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Swiss Confederation

Federal Department of the Environment,  
Transport, Energy and Communications DETEC

**Federal Office for the Environment FOEN**  
Air Pollution Control and Chemicals Division

# Update on ICP M&M activities in Switzerland

Reto Meier

ICP M&M TF Meeting

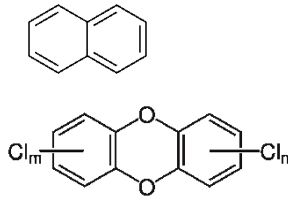
Madrid, 3 April 2019



# Overview



Soil solution measurements  
in Swiss forests



POPs biomonitoring with lichens



Recent policy developments



# Mapping N-deposition 2015

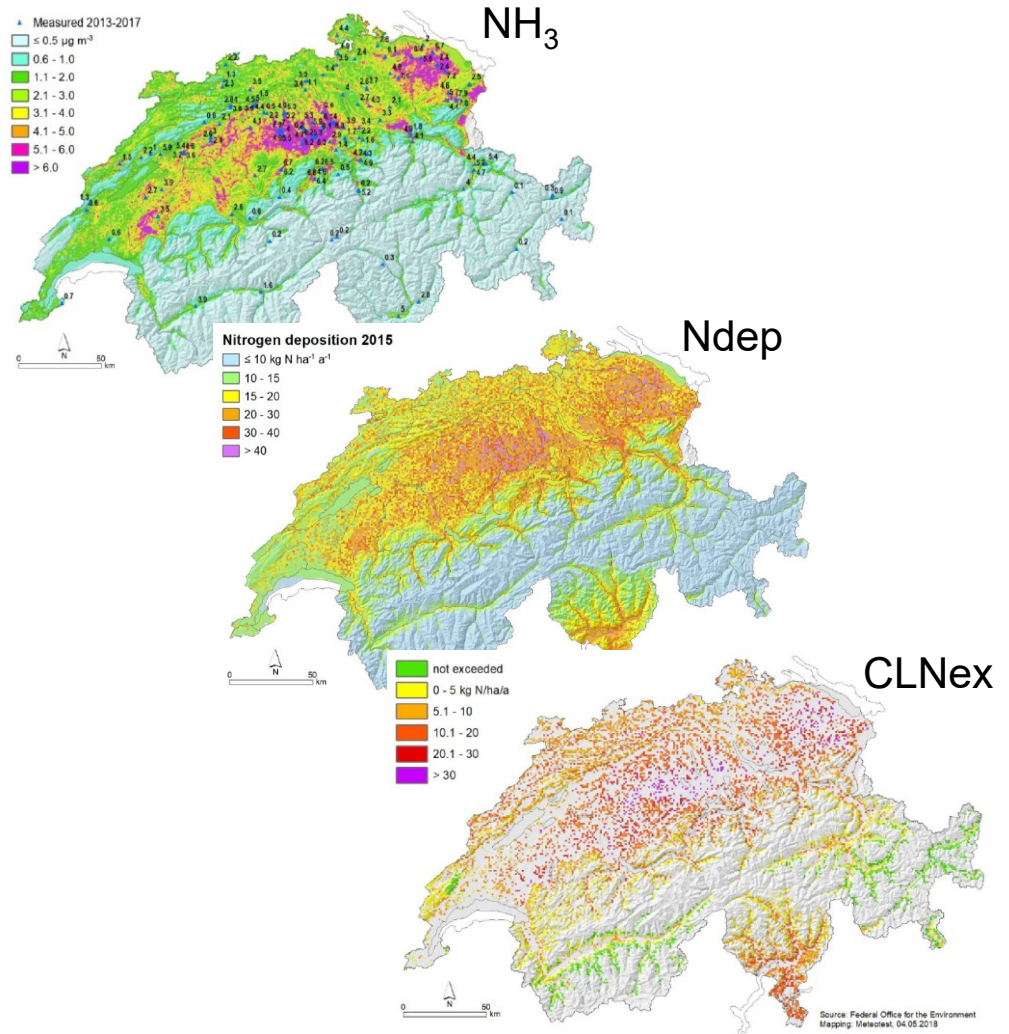


## Mapping Nitrogen Deposition 2015 for Switzerland

Technical Report on the Update of Critical Loads and Exceedance, including the years 1990, 2000, 2005 and 2010

Commissioned by: Federal Office for the Environment (FOEN)

