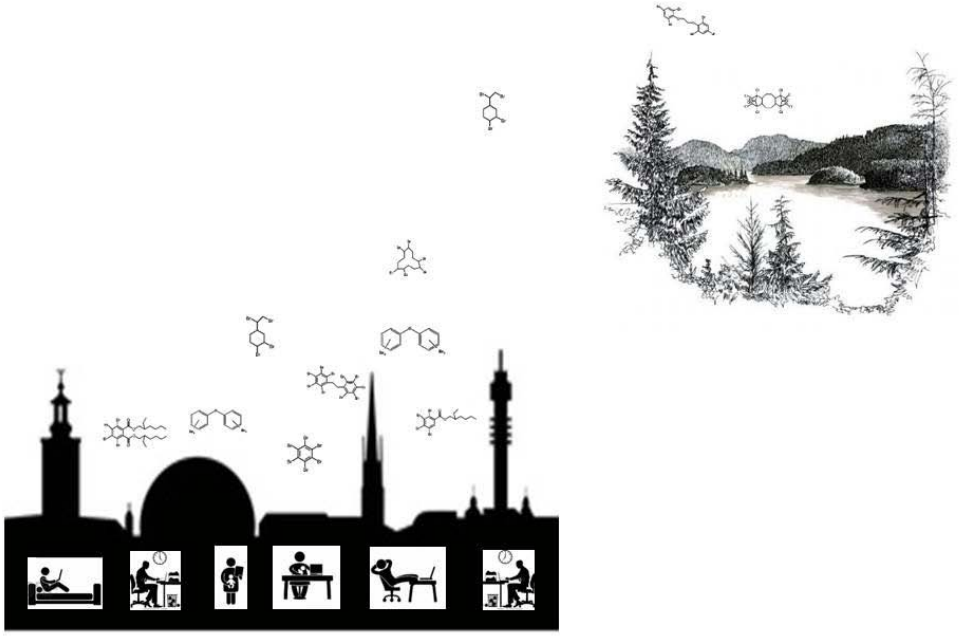
itm.
Department of Applied Environmental Science

Stockholm University

Legacy persistent organic pollutants and chemicals of emerging concern in Sweden: from indoor environments to remote areas



Seth Newton, Ulla Sellström, Karin Wiberg, Terry Bidleman, Magnus Bergknut, Jacinthe Racine, Cynthia de Wit

Background

- Persistent organic pollutants (POPs) are ubiquitous globally
- Transported in the ocean or atmosphere followed by deposition to surfaces
- Several of the legacy POPs were used as pesticides (e.g. DDT, HCHs, Chlordane)
- PBDEs are “indoor POPs” and are being replaced with novel flame retardants (NFRs)

Aim

This thesis aims to track the fate of PBDEs and NFRs in indoor environments, their release to the outdoors via ventilation systems, their occurrence in urban outdoor air, and their fate in atmospheric deposition in remote areas as well as study the deposition of legacy POPs

itm.
Department of Applied Environmental Science

Sampling locations - indoor environments

Stockholm University

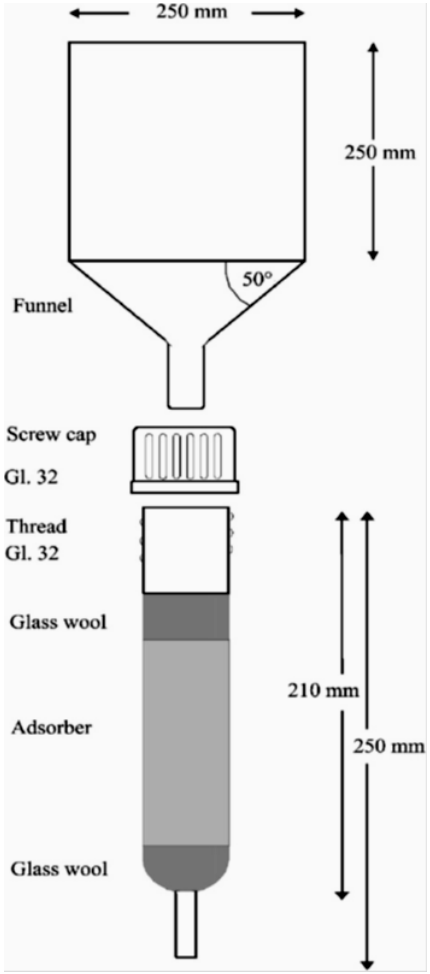
Indoor air, ventilation system air, and dust

