

Pesticide path from fields to rivers

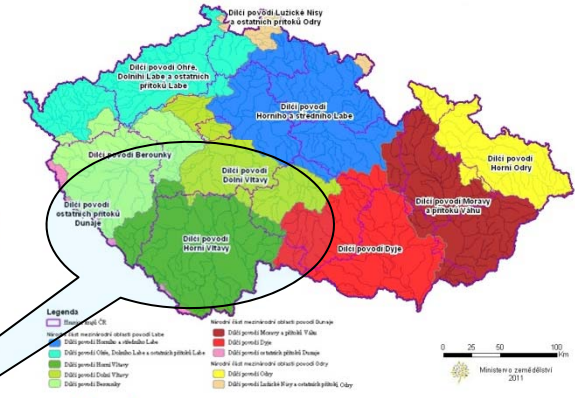
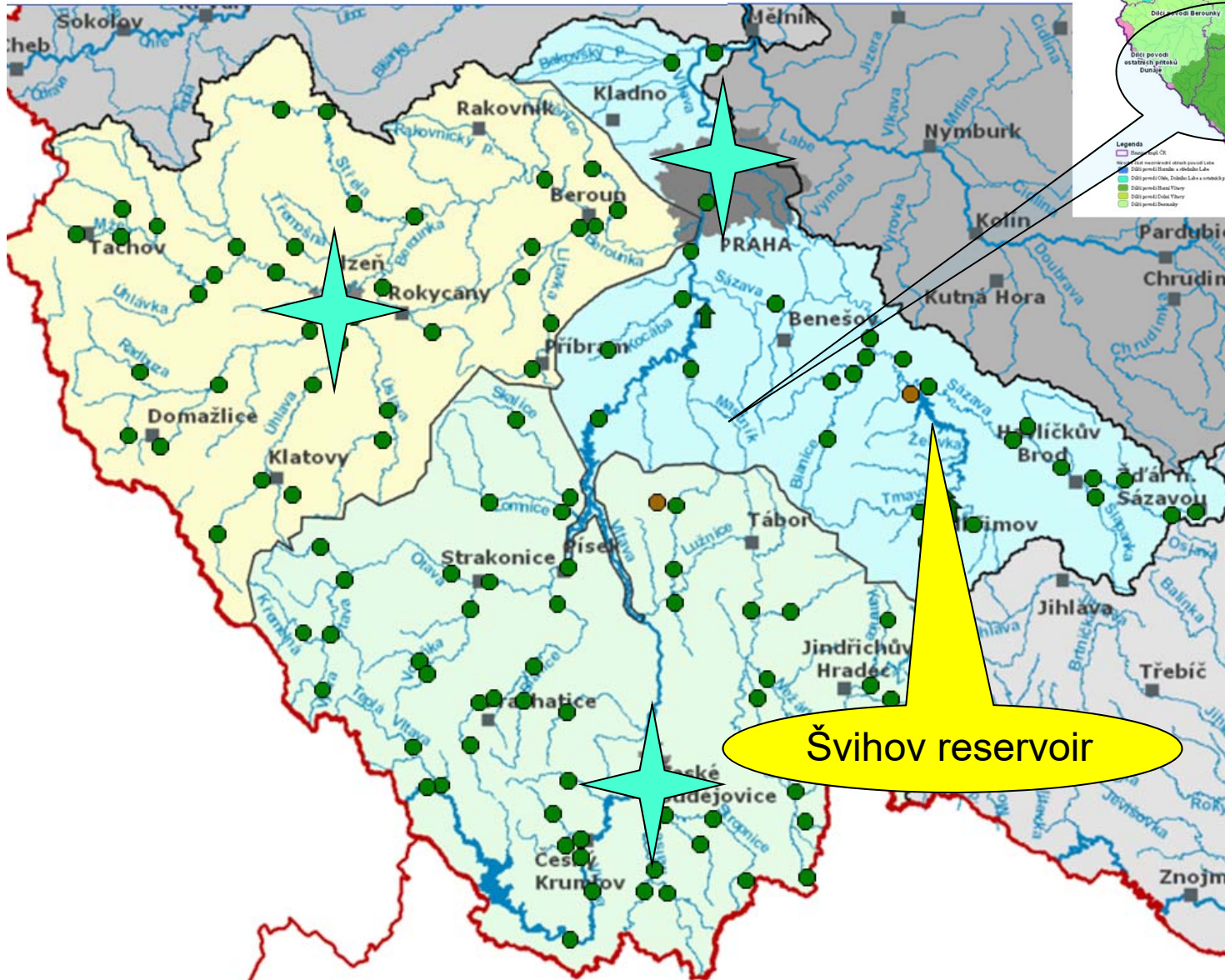
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Antonín Zajíček²

¹Povodí Vltavy, State Enterprise

²Research Institute for Soil and Water Conservation

Where we are?

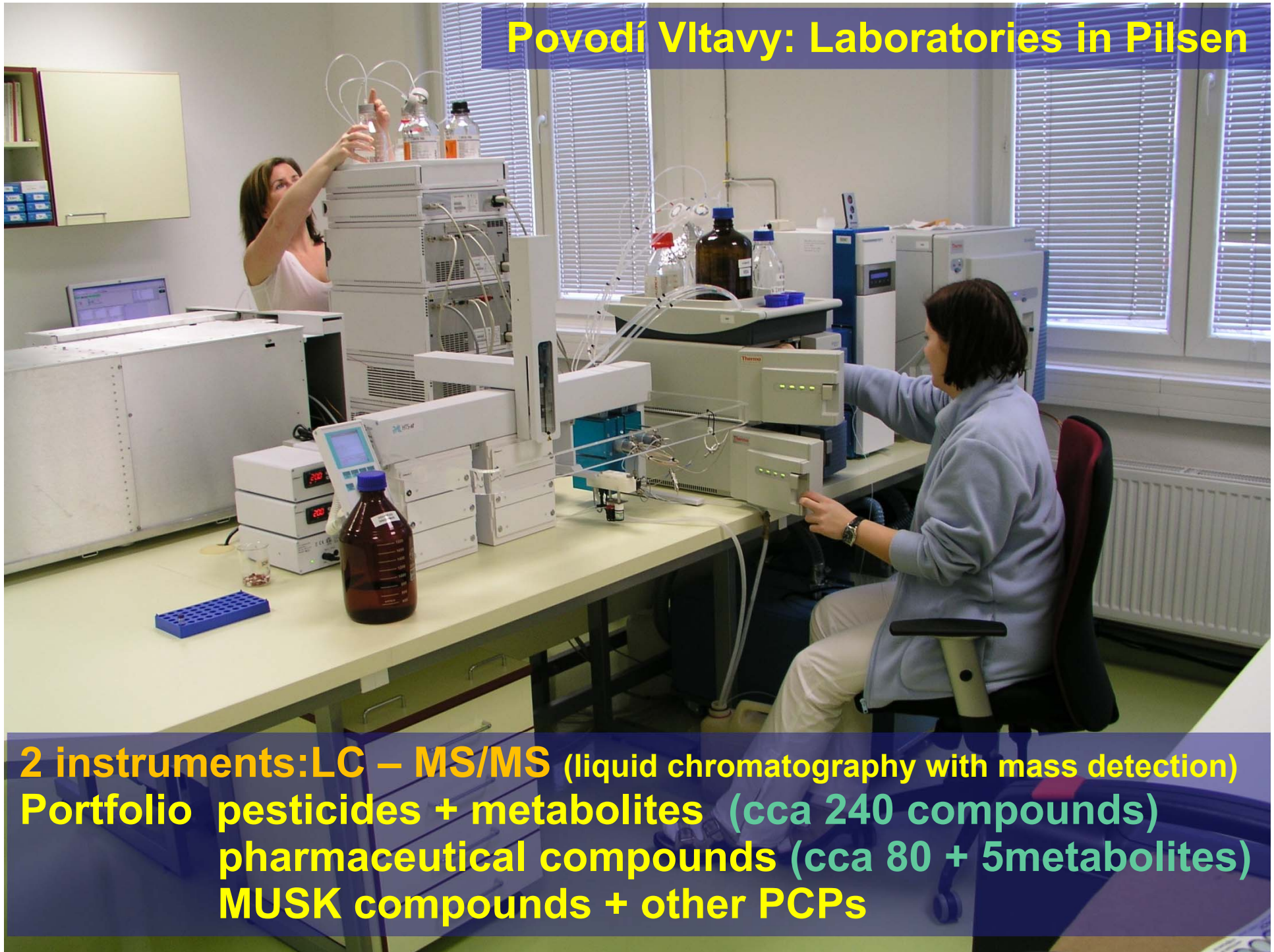
Vltava river basin Vltava river board



Catchment area
28 708 km²
23000 km of rivers
111 reservoirs
31 main reservoirs
343 weirs
19 power plants
3 laboratories



Povodí Vltavy: Laboratories in Pilsen



2 instruments: LC – MS/MS (liquid chromatography with mass detection)
Portfolio pesticides + metabolites (cca 240 compounds)
pharmaceutical compounds (cca 80 + 5 metabolites)
MUSK compounds + other PCPs

The common measured pesticides in water Vltava river catchment *surface, underground and drainage water*

1. Nitrate pesticides:

- terbutylazin and metabolites (ESA, OA)
- acetochlor and metabolites (ESA, OA)
- metolachlor and metabolites (ESA, OA)
- atrazin desethyl
- metazachlor and metabolites (ESA,OA)
- Dimethachlor and metabolites (ESA, OA)
- alachlor ESA
- metamitron
- metribuzin
- mancozeb
- propiconazol
- tebuconazol
- Hexazinon
- chloridazon and metabolites

