Passive air sampling used as a powerful tool in environmental specimen banking

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Environmental Specimen Banks (ESBs)

Environmental specimen banks: archiving samples from the environment for future research and monitoring purposes.

Banked samples: used to study environmental processes and change through time (Kuester, Becker et al. 2015).

Sample requirements:

- Relevant for research and monitoring
- Typical for sampling site and time
- Identical subsamples
- Stable enough and not too big
- Limited treatment before storage

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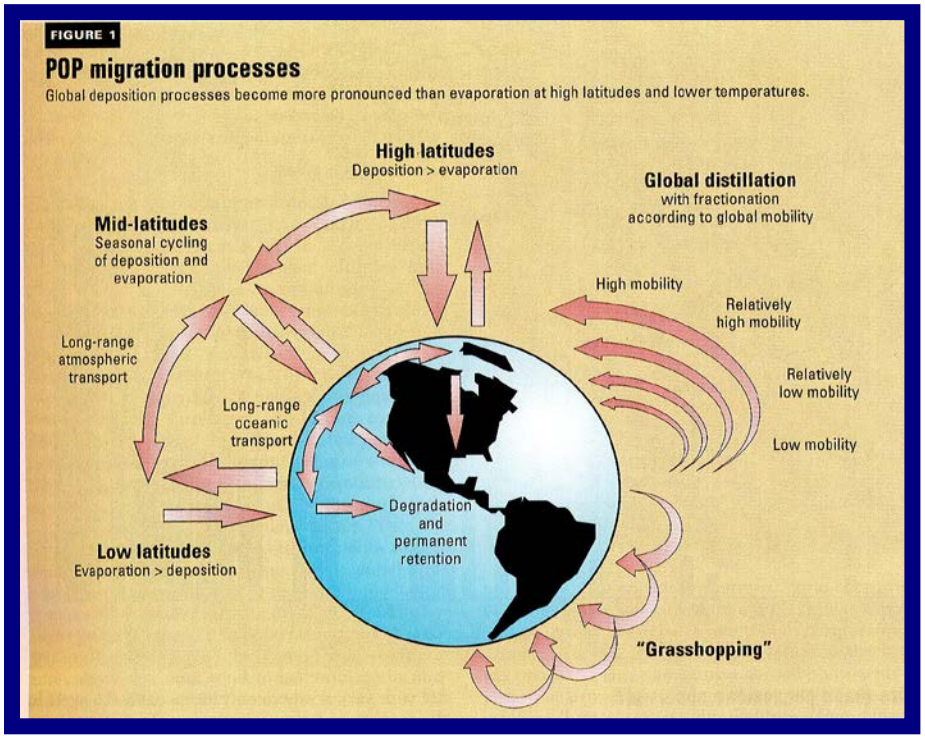
Atmosphere important pathway

POP criteria (Stockholm Convention, Annex D): persistence, bioaccumulation, potential for long-range environmental transport (LRET), and toxicity

Long range atmospheric transport (LRAT) important for typical POPs and also new emerging POPs

Fast reacting sentinel

However, only two ESBs are sampling air samples and only one the gas phase.



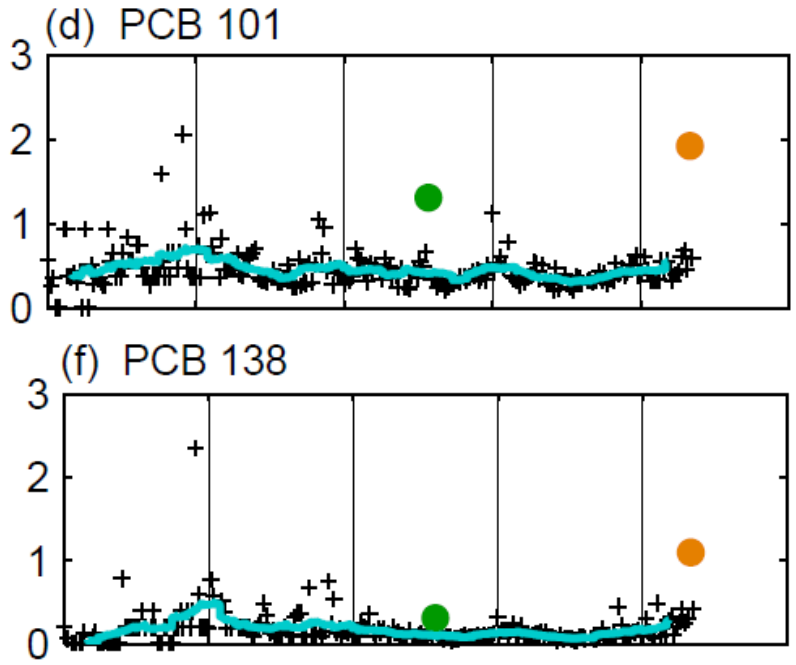
(Wania and Mackay 1996)

