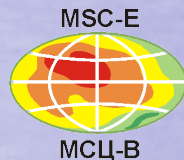


Assessment of heavy metal pollution within EMEP

O. Travnikov, I. Ilyin, M. Kleimenov, O. Rozovskaya, I. Strijkina (**MSC-E**)

W. Aas, K. Breivik, P.B. Nizzetto, K.A. Pfaffhuber (**CCC**)

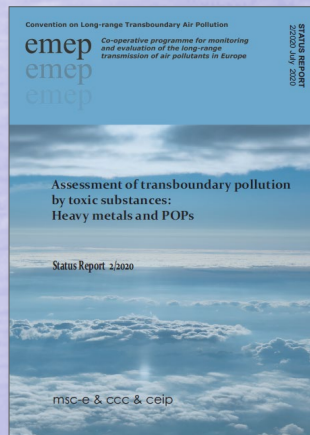
K. Mareckova, S. Poupa, R. Wankmueller, K. Seussall (**CEIP**)



Main activities on heavy metals in 2020

- *Operational activities:*
 - Emissions - collection, gap-filling, gridding (CEIP)
 - Monitoring - data collection and analysis (CCC)
 - Model assessment of pollution levels (MSC-E)
- *Co-operation and research activities (MSC-E):*
 - Co-operation with **national experts** (case studies - Germany)
 - Scientific co-operation on **mercury pollution** (countries, AMAP)
 - Co-operation with the **effect community** (WGE)

Status report 2020



Technical and data reports



Case studies for the EMEP countries (2010-2020)

Objective:

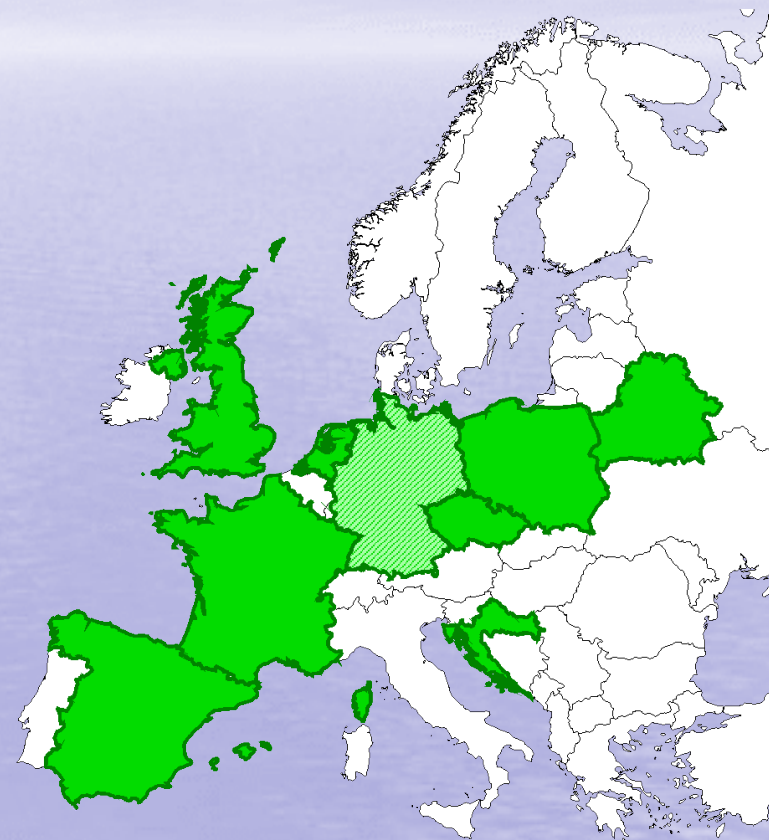
Assessment of HM and POP pollution on a country scale involving **national experts** and variety of **national data**

Countries involved:

Czech Republic, Croatia, Netherlands, Belarus, UK, Poland, Spain, France, **Germany**