2. Uronic acid pesticides:

- diuron
- isoproturon
- chlorotoluron
- linuron
- nicosulfuron

3. Total herbicides

- glyphosate
- AMPA

4. Insecticides:

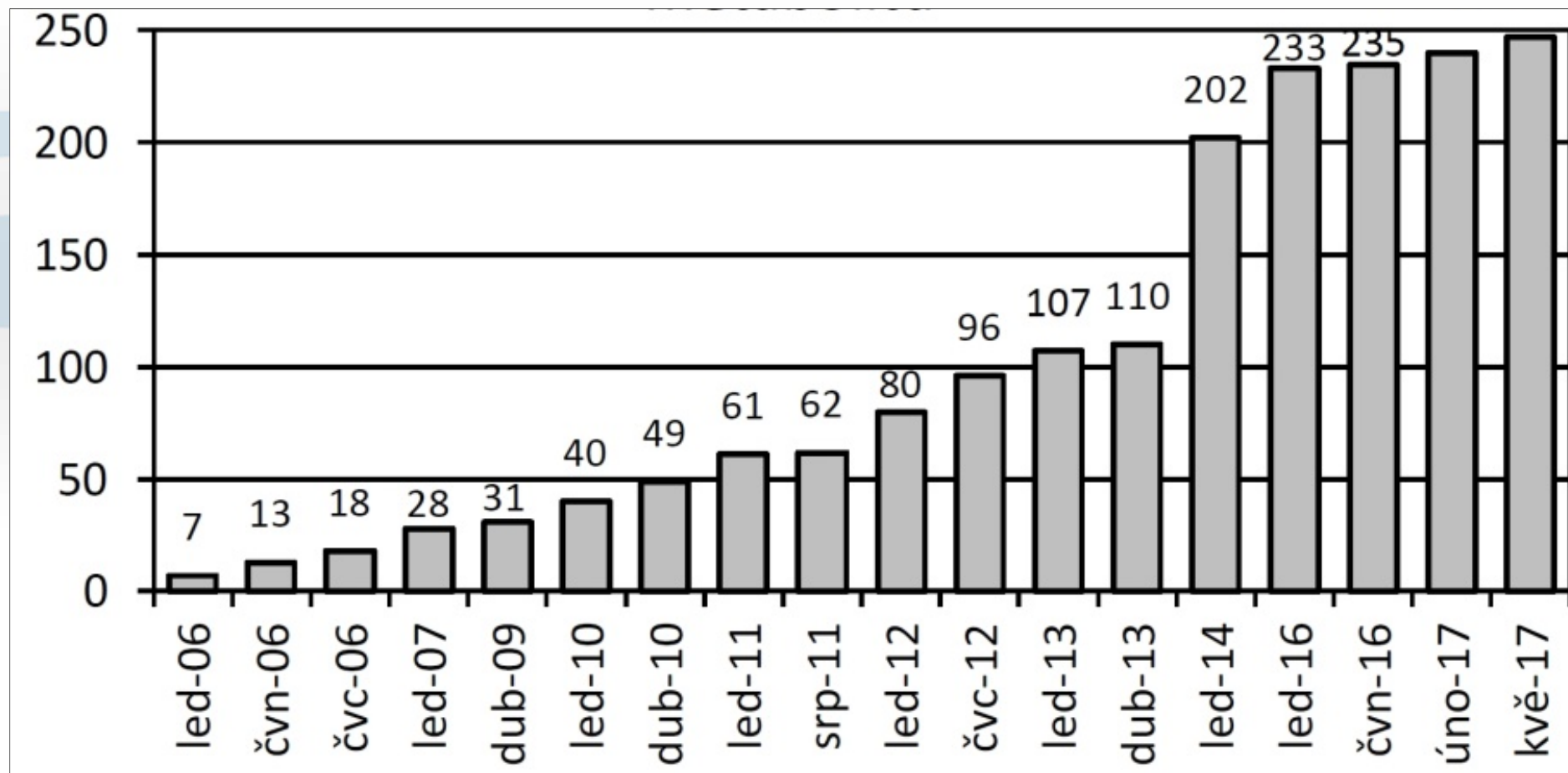
- DEET





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Number of analysed pesticides in Vltava river board laboratories in years 2006-2017



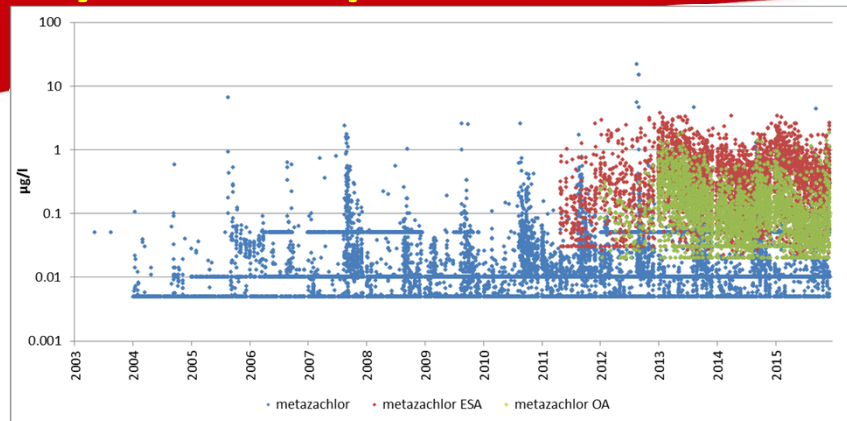
What influences the occurrence of pesticides in surface water?

The concentration and dynamic of pesticides is influenced by the following:

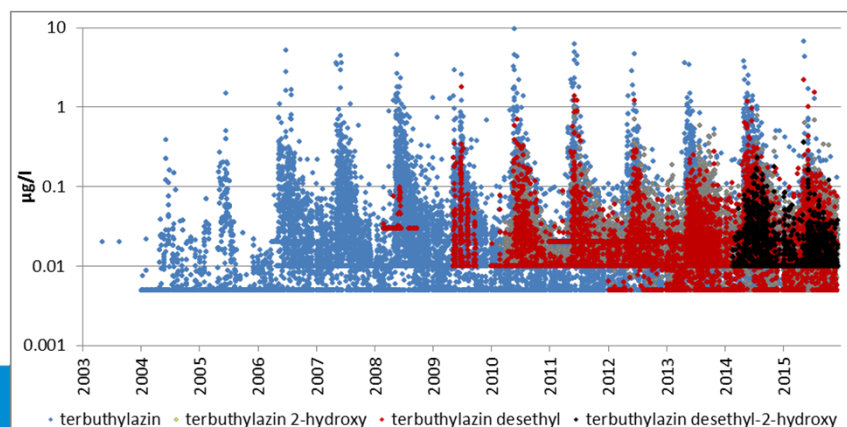
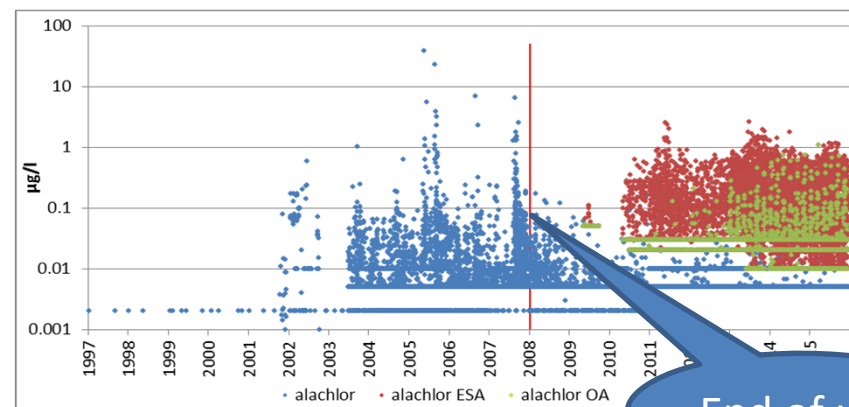
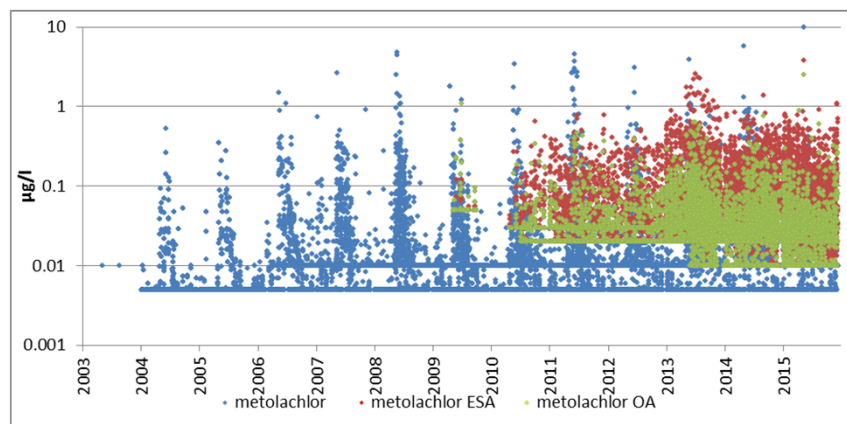
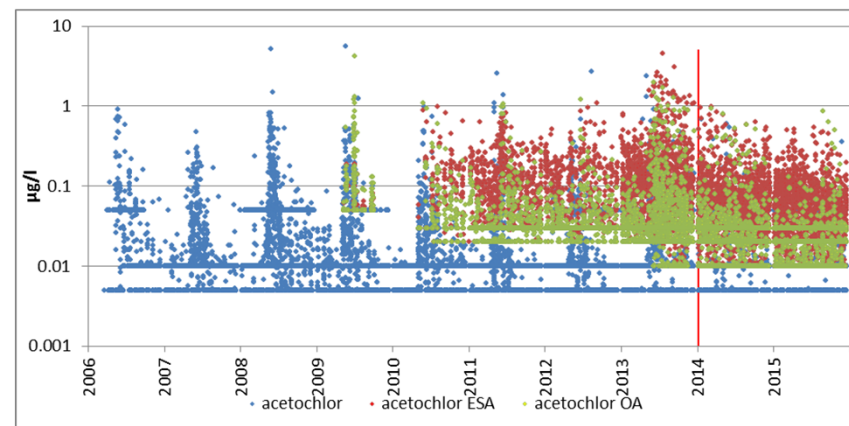
- 1) Manner and extent of application**
- 2) Type of soil, current in the soil, fissures in the soil**
- 3) Existence and functionality of drainage systems**
- 3) Precipitation**
- 4) Dissolubility in the water, persistence, half-time**

- In the world there are more than 800 effective substances registered**
- In the Czech Republic there are 250 substances – registered in database (ÚKZÚZ)**

