

Networks for soil monitoring and mercury

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- naturally occurring levels of mercury or mercury compounds or anthropogenically introduced mercury+compounds or a result of mercury deposition from atmosphere = quite complex to analyze and interpret.
- content (natural) depends on geochemical properties of the site and composition and patterns of land use
- information very useful locally, methods and activities exist, but in a limited scale.
- Mercury abundance in the Earth's crust is very low being in the range 0.02 to 0.06 mg/kg, although there are more local sinks, more concentrated in argillaceous sediments and in coal, and minerals.
- if a higher content in soil, then more relevant for a control releases or to contaminated site management than soil management.
- **talk by prof. Milena Horvat on mechanisms and exchanges between mercury species and environmental compartments**

Existing networks/activities

- **networks/monitoring activities reviewed - if comprise mercury, then they only look at total mercury, if a more in-depth distinction is needed, additional parameters are studied (biota)**
- International Union of Soil Sciences Pedological societies (mercury reviews rare)
- FAO's Global Soil Partnership (no mercury through Global Soil Laboratory Network(s) - GLOSOLAN)
- national soil survey(s) - national soil monitoring networks SMN - variable among countries, mercury in some, rather other metallic elements are studied. (i.e. Cd, Zn etc).

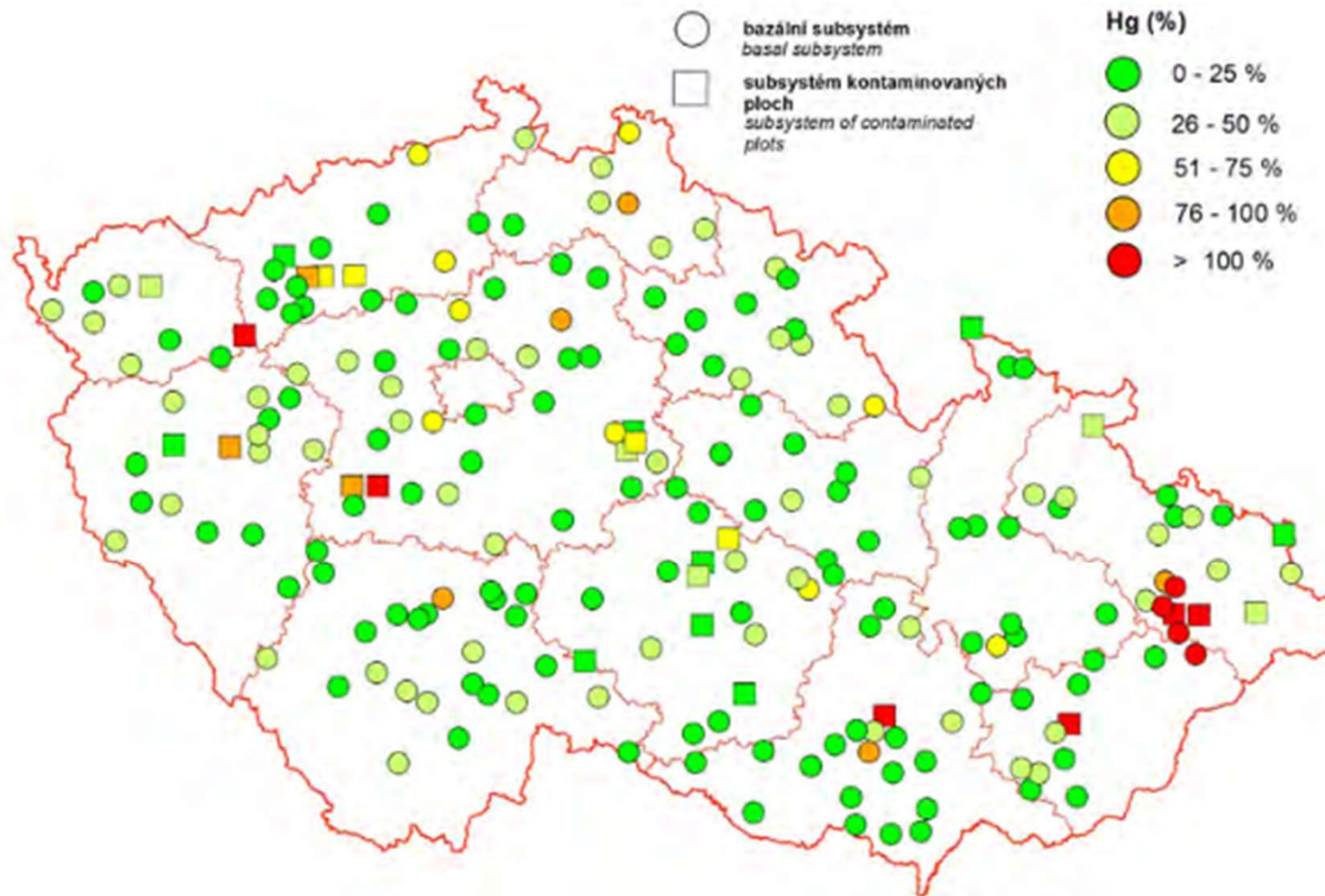
Example of national soil monitoring - CZ