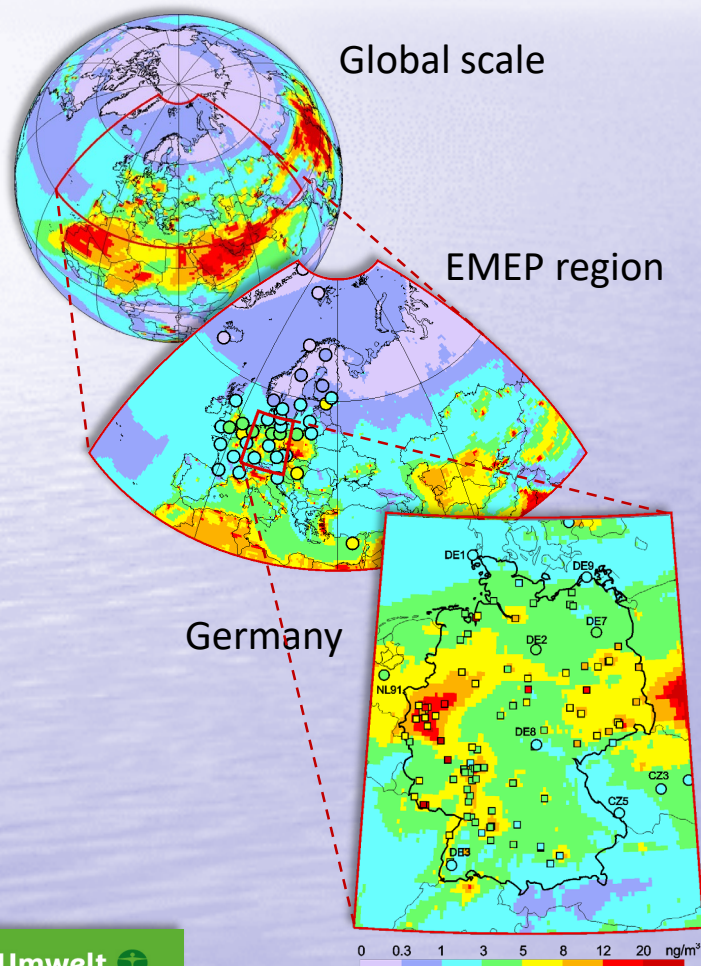
Main outcomes:

- Refined information on pollution levels
- Analysis of national emissions
- Improvement of modelling approaches



Participating countries

Country-scale assessment of HM pollution in Germany

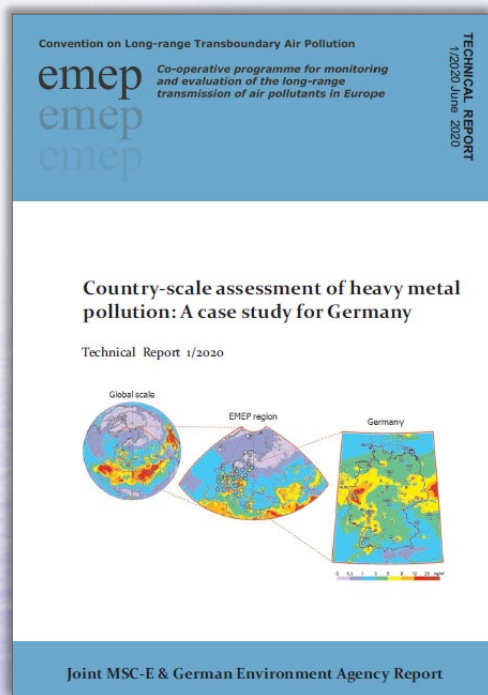


Main features of the study:

- Model assessment of **Pb**, **Cd** and **Hg** levels in Germany in 2014-2016
- **Multi-scale** modelling approach (global, regional, local)
- Thorough **evaluation of modelling results** vs. observations (EMEP and national)

The project was jointly funded by EMEP and the country (UBA, Germany)

Country-scale assessment of HM pollution in Germany



In collaboration with:
G. Schütze, S. Feigenspan
and K. Uhse (UBA)