Dynamic of pesticides concentrations in surface water CZ



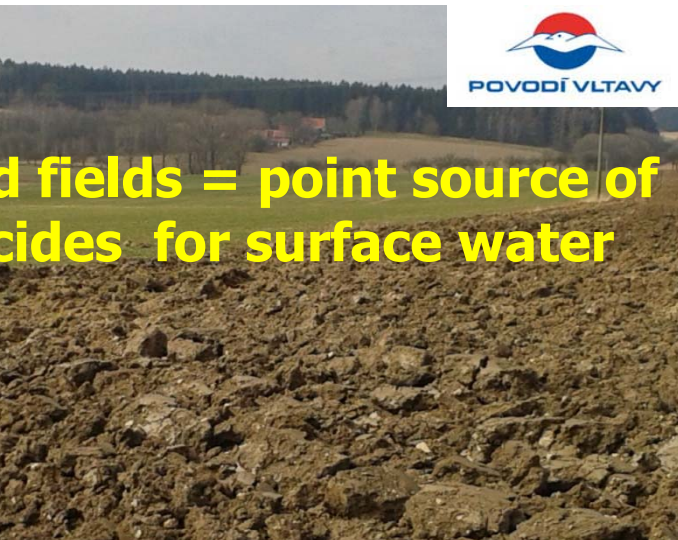
parent compounds and metabolites



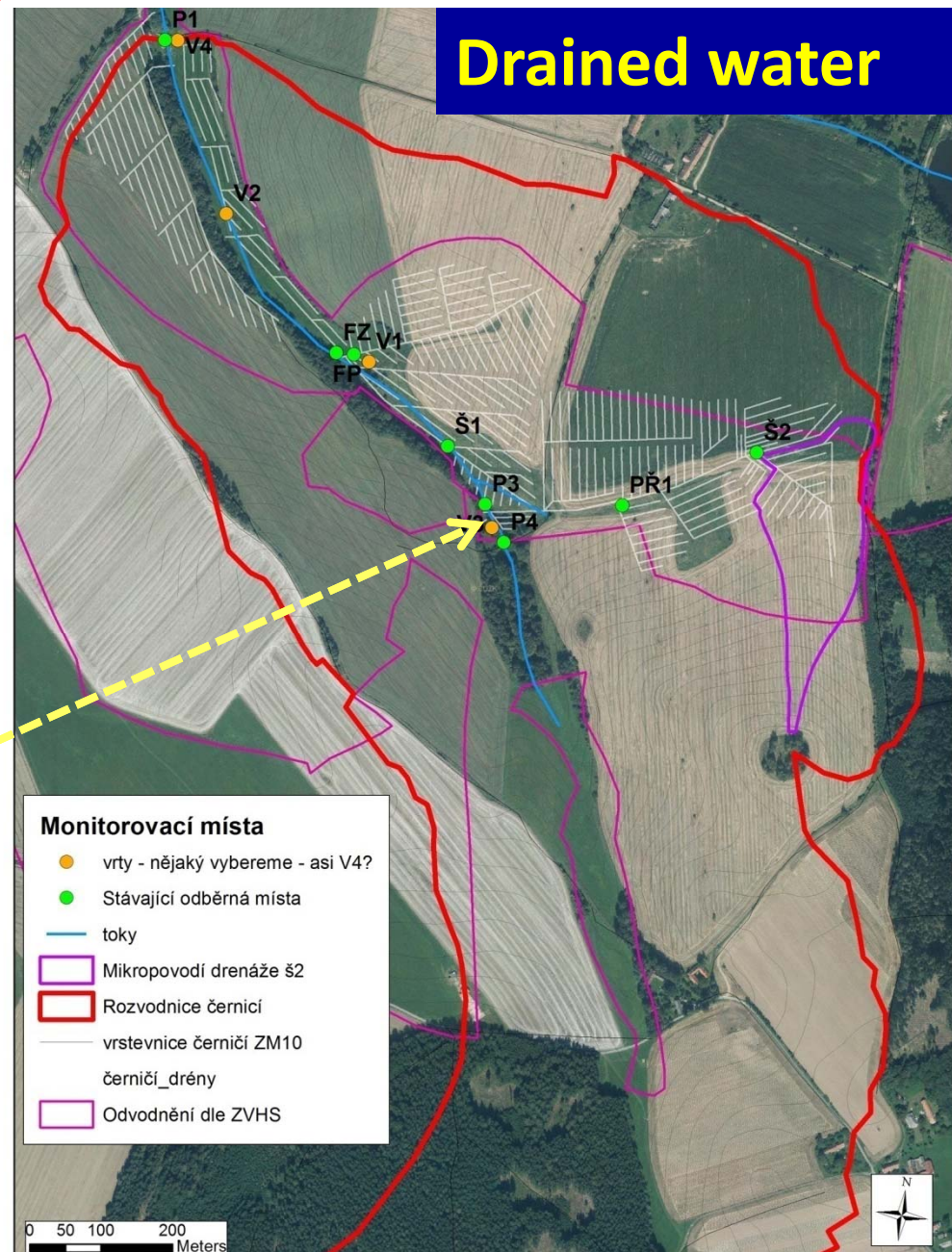
Kodeš: Aktuální výsledky celostátního monitoringu pesticidů v podzemních vodách, ČHMU, 2017

„Studying the causation and concentration dynamics of pesticide burdens in small water courses“

project TAČR TA04021527:



Drained fields = point source of pesticides for surface water



Experimental catchments of RISWC/VUMOP

Černičí 1,38 km²

Š2 – drainage group, subcatchment area 3,8 ha, $Q_{avg} = 0,26$ l/s

Arable land - grains, potatoes, rape, corn

P1 – surface runoff, arable land, grass, forests

subcatchment area 1,4 km², $Q_{avg} = 5,4$ l/s

Vepříkov 48,2 ha

VP1 19,95 ha, drained 8,7 ha;

$Q_{avg} = 0,57$ l/s

VP2 28,25 ha, drained 21,3 ha;

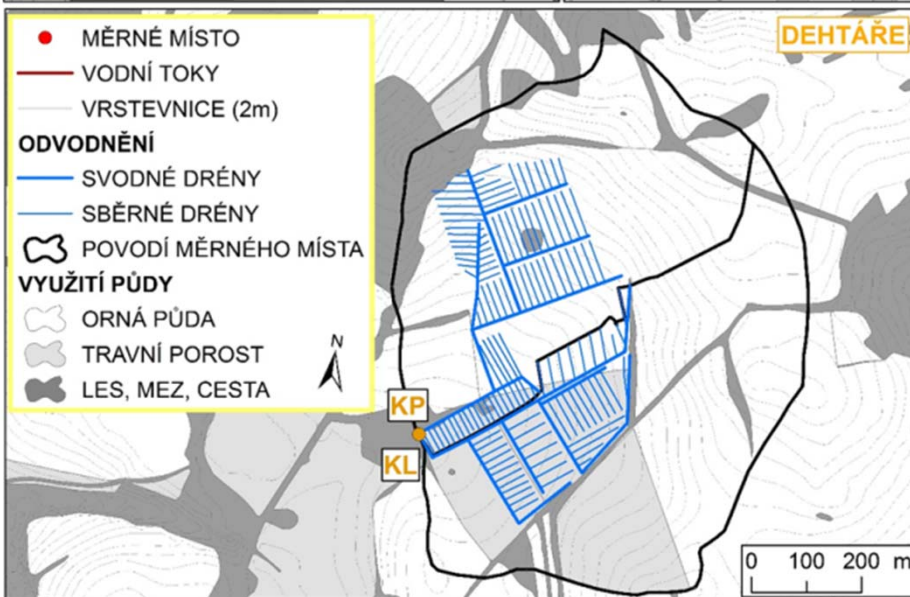
$Q_{avg} = 0,71$ l/s

Arable land, corn for biogas station

Dehtáře 58 ha, 19 ha drained

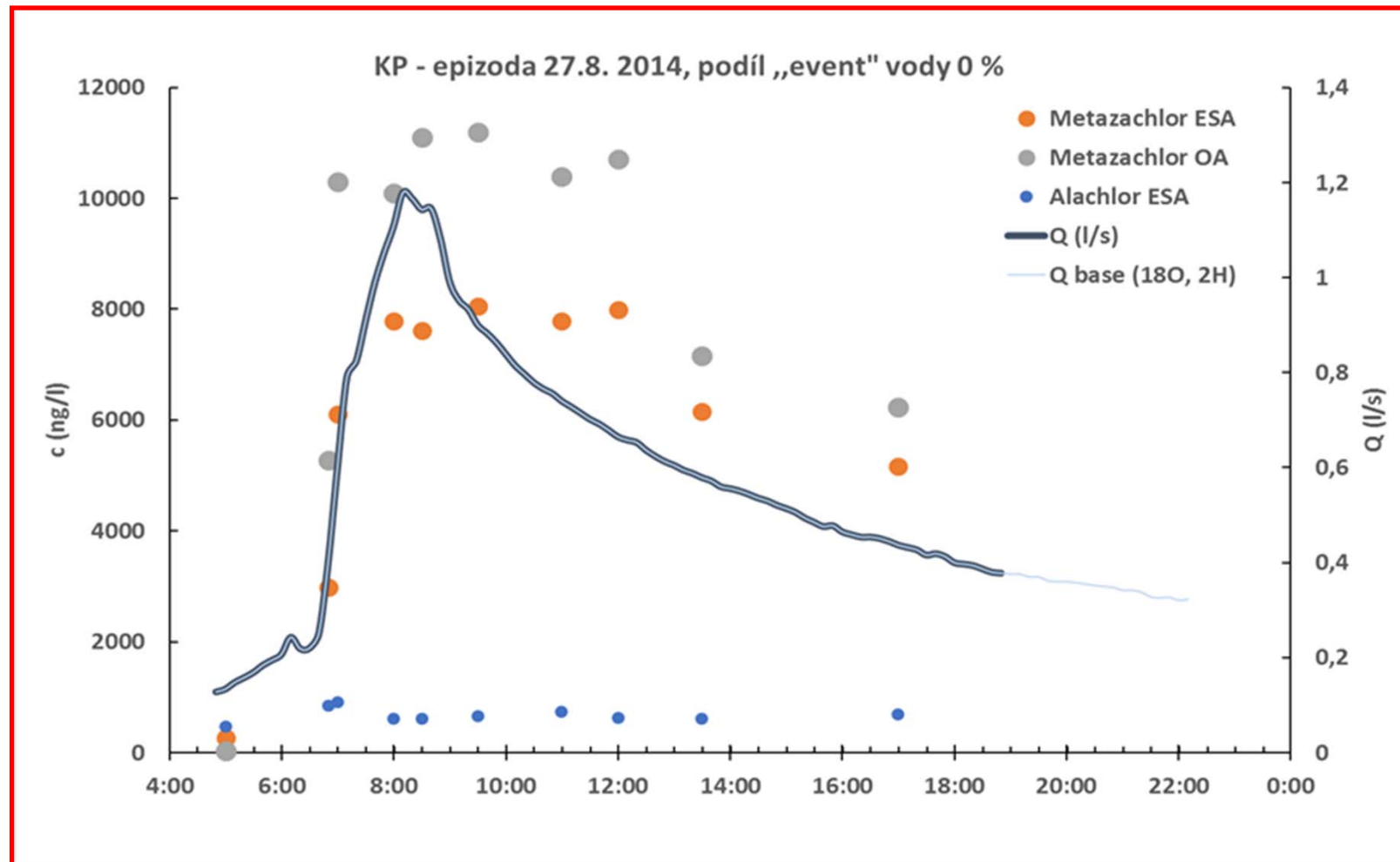
KL (29,6 ha) grass

KP (28,3 ha) arable land - grains, potatoes, rape, corn



•Převzato z prezentace Zajíček, Dehtáře,2017

Dehtáře experimental catchment: rainfall/runoff events dynamics of metabolites in drainage outflow

