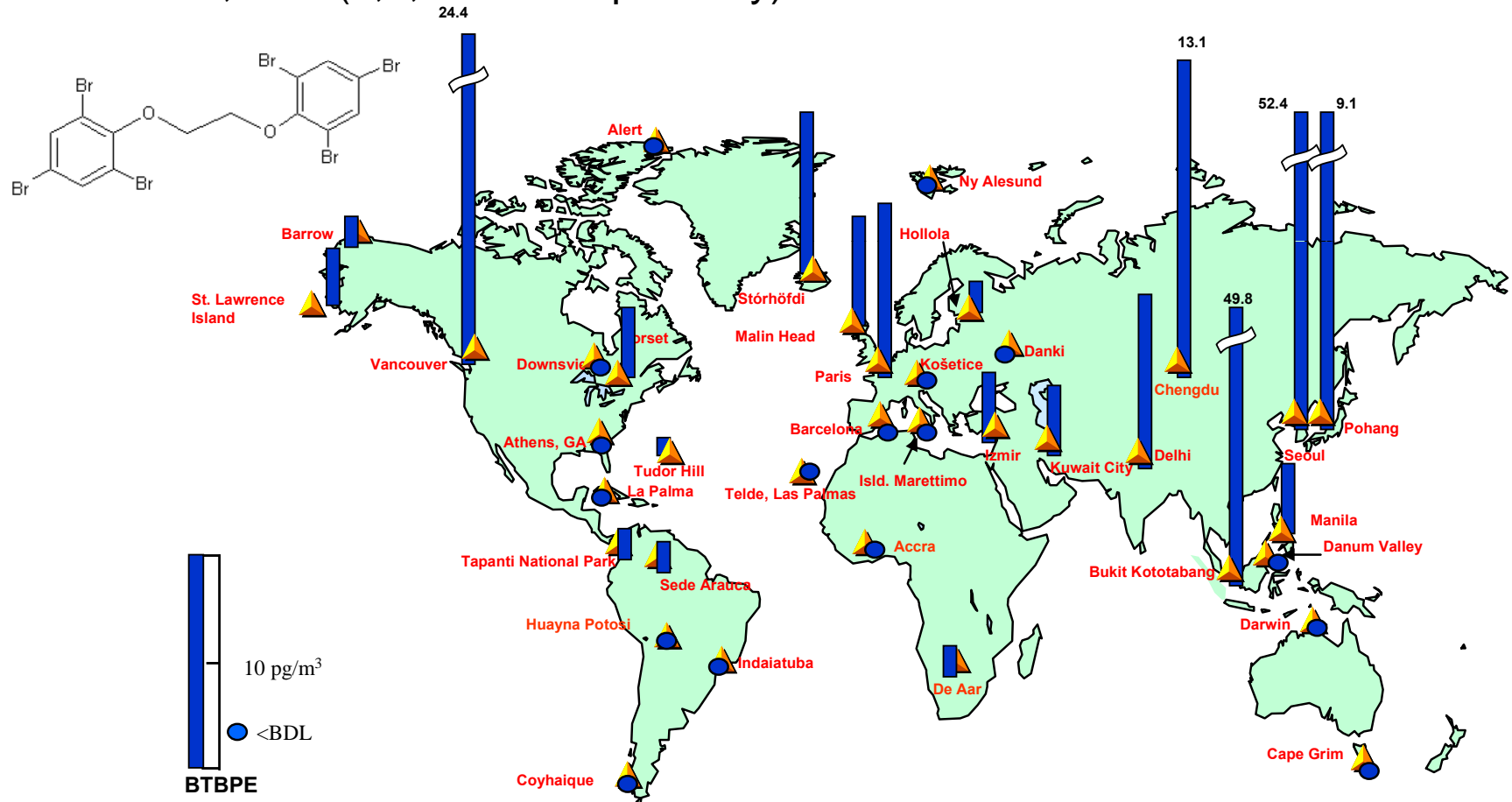


BDL = below detection limit

Σ Endosulfans = Endosulfan I + Endosulfan II + Endosulfan sulfate

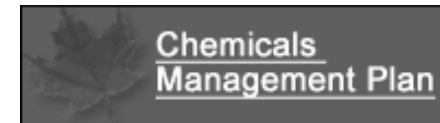
New 'BFRs' under GAPS

BTBPE – 1,2-bis (2,4,6-tribromophenoxy)-ethane

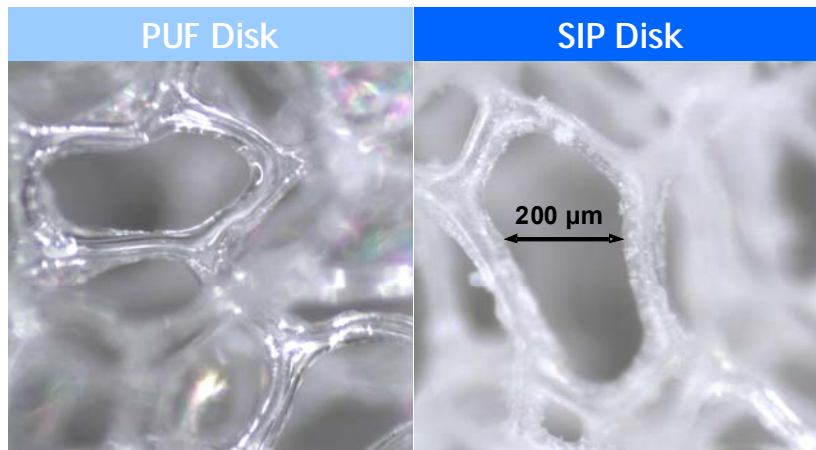


Looking ahead...Emerging chemicals under GAPS