- 4 stores
- 4 apartments
- 5 offices
- 2 schools

itm.
Department of Applied Environmental Science

Atmospheric Deposition Sampling

Stockholm University



Gocht et al. (2007)

- Sampler equipped with heating pad
- Placed 2 meters above the ground
- Samples taken every two months
- September 2009 – August 2010

itm.
Department of Applied Environmental Science

Methods

Stockholm University

Outdoor air

↓

Soxhlet
(DCM, 24 hours)

Indoor air, ventilation system air, and dust

↓

Sonication
(DCM, 2 x 30 minutes)

Atmospheric Deposition

↓

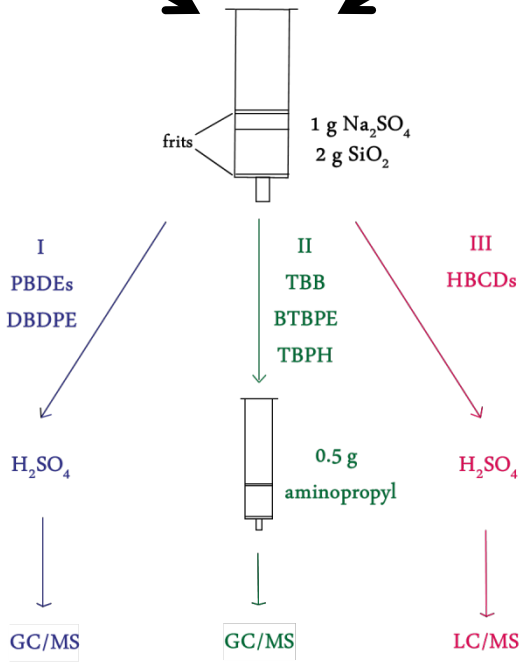
ASE DCM:*n*-hexane

↓

Florisil

↓

GC-HRMS



*Sahlström et al., ABC, 2012

itm.
Department of Applied Environmental Science