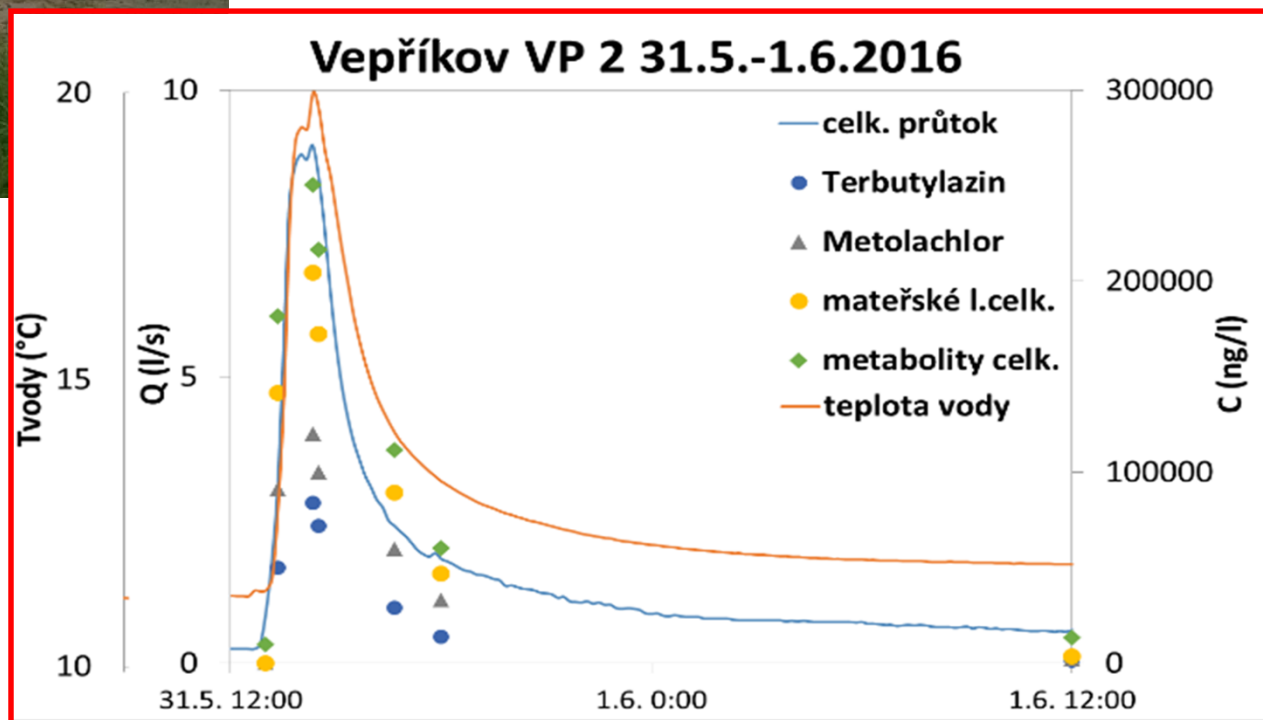


Conditions: arable land, 7 weeks after application, no „new“ water in outflow, increasing concentration of metabolites in outflow



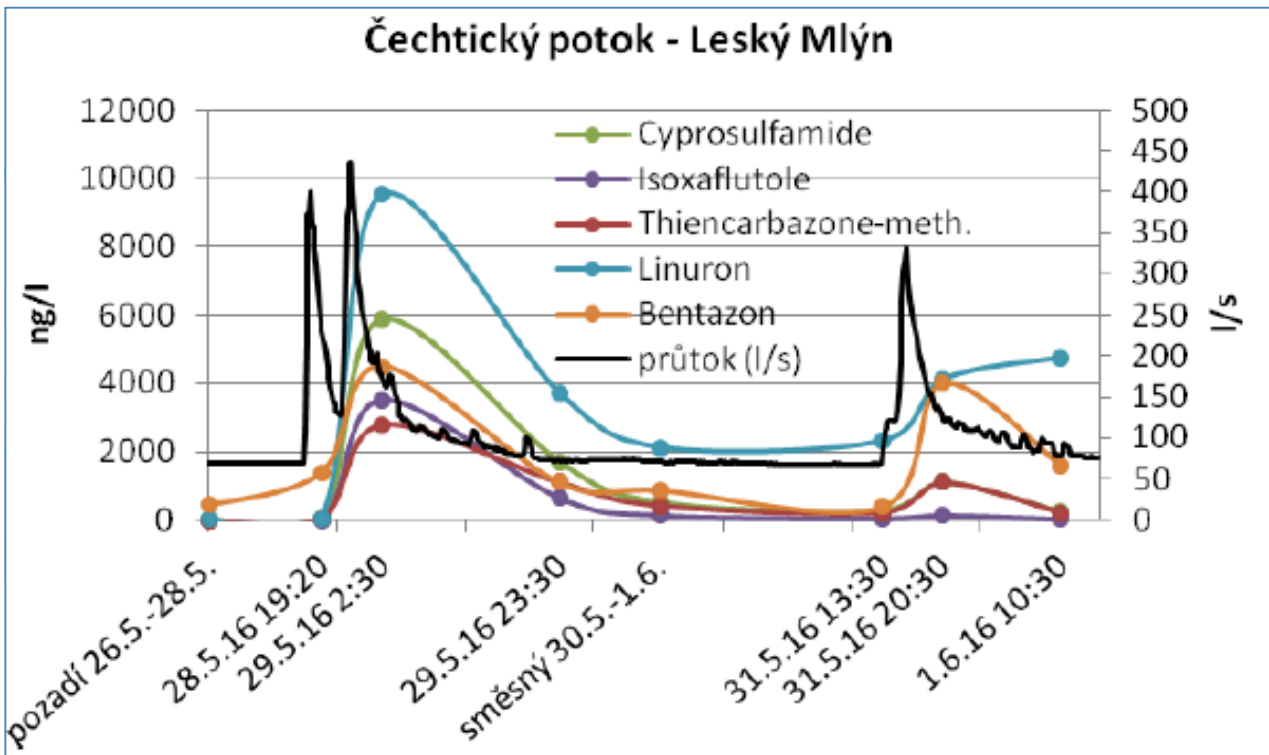
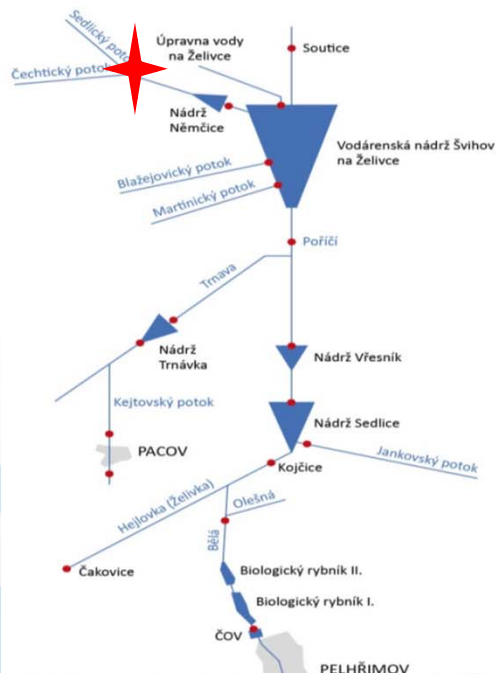
VEPŘÍKOV - CORN

rainfall/runoff events



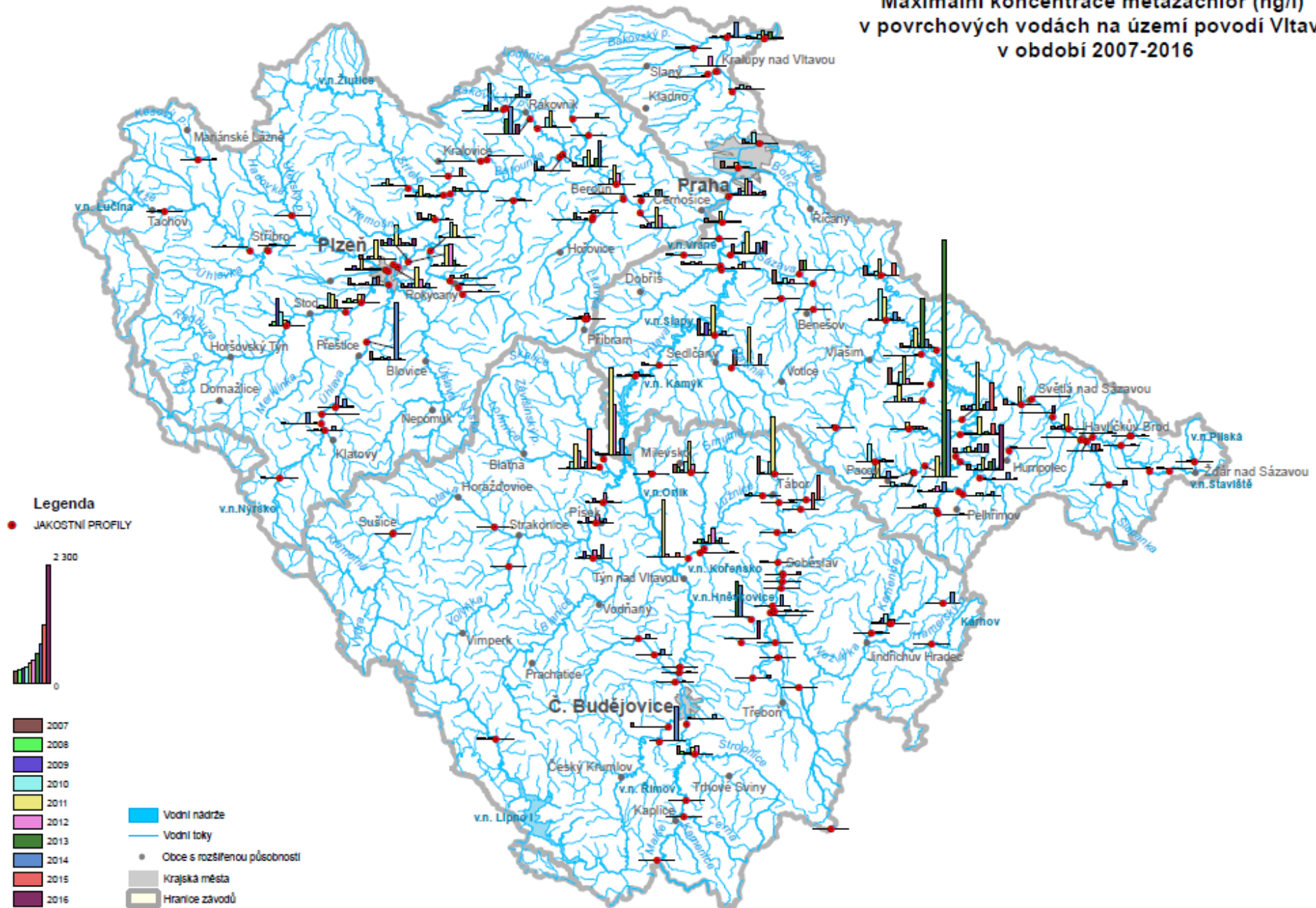
- **Application: 7.5.2016, preemergent application on corn**
- **Gardoprim Gold dose 4 l/ha; (S-metolachlor 312,5 g/l a Terbutylazin 187,5 g/l)**
- **Rainfall event: 20 mm; Q: from 0,25 l/s to 9,0 l/s during 90 minutes**
- **Runoff of pesticides during 24 h event was 33 g, 14,6 g parent compounds (5,5 g Terbutylazin a 8,9 g Metolachlor) a 18,4 g metabolites**

