Progress in evaluation of pollution levels of heavy metals and persistent organic pollutants in EECCA countries

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Protocols on heavy metals (HMs) and persistent organic pollutants (POPs) of 1998

Protocol on HMs: **Lead (Pb), cadmium (Cd), mercury (Hg)**

Protocol on POPs: **PCDD/F, PAH, PCB, HCH, HCB… …**

According to the protocols,

- **Each Party within geographical scope of EMEP shall report information on the levels of emissions**

- **EMEP shall, using models and measurements provide Parties with information on pollution levels and transboundary transport**

Information available in EMEP:

§ ***Emission data***

§ ***Modelling results***

- ***Maps of concentrations and depositions***
- ***Transboundary pollution***
- ***Temporal trends of pollution levels***
- ***Ecosystem-dependent depositions***

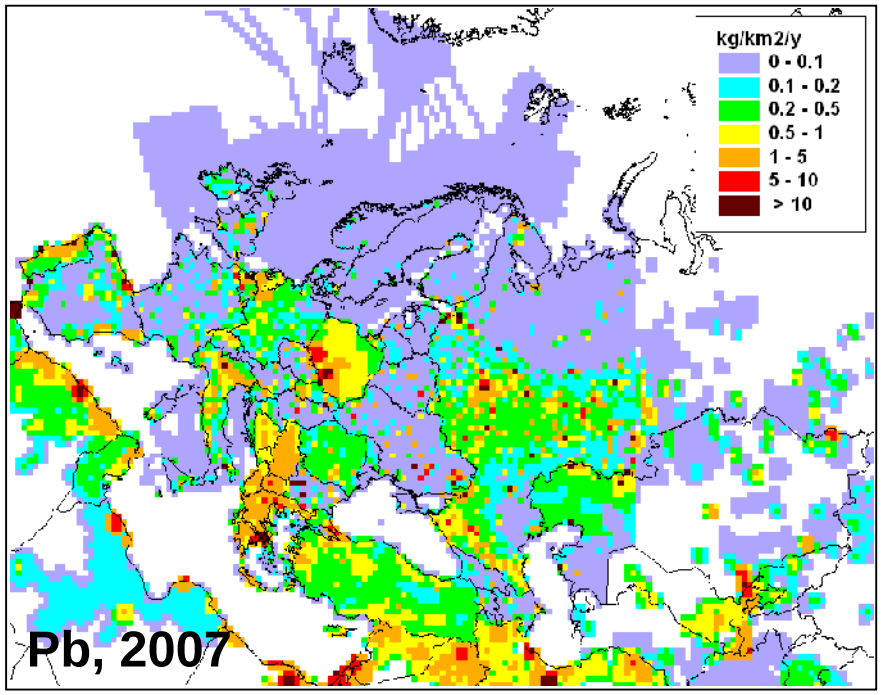
§ ***Monitoring***

Lead emissions in 2007.

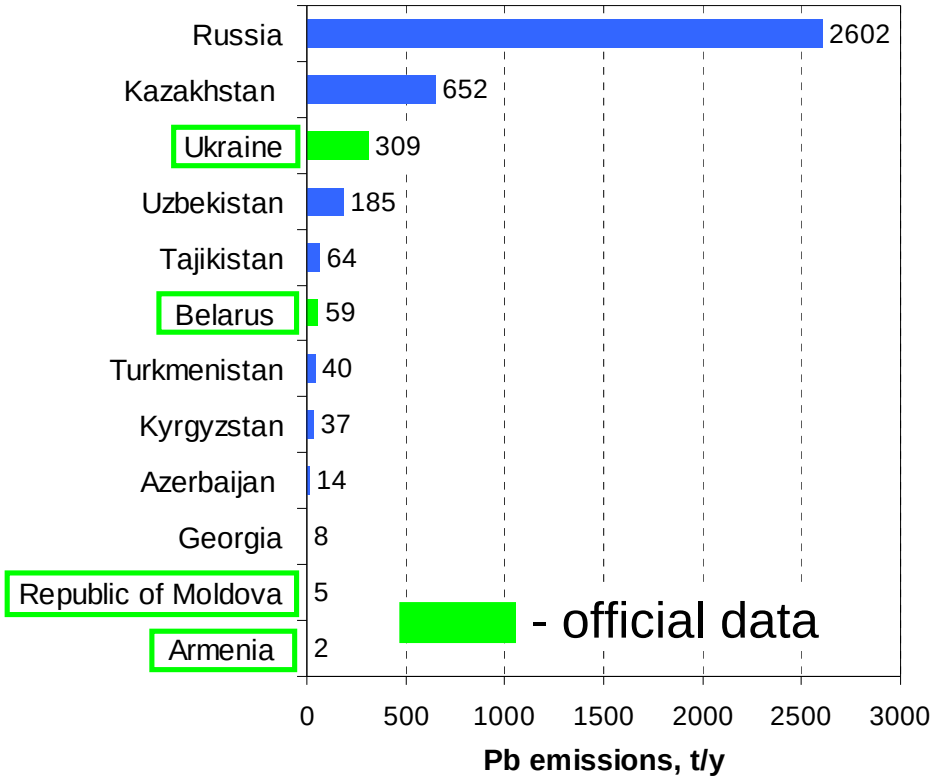
Official data: 35 *countries within EMEP (including 4 EECCA countries)*

Other countries:

- ***TNO expert estimates (European part of EMEP region)***
- ***Lead: Global data for 1990 (Pacyna et al., 1995)***
- ***Mercury: Global data of AMAP/UNEP for 2005.***
- ***Cadmium: Cd = Coeff * Hg***



Pb emissions in EECCA countries

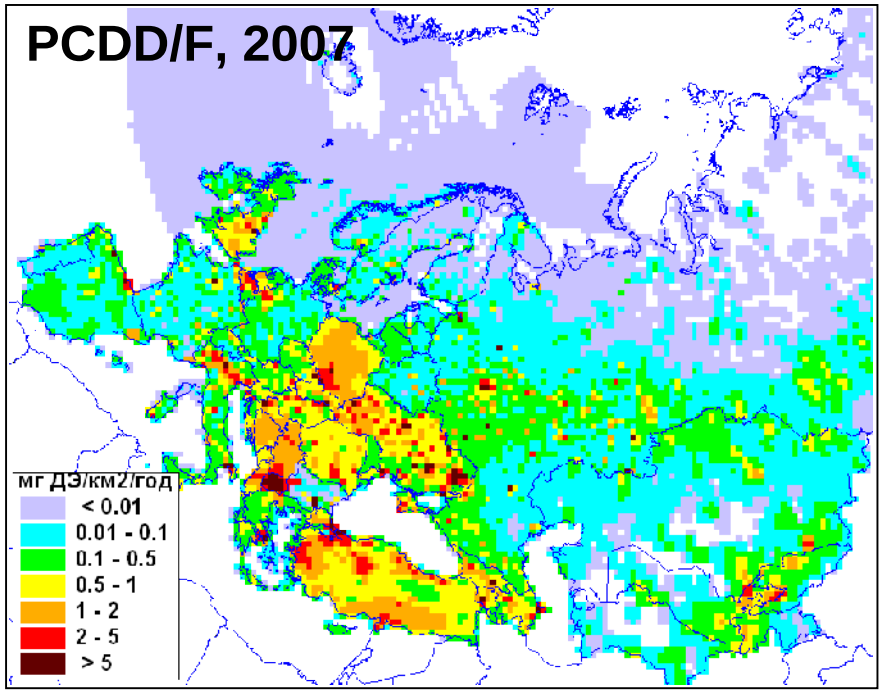


PCDD/F emissions in 2007.

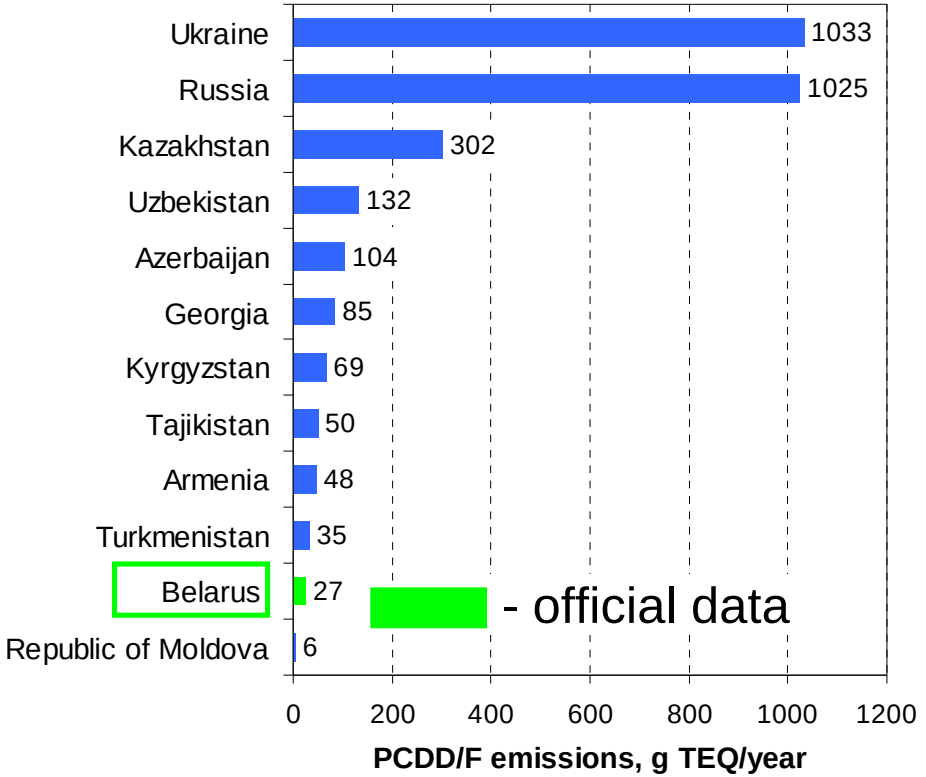
Official data: 35 *countries within EMEP (including 1 EECCA country)*

Other countries:

