

Thorough Analysis of Contaminants in Arctic Air Samples by Means of GCxGC/ToF-MS

Laura Röhler^{1,2}, Martin Schlabach², Walter Vetter³

¹ Department of Chemistry, Biotechnology and Food Science, Norwegian University of Life Sciences, Ås, Norway

² Department of Environmental Chemistry, Norwegian Institute for Air Research, Kjeller, Norway

³ Department of Food Chemistry, University of Hohenheim, Stuttgart, Germany



Motivation

- Long range transport (LRT) is, in addition to persistence, bioaccumulation and toxicity, one of the four features defining a Persistent Organic Pollutant (POP)
- The atmosphere represents a key pathway for which many POPs are delivered to remote Arctic areas and there they may accumulate in food-chains to potentially harmful levels
- Arctic air samples have therefore been analysed to screen for potential unknown organic contaminants exhibiting LRT behaviour

Material & Method

- **Active air samples** from Ny-Ålesund, Spitsbergen, Norway (Fig. 1)
- **Ca. 1000 m³** air collected on polyurethane foam plugs (PUF)
- **Soxhlet extraction** with diethylether/ *n*-hexane (1:9 v/v) [1]
- **No sample cleanup** in order to avoid loss of unknowns
- **GCxGC/ToF-MS analysis** (LECO Pegasus 4D)
- **Data calculation:** LECO ChromaTOF-Software



Fig.1: Zeppelin sampling station, Spitsbergen, Norway

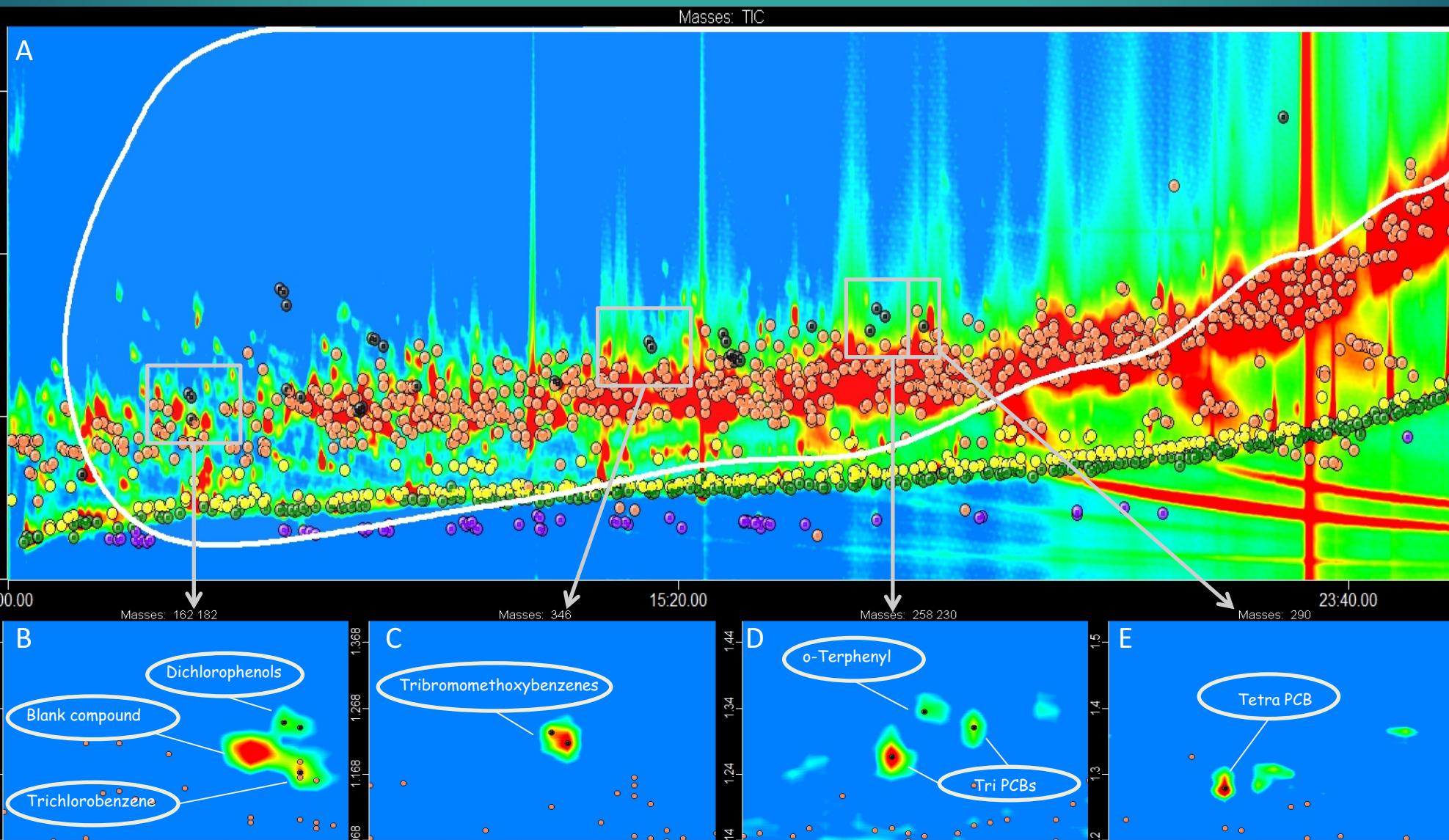


Fig. 2A: 2D Plot of a GCxGC/ToF-MS analysis from one of the PUF air samples from Spitsbergen, Norway; Classification of **blank compounds**: cyclic siloxanes (purple); alkanes (yellow); alkenes and cycloalkanes (green); PUF breakdown products, e.g. various glycoethers and dioxolane-like compounds (orange); **Identified compounds of interest** (black); **Region of CUPs, BFRs, POPs, and PFRs** (white); Fig. 2B-E: Pop-ups with specific masses for the shown compounds

Conclusions

- Each sample contained approx. 25 000 compounds, of which 99 % were blank compounds and 1 % compounds of interest
- In Fig. 2, a selection of the most common blank compound classes are highlighted. The up to now identified compounds of interest and an area where most of the currently measured POPs and emerging new POPs were located,
- Identification was mainly based on library matches, so further work has to be done on the confirmation of several compounds
- Some of the compounds have been detected in Arctic air for the very first time
- Others show positive matches to new contaminants, compiled by model approaches [2,3]

Acknowledgement

This project has received financial support from the Research Council of Norway (202821/V11) and NILU

References

- [1] Hjellbrekke, A., Aas, W., *Chemical Co-ordinating Centre of EMEP (CCC)*, EMEP Sampling manual, station description etc: <http://tarantula.nilu.no/projects/ccc/>
 [2] Howard, P. H., Muir, D. C. G., Identifying New Persistent and Bioaccumulative Organics Among Chemicals in Commerce. *Environ. Sci. Technol.* 2010, 44, (7), 2277-2285
 [3] Brown, T. N., Wania, F., Screening chemicals for the potential to be persistent organic pollutants: A case study of Arctic contaminants. *Environ. Sci. Technol.* 2008, 42, (14), 5202-5209