- Central Institute for Supervising and Testing in Agriculture (CISTA), Ministry of Agriculture
- national/basal soil monitoring (bazální monitoring půd - Basal Soil Monitoring System) was established in 1992 (know-how transfer from Bavarian agriculture authority (BLA)), methodology adapted in 1995.
- over 214 sampling sites characterizing land-use/genetic soil types in the country and also contaminated land (27 sites)
- sampling of topsoil for some parameters yearly, but otherwise every 6 years, (for mercury only Hg_{tot} and at the site establishment and then every 6th year).
- assessment in a comprehensive report covering period 1992-2013 monitoring activities

(http://eagri.cz/public/web/file/520923/Publikace_25_let_Monitoring_Zemedelskych_pud_1992_2013.pdf)

Example of national soil monitoring - CZ

Figure 93. Mercury (Hg) concentrations in BSMS soils, 2013 (214 monitoring plots); concentrations are expressed as a percentage of the precautionary value



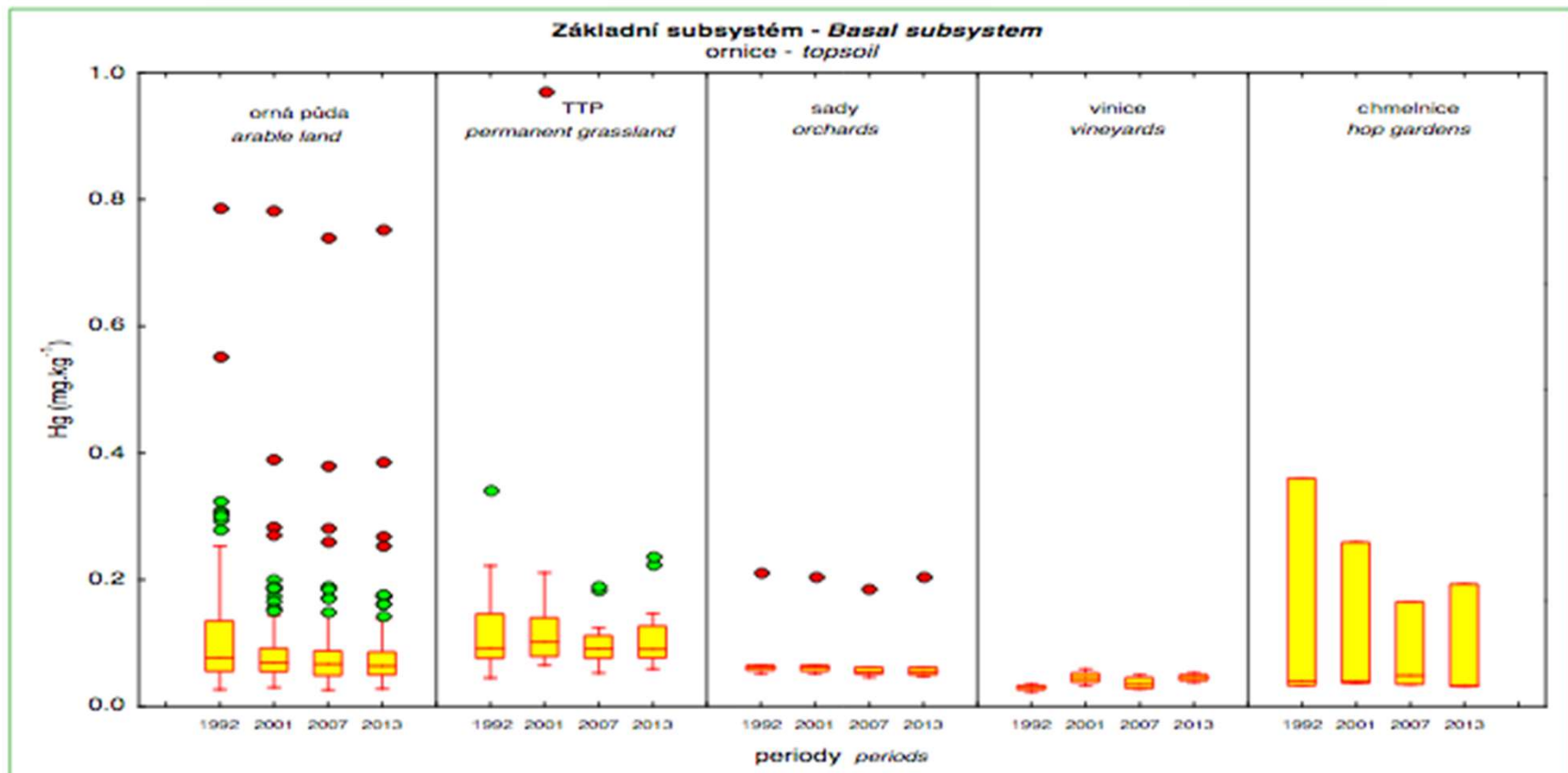
Example of national soil monitoring - CZ