Efforts underway to broaden target list:
FTOHs, CUPs, siloxanes



SIP Disk Pilot Study (March 2009, 20 GAP sites)



50×
magnification



Shoeib et al., Anal. Chem. 2008

POPs Modeling

GMP on POPs Transport and Trends

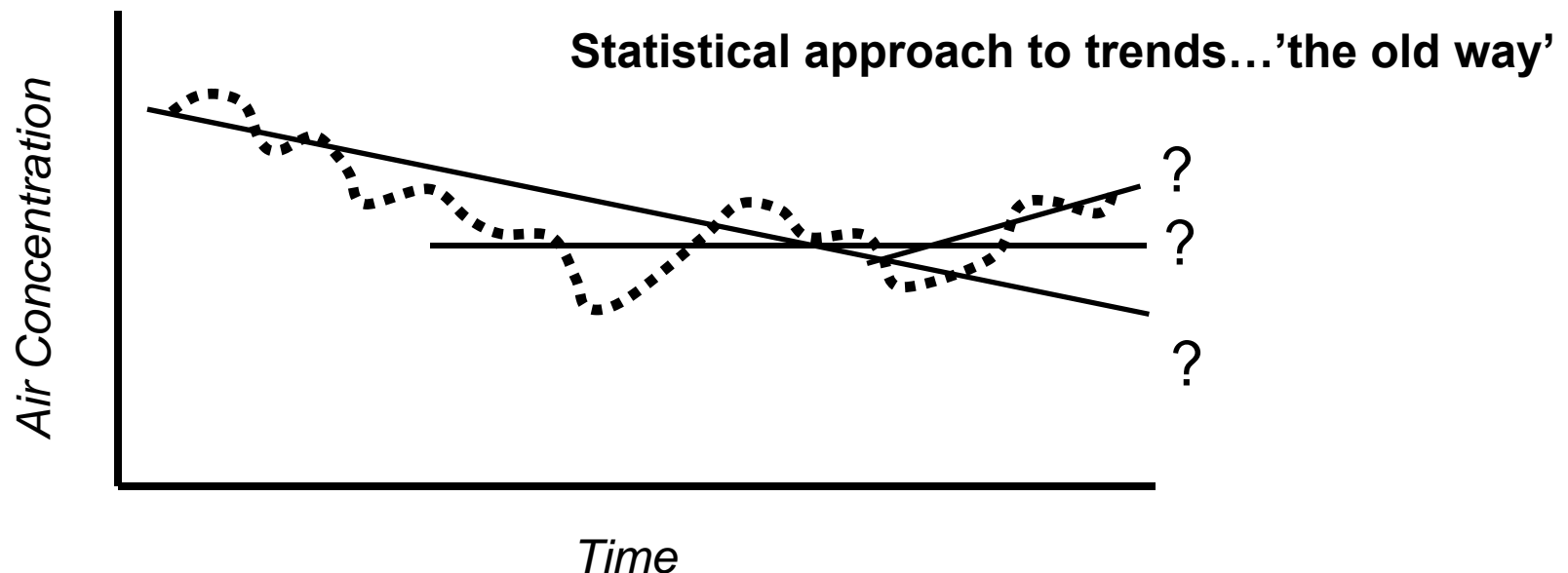
Excerpt from Co-chairs Report, GMP Report for Effectiveness Evaluation – Conclusions and Recommendations.