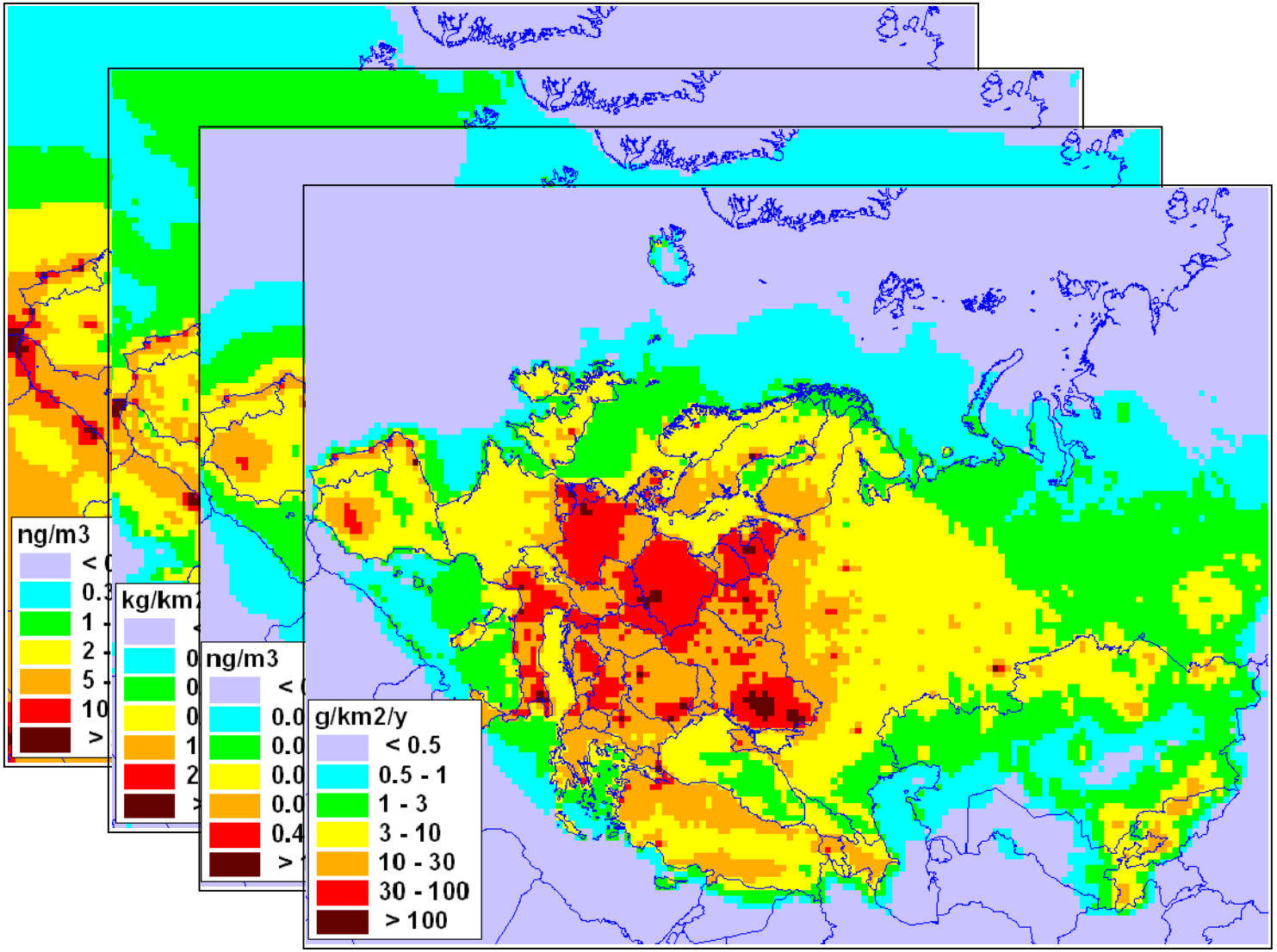
- ***TNO expert estimates (European part of EMEP region)***
- ***POPCYCLING-Baltic project (European part of EMEP region)***
- ***Global data (UNEP, 1999, Li, 2004, Breivik et al, 2007, Zhang and Tao, 2008)***



PCDD/F emissions in EECCA countries



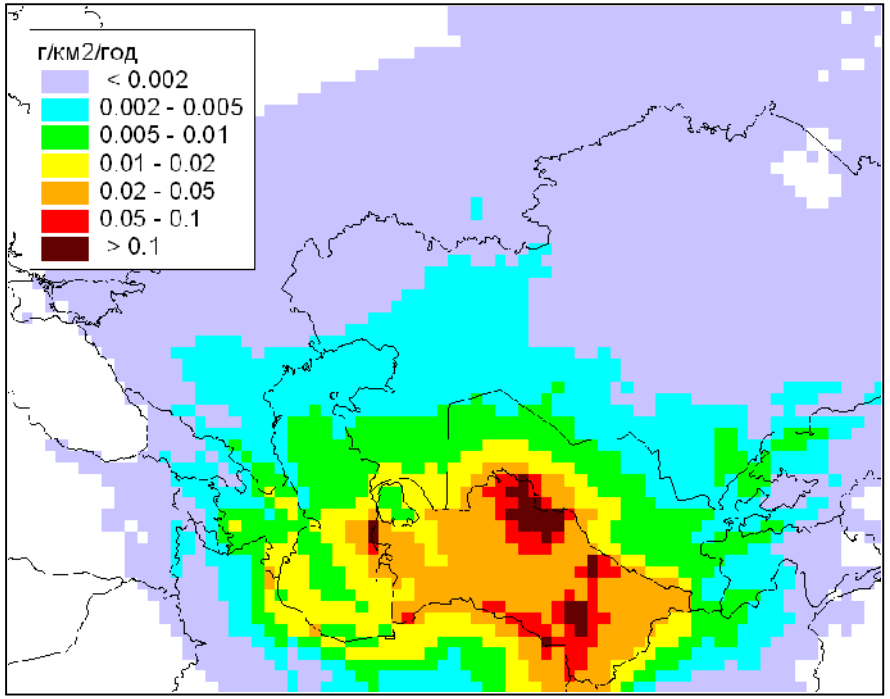
HM and POP pollution levels in EMEP region and EECCA countries in 2007

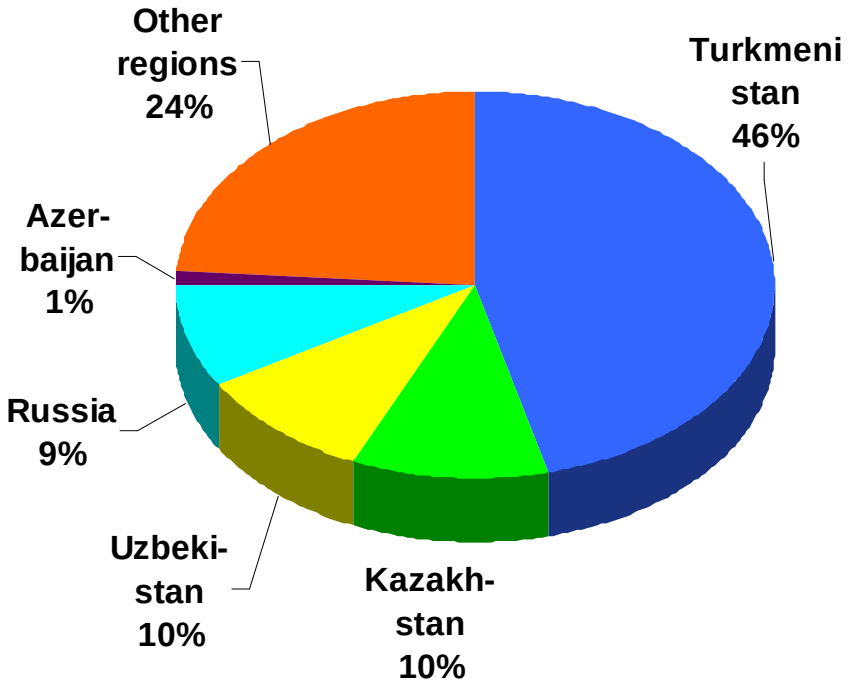


Total depositions of B(a)P

Transboundary transport of heavy metals and POPs in the EMEP region

Depositions of mercury from Turkmenistan sources in 2007.

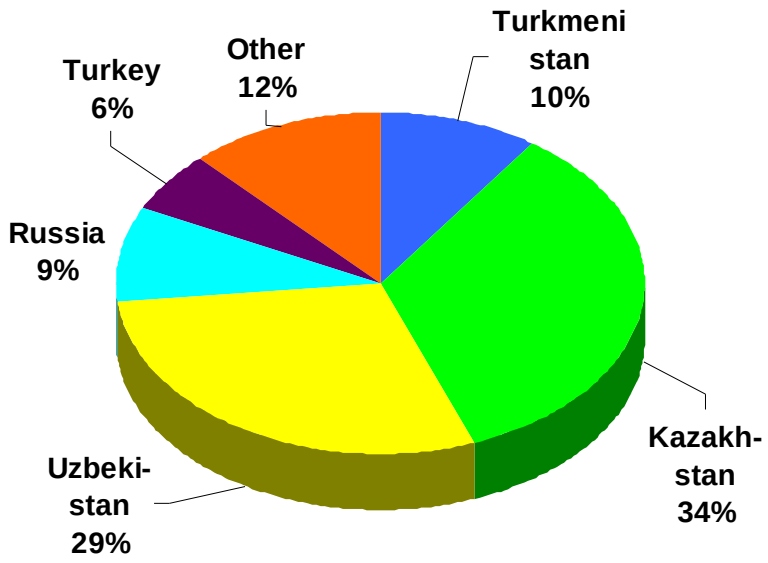




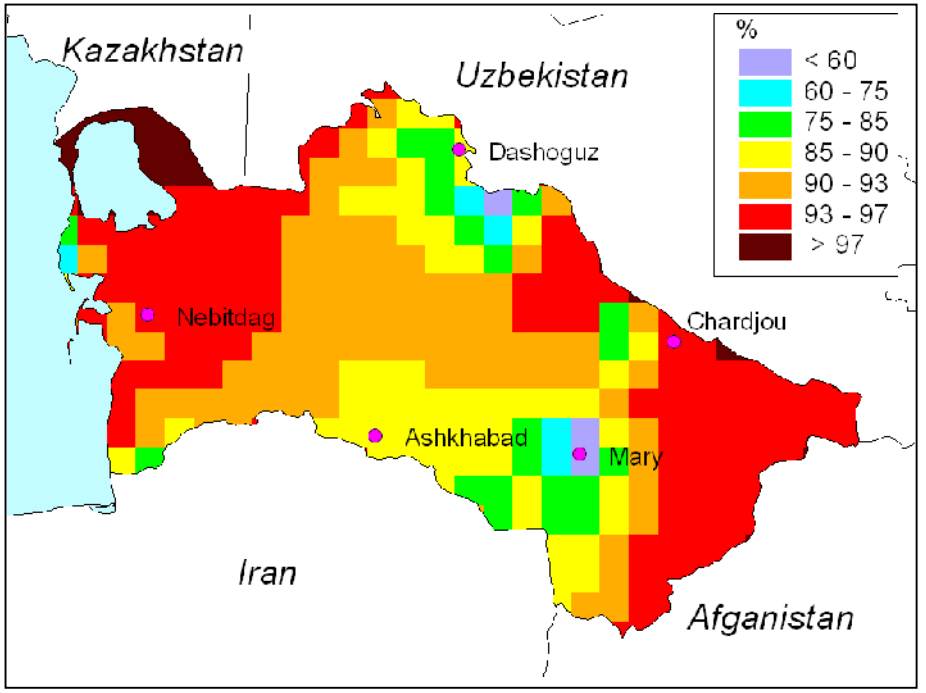
Depositions of mercury from Turkmenistan sources in 2007