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Download report [here](#)

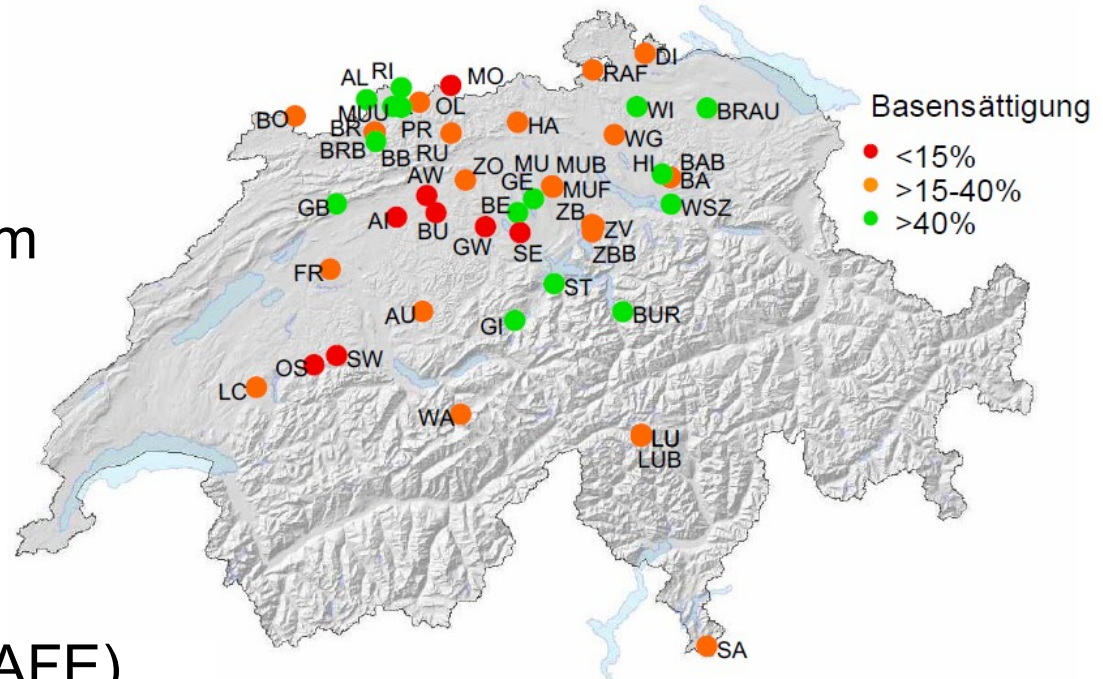


# Soil solution in Swiss forest stands: a 20 year's time series

Monitored since 1997,  
initially 9 sites, today 47

- Altitude 290-1870 m a.s.l.
- Precipitation 900-1800 mm
- Leaching 140-1100 mm
- pH(CaCl<sub>2</sub>) 3.4-6.5
- Base saturation 3-100%
- C:N 12.4-29.3
- Weathering rate 0-60cm  
0.15-28.3 keq ha<sup>-1</sup> a<sup>-1</sup> (SAFE)