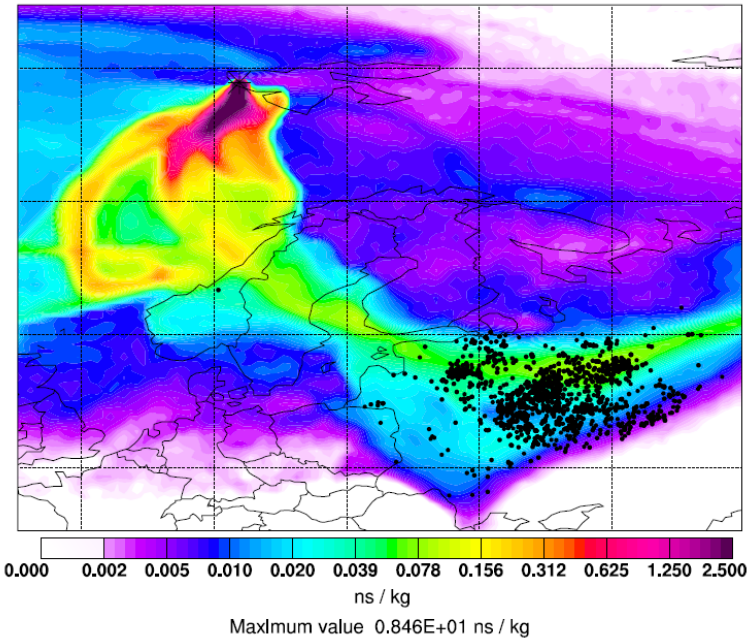
Active Air Sampling (AAS)

State of the art technology

Quantitative and good time resolution

Expensive and difficult to prepare homogenious subsamples





(Eckhardt, Breivik et al. 2007)

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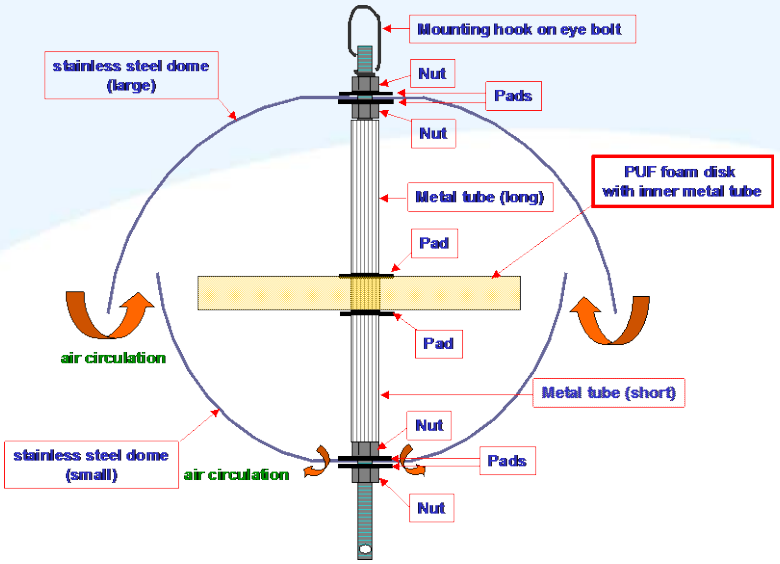
Passive Air Sampling (PAS)

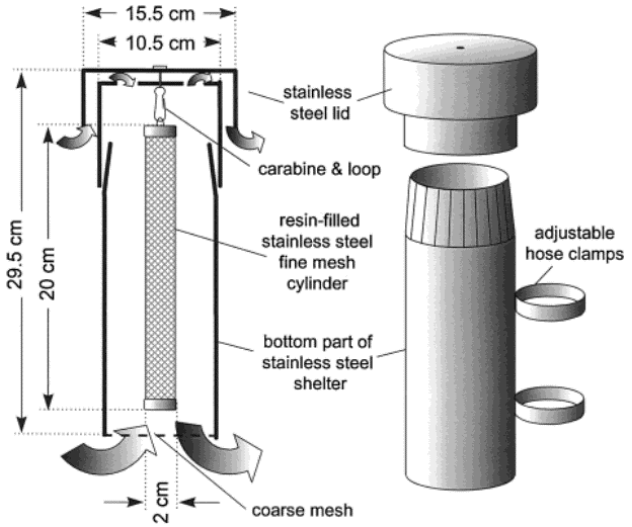
Promising new tool (PUF-PAS, XAD-PAS, …)

Cheap enough to set up several parallel samplers at one site

Very limited uptake of particulate matter

Semi-quantitative





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Comparison AAS, PAS-PUF, PAS-XAD