Transboundary transport of mercury from Turkmenistan sources in 2007

Country's contributions to mercury depositions in Turkmenistan from anthropogenic sources



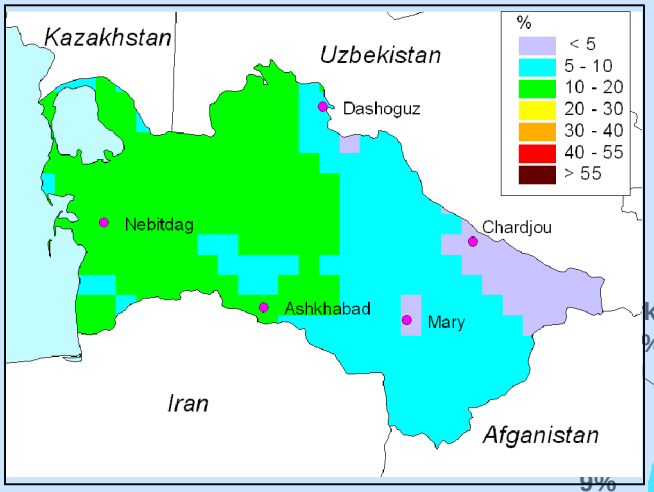
Over the country as a whole



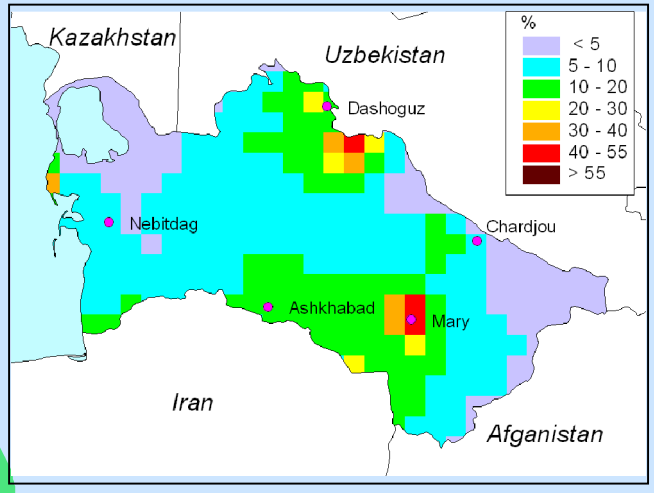
Spatial distribution (50x50 km)

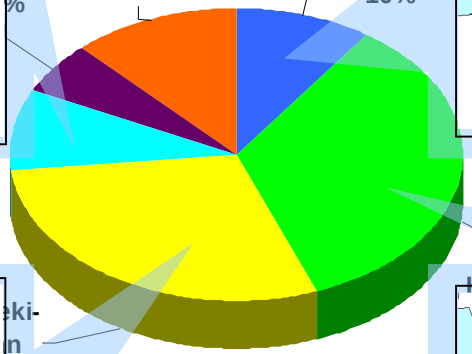
Contributions of different sources to mercury deposition