*Plots with sampling in 2016*

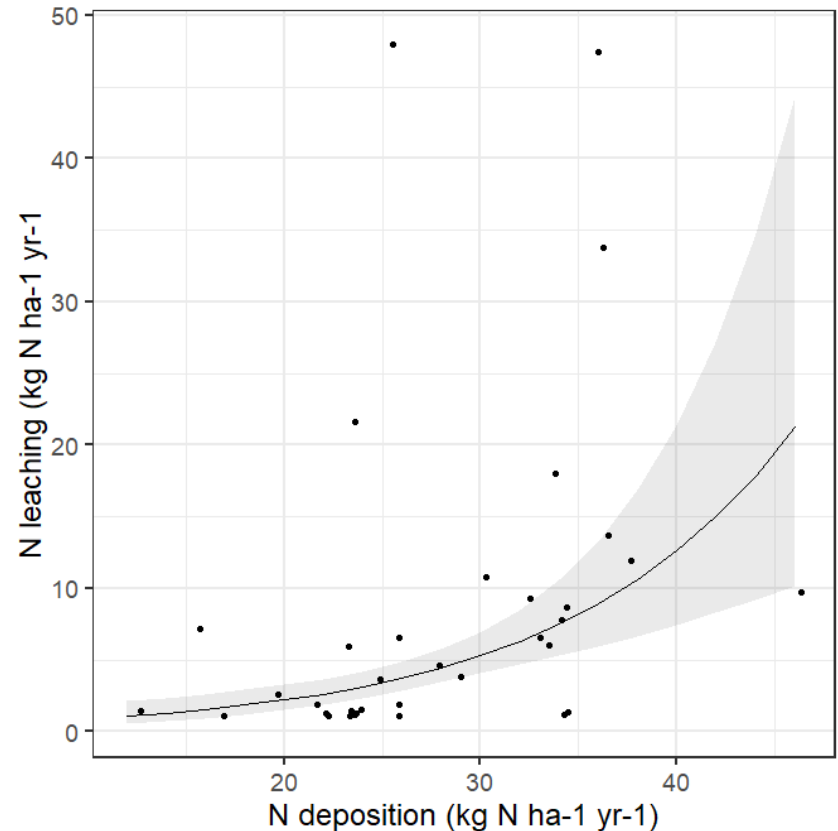
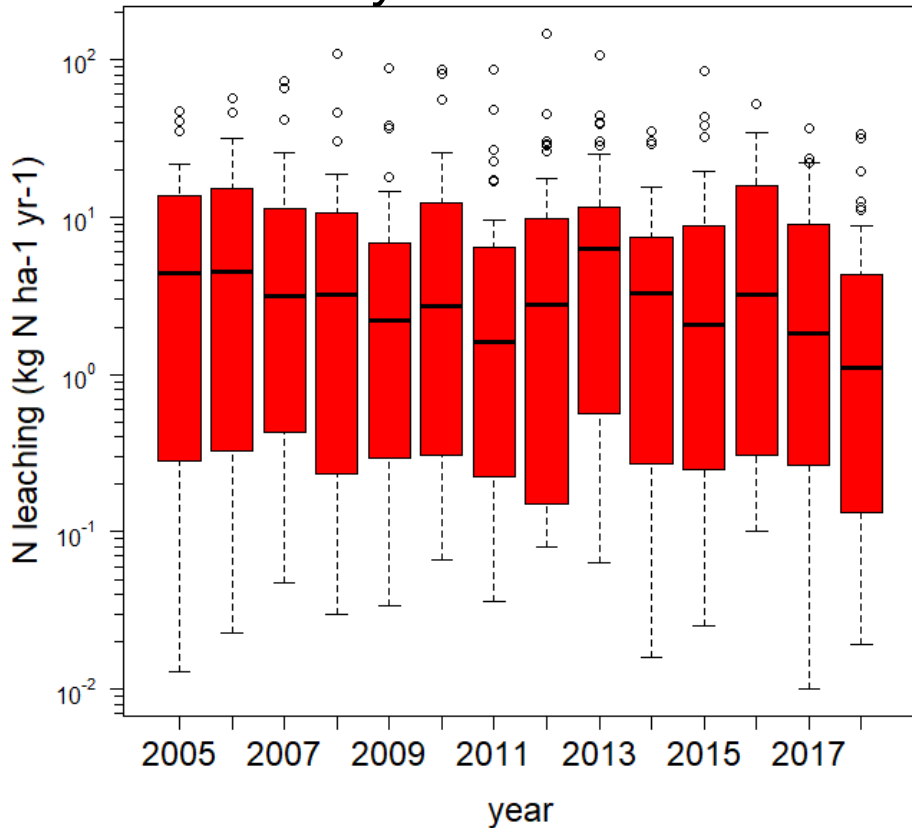


*Braun et al., in preparation*



# N-deposition and N-leaching 2005-2018

*Preliminary data*



Decrease in N-leaching – due to decrease in N deposition and increase in drought (contribute in equal parts)

Averages 2005-2018:

N-dep: 29.9 kg N ha<sup>-1</sup> yr<sup>-1</sup> (range 12.7-60.9)

N-leach: 9.4 kg N ha<sup>-1</sup> yr<sup>-1</sup> (range 0.1-55.2)