SURFACE WATER – RAINFALL/RUNOFF EVENT



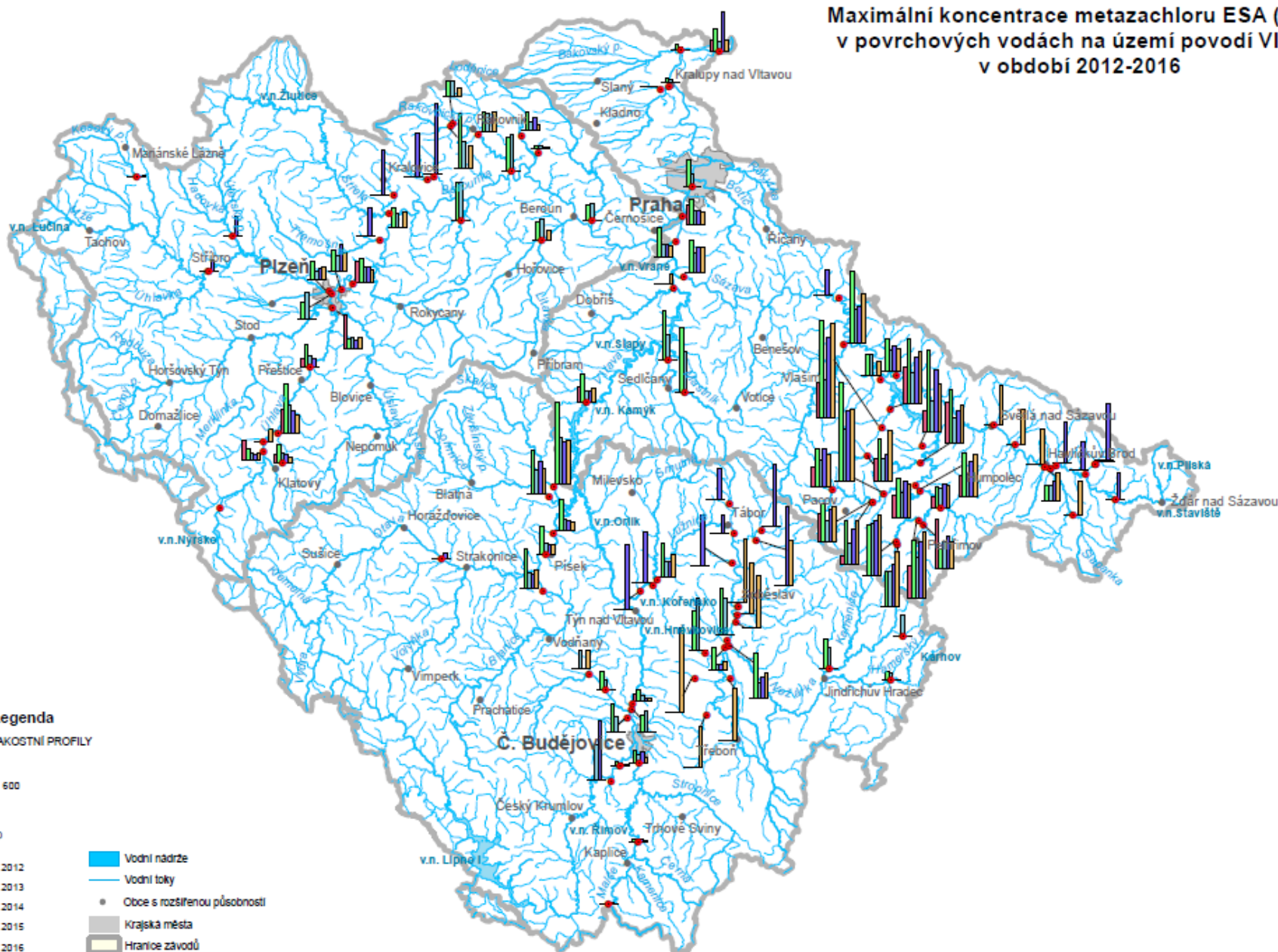
Metazachlor: max. concentrations 2007-2016

Maximální koncentrace metazachlor (ng/l)
v povrchových vodách na území povodí Vltavy
v období 2007-2016



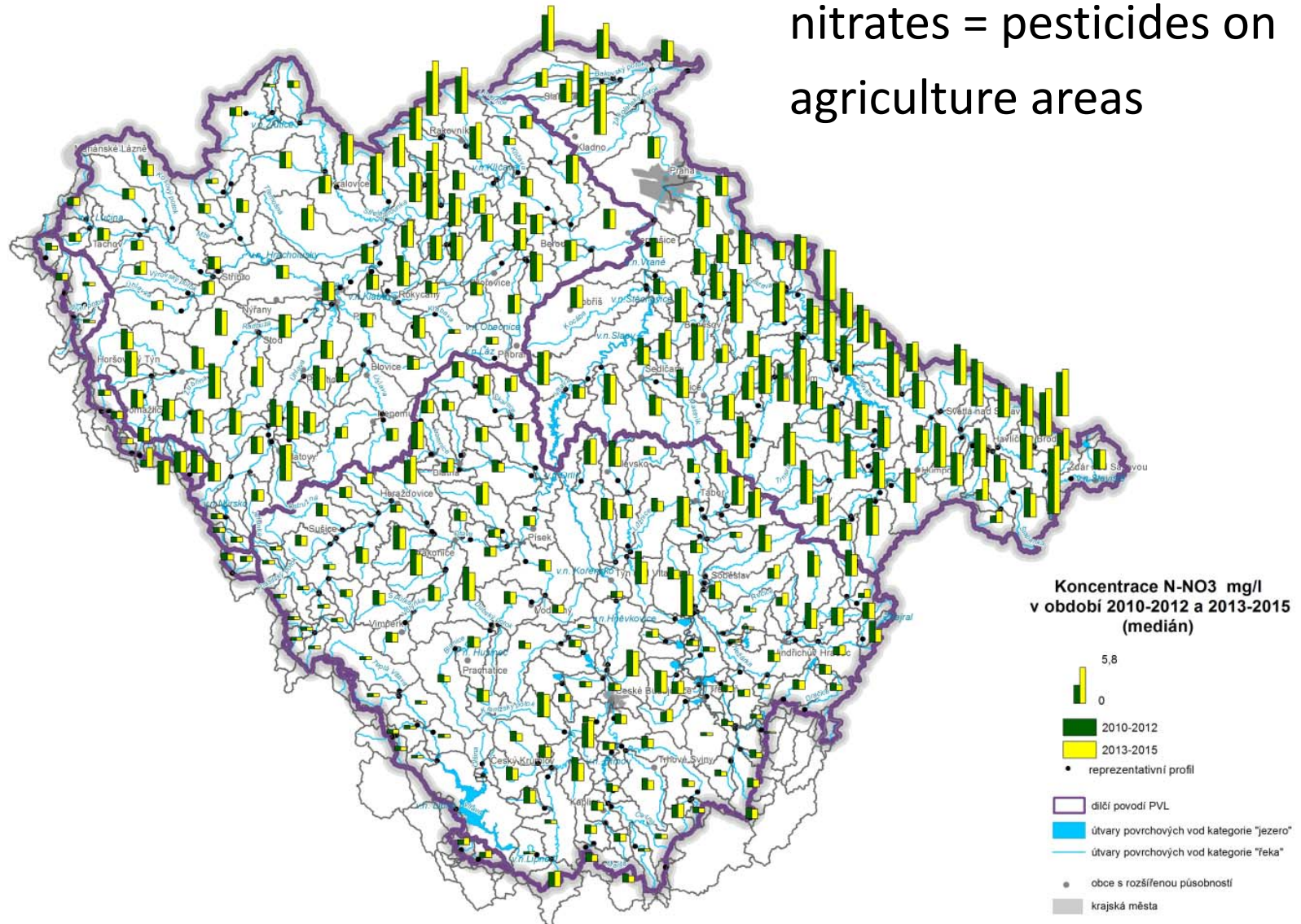
Metazachlor ESA: max. concentrations 2012- 2016

Maximální koncentrace metazachloru ESA (ng/l)
v povrchových vodách na území povodí Vltavy
v období 2012-2016