Long-range transport

29. The coordination group concluded that **knowledge on long-range transport was key to assessing changes in POPs levels over time** and to assess the effectiveness of the Convention. The physical-chemical properties of each chemical defined how it was transported over long distances – whether they were “flyers” through air, or “swimmers” through water. Overall persistence defined how long a compound would remain in the environment. Compounds that are persistent and capable of being transported long distances would be expected to last a long time in remote areas and make it difficult to determine the effectiveness of the Convention. Some of the POPs that might be included in the Convention could be more water soluble and as such marine transport by ocean currents might be important to examine in the future.

Assessing POPs Transport and Trends

- Article 16 – Effectiveness Evaluation – Stockholm Convention on POPs**
- **temporal trend information** i.e. “are things improving?”
 - **information on regional and global transport**

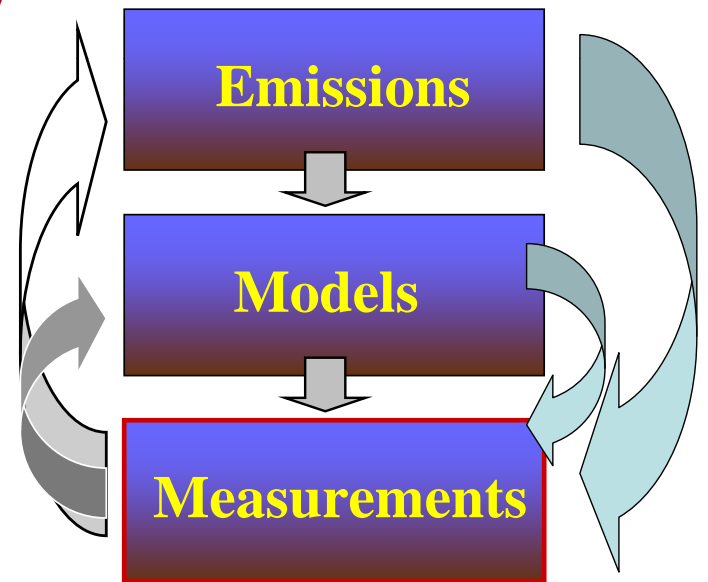


Long-range Transport (LRT), Climate, and POPs trends

Beyond statistics... 'Effectiveness Evaluation'

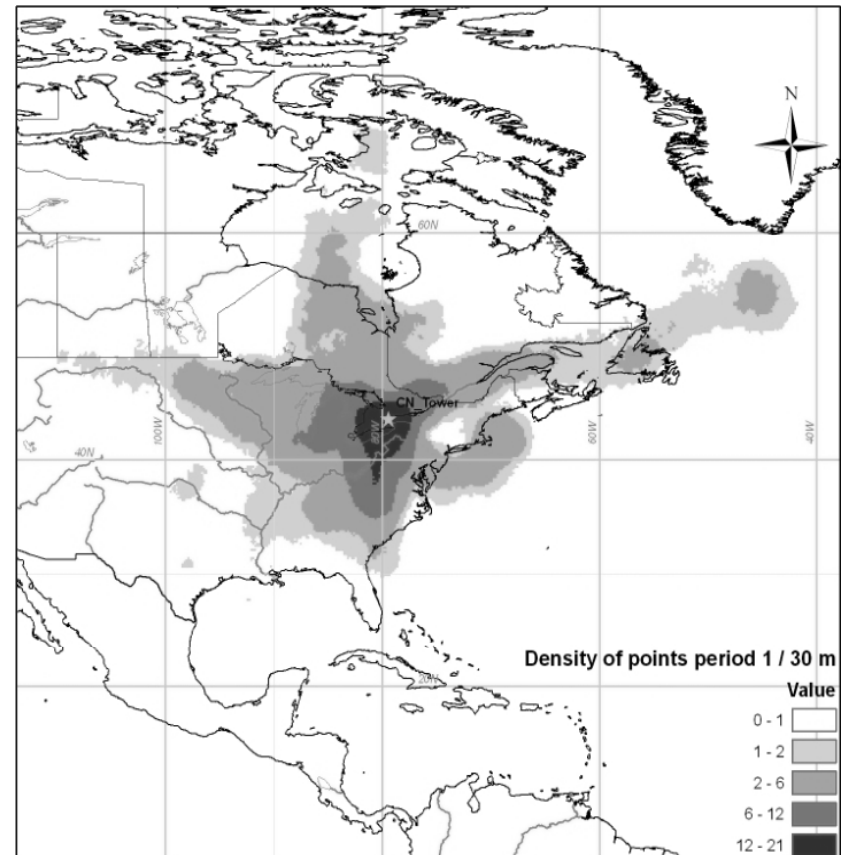
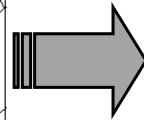
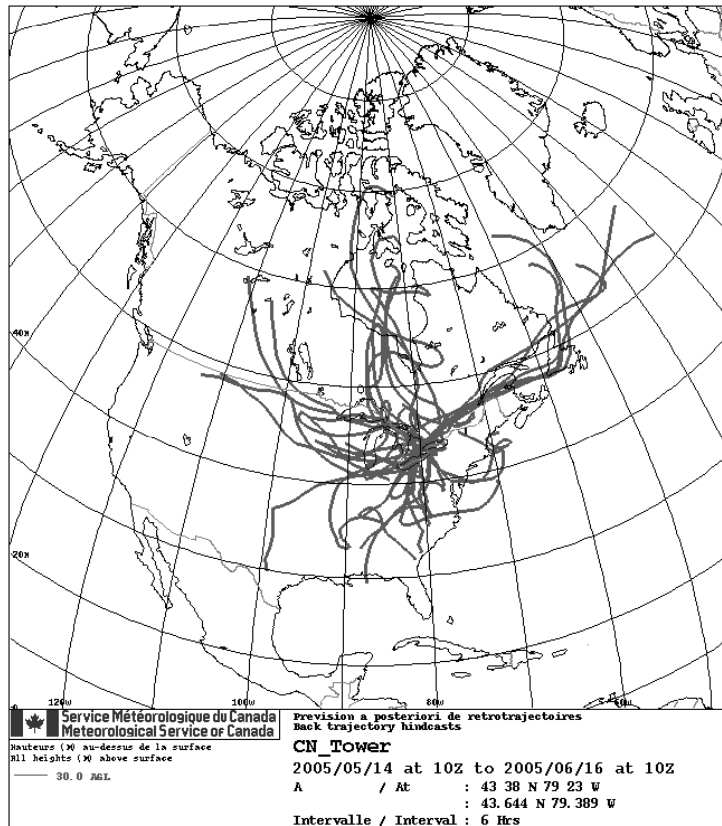
- 1.) Airshed maps
- 2.) Transport Models
- 3.) Climate interactions on POPs trends

