

# Temporal trends of PFAS in dated sediment cores from Finland and Baltic Sea

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# How can sediments be utilized in PFAS research?

*“Life can only be understood backwards; but it must be lived forwards.” - Søren Kierkegaard*

Sediment layers serve as a natural archive for the environmental concentrations of persistent pollutants.

Long-chain PFAS compounds tend to bind to sediment particles

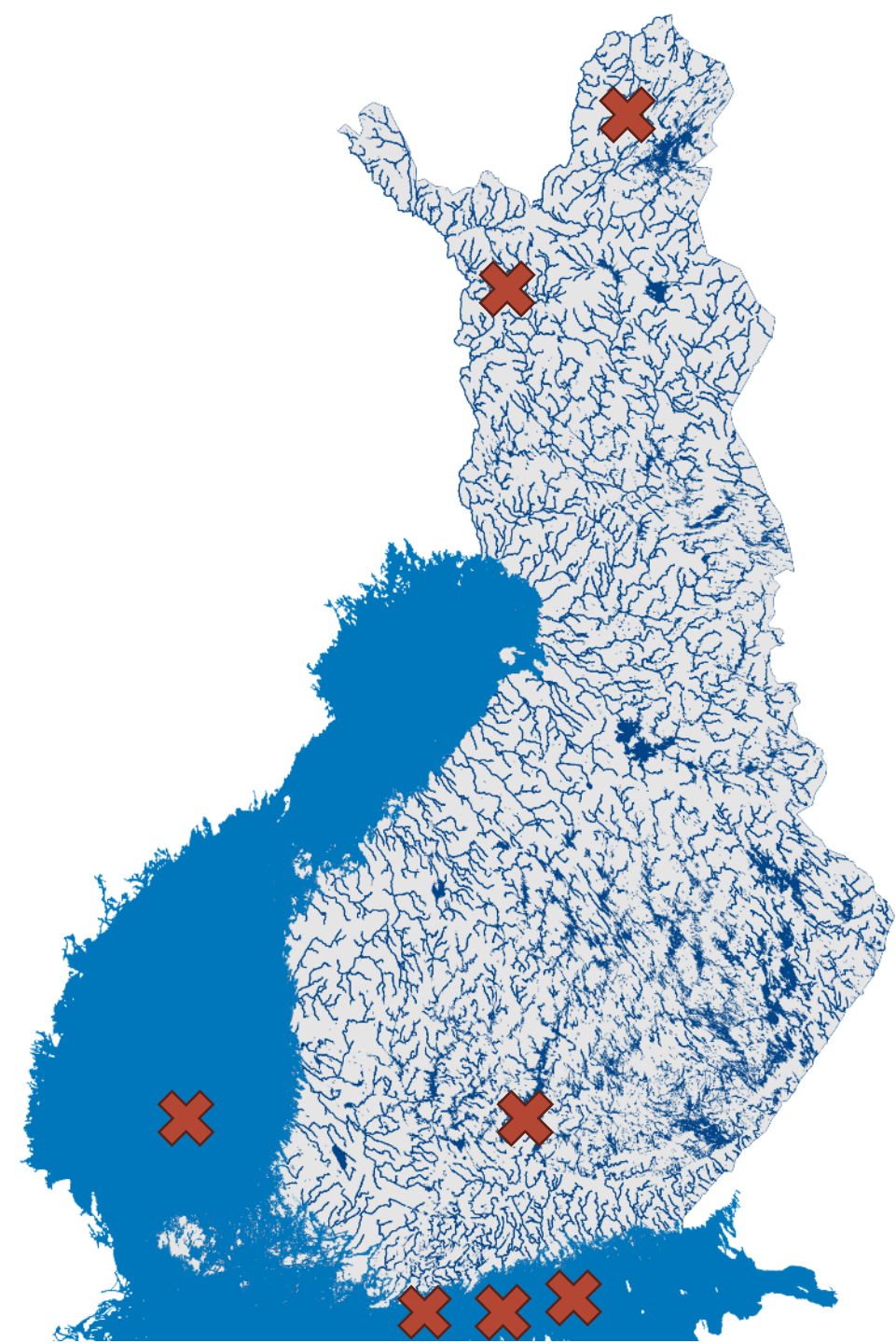
→ Historical environmental concentrations can be examined



# Sediment core sampling

Sediment cores were collected from 5 marine sites and from 3 lakes

All lakes are pristine waterbodies without any direct pollution sources.