Stockholm University

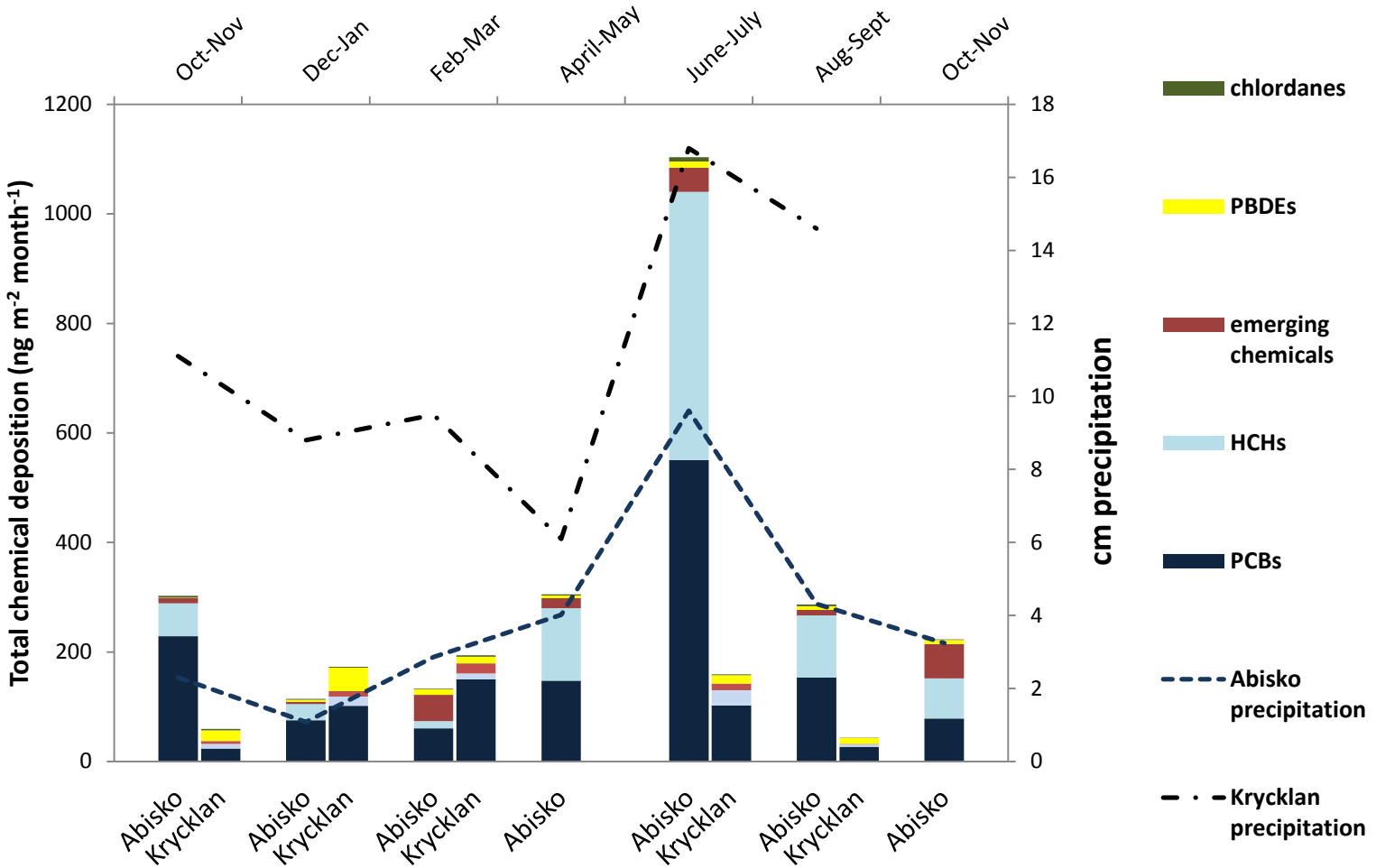
Indoor Air Results

Compound	Detection Frequency	Median Concentration	Average Concentration	Range
TBECH	96%	60	98	<7.0-860
PBT	88%	11	17	<0.14-75
HBB	72%	4.4	12	<4.7-68
EHTBB	40%	-	460	<9.2-9000
TBPH	48%	-	23	<2.1-240
DBDPE	48%	-	45	<9.7-460
BDE 47	44%	-	8.6	<5.8-64
BDE 100	16%	-	1.8	<3.1-6.0
BDE 99	40%	-	2.7	<5.1-12

itm.
Department of Applied Environmental Science

Stockholm University

Atmoshperic Deposition Results



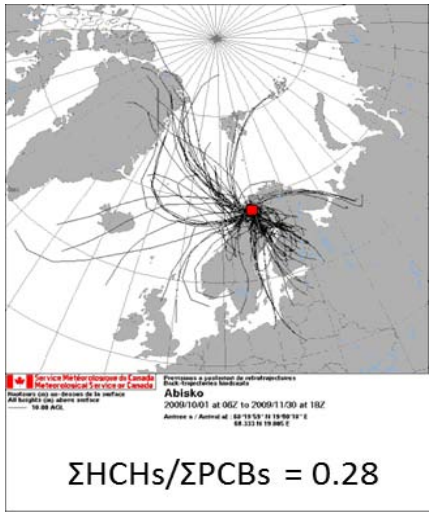
Chemicals of emerging concern in deposition: TBECH, BTBPE, DP, trifluralin, chlorothalonil

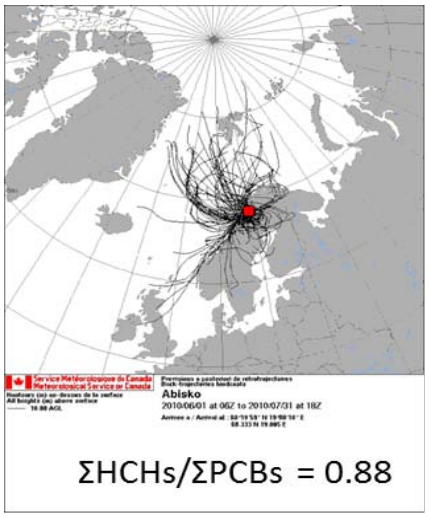
itm.
Department of Applied Environmental Science