...the new way



Assessing Transport and Trends – 1. Airshed Maps

- forward/backward air parcel trajectories -

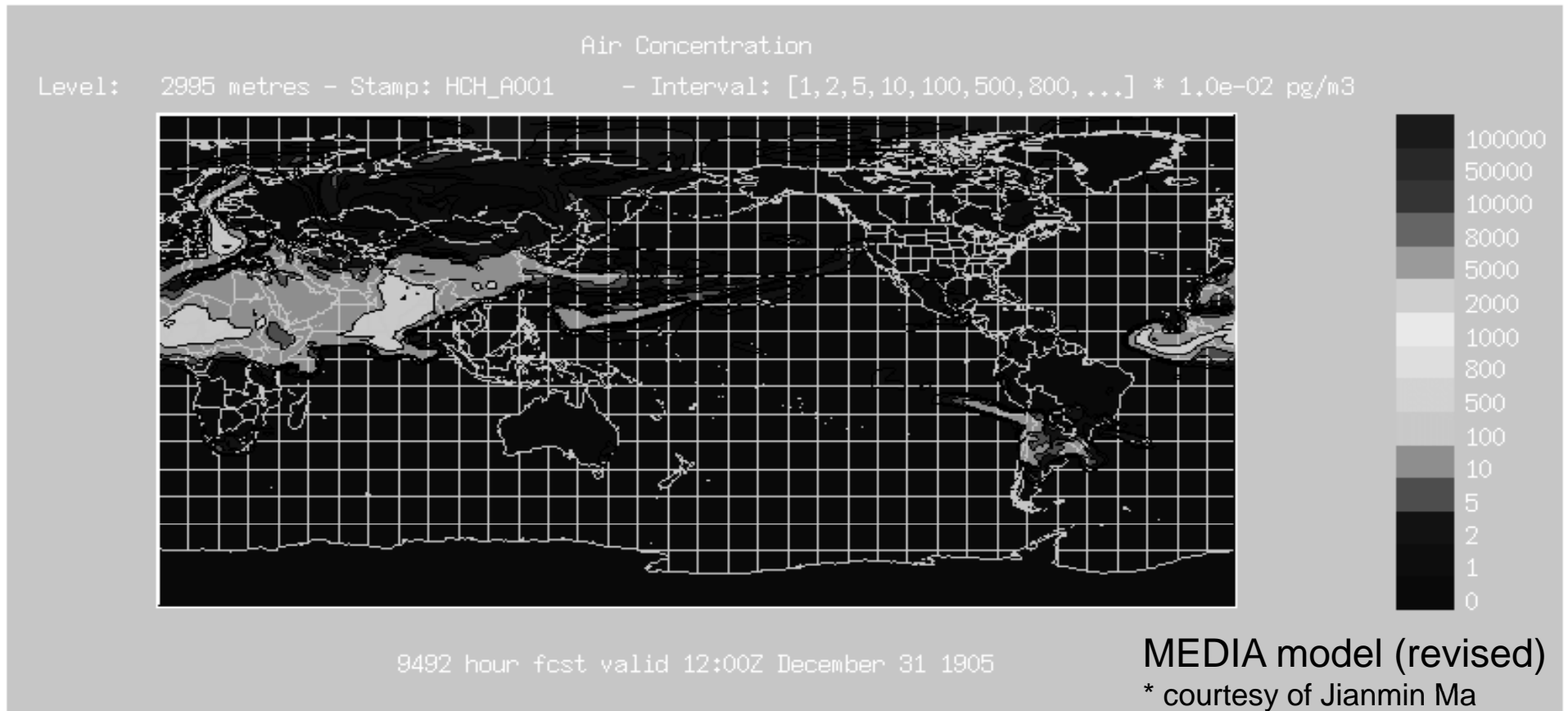


Assessing Transport / Trends – 2. Global Transport Models

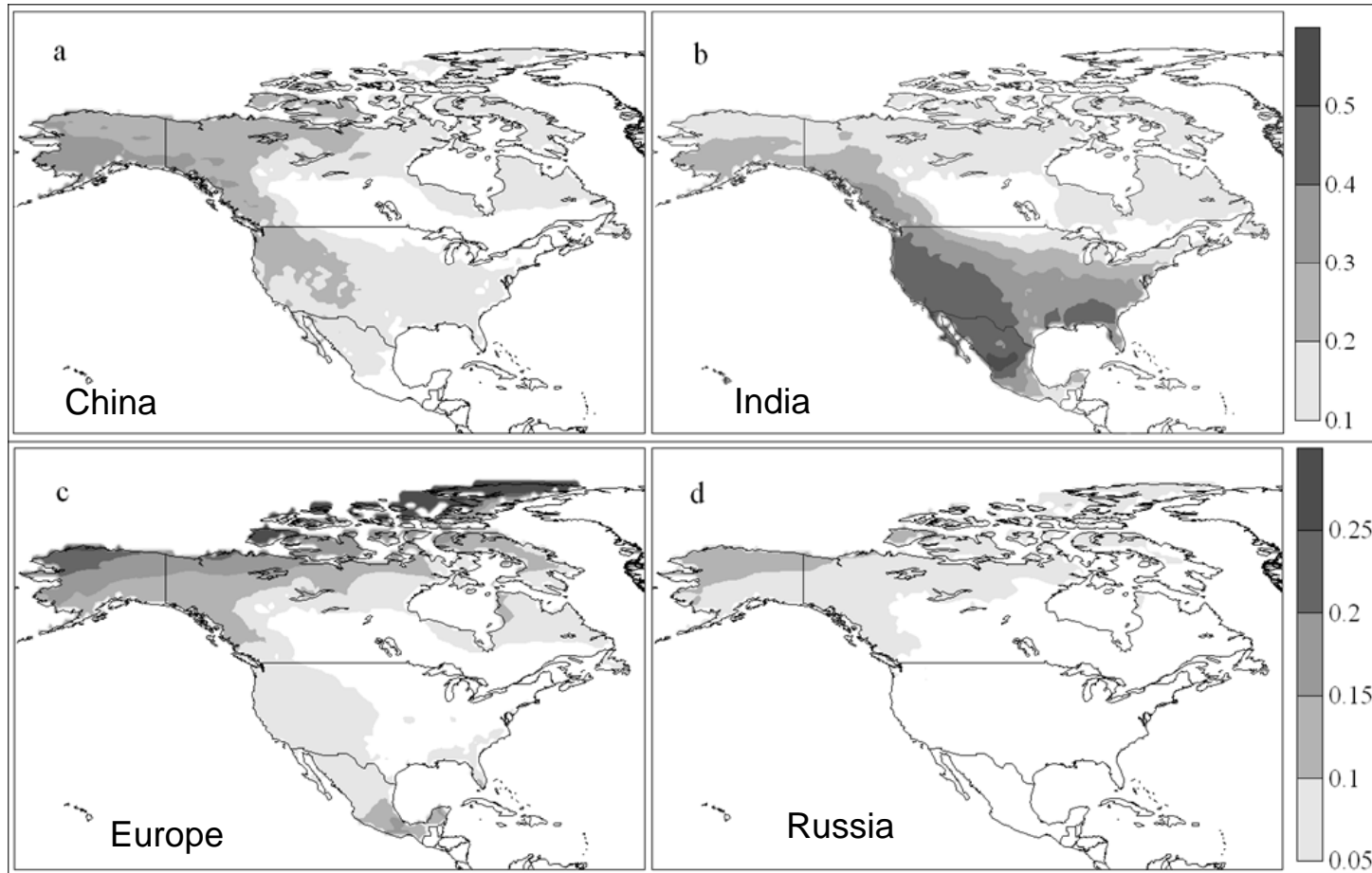
(emissions estimates + GAPS

data)

γ -HCH (lindane)



Modeled inputs of γ -HCH from different sources

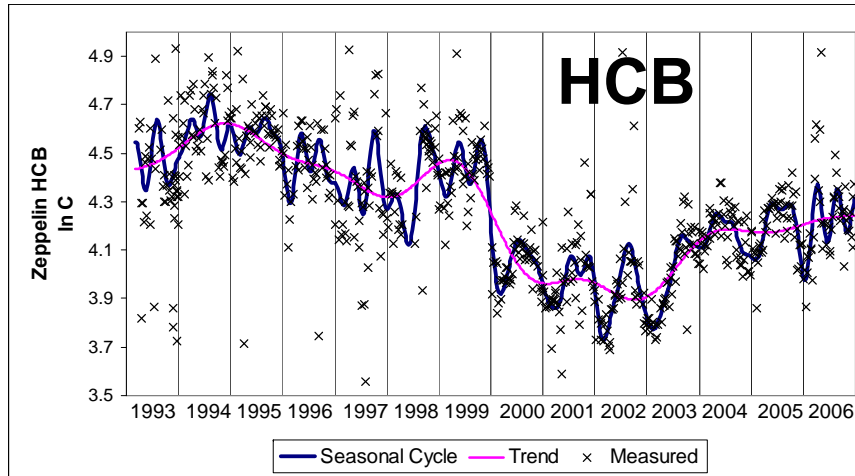


Model computed ratios of model scenarios 2-5 and scenario 1 for annual total deposition (Wet + dry) over North America highlighting the impact of different emission source on North America.

