

Long-term monitoring of persistent organic pollutants (POPs) in air at Zeppelin station

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Introduction

Persistent organic pollutants (POPs) can undergo long-range transport, are toxic, bioaccumulative and persistent in the environment.

Long-range transport via air is one of the most important source to POP pollution in remote areas where there are few or no local sources.

NILU performs air monitoring of POPs at Zeppelin station.

The air monitoring of POPs at Zeppelin station:

- has high priority due to the presence of POPs in remote areas and their harmful impacts on the environment;
- increases the knowledge on long-range transported POPs as a source to the Arctic environment;
- follow changes in levels over time as an effective evaluation of national and international control strategies (e.g. CLRTAP, Stockholm Convention);
- is part of the Norwegian national monitoring programme of long-range transported air pollutants, conducted by NILU on the behalf of the Norwegian Environment Agency, and the Ministry of Climate and Environment;
- has been ongoing at Zeppelin station since the beginning of 1990s;
- is one of the longest time series of POPs available on a global scale.

Air sampling

Air samples are collected at the Zeppelin station:

- on a weekly basis (i.e. 48-72 h samples per week, 52 samples per year);
- using high-volume air samples (V=600 m³ per 24 h);
- using glass fiber filters (GFF) to collect POPs associated to particles and polyurethane foam (PUF) adsorbents to collect POPs in gas phase.

Samples are analyzed using GC-MS at NILU.

Targeted compounds:

hexachlorobenzene (HCB), hexachlorohexanes (HCHs), DDTs, chlordanes (CHLs), polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), hexabromocyclododecane (HBCD), polycyclic aromatic hydrocarbons (PAHs), and per- and polyfluorinated alkyl substances (PFAS).

Results are reported in annual reports to the Norwegian Environmental Protection Agency as well as to international conventions, programmes and networks such as the European Monitoring Evaluation Programme (EMEP) under the Convention on Long-range Transboundary Air Pollutants, and the Arctic Monitoring and Assessment Programme (AMAP) etc.

Data are stored and publically available in the EBAS database:

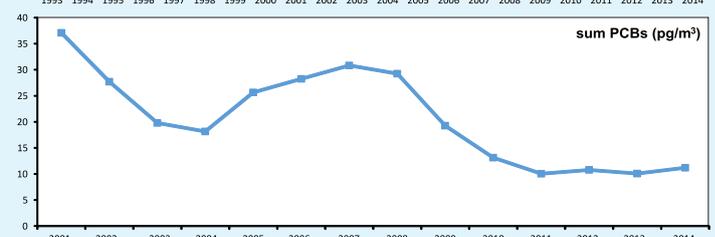
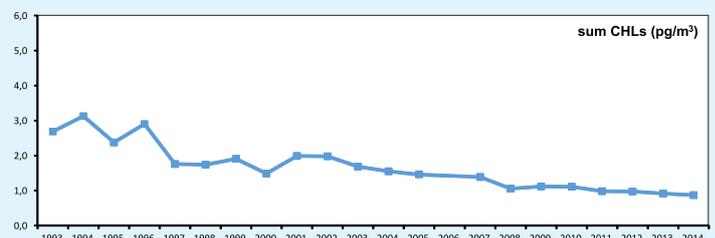
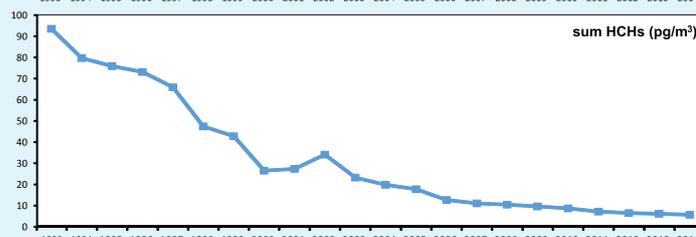
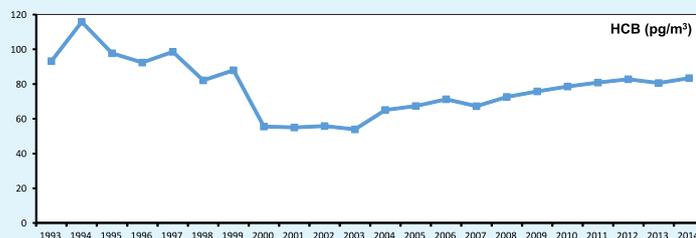
- <http://ebas.nilu.no>.



The Zeppelin station at Ny-Ålesund. Photo: Ove Hermansen.



Results



Declining time-trends for HCHs, DDTs, CHLs, and PCBs at Zeppelin indicates successful implementation of national and international control strategies.

Slower decline in recent years indicates a tendency towards equilibrium with other media and/or release from secondary and remaining primary sources.

HCB concentrations at Zeppelin have increased during the last decade, and current levels are higher than in Southern Norway. The cause remains poorly understood. No significant trends are seen for HBCD, PFAS and PAHs.

	Monitoring period	t _{1/2}
HCHs	1993-2012	4.1-4.9
DDTs	1993-2012	5.0-8.8
Chlordanes	1993-2012	9.3-17
PCBs	1998-2012	4.4-11
PBDEs	2006-2012	2.6-4.1