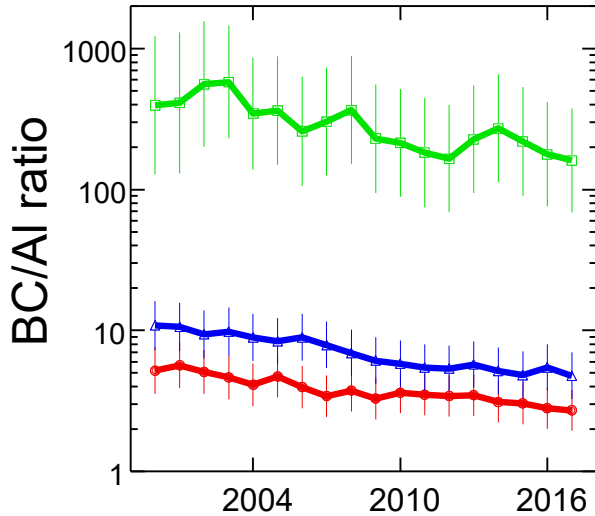
*Braun et al., in preparation*



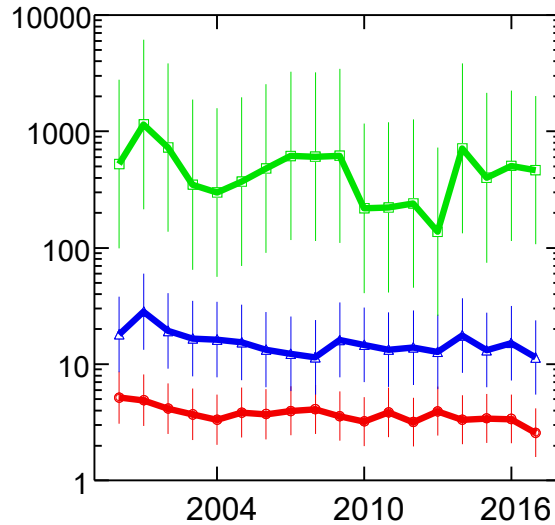
# Development of acidification

*Preliminary data*

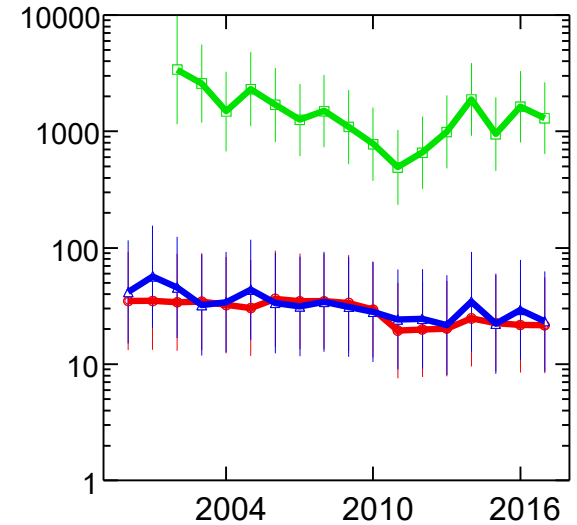
Depth <30 cm



Depth 30-60 cm



Depth >60 cm



Base saturation (0-40 cm)

— <15% — >15-40% — >40%

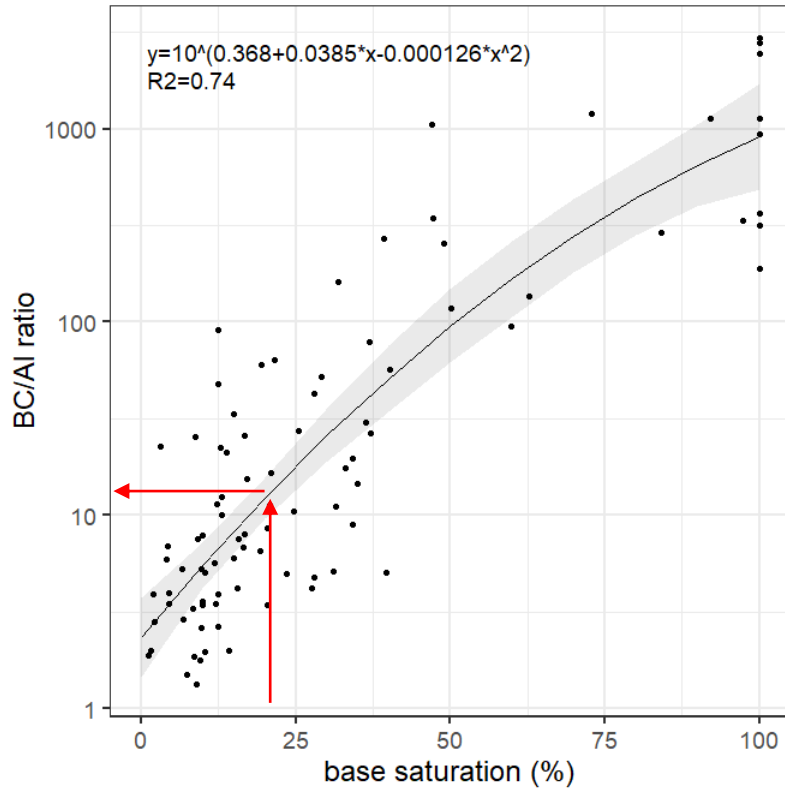
- Decrease in BC/Al strongest in the uppermost soil
- Further progress of acidification is weaker in more acidified soils