From Russia

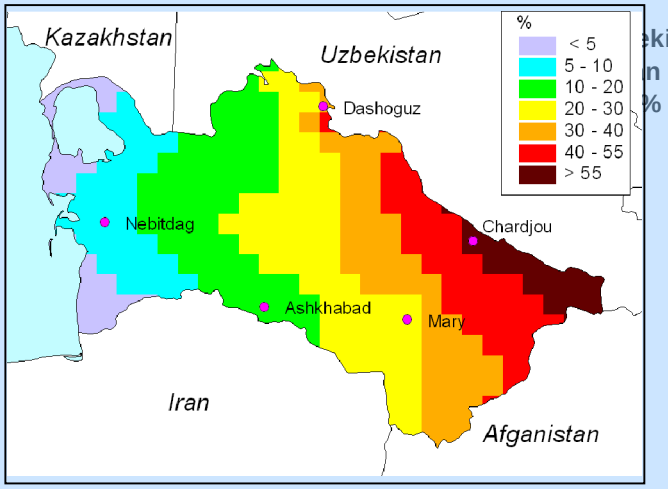


From national sources

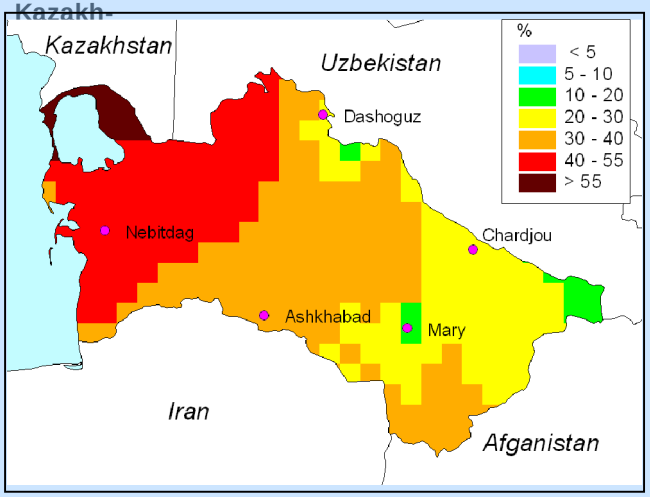




From Uzbekistan

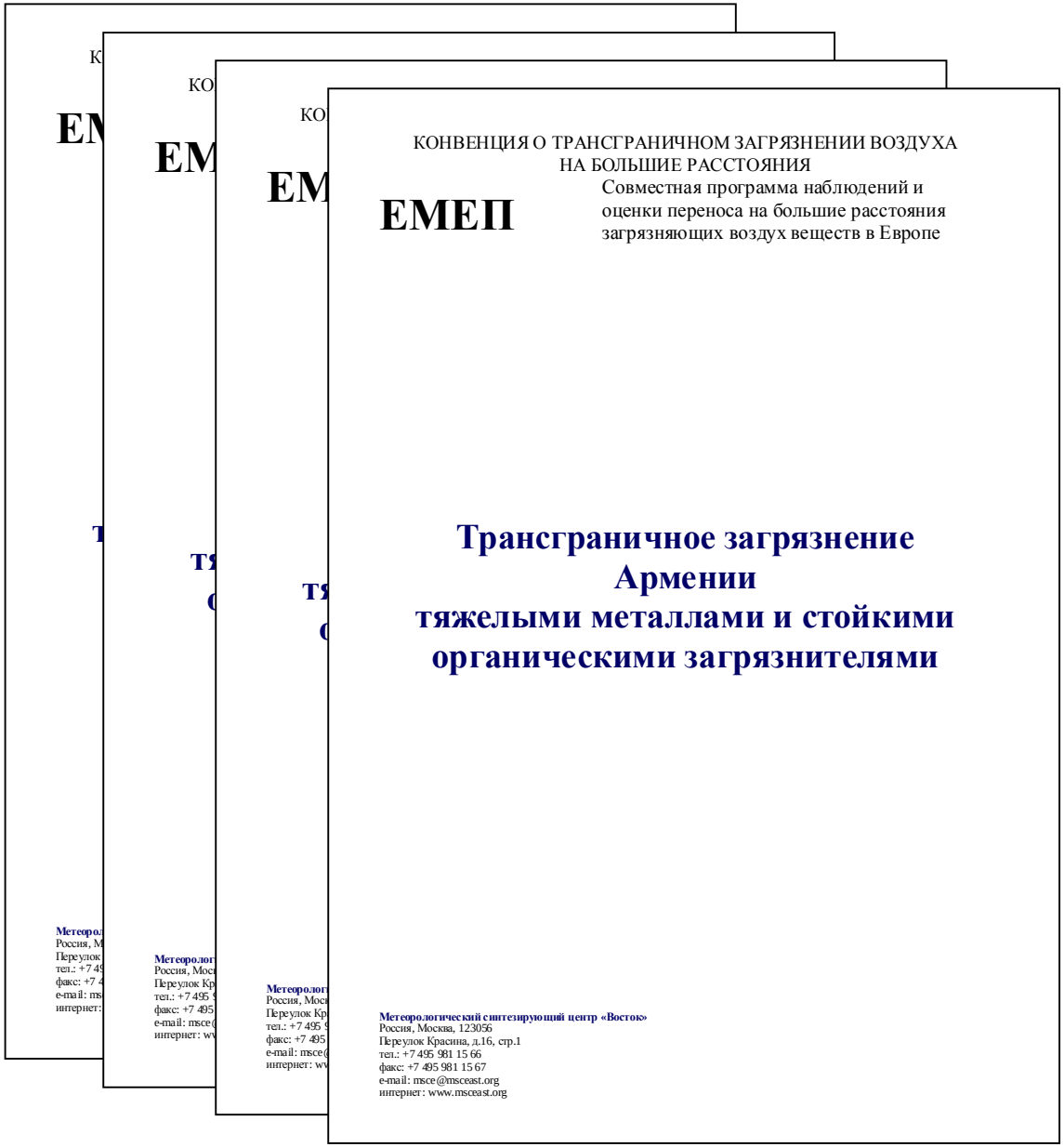


From Kazakhstan



Information for EECCA countries

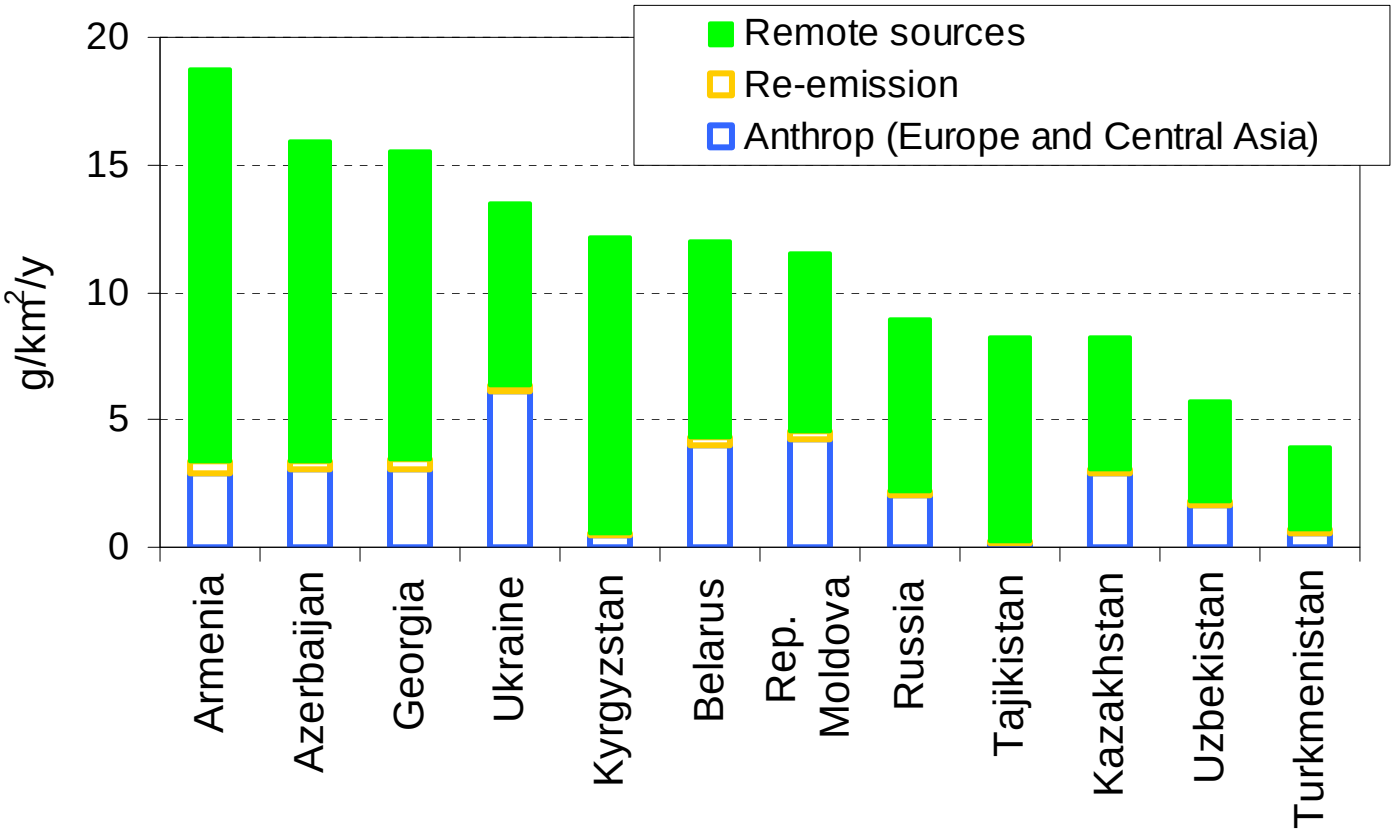
www.msceast.org



Directions of other activities:

- Modelling over global scale
- Evaluation of HMs and POPs wind re-suspension
- Detailed assessment of pollution levels in individual countries

Mercury deposition fluxes in EECCA countries in 2007



Contribution of remote mercury sources: 55 – 95%

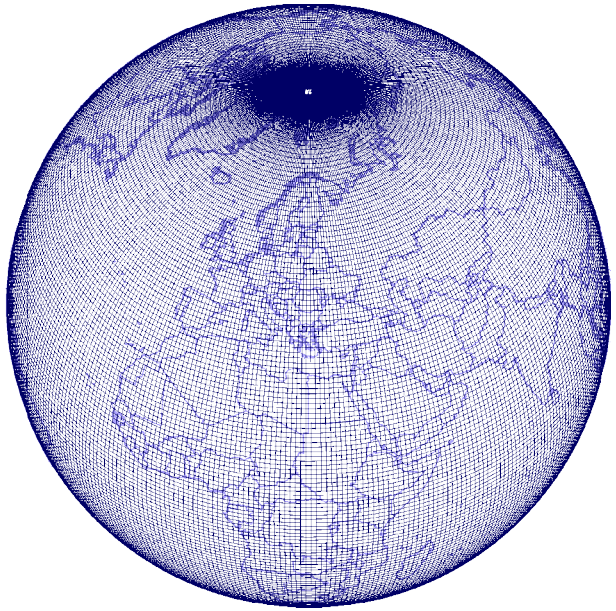
Also for Pb: 5 – 50%
for Cd: 2 – 50%
for POPs: up to 10% (N. America)

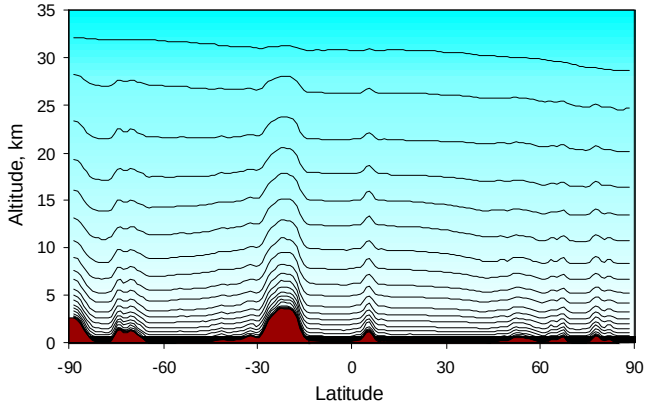
Global modelling framework GLEMOS

Developed within EMEP programme

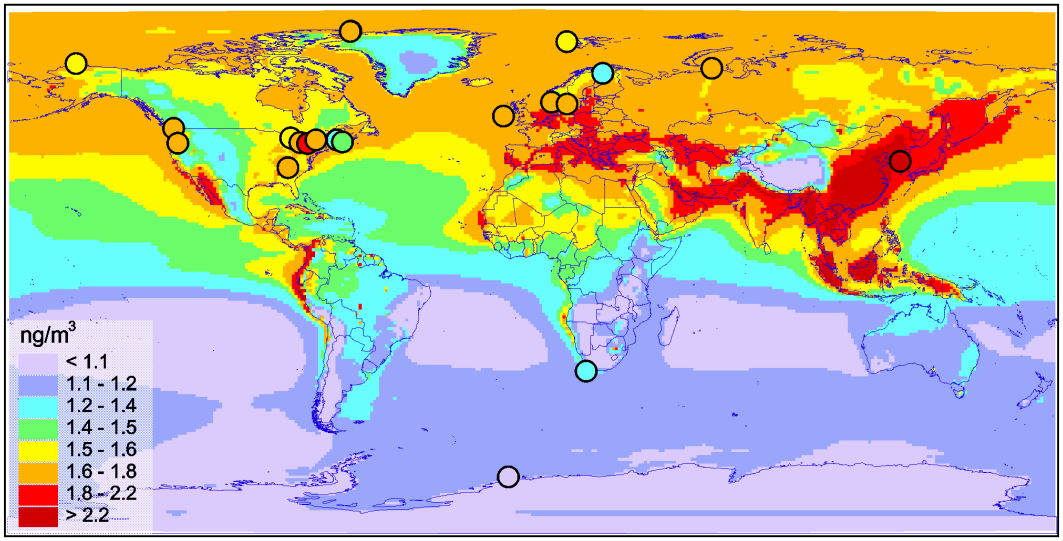
Key features:

- Regional to global scale
- Variable spatial resolution (from 5º×5º to 0.25º×0.25º)
- Nesting procedure
- Multi-pollutant Multi-media approach
- Flexible modular structure





Pilot modelling results for Hg



Hg^0 air concentration (2001)