# Sediment core sampling



1 cm slices

0 - 1

1 - 2

2 - 3

3 - 4

4 - 5

5 - 7

7 - 9

9 - 11

2 cm slices

14 - 16

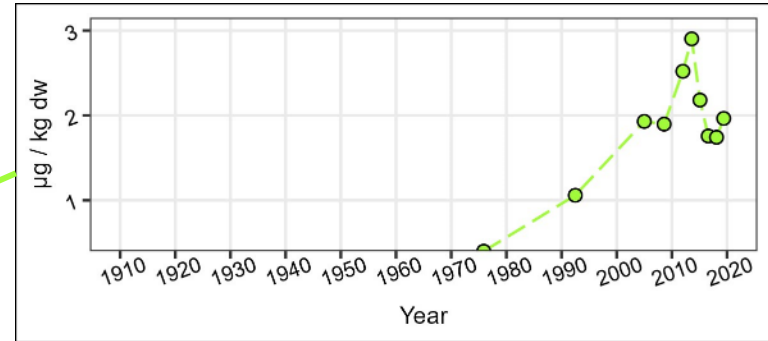
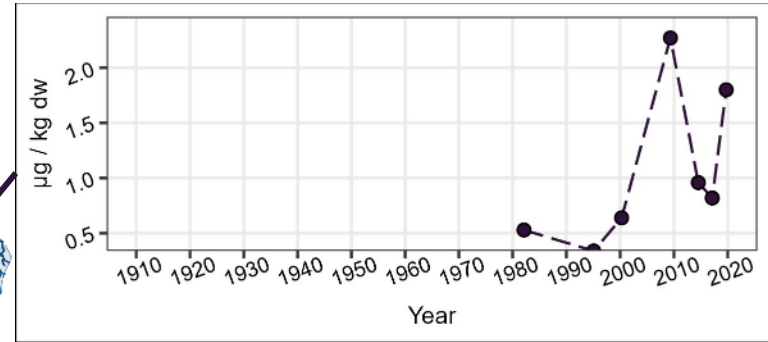
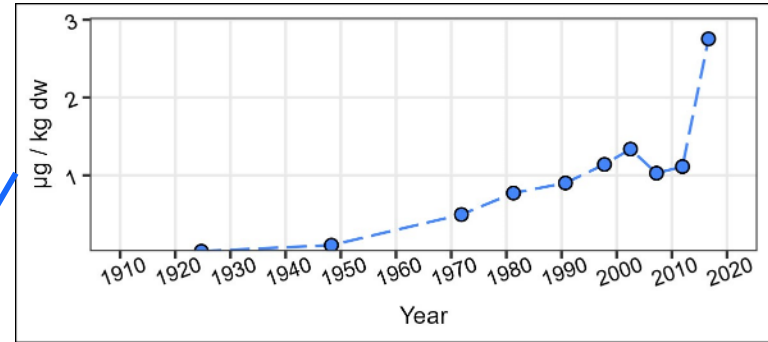