a: S2/S1 b: S3/S1, c: S4/S1, d: S5/S1; S1: All source in NH, S2: sources in China, S3: Sources in India, S4: sources in Europe, S5: sources in Russia.

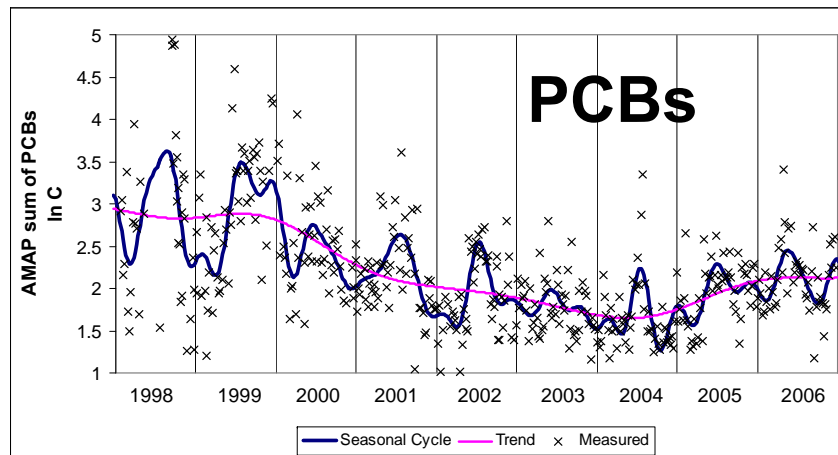
* courtesy of Jianmin Ma

Assessing Transport / Trends – 3. Climate Effects



Increase in HCB, PCB and DDT air concentrations at Zeppelin Mtn, Svalbard attributed to reduction in ice cover.

(courtesy of Roland Kallenborn, NILU)



- site specific – ‘comparability’
- ‘climate variability’ vs ‘climate change’

Overview

In Canada, the Chemicals Management Plan directs research and monitoring efforts on new priority chemicals.