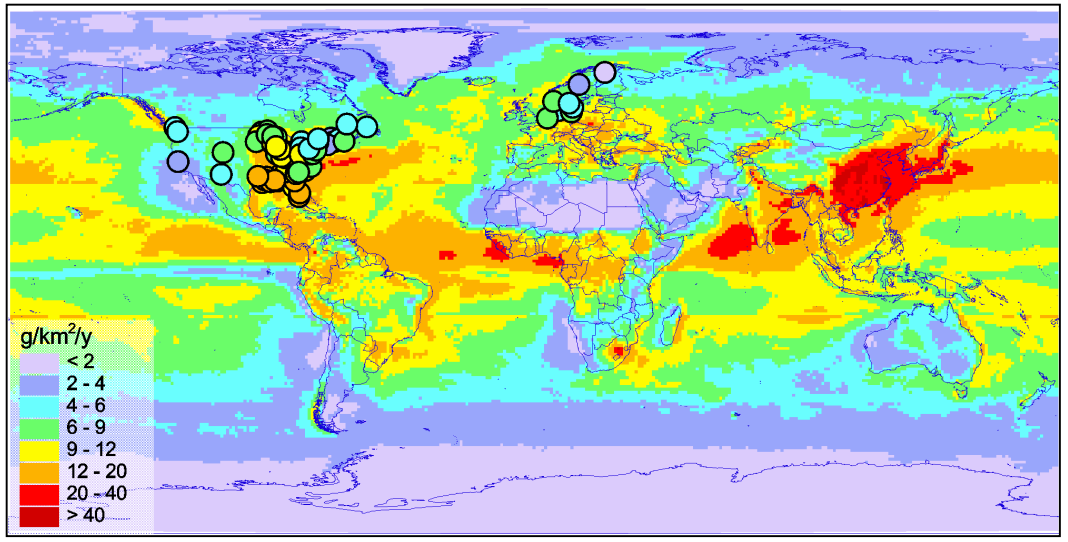
Modelling: GLEMOS

Measurements: EMEP, AMAP, CAMNet, field measurements

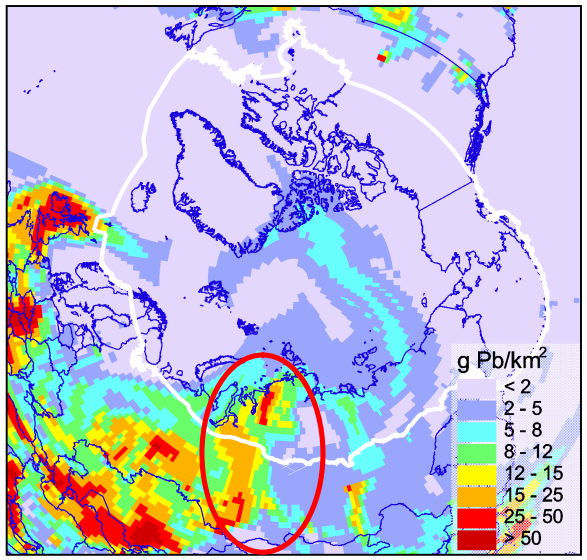
Hg wet deposition (2001)

Modelling: GLEMOS

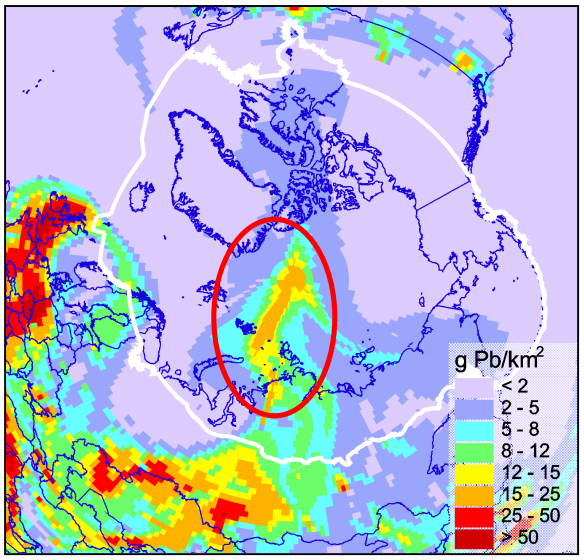
Measurements: EMEP, NADP/MDN



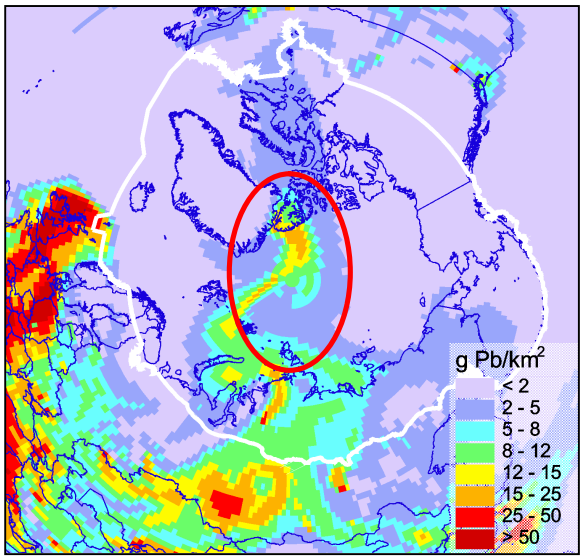
Atmospheric transport to the Arctic from Siberian and Central Asian sources (lead, 2001)



January, 13



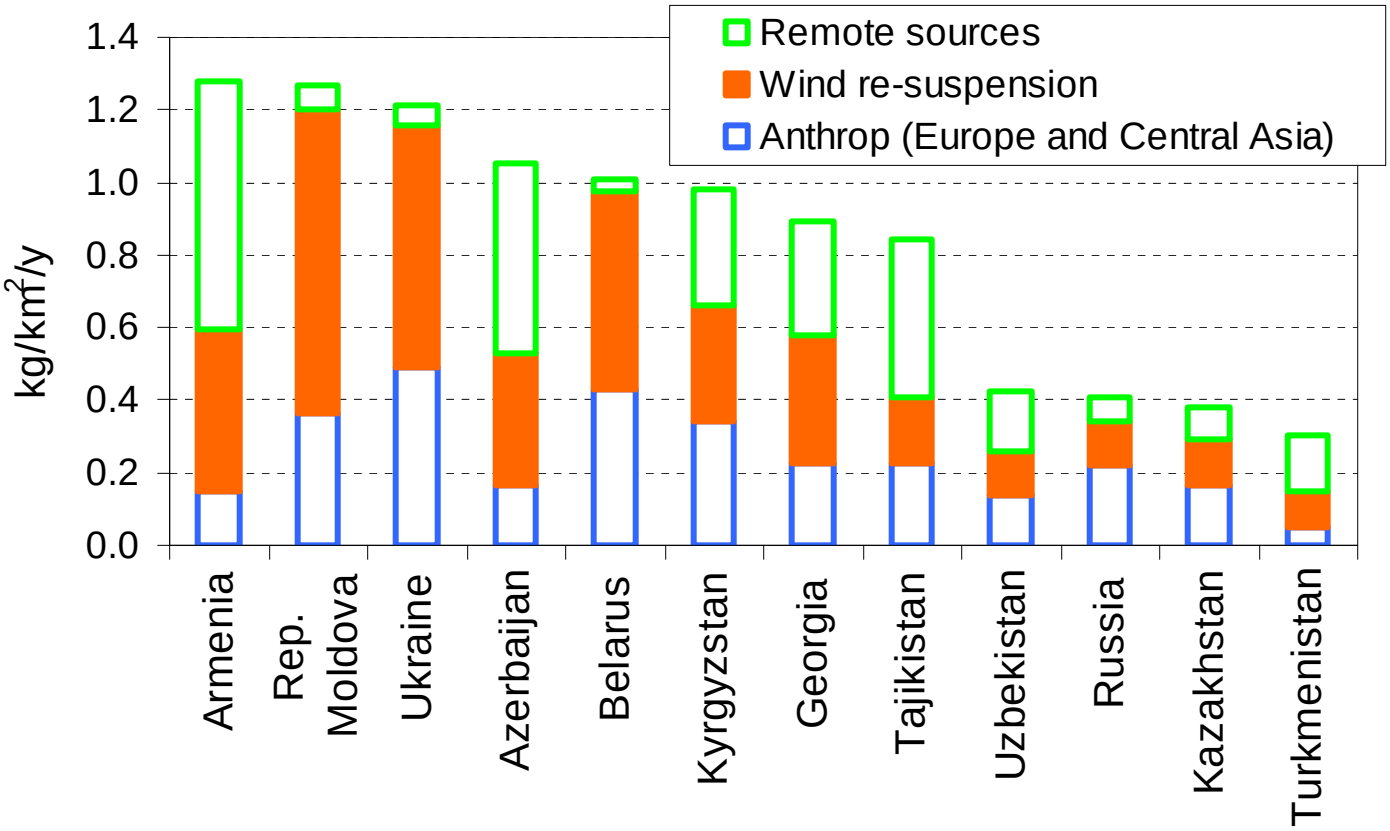
January, 15



January,16

Wind re-suspension

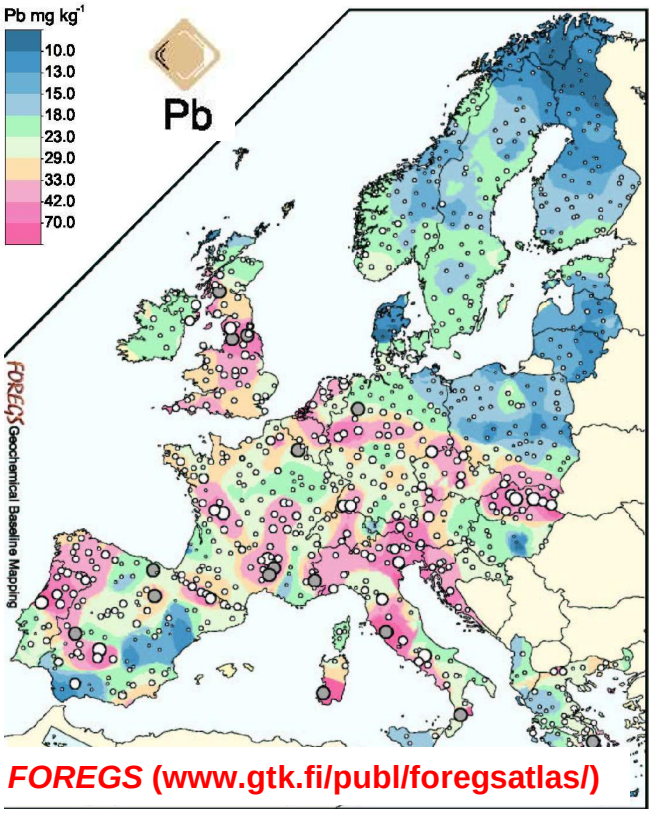
Deposition fluxes of lead in EECCA countries in 2007