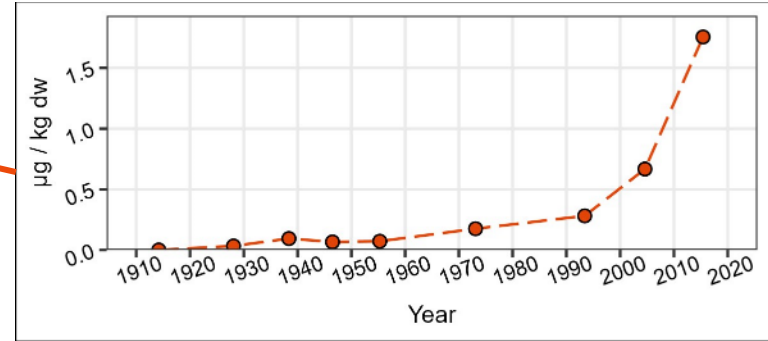
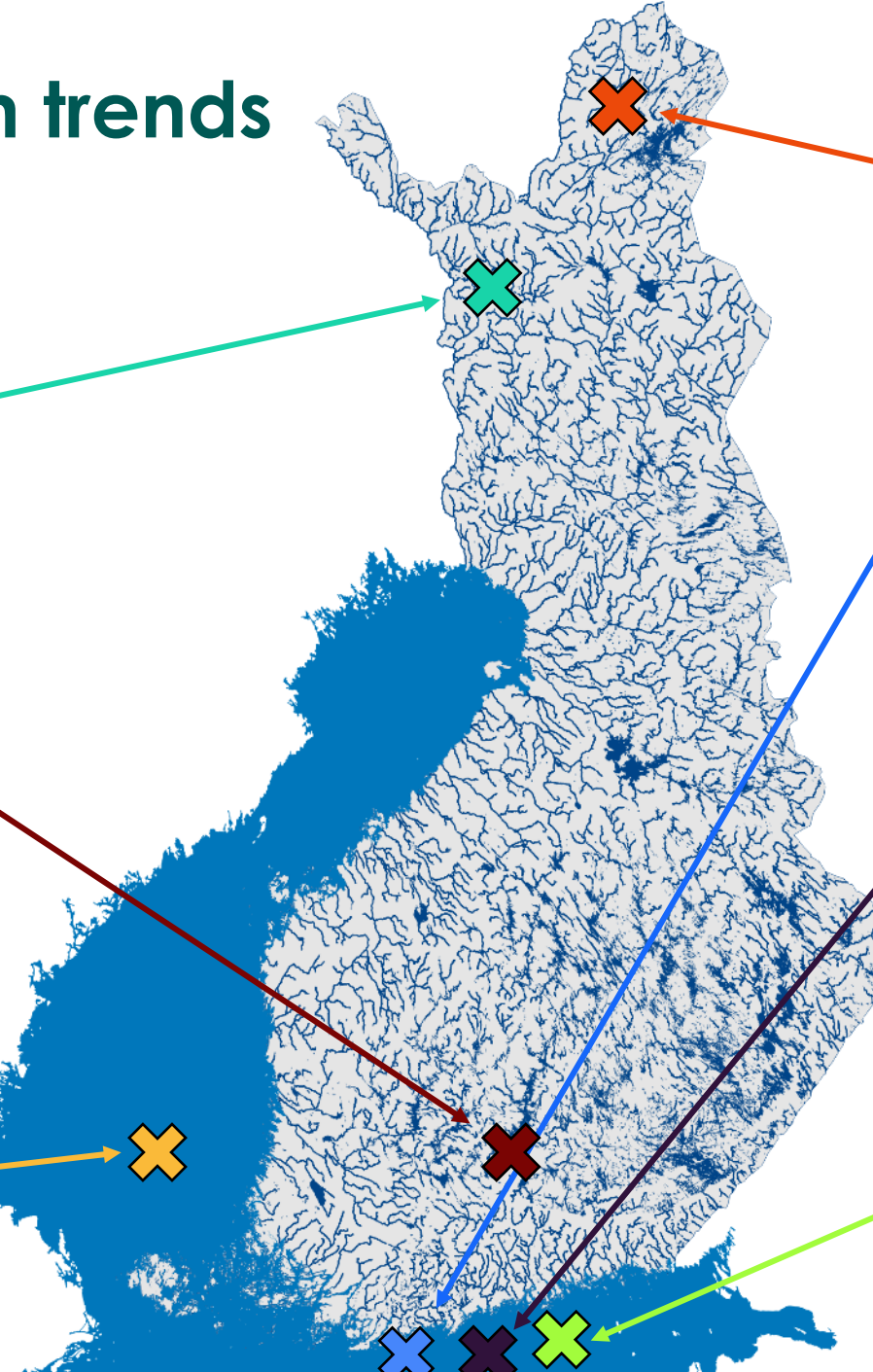
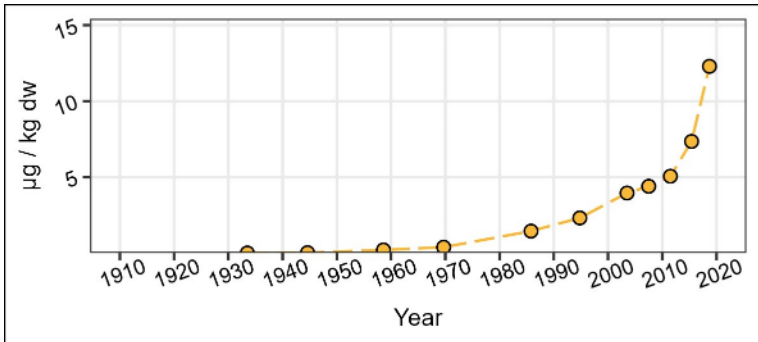
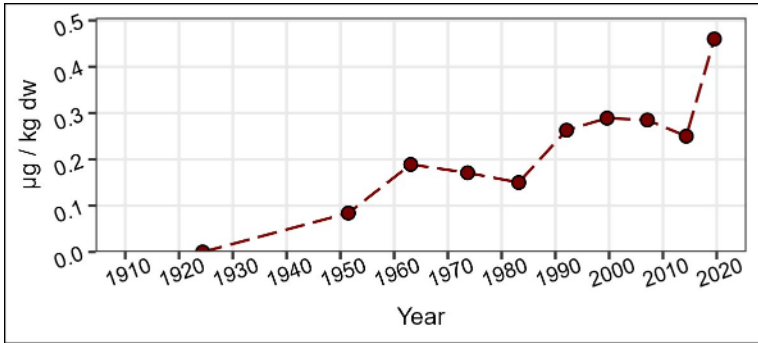
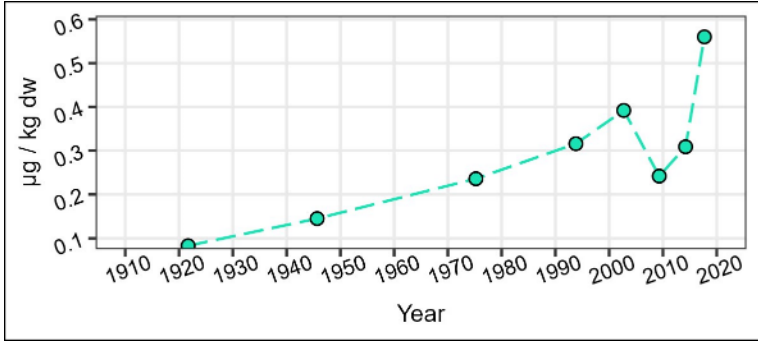
19 - 21