Nitrates: median 2010 – 2012 a 2013 - 2015

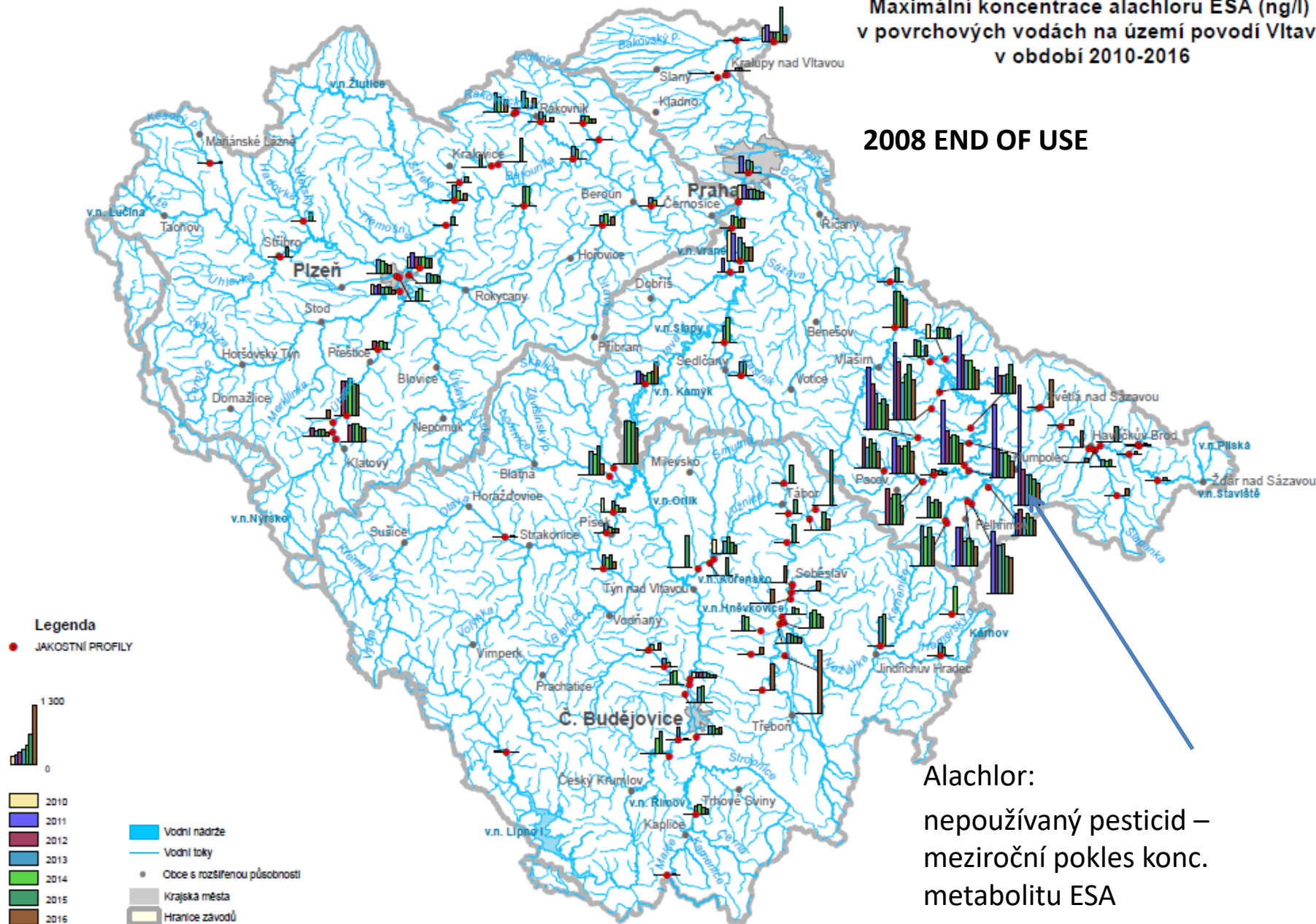
nitrates = pesticides on agriculture areas



Alachlor ESA: max. concentrations 2012 - 2016

Maximální koncentrace alachloru ESA (ng/l)
v povrchových vodách na území povodí Vltavy
v období 2010-2016

2008 END OF USE

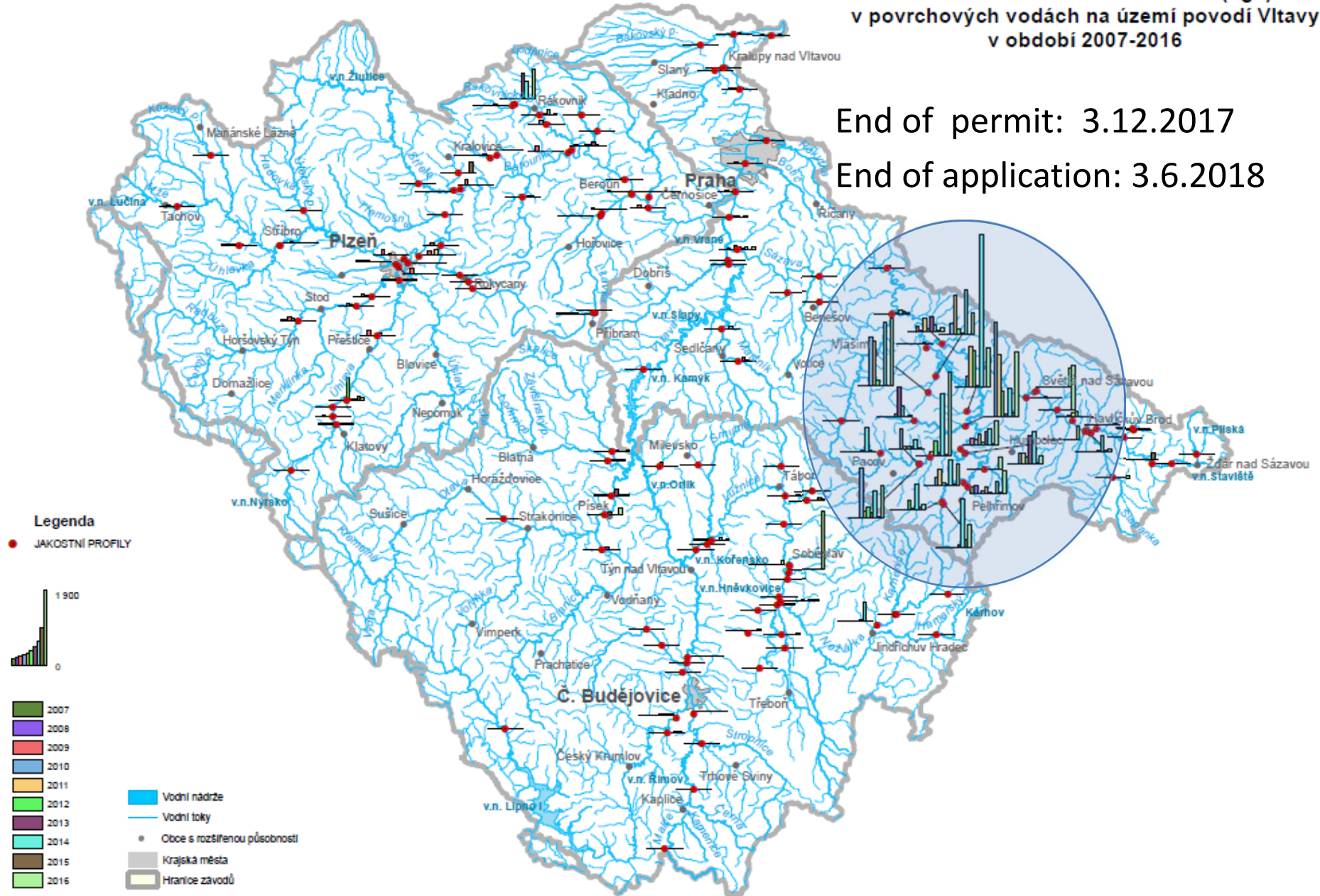


Linuron: max. concentrations 2012 - 2016

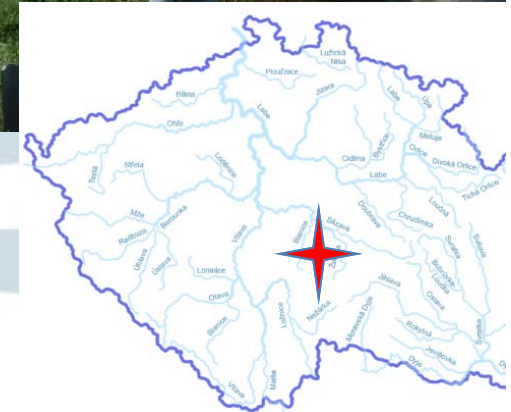
Maximální koncentrace linuronu (ng/l)
v povrchových vodách na území povodí Vltavy
v období 2007-2016