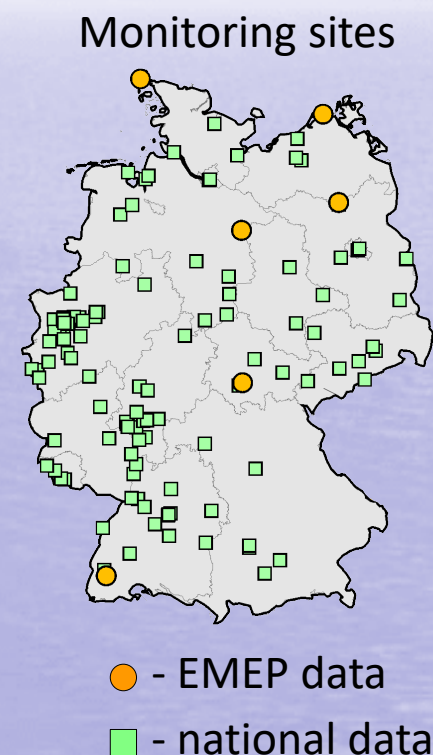
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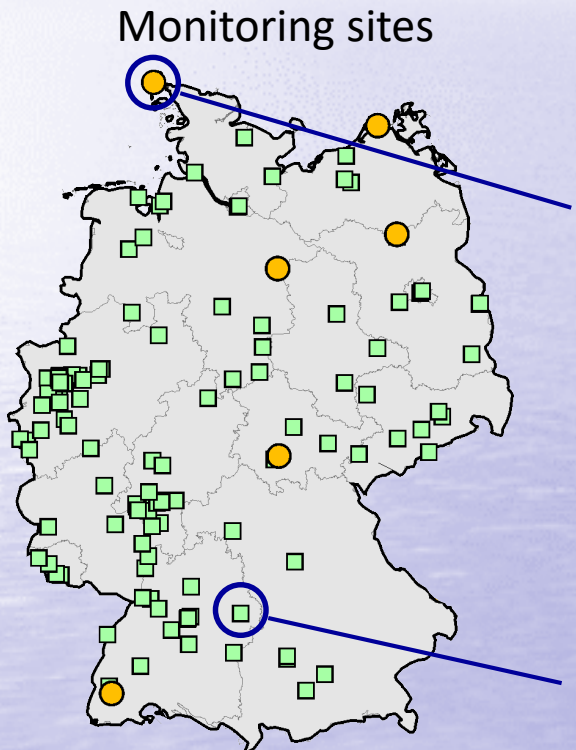
Lessons learned for the EMEP assessment

- Use of **national monitoring data** largely expands the scope of the analysis but requires additional metadata (location, methodology etc.)
- Modelling results are sensitive to **detailed emissions data** (spatial distribution, height, chemical speciation etc.)
- **Fine resolution modelling** ($0.1^{\circ} \times 0.1^{\circ}$) simulates regional/national background but still does not reproduce effects of local pollution
- The **multi-scale modelling** allows distinguishing different pollution scales for targeting national, regional and global policies

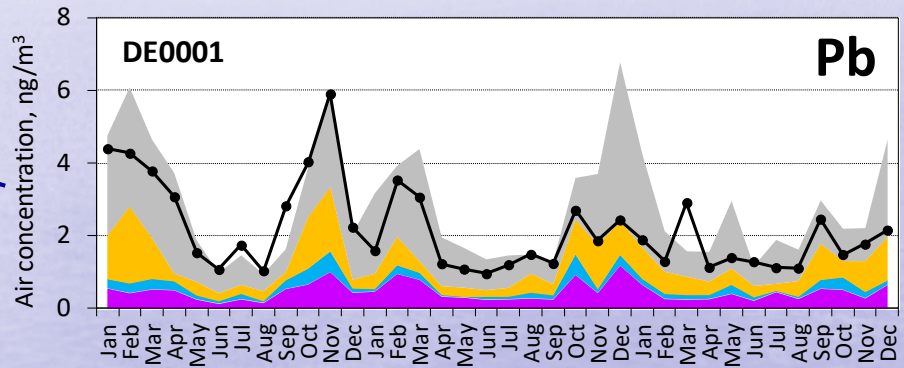


Interlink of different scales (Germany)