## Performed analyses

- Total organic carbon
- Cs137 and Pb210
  - Chernobyl peak and CRS-dating
- PFAS (18 PFAAs)



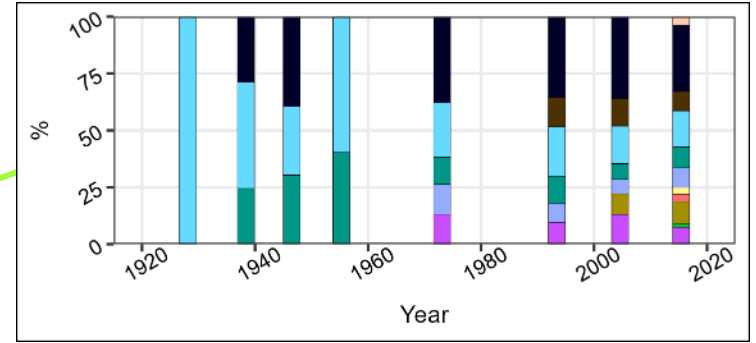
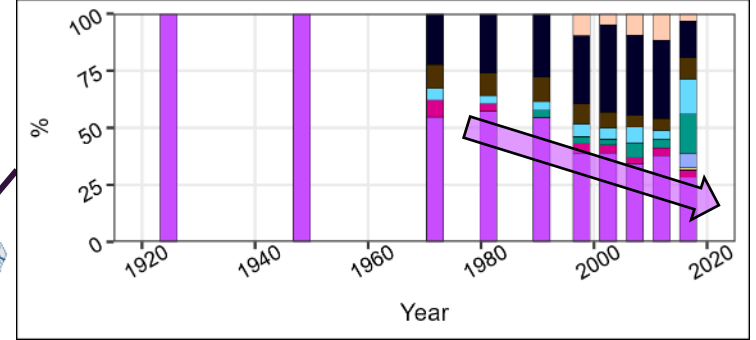
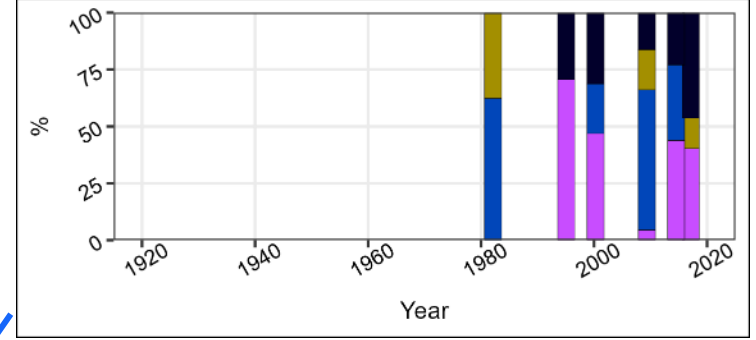