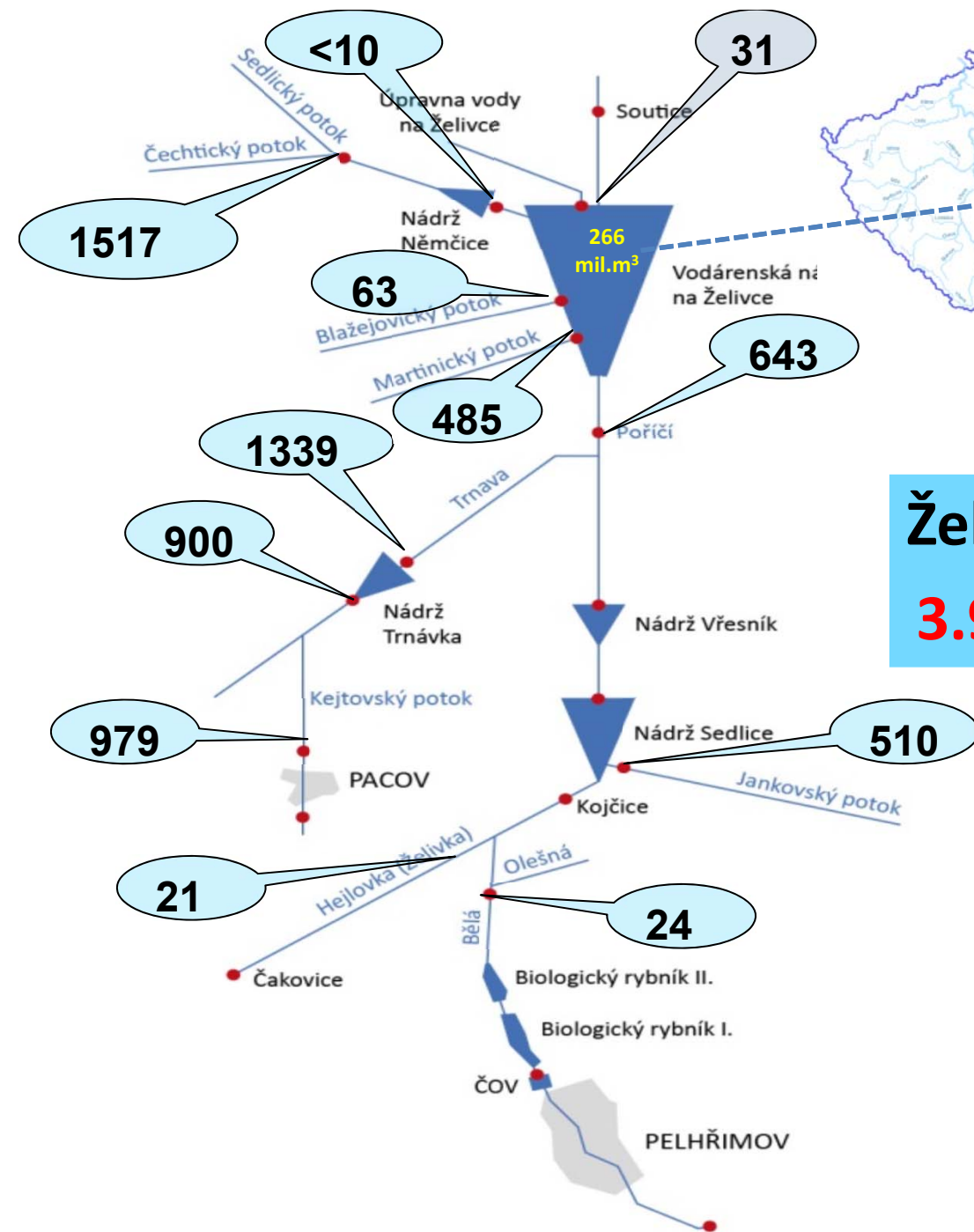
End of permit: 3.12.2017

End of application: 3.6.2018



Autumnal rainfall/runoff events in Švihov reservoir catchment





„autumnal harvest of pesticides“

3.9.- 4.9.2018

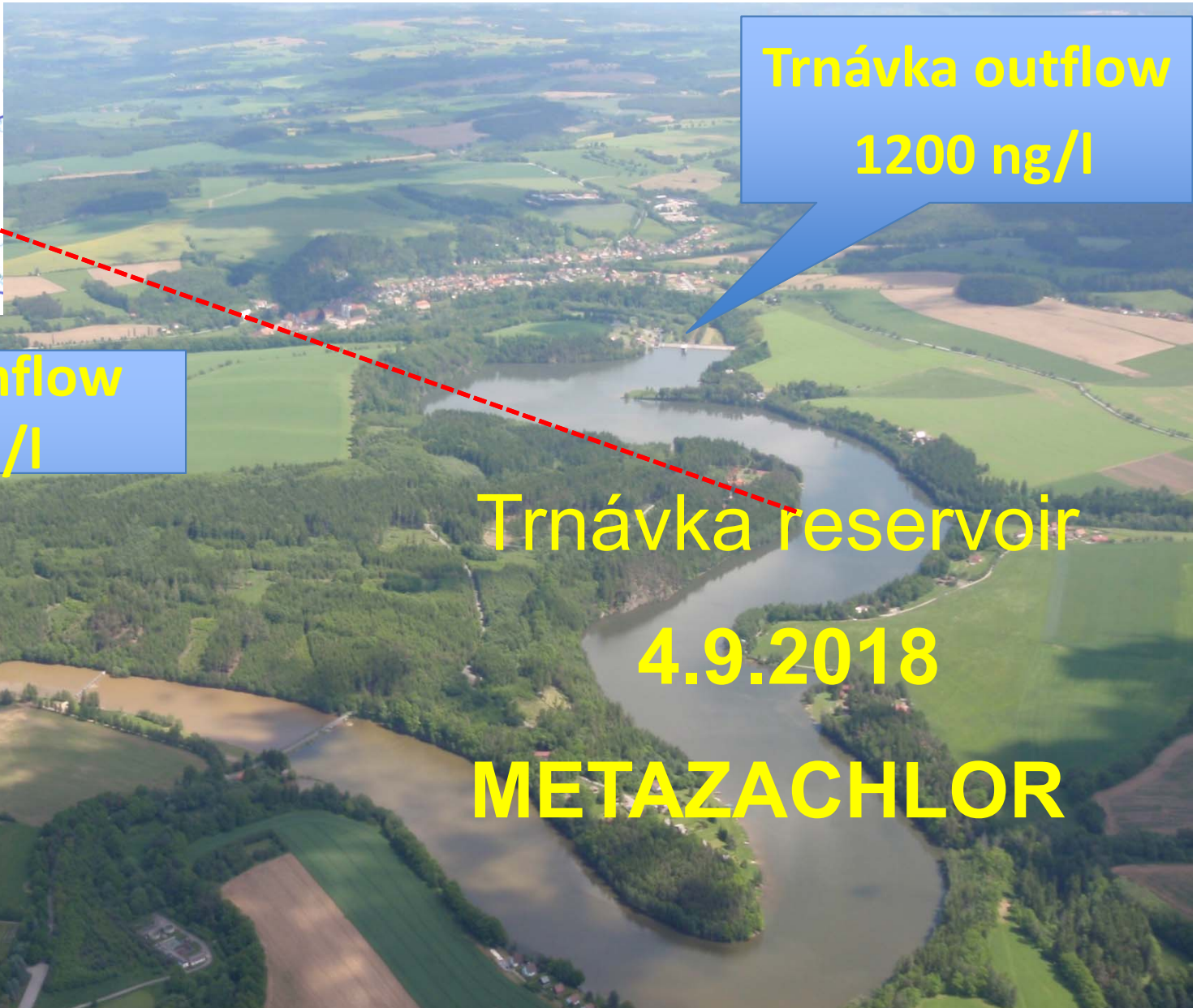
Metazachlor (ng/l)

„after rainfall“

Želivka catchment 1178 km²

3.9.2018 Metazachlor





Trnávka outflow
1200 ng/l

Trnávka inflow
900 ng/l

Trnávka reservoir

4.9.2018

METAZACHLOR

Total water volume in reservoir = cca 1,5 mil m³; by conc. 1000 ng/l it is more than **1kg apl. metazachlor** + metabolites in the reservoir

Theoretic example:

Which area was „washed“ to Trnávka reservoir? cca 1,5 ha field of rape

Autor (4532-1)

Základní údaje Označení Použití Dodatečné informace Sout

Obchodní název: Autor

Evidenční číslo: 4532-1

Držitel povolení: Adama CZ s.r.o.

Status povolení: Standardní registrace

Aktuální stav rozhodnutí: Platné rozhodnutí

Název účinné látky: Metazachlor (*Metazachlor*) 500 g/l (SI)

Biologická funkce: Herbicid

Formulační úprava: Suspenzní koncentrát

Dose per hectare

Author:

500 g/l, 1,5l/ha, tj 750g/ha

Butisan:

400g/l, 2l/ha tj. 800g/ha

cca 1 kg of metazachlor in total volume

Trnávka reservoir

Autor (4532-1)

[[Nové hledání](#)] [[Zpět na seznam](#)]  

Základní údaje Označení **Použití** Dodatečné informace Souběžný obchod

Pozor! Další podrobnosti k použití naleznete na záložce [Dodatečné informace](#).

OL ↓	LA ⇅	Moření ⇅	Plodina ⇅	Škodlivý činitel ⇅	Dávkování
AT	Ne	Ne	řepka olejka ozimá	plevele jednoděložné jednoleté, plevle dvouděložné jednoleté	1,5 l/ha ; 300-400 l vody/ha

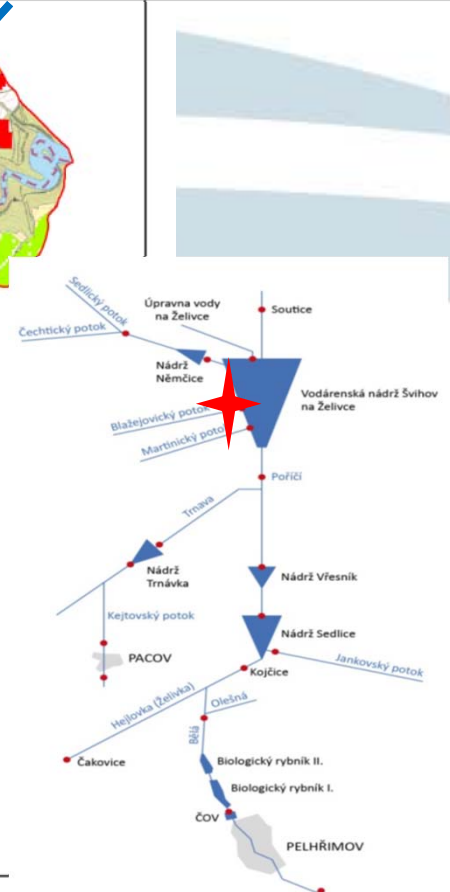
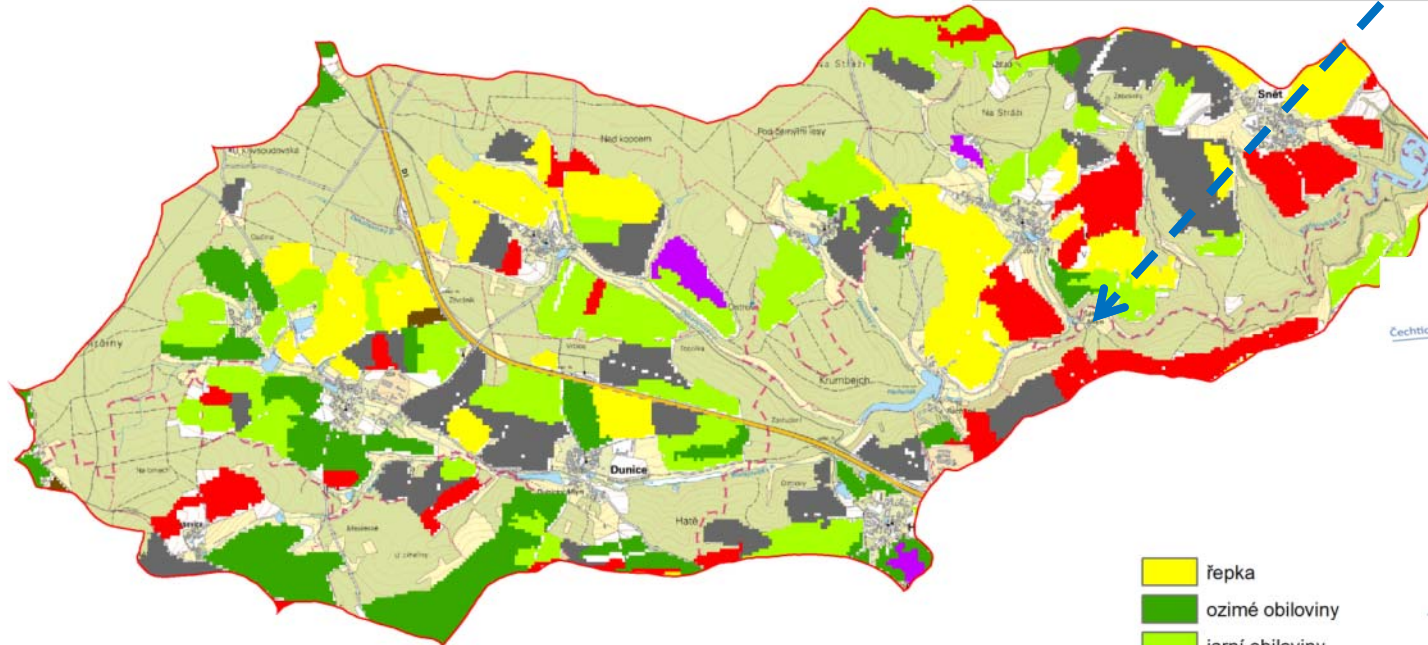
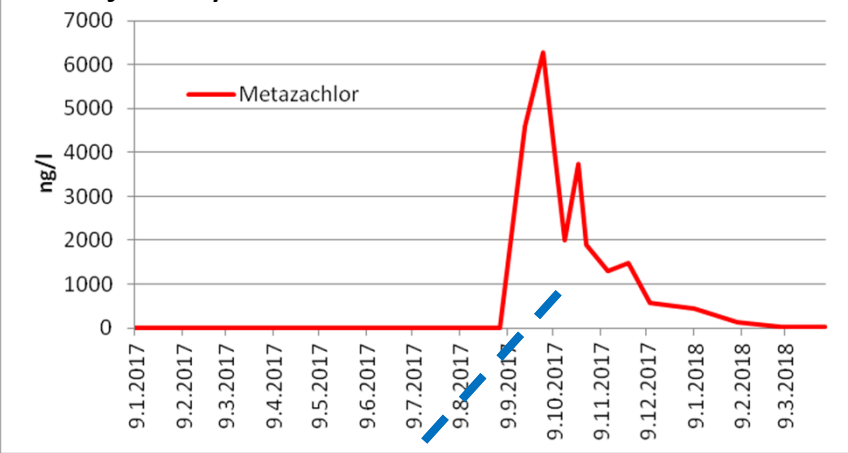
Metazachlor and rape