Table 36. Descriptive statistics of mercury (Hg) concentrations in BSMS soils, 1995–2013 (mg.kg⁻¹, basal subsystem, topsoil, other soils (medium heavy and heavy),

Kultura / Cultures	Rok / Periods	Ostatní půdy / Other soils								
		Počet / Number of plots	Průměr / Mean	Min	Max	0.10 perc.	0.25 perc.	Median	0.75 perc.	0.90 perc.
Orná půda / Arable land	1995	0	---	---	---	---	---	---	---	---
	2001	117	0,09	0,04	0,78	0,05	0,06	0,07	0,09	0,15
	2007	117	0,09	0,03	0,74	0,04	0,05	0,07	0,09	0,14
	2013	117	0,08	0,04	0,75	0,04	0,05	0,06	0,09	0,14
TTP / Permanent grassland	1995	0	---	---	---	---	---	---	---	---
	2001	15	0,17	0,07	0,97	0,08	0,08	0,10	0,14	0,21
	2007	15	0,18	0,05	1,40	0,06	0,08	0,10	0,11	0,19
	2013	15	0,18	0,06	1,26	0,06	0,08	0,09	0,13	0,22
Sady / Orchards	1995	0	---	---	---	---	---	---	---	---
	2001	5	0,09	0,05	0,20	0,05	0,06	0,06	0,07	0,20
	2007	5	0,08	0,05	0,19	0,05	0,05	0,05	0,06	0,19
	2013	5	0,08	0,05	0,21	0,05	0,05	0,06	0,06	0,21
Vinice / Vineyards	1995	0	---	---	---	---	---	---	---	---
	2001	2	0,04	0,03	0,05	0,03	0,03	0,04	0,05	0,05
	2007	2	0,04	0,03	0,04	0,03	0,03	0,04	0,04	0,04
	2013	2	0,04	0,04	0,05	0,04	0,04	0,04	0,05	0,05
Chmelnice / Hop gardens	1995	0	---	---	---	---	---	---	---	---
	2001	3	0,11	0,04	0,26	0,04	0,04	0,04	0,26	0,26
	2007	3	0,08	0,04	0,17	0,04	0,04	0,05	0,17	0,17
	2013	3	0,09	0,03	0,19	0,03	0,03	0,03	0,19	0,19

Example of national soil monitoring - CZ

Figure 92. Range of mercury (Hg) concentrations in BSMS soils, 1992–2013 ($\text{mg}\cdot\text{kg}^{-1}$, basal subsystem, topsoil, Aqua Regia extraction)



Existing networks/activities

- EU-wide monitoring effort is undertaken by the statistical office of the European Union (Eurostat).
- a regular survey (LUCAS - Land Use and Coverage Area frame Survey) to monitor the situation of land use, land cover and changes over time across the EU, but no contaminants (no mercury followed).
- interval of the survey was fixed to three years.
- The sampling is based on a regular grid across the EU (2×2 km grid, about 1 000 000 georeferenced points). Each point has been classified in accordance with seven land cover classes using orthophotos or satellite images. Of these points, approximately 270 000 points are visited in the field by surveyors to assess the validity of the remote sensing observations and to collect additional information that cannot be assessed remotely.
- Physical inspection/analysis is in about 10% of sites but chemicals/risk elements are done through national networks.
- parameters studied in LUCAS
 - the percentage of coarse fragments
 - particle size distribution (% clay, silt and sand content)
 - pH (in CaCl_2 and H_2O)
 - organic carbon (g/kg)
 - carbonate content (g/kg)
 - phosphorous content (mg/kg)
 - total nitrogen content (g/kg)
 - extractable potassium content (mg/kg)
 - cation exchange capacity (cmol(+)/kg).