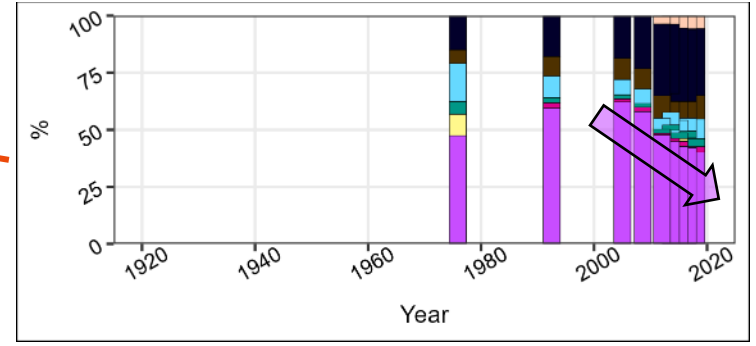
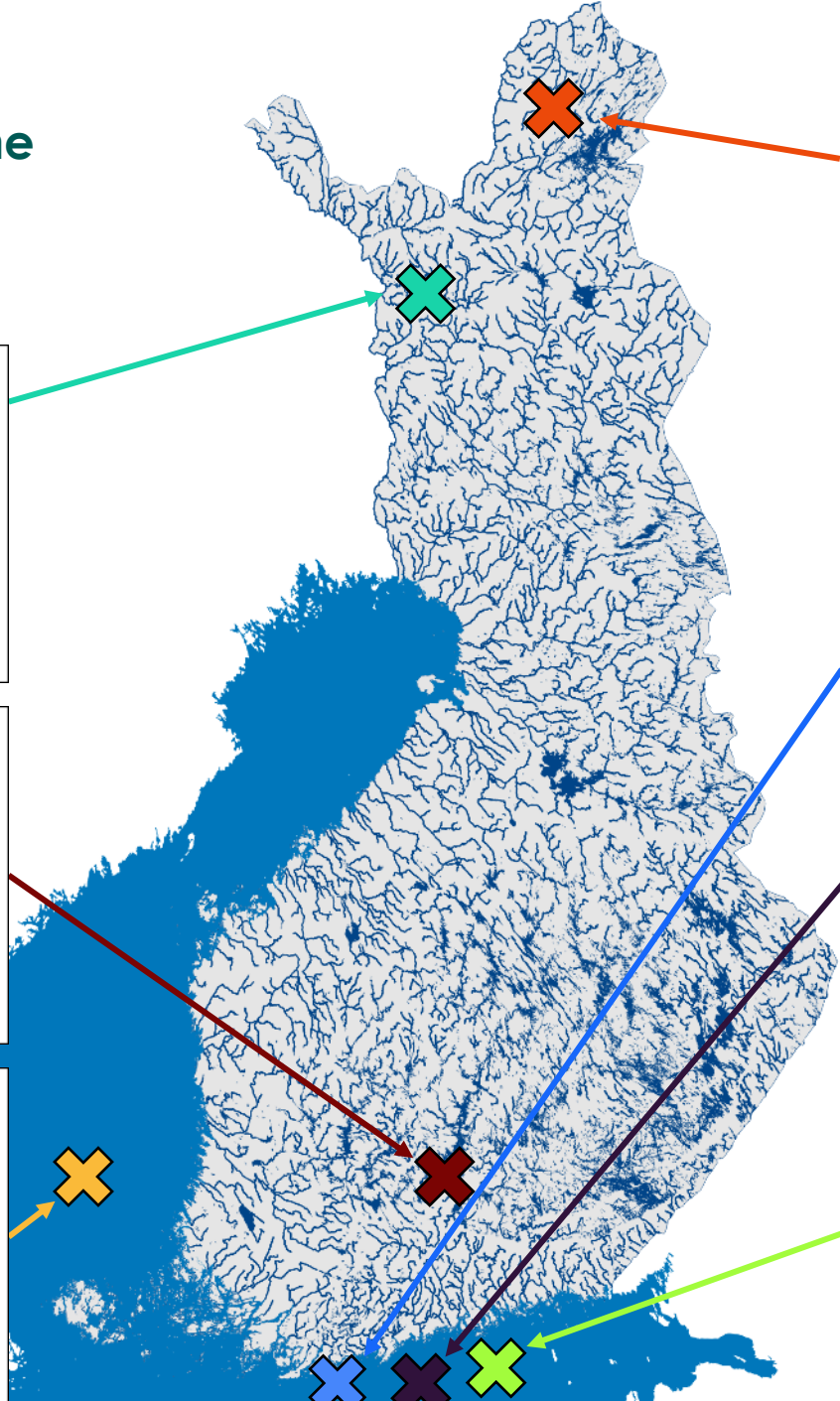
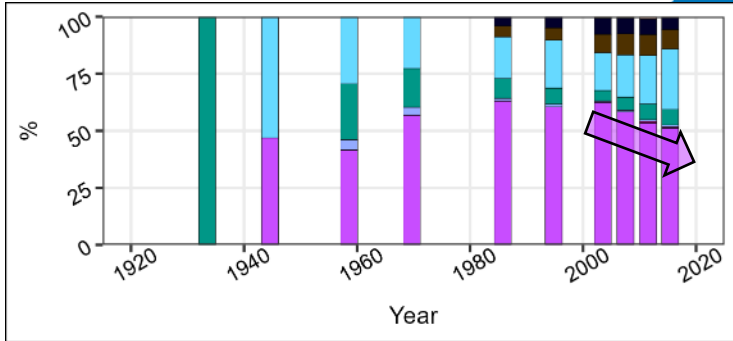
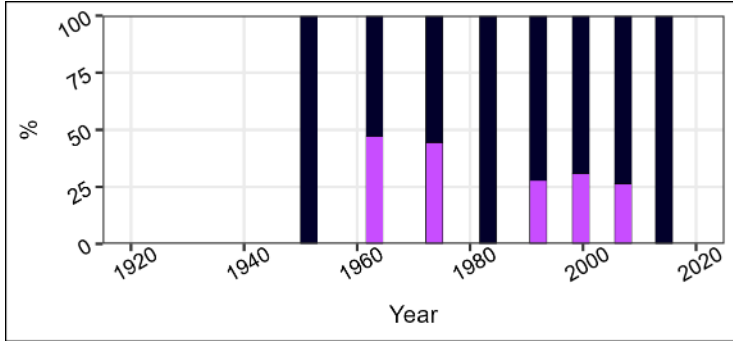
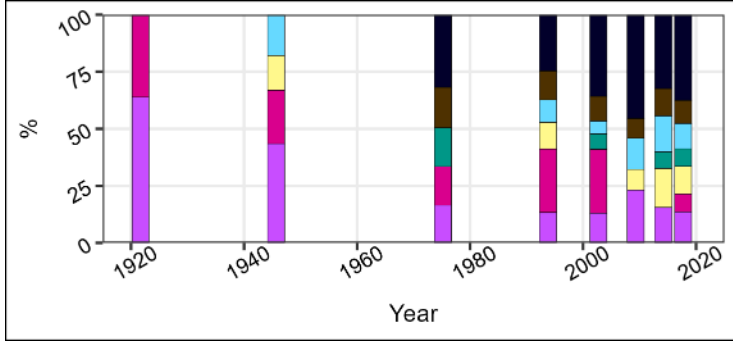
# $\Sigma$ PFAS concentration trends