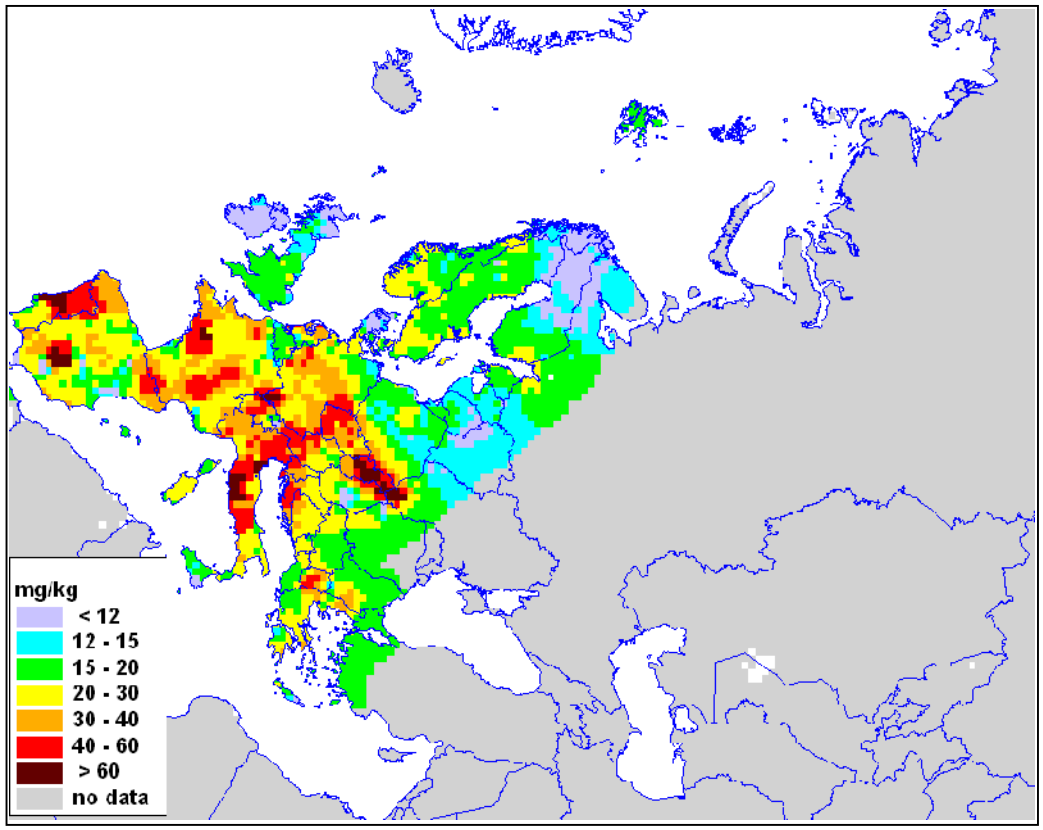
Contribution of wind re-suspension: 20 – 65%

Input of heavy metals to the atmosphere because of wind re-suspension of dust

Wind re-suspension of HM = f (wind re-suspension of dust, soil conc.)



FOREGS (www.gtk.fi/publ/foregsatlas/)



Information from EECCA countries (wind re-suspension of dust, concentrations in soils) is highly appreciated!

Detailed assessment of pollution levels in individual countries

Factors affecting quality of the pollution assessment:

Ø Emission data (completeness of the data, spatial distribution, temporal variability etc..)

Ø Monitoring data (network density, data quality, representativeness of stations etc….)

Ø Modelling results (spatial resolution, model parameterizations, etc ...)

Detailed complex analysis for an individual country can be performed in the framework of special case study

Case study

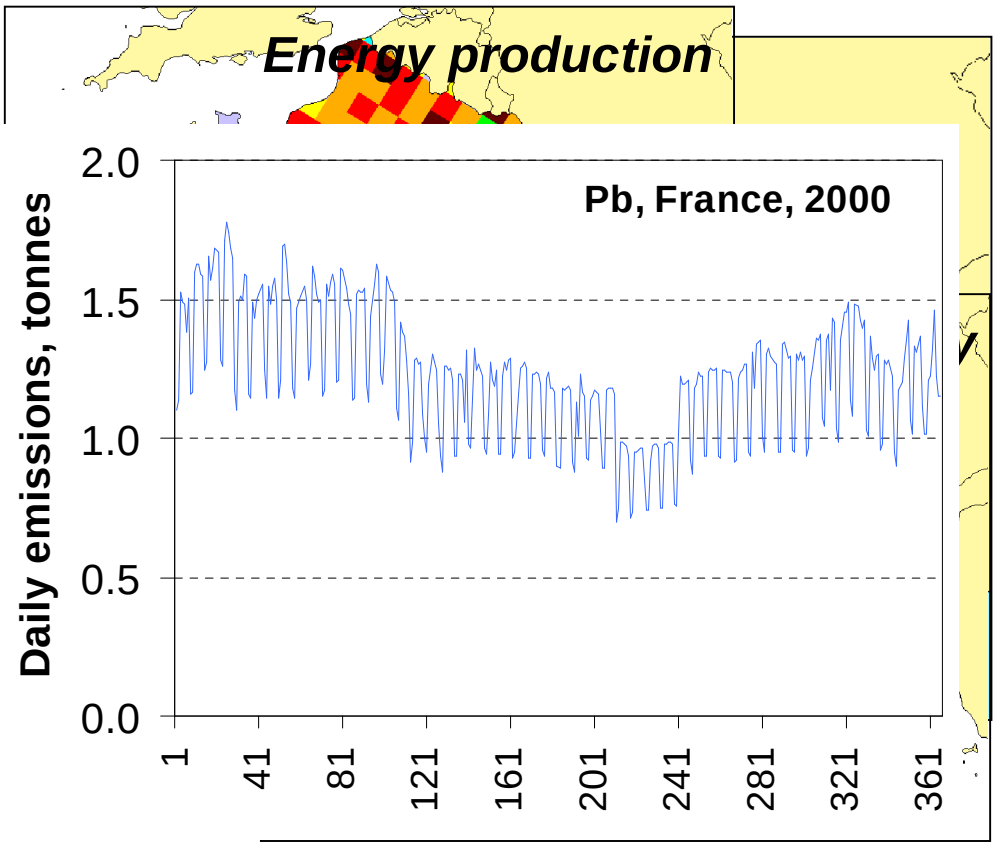
Main purpose:
A complex analysis of factors affecting quality of the assessment of heavy metal pollution levels using variety of available information (detailed emissions, monitoring and modelling results).

Expected output:
§ Detailed assessment of pollution levels and factors controlling them in individual countries

§ Recommendations to further improvements of pollution assessment components (quality of emissions, model parameterizations, quality and representativeness of monitoring data etc..)

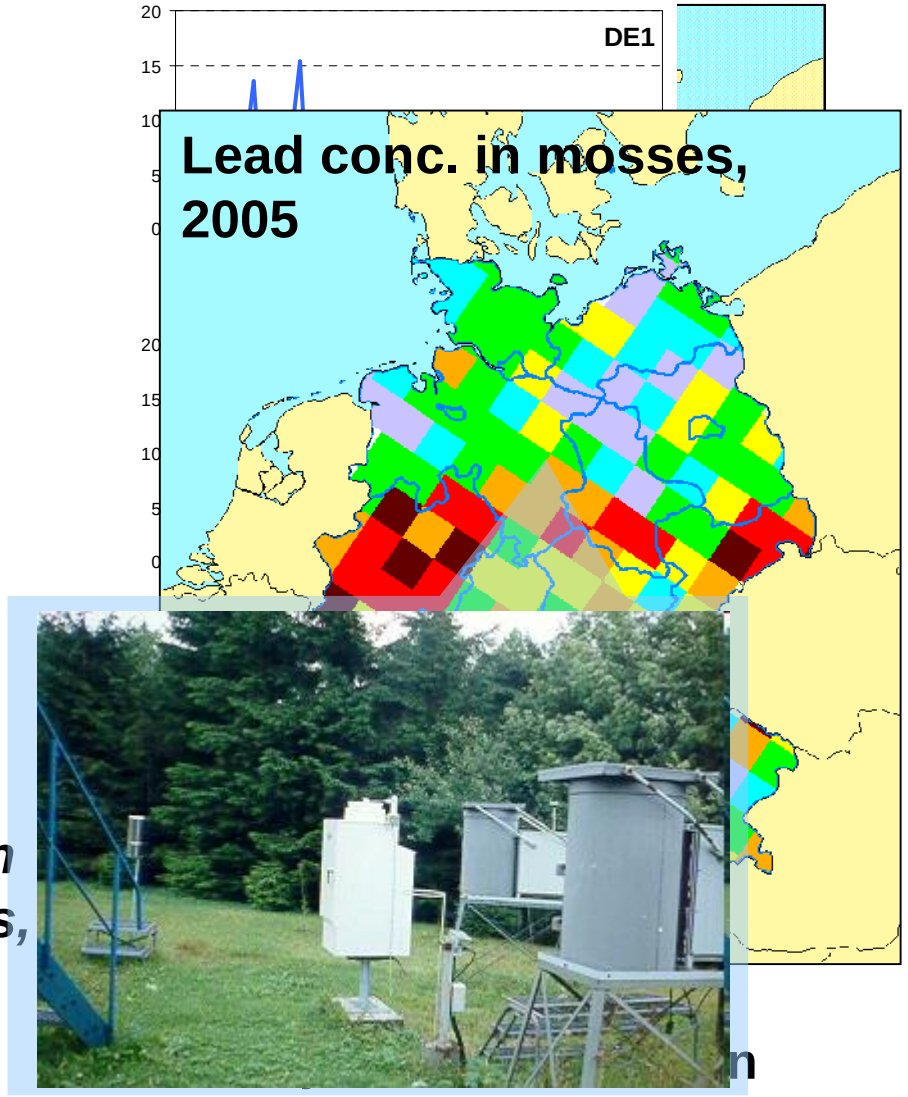
Emission data for the case study

- *Total emissions in a country*
- *Emission source categories data*
- *Large point source data Emission factors*
- *Temporal variability of emissions*
- *Emission factors*
- *Data with high spatial resolution*