*Braun et al., in preparation*

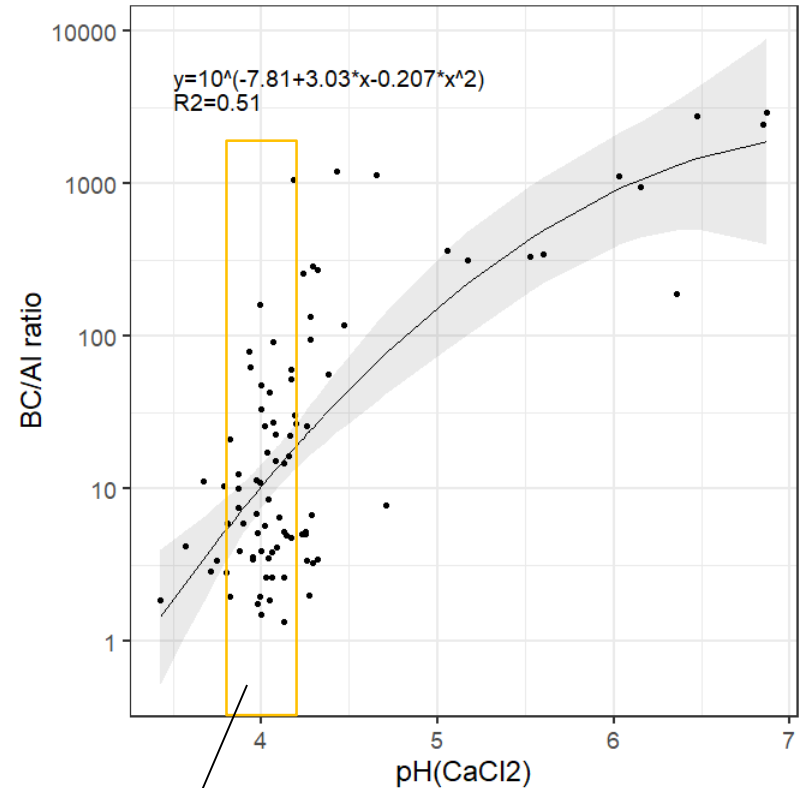


# Acidification parameters

*Preliminary data*



BS of 20%  $\hat{=}$  BC/AI of 12



Al buffer range - very high buffer capacity

*Braun et al., in preparation*





# POPs Biomonitoring with lichens



Success monitoring of regulated compounds (CLRTAP POPs Protocol and/or Stockholm Convention) for documenting their decrease in the environment.