# PFAS PROFILES

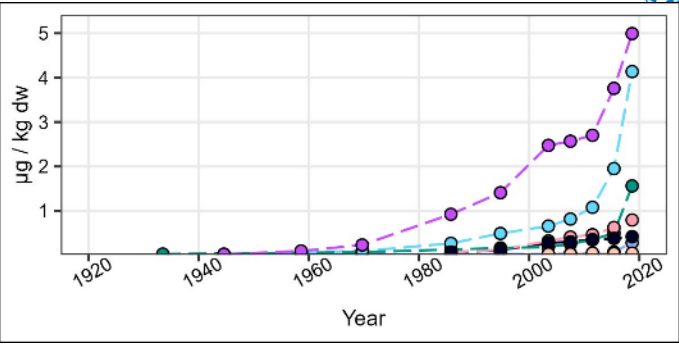
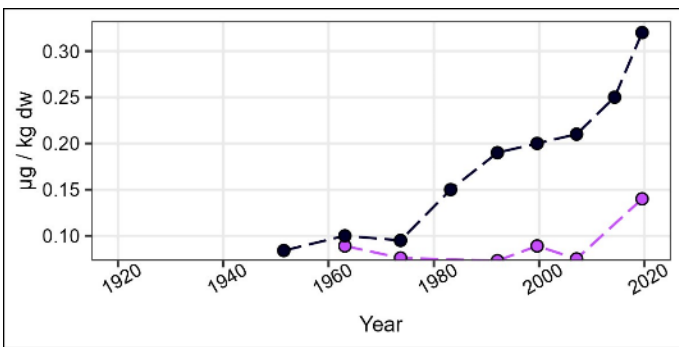
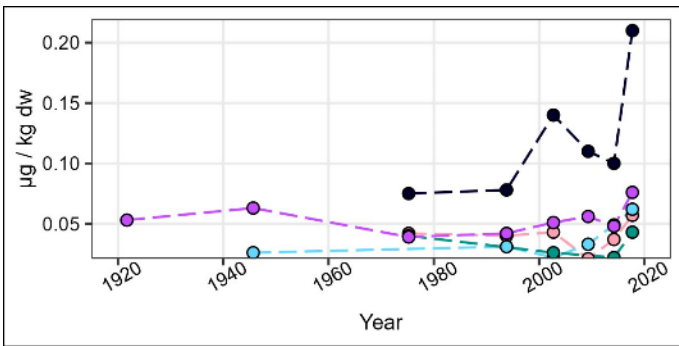
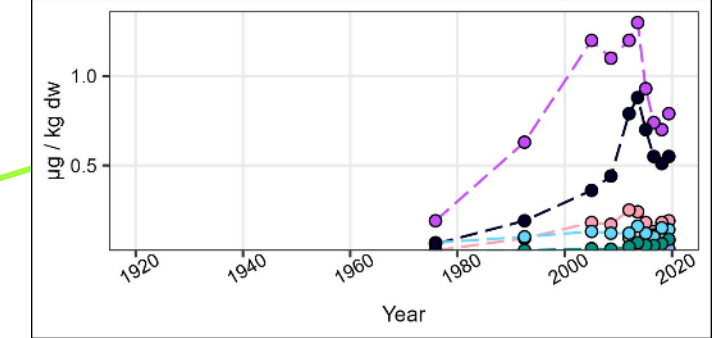
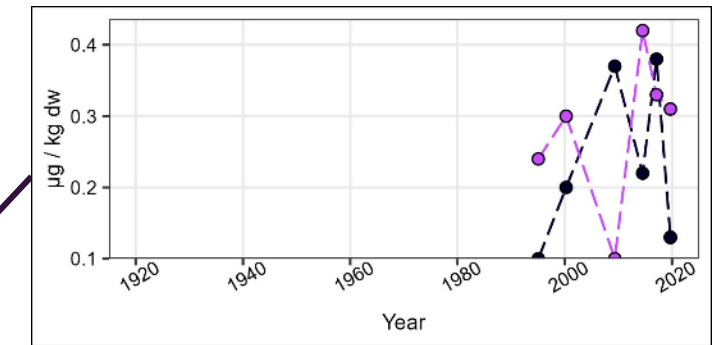