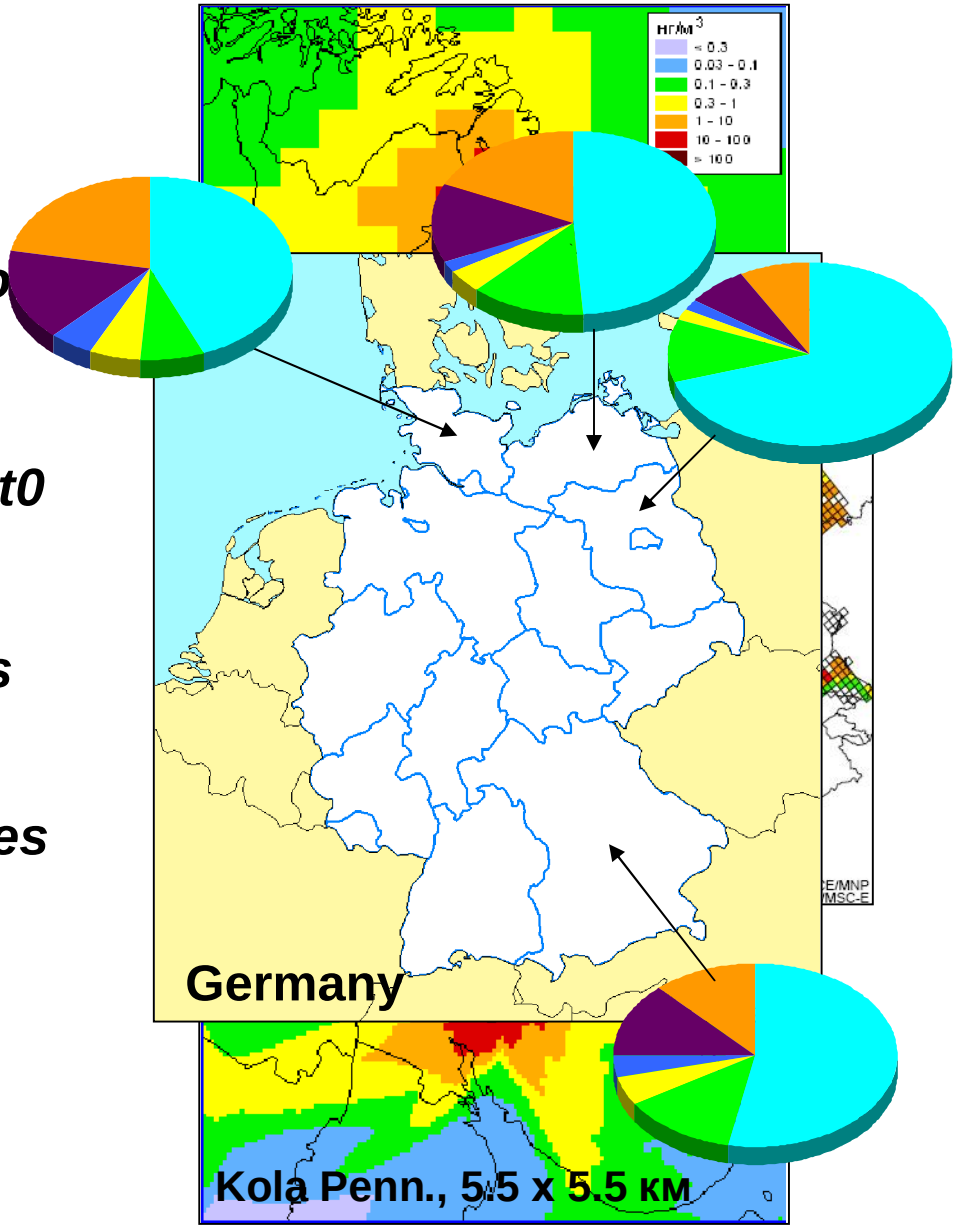
Monitoring data

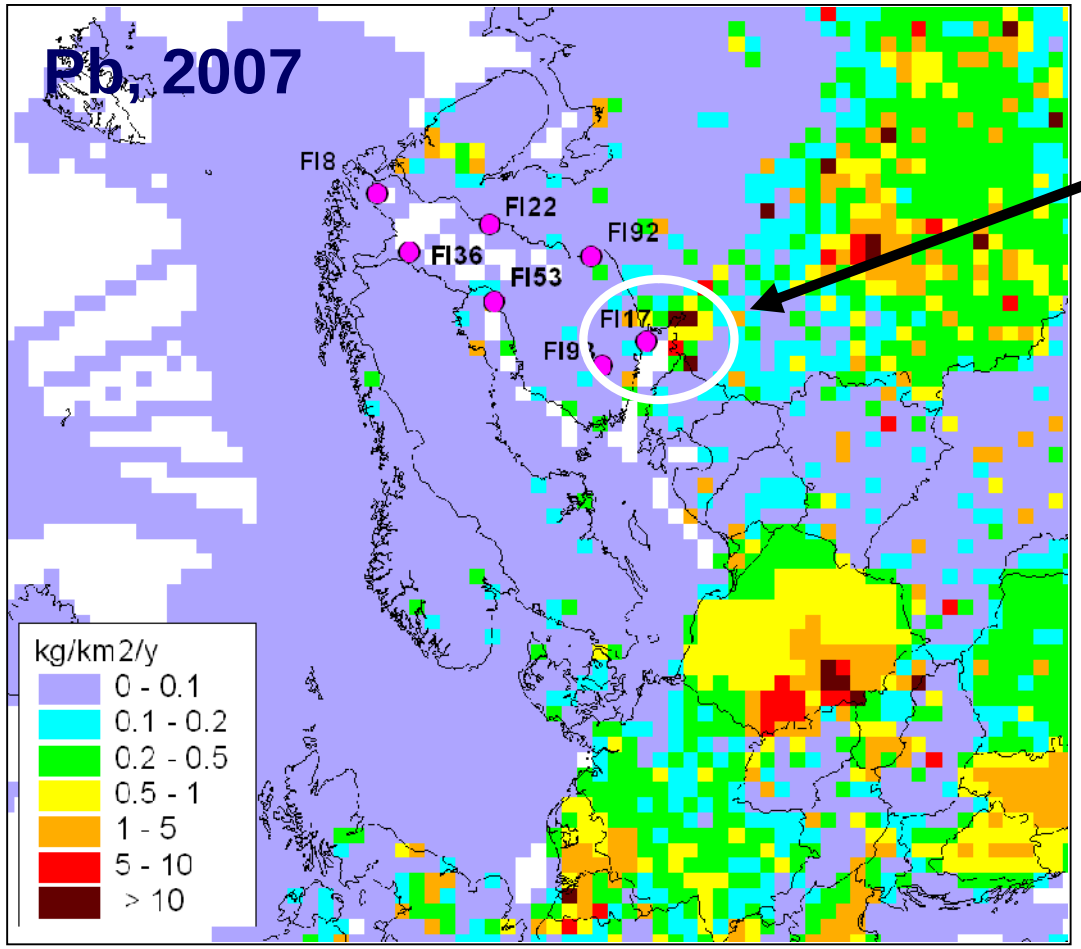
- *Ø Concentrations in air and in precipitation at EMEP stations*
- *Ø Concentrations in air and in precipitation at national networks*
- *Ø Detailed site description, its representativeness*
- *Ø As high as possible temporal resolution*
- *Ø Additional measurement information (e.g., concentrations of HMs in mosses, throughfall measurements)*



Expected results

- Ø *Calculated concentrations and deposition with high spatial resolutio*
- Ø *Contributions of administrative regions and neighbouring countries t0 pollution levels*
- Ø *Contributions of source categories to pollution levels*
- Ø *Contributions of large point sources to pollution levels*
- Ø *Critical loads exceedances maps*



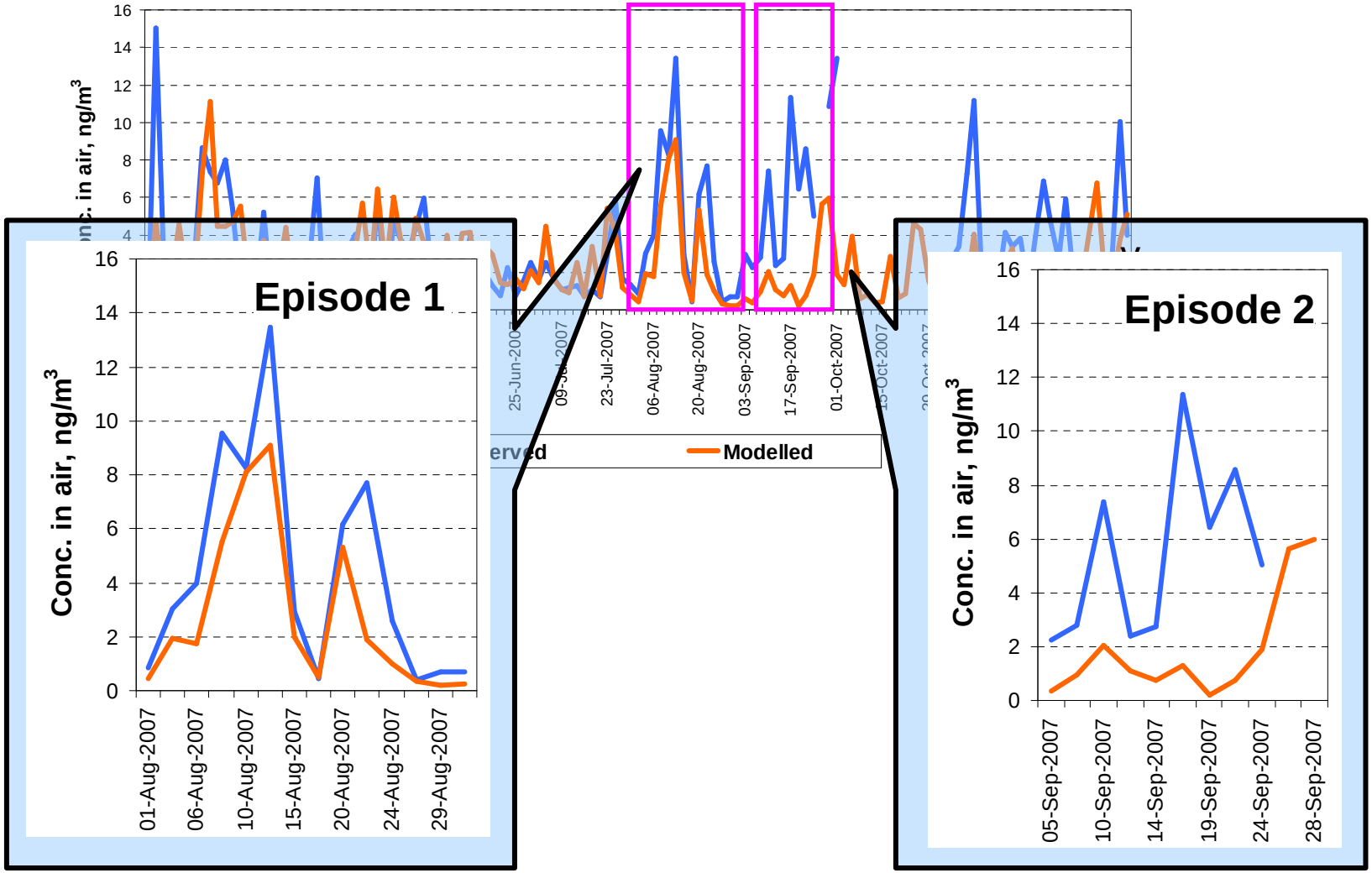


Station FI17 (Virolahti II)

ø Concentrations in air and in precip.