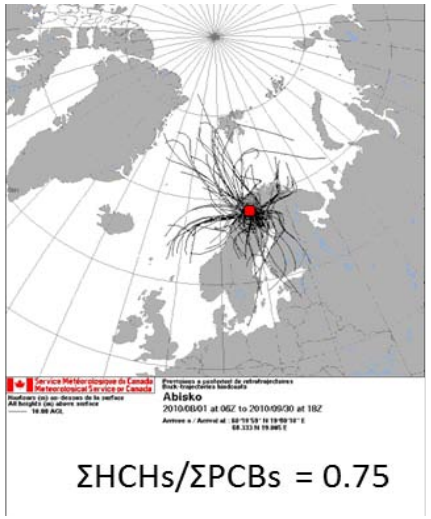
Air parcel back trajectories at two sites

Stockholm University

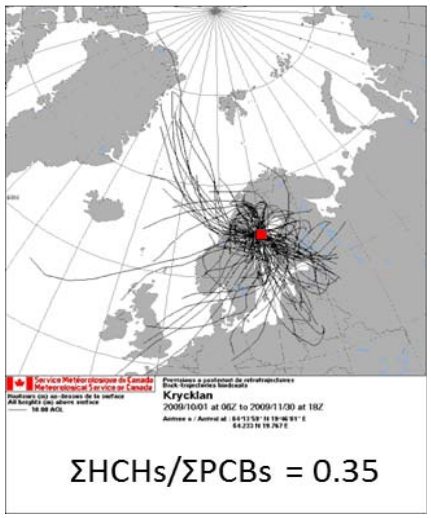
Abisko

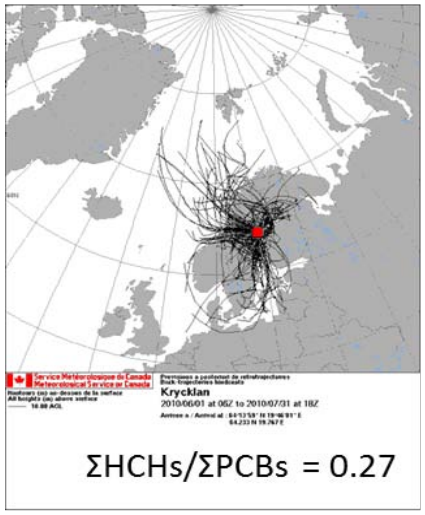


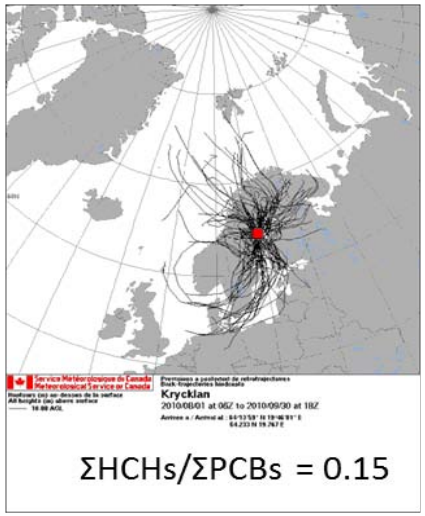




Krycklan







Oct-Nov 2009

June-July 2010

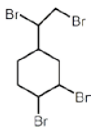
Aug-Sep 2010

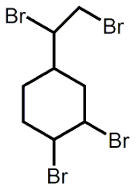
itm.
Department of Applied Environmental Science

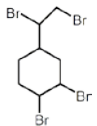
Stockholm University

Conclusions

- TBECH may be an important chemical in Sweden in the future
- Known PBDE replacements are present in Sweden (DBDPE, EHTBB, and TBPH) but others are present as well – HBB, PBT, etc.
- PBDEs and NFRs reach outdoor air via ventilation from buildings
- Legacy POPs still constitute the bulk of deposition in northern Sweden







itm.
Department of Applied
Environmental Science

Stockholm
University

Thanks for listening!

Acknowledgements:

- Marie Curie ITN **INFLAME** for funding
- Dimitrios Panagopoulos for sampling
- Participants in sampling