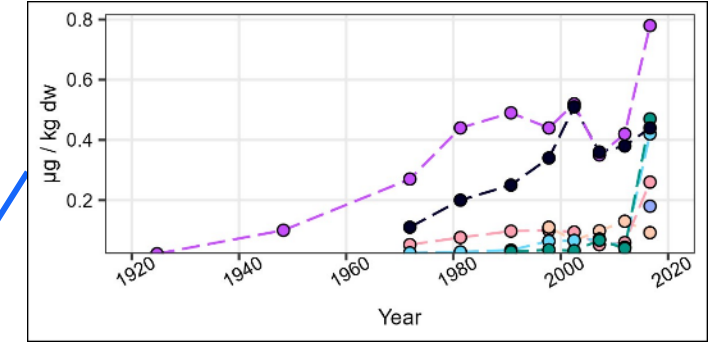
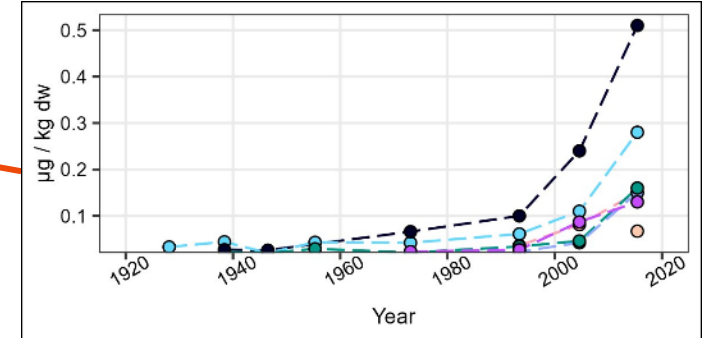
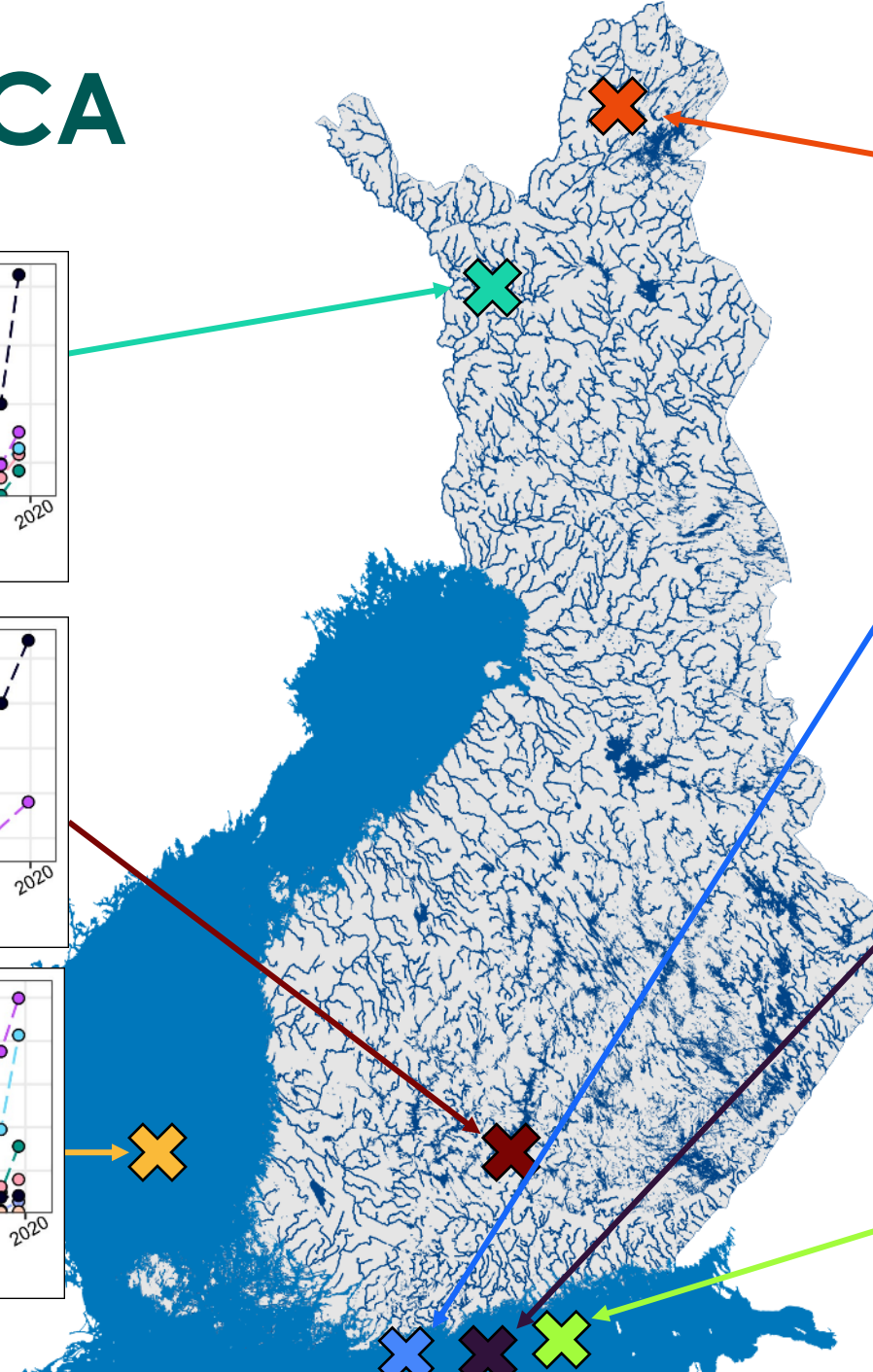
(The percentage of a compound in the  $\Sigma$  concentration)