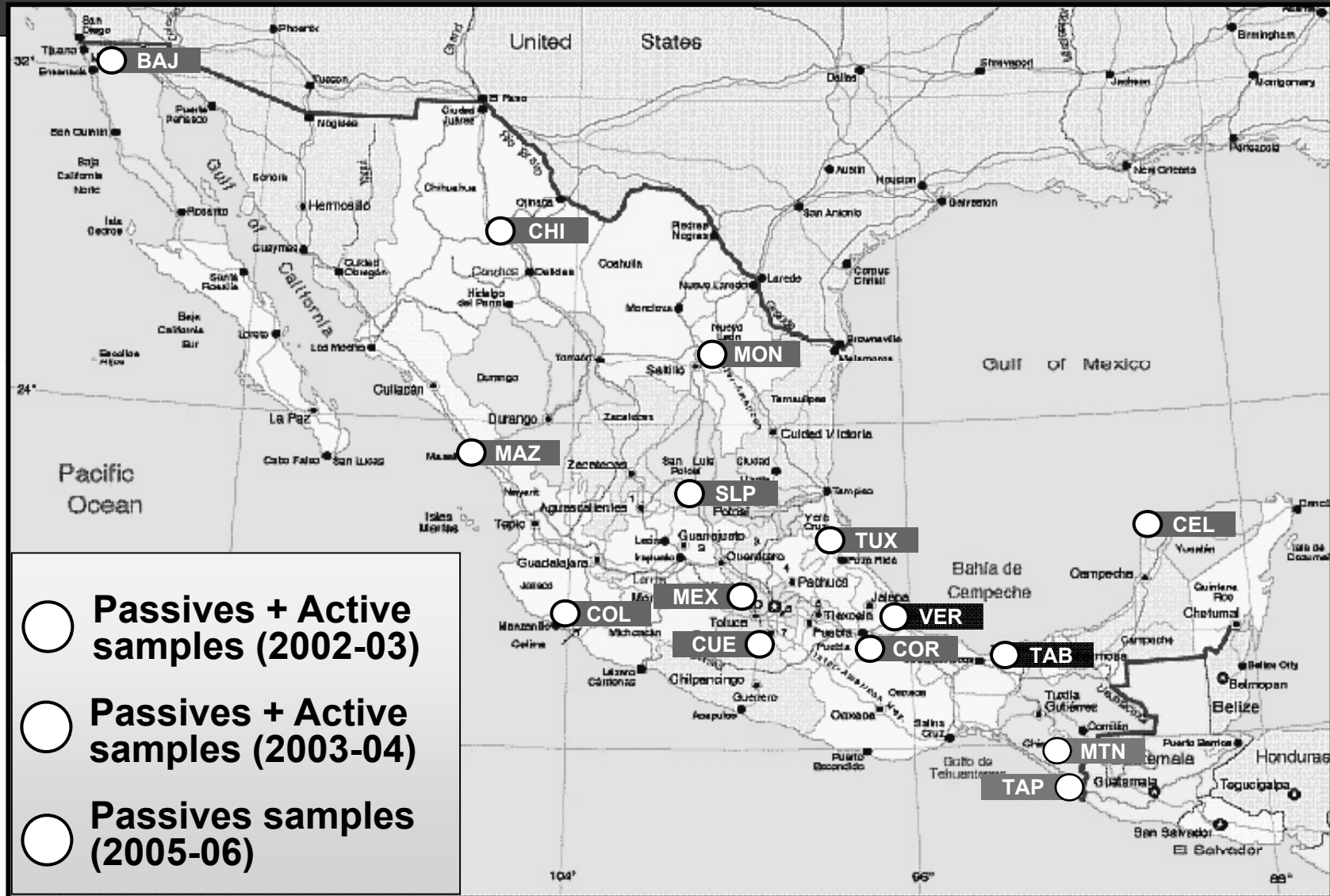
Canada supports domestic, regional and global air monitoring programs for POPs.

Canadian measurement programs are integrated with modeling and meteorology expertise.

Canadian programs take part in capacity building, including QA/QC activities.

Gracias...