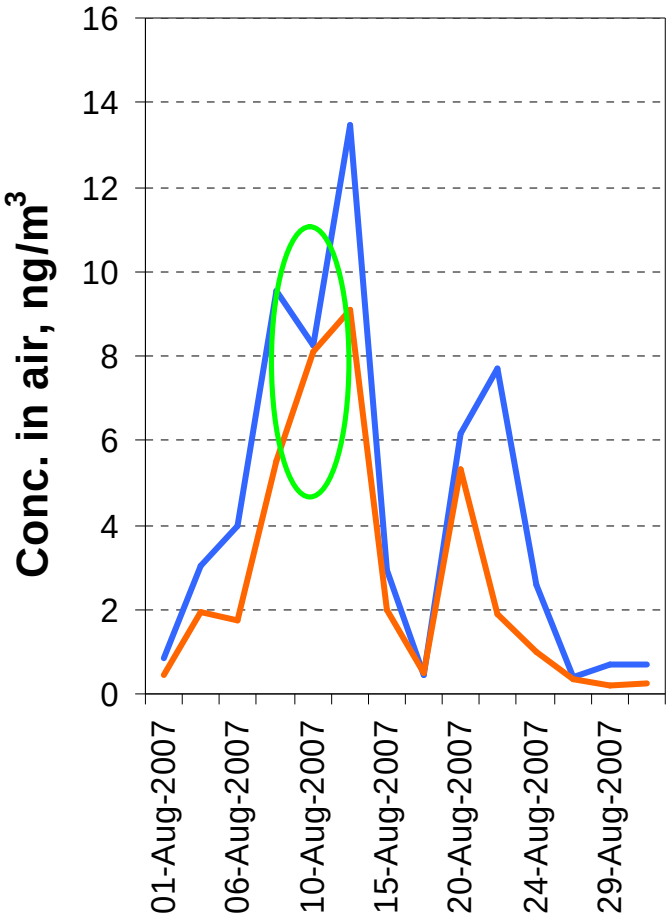
ø High (daily) temporal resolution for conc. in air

Comparison of concentrations in air at FI17 (Pb, 2007)

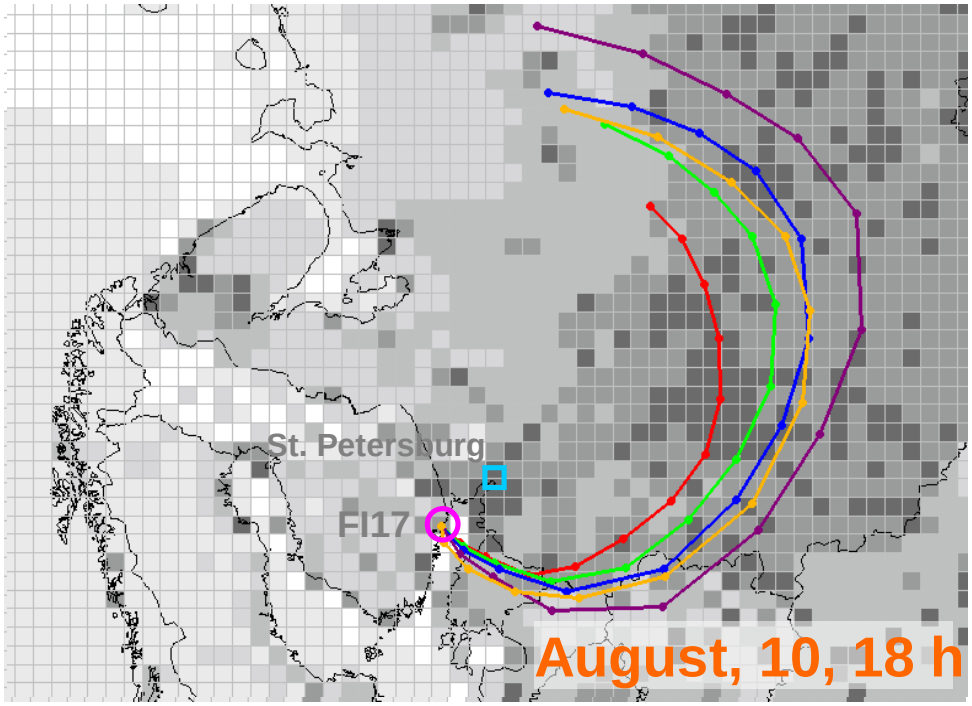


Application of back trajectories

Episode 1: 10 August 2007

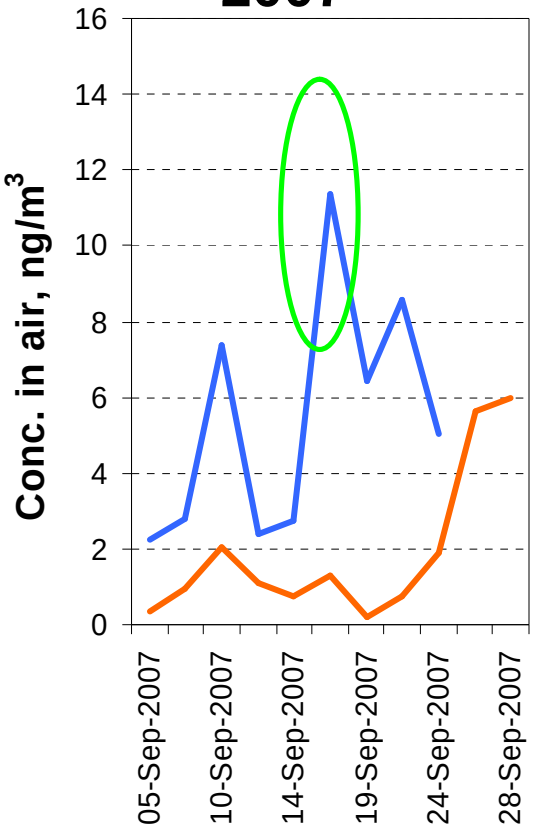


72 hrs back trajectories and emissions of lead

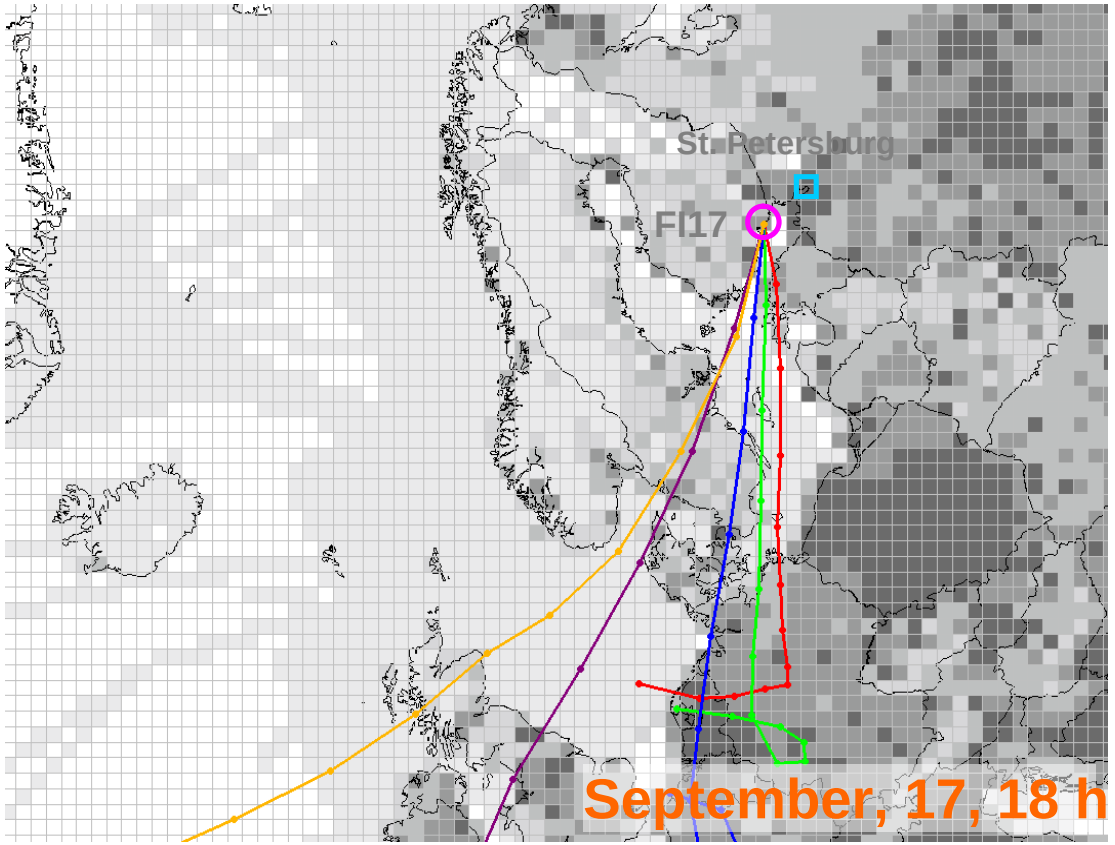


Application of back trajectories

Episode 2: 17 September 2007



72 hrs back trajectories and emissions of lead



Emission, g/km2/y

0.001 - 5.000	
5.000 - 30.000	
30.000 - 100.000	
100.000 - 500.000	
500.000 - 60000.000	

Traj. Height, m

- Layer 1 (40 m)
- Layer 2 (110 m)
- Layer 3 (230 m)
- Layer 5 (700 m)
- Layer 7 (1400 m)

Countries interested in taking part in the case study are welcomed!