➤ Biomonitoring from 1995 repeated in 2014

## Studied substances:

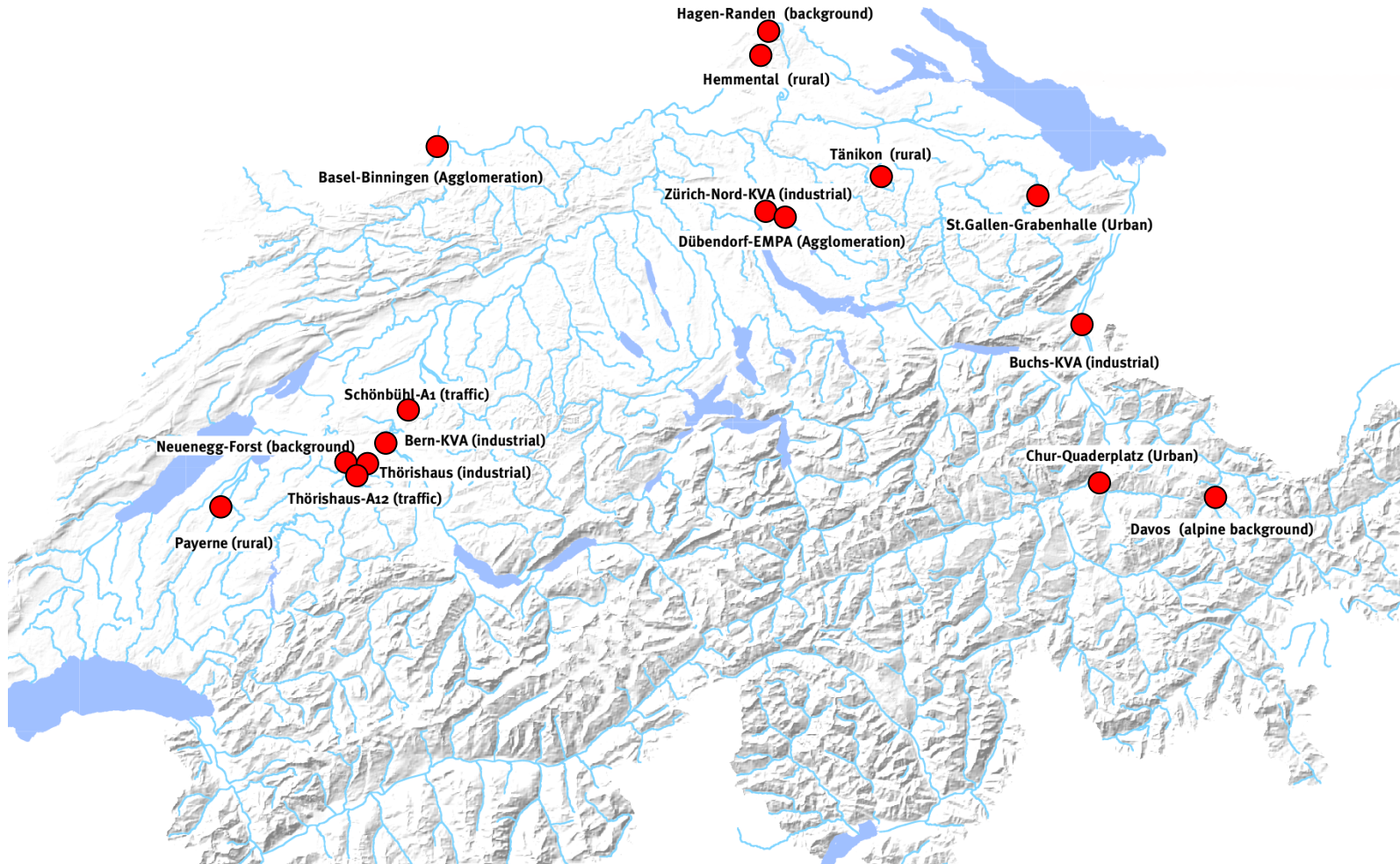
- Polychlorinated dibenzo-p-dioxins/furans (PCDD/PCDFs)
- Organochlorine pesticides/insecticides (OCPs) i.e. DDT, Lindane
- Polychlorinated biphenyls, i.e., dioxin-like and nondioxin-like PCBs
- Polybrominated biphenyl ethers (PBDEs)
- Polycyclic aromatic hydrocarbons (PAHs)

*Herzig et al. 2019; doi:10.1007/s11356-019-04236-9*





# 16 sampling sites accross Switzerland: *background, rural, cities, traffic, industrial*

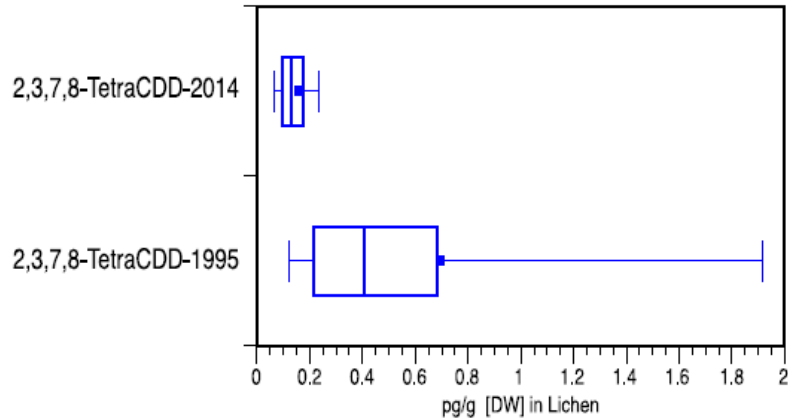
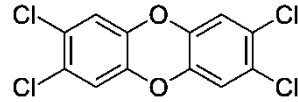