Catchment of Blažejovický stream year 2017

Crops harvested in the year 2017

rape km2	2,87
corn km2	1,91
rape % catchment area	8,61%
corn % catchment area	5,71%

Blažejovický stream

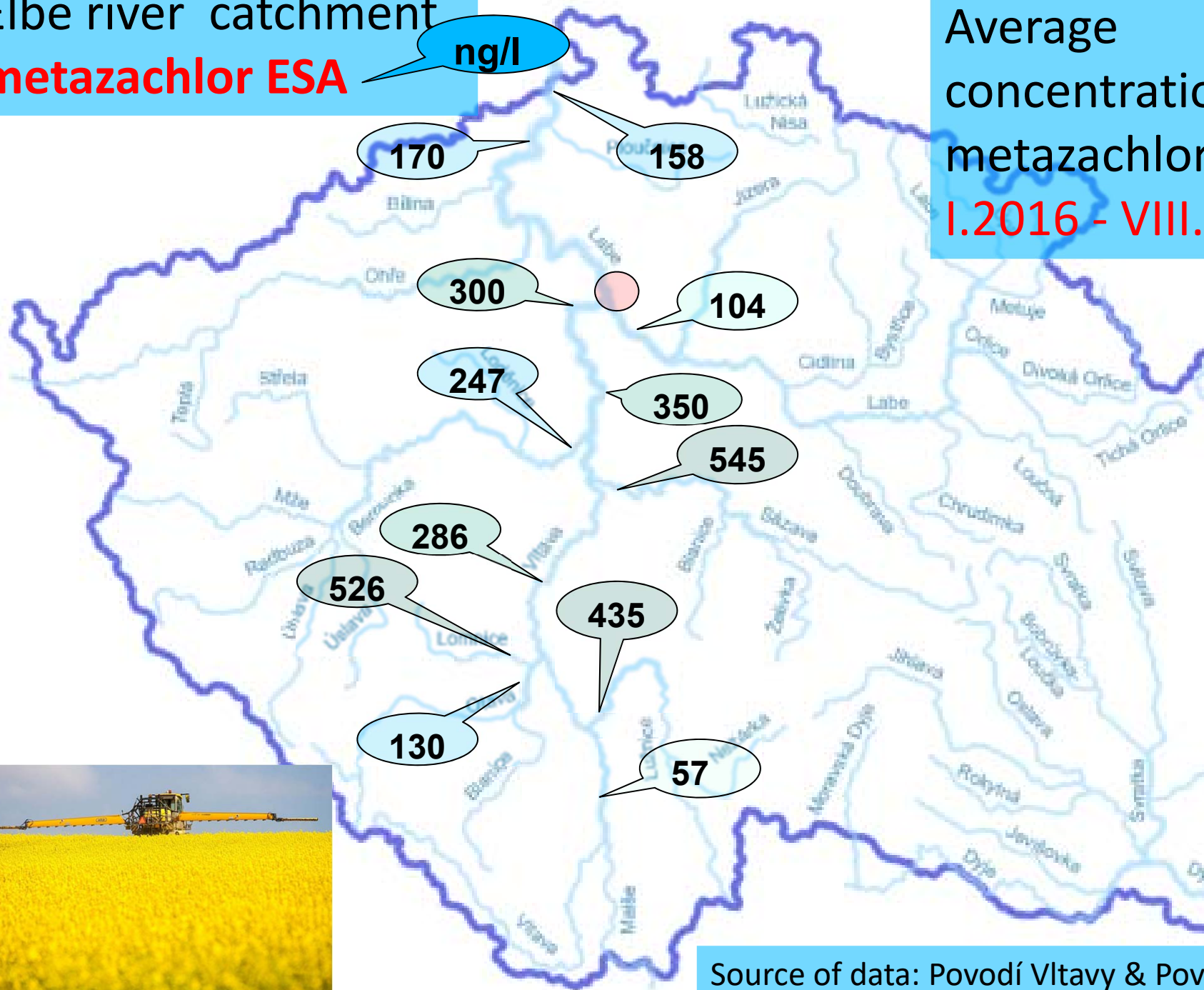


- řepka
- ozimé obiloviny
- jarní obiloviny
- cukrovka
- kukuřice
- trávy na orné půdě
- ostatní plodiny

Source: CHMI
(REMOTE SENZING)

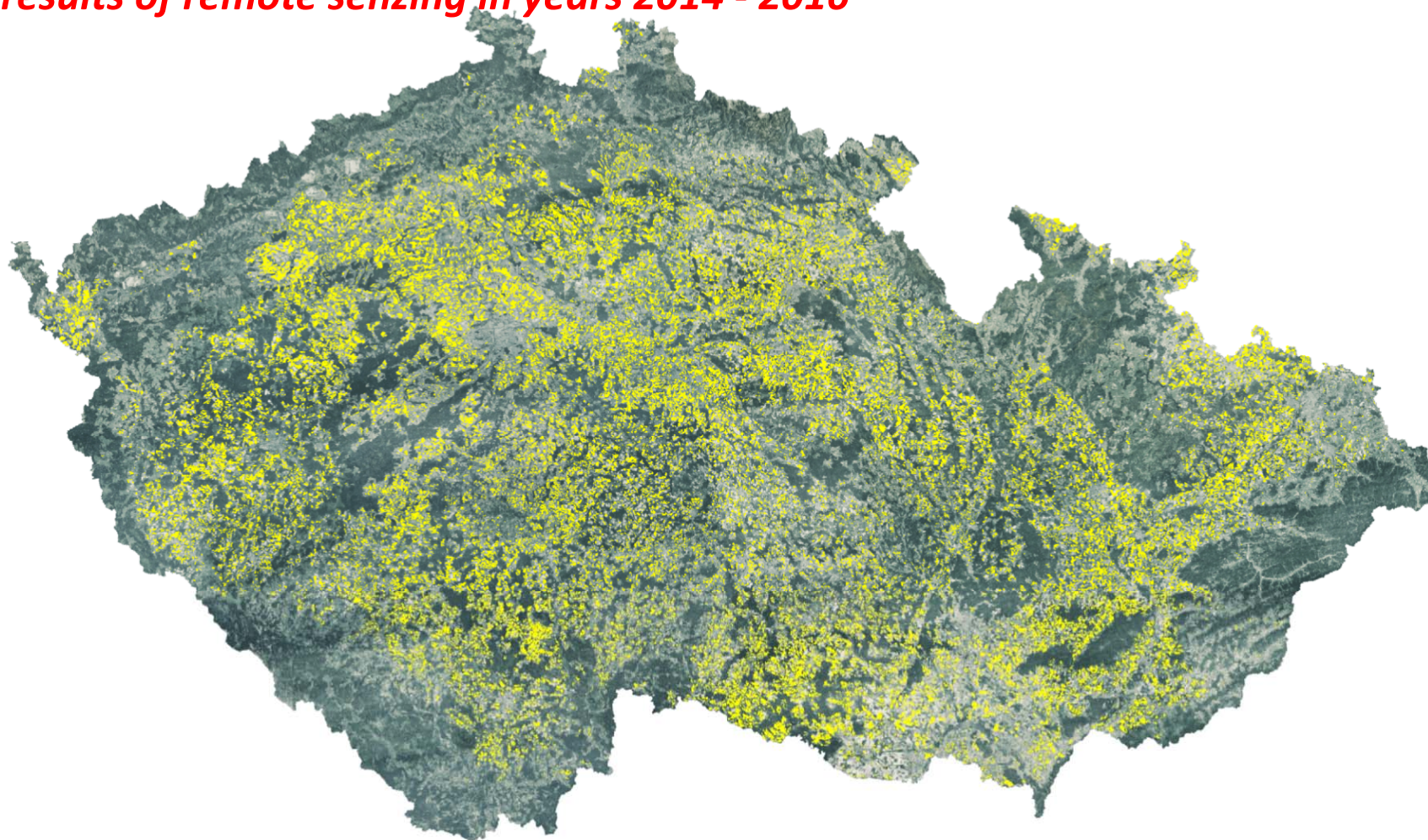
Elbe river catchment
metazachlor ESA

Average
concentrations of
metazachlor in
I.2016 - VIII.2018



Source of data: Povodí Vltavy & Povodí Labe

Map of RAPE occurrence in Czech Republic
results of remote sensing in years 2014 - 2016



www.chmi.cz

Kodeš: Aktuální výsledky celostátního monitoringu pesticidů v podzemních vodách, ČHMU, 2017



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Thank you for your attention
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