Contribution of global/regional/national sources to HM pollution

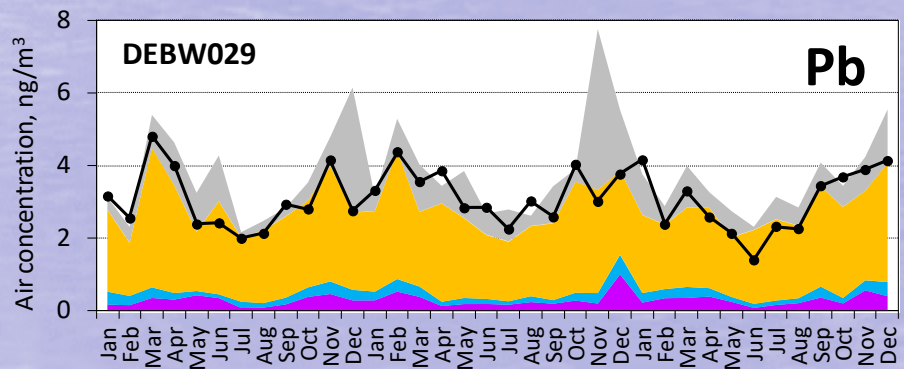


Pb air concentration at site DE0001



- - Measured
- - Secondary
- - Germany
- - EMEP
- - Global

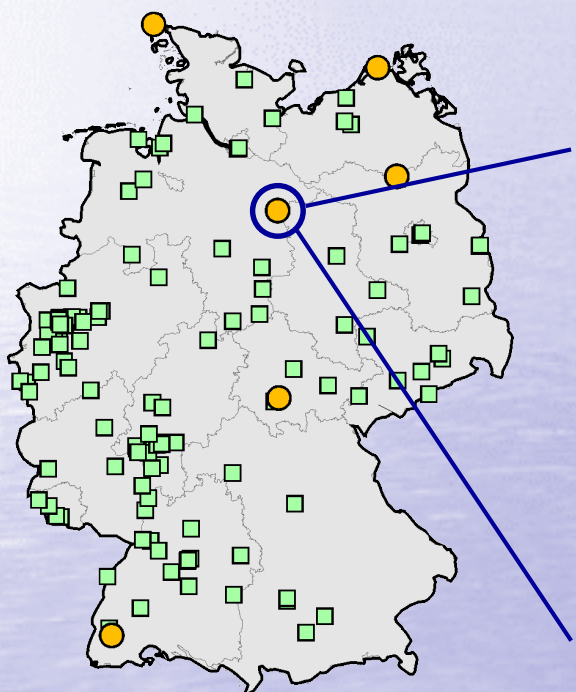
Pb air concentration at site DEBW029



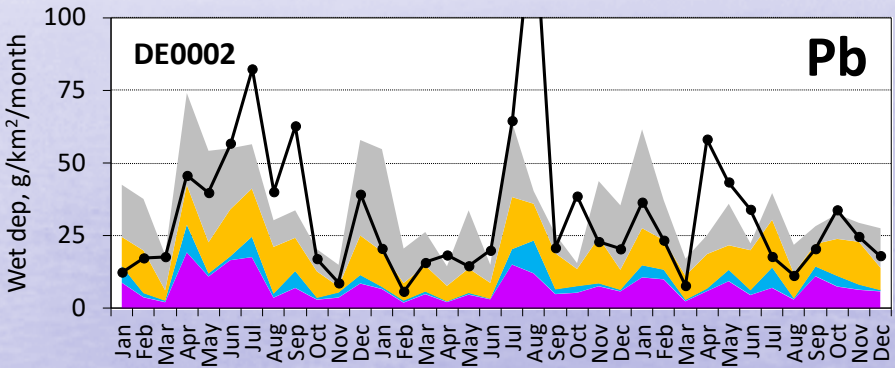
Interlink of different scales (Germany)