*Herzig et al. 2019*

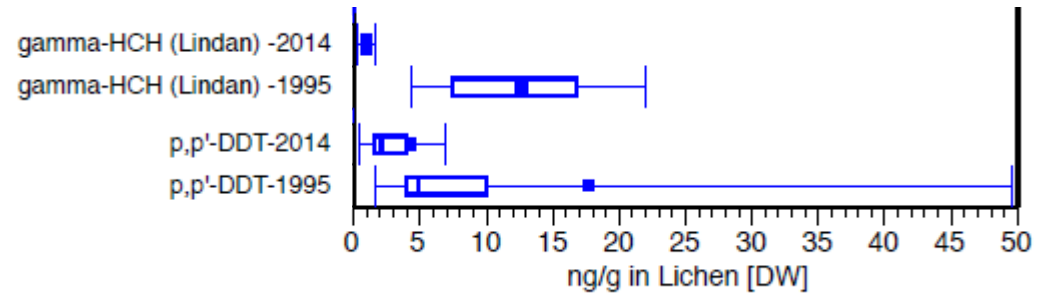
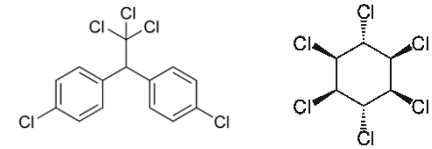


# Decrease of 40-80% (medians) for most of the studied substances

2,3,7,8-TetraCDD  
(Seveso Dioxin)

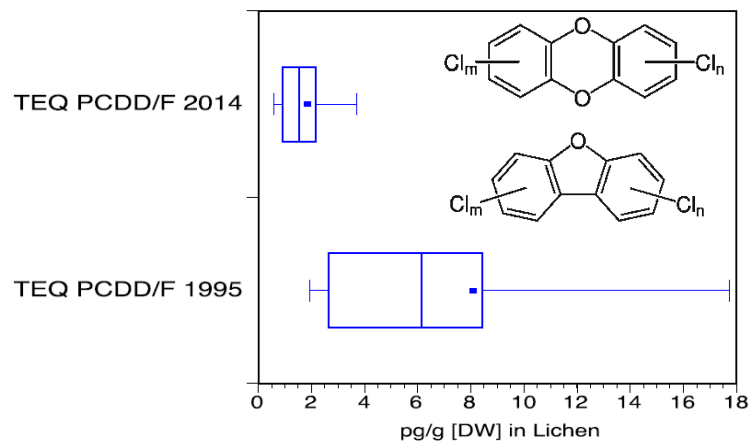


DDT, Lindane

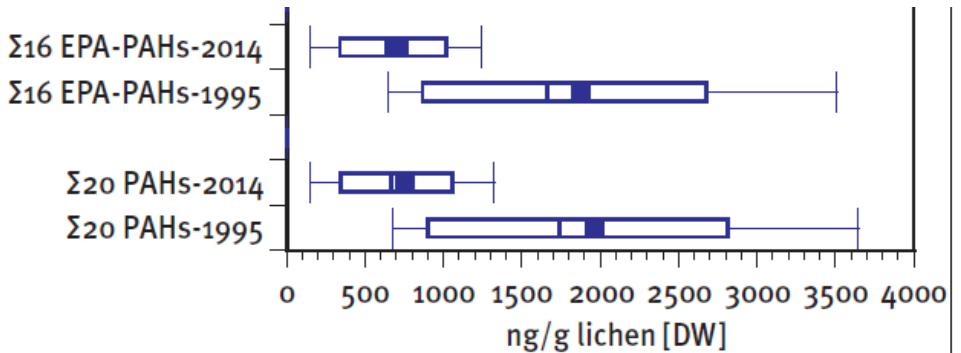
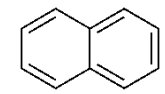