Air and Soil Sampling: 2002-2006, 15 sites

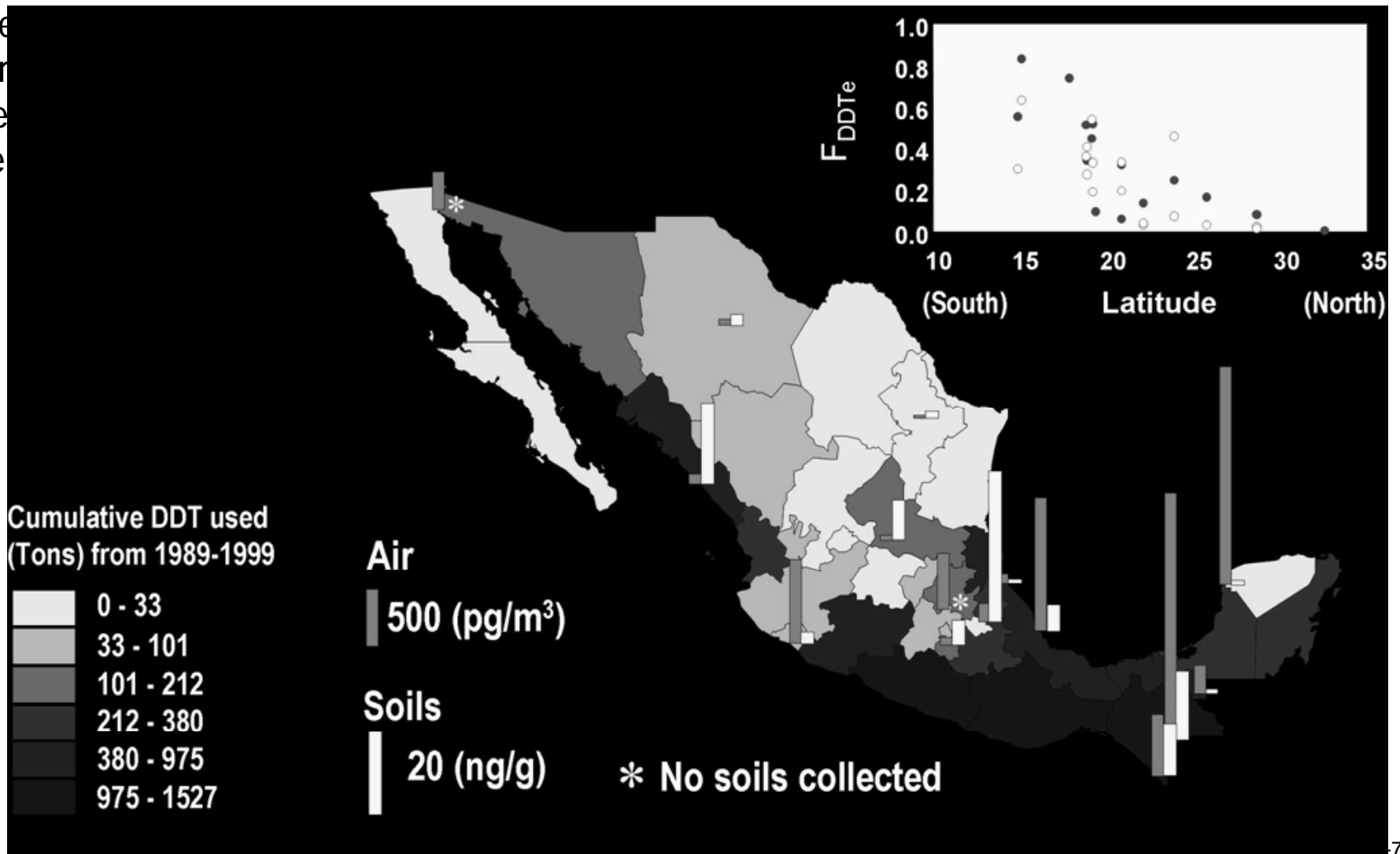


Analytes of interested: OCP, CUP, PCB, PBDE

DDT in air and soil of Mexico

DDT in air and soil decreased from the south to

the
for
He
be



Trinational Inter-laboratory Study for POPs in Air 2006

Participating Labs:

Canada	X	3	Mexico	X	6
US	X	2	China	X	1

Analysis of:

- Common reference standard (CRS) of PCBs
- CRS of OCPs
- CRS of PAHs
- Air sample extract from Veracruz, Mexico

Trinational Inter-laboratory Study for POPs in Air 2006

Results:

Table 3. Performance statistics for chemicals reported by five or more laboratories

	PCBs <u>50 congeners¹</u>	OCPs <u>19 compounds</u>	PAHs <u>14 compounds</u>
CRS, percent of target			
mean	87.9 - 128.3	48.8 - 110.0	87.7-100.5
% RSD	3.8 - 45.3	6.3 - 55.0	6.0 - 20.7
median	91.6 - 107.4	38.6 - 104.3	88.9 - 100.6
	PCBs <u>20 congeners¹</u>	OCPs <u>12 compounds</u>	PAHs <u>11 compounds</u>
Veracruz air extract			
% RSD	21.0 - 103.8	23.7 - 207.0	40.3 - 115.3
% MAD	9.4 - 74.4	6.2 - 73.7	14.6 - 61.7

1. single congeners or congener groups.

RSD = relative standard deviation; MAD = median absolute deviation