Contribution of **global/regional/national** sources to HM pollution

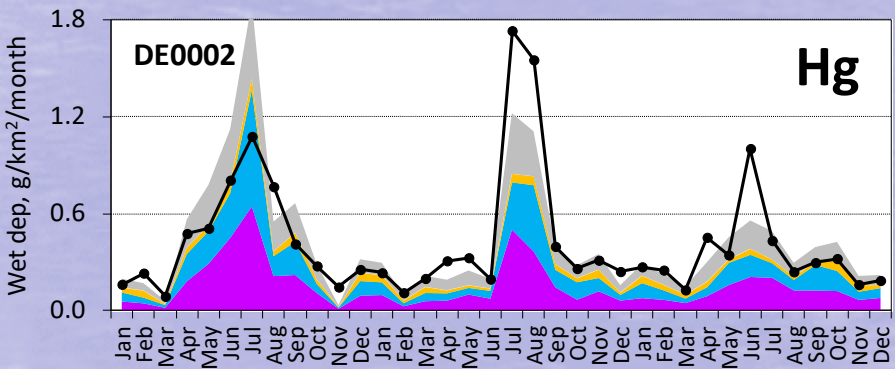
Monitoring sites



Pb wet deposition at site DE002



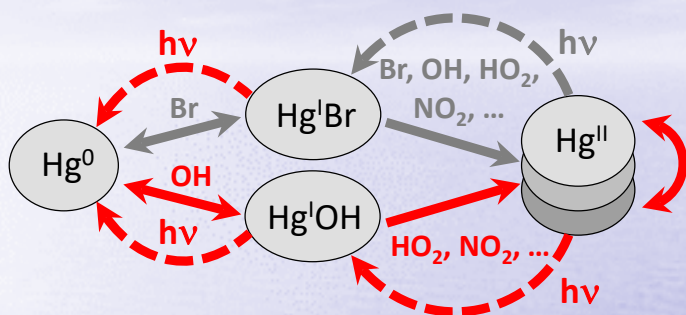
Hg wet deposition at site DE002



- - Measured
- - Secondary
- - Germany
- - EMEP
- - Global

Study of Hg atmospheric chemistry

General scheme of Hg redox chemistry



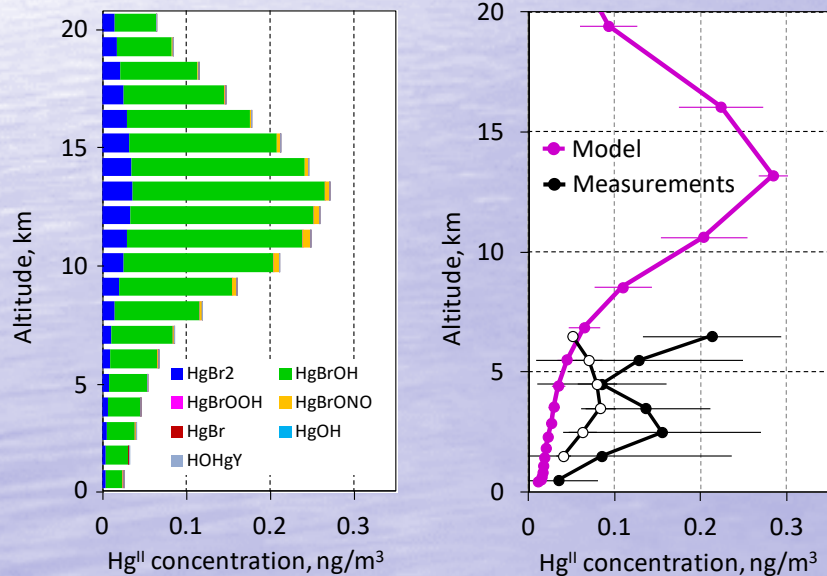
Objective:

- Analysis and evaluation of **new Hg oxidation/reduction mechanisms** in the atmosphere

Current activities:

- Collaborative study by international research group (**EMEP/MSC-E, Spain, France, USA, Canada, UK, Germany**)
- MSC-E contributes **with model evaluation** of the new mechanisms

Simulated Hg^{II} concentration



The new results were submitted for publication in *PNAS*

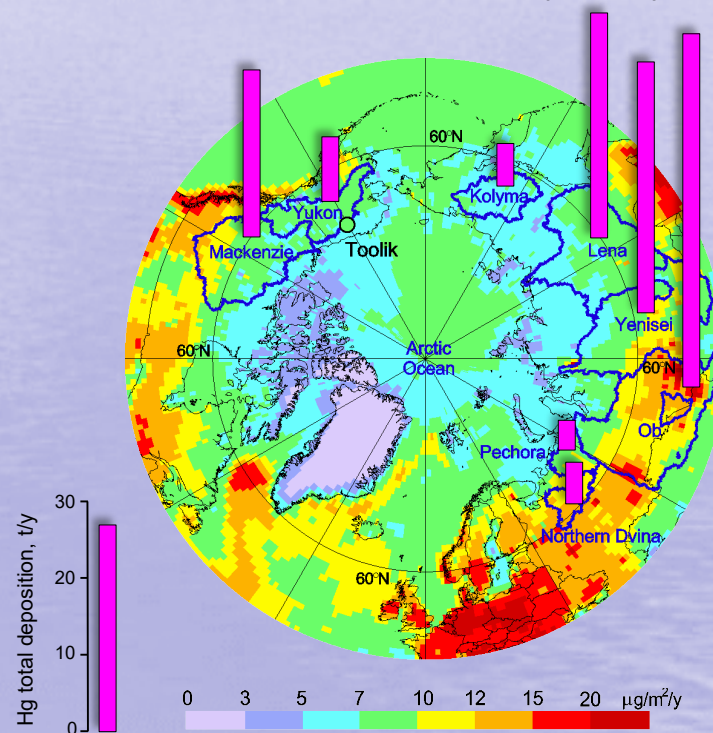
Mercury pollution of the Arctic

Contribution to the AMAP Mercury Assessment 2021

Information included:

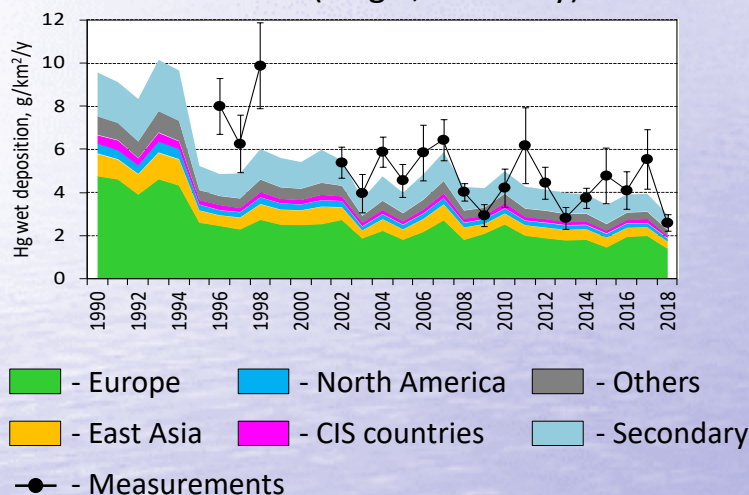
- Multi-model assessment of Hg deposition to the Arctic in 2010 and 2015
- Mercury deposition to the Arctic rivers watersheds
- Sources apportionment of Hg deposition to various sub-regions of the Arctic

Hg deposition to the Arctic rivers watersheds (2015)



Attribution of long-term pollution changes (in co-operation with TF HTAP)

Long-term changes of Hg wet deposition
at site DE9 (Zingst, Germany)



TF HTAP workshop (virtual) with participation of modelling groups, AMAP, Minamata and Stockholm Conventions (December 2020)

Objective:

- Analysis of the **key factors** effecting long-term Hg and POP pollution changes (*direct and secondary emissions, climate and LU change, etc.*)

Tentative program:

- Analysis of available global Hg and POP **emission inventories** and **measurements**
- **Multi-model assessment** of long-term trends (1990-2019) in EMEP and other regions
- **Sensitivity simulations** to identify effect of various factors

Co-operation with ICPs (WGE)

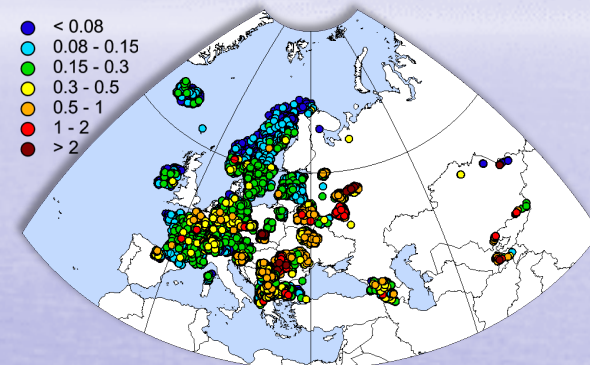
Current:

- Joint analysis of heavy metal measurements in moss in co-operation with **ICP-Vegetation** (TF meeting, Riga, January 2020)

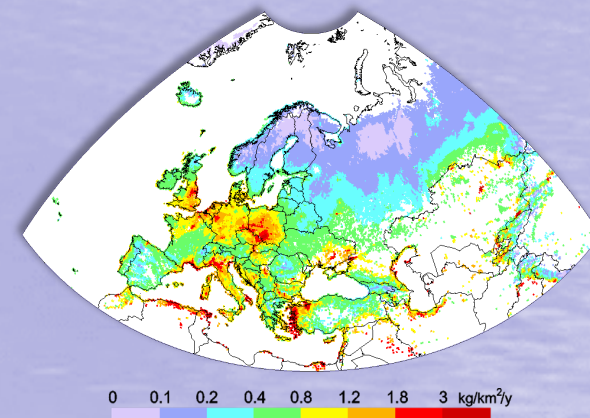
Potential:

- Analysis of heavy metal trends in co-operation with **ICP-Integrated Monitoring** and **ICP-Forests**
- Information exchange with **ICP-Waters** on Hg deposition to water bodies
- Co-operation with **CCE** on assessment of exceedances of heavy metal critical loads

Cd concentration in moss



Pb deposition to forests



Main future activities

- Attribution of **long-term changes of Hg pollution** (co-operation with TF HTAP, AMAP, Minamata Convention)
- Scientific co-operation with national experts on research of **Hg atmospheric chemistry**
- Country-scale pollution assessment (**case studies**)
 - *Generalizing and application of gained experience to **EMEP operational modelling***
 - *Initiation of a **new study***
- Co-operation with the **effect community** (WGE, ICPs)