TEQ PCDD/PCDFs WHO(2005)

b



PAH sum parameters

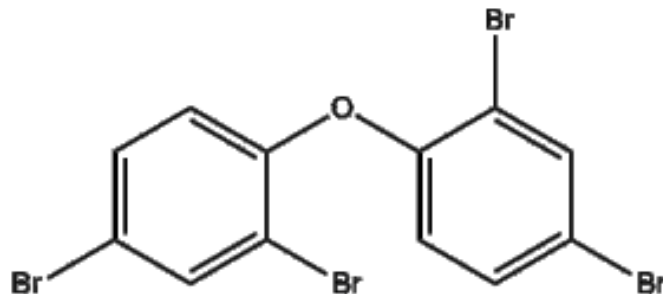




# Increase of PBDE at industrial and road traffic sites

Polybrominated diphenyl ethers (PBDE) are used as flame retardants

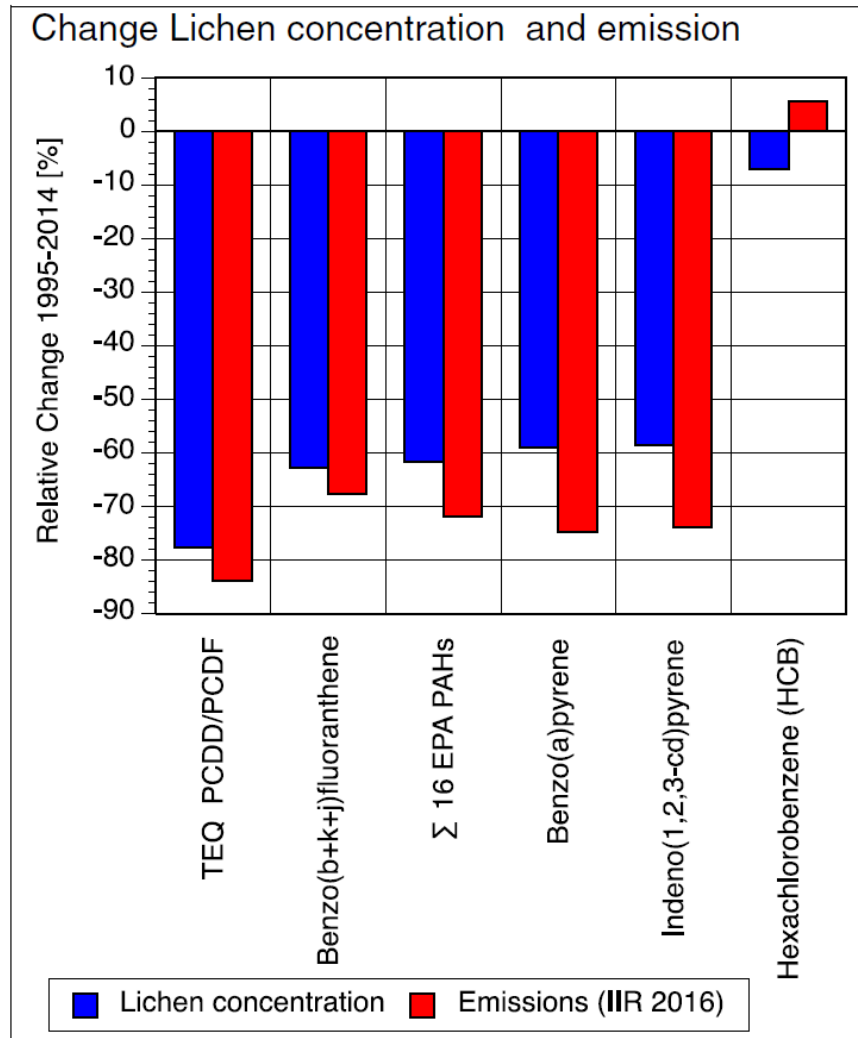
- Increased lichen concentrations found at road traffic sites and an industrial site in proximity to a scrap vehicle recycling facility
- reduced concentrations in lichens at rural and background sites



*Herzig et al. 2019*



# Comparison with emission data



Comparison of percentage changes in lichen concentrations with percentage changes in emissions according to Switzerland's IIR 2016

*Herzig et al. 2019*



# Amended Gothenburg Protocol

Swiss Parliament agreed to the 2012 amendments to the Gothenburg Protocol

27.11.2018      Council of States 34:0  
05.02.2019      National Council 156:0





# Abatement of ammonia emissions

Two ammonia emission abatement measures are currently in national consultation process:



Mandatory low emission slurry application

- today >40% applied with trailing shoe (economic incentives)
- potential ~70% (limited due to topography)



Mandatory cover of slurry storage

- today about 90% of storage covered