- PFDoDA
- PFUnDA
- PFDA
- PFNA
- PFOA
- PFHpA
- PFHxA
- PFPeA
- PFBA
- PFHpS
- PFHxS
- PFBS
- PFOS





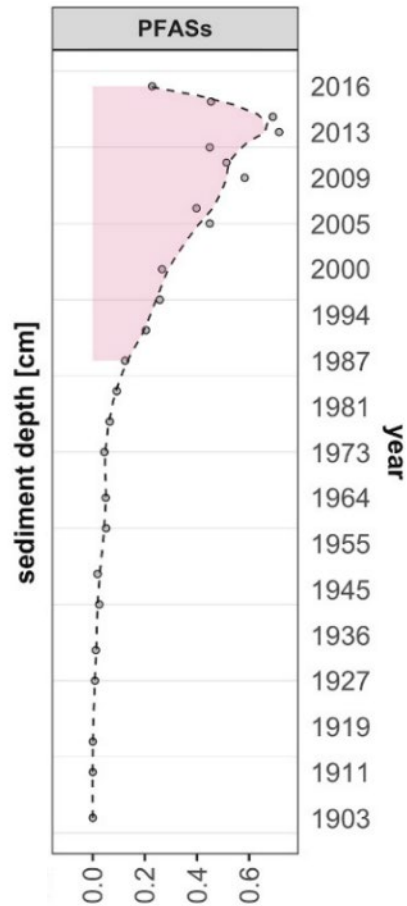
# PFOS and LC-PFCA



- PFDoDA
- PFUnDA
- PFDA
- PFNA
- PFOA
- PFHpA
- PFOS

# Results of sediment studies from around the world

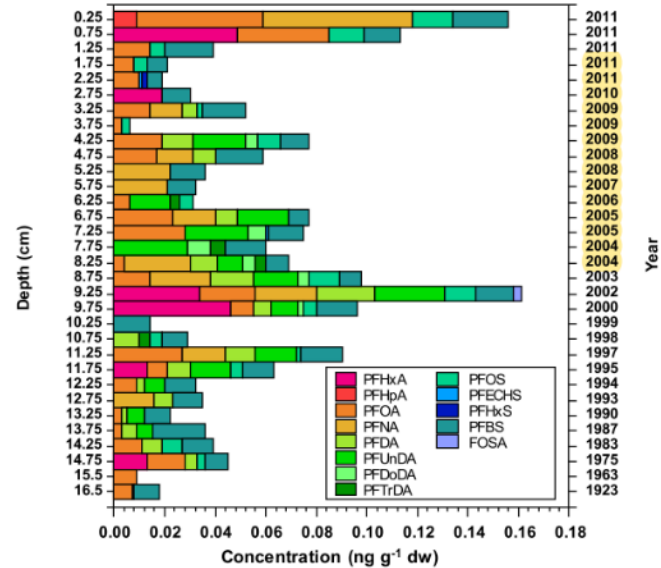
## The North Sea



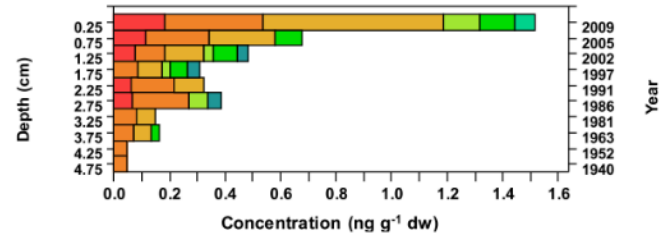
Logemann et al. 2022

## Arctic Canada

(A) Lake Hazen

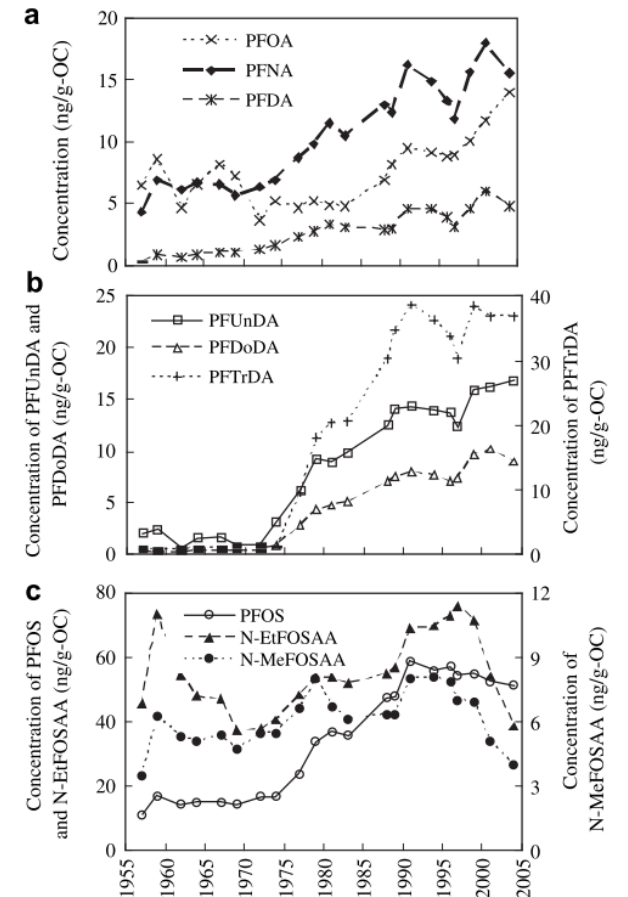


(B) Lake B35



MacInnis et al. 2019

## Tokyo Bay



Zushi et al. 2010



# Conclusions

- Concentrations of PFAS compounds in Finnish aquatic sediments appear to show an increasing trend.
  - This trend is evident at many locations, including for PFOS, despite its restrictions.
- Concentrations of certain long-chain PFCA compounds are increasing particularly rapidly
- Due to atmospheric deposition, it is not easy to find "PFAS-free" water bodies.
- Sediment studies do not provide information on the development of environmental concentrations of short-chain compounds because these compounds do not tend to bind to sediments.

THANK YOU!