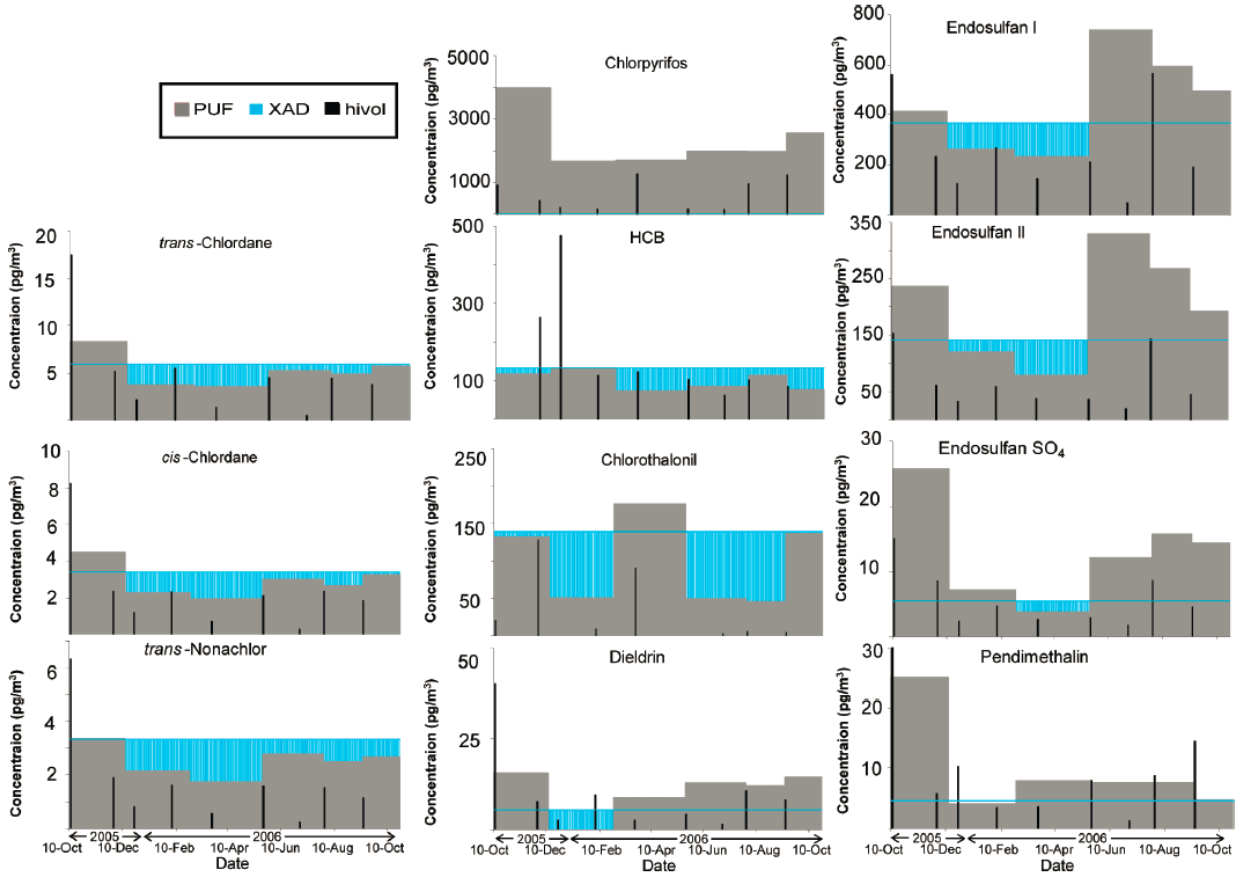


FIGURE 2. Comparison of air concentrations for pesticides measured using three different air sampling methods at the field site at Belen, Costa Rica between October 10, 2005 and October 24, 2005. Data from the XAD-PAS for chlorpyrifos are omitted given uncertainty in its sampling rate.

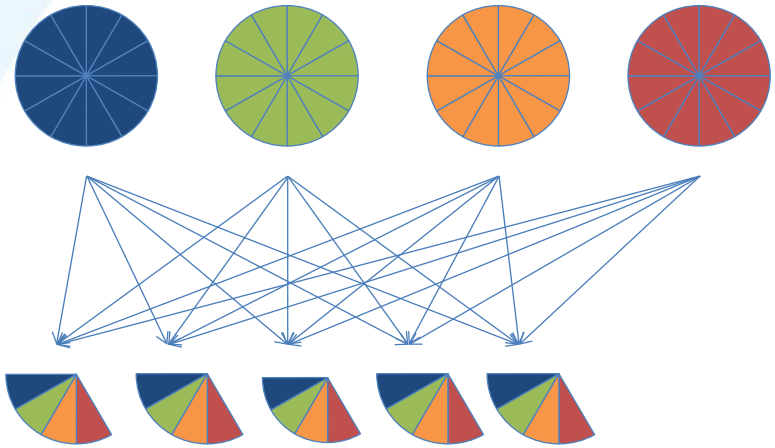
Gouin et al., 2008

Air sampling scheme

Continously sampling (4 periods per year)

Each periode:

- 12 PUF-PAS samples
- 12 XAD-PAS samples
- 12 composed filter samples (AAS)



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Conclusion

Combination of AAS (particles) and PAS (~ gas phase)

Acceptable price and space requirement

Possible to study LRAT of emerging compounds in future

Important for future monitoring and regulatory work

Limitations:

Determination of sample volume

Blank levels

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Thank you for your attention!

Questions?

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