

A comprehensive and continuous pesticide screening during one growing season in five small Swiss streams

Eawag: Rahel Comte, Simon Mangold, Heinz Singer, Simon Spycher, Christian Stamm

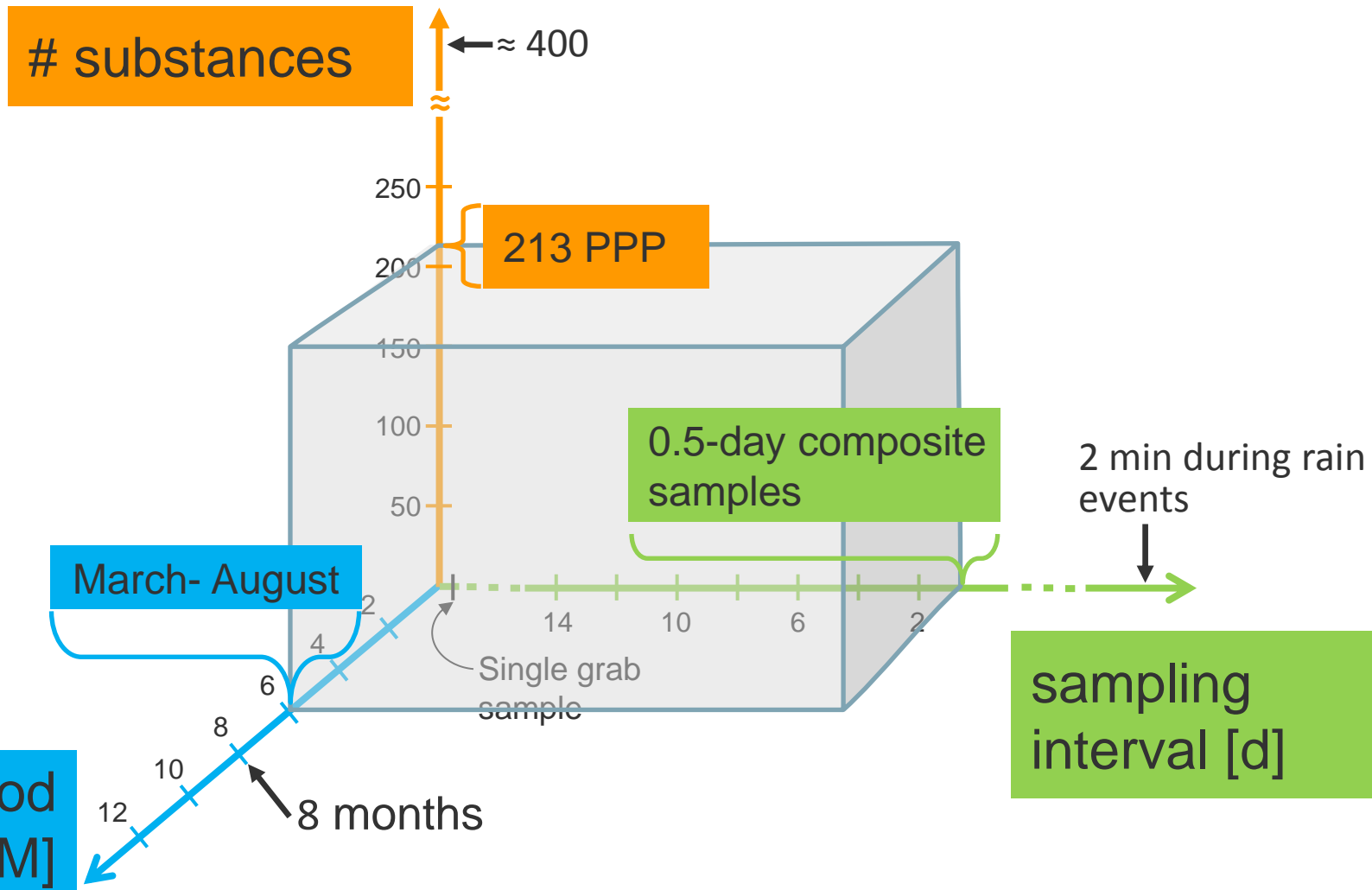
Oekotoxzentrum: Marion Junghans, Miriam Langer

FOEN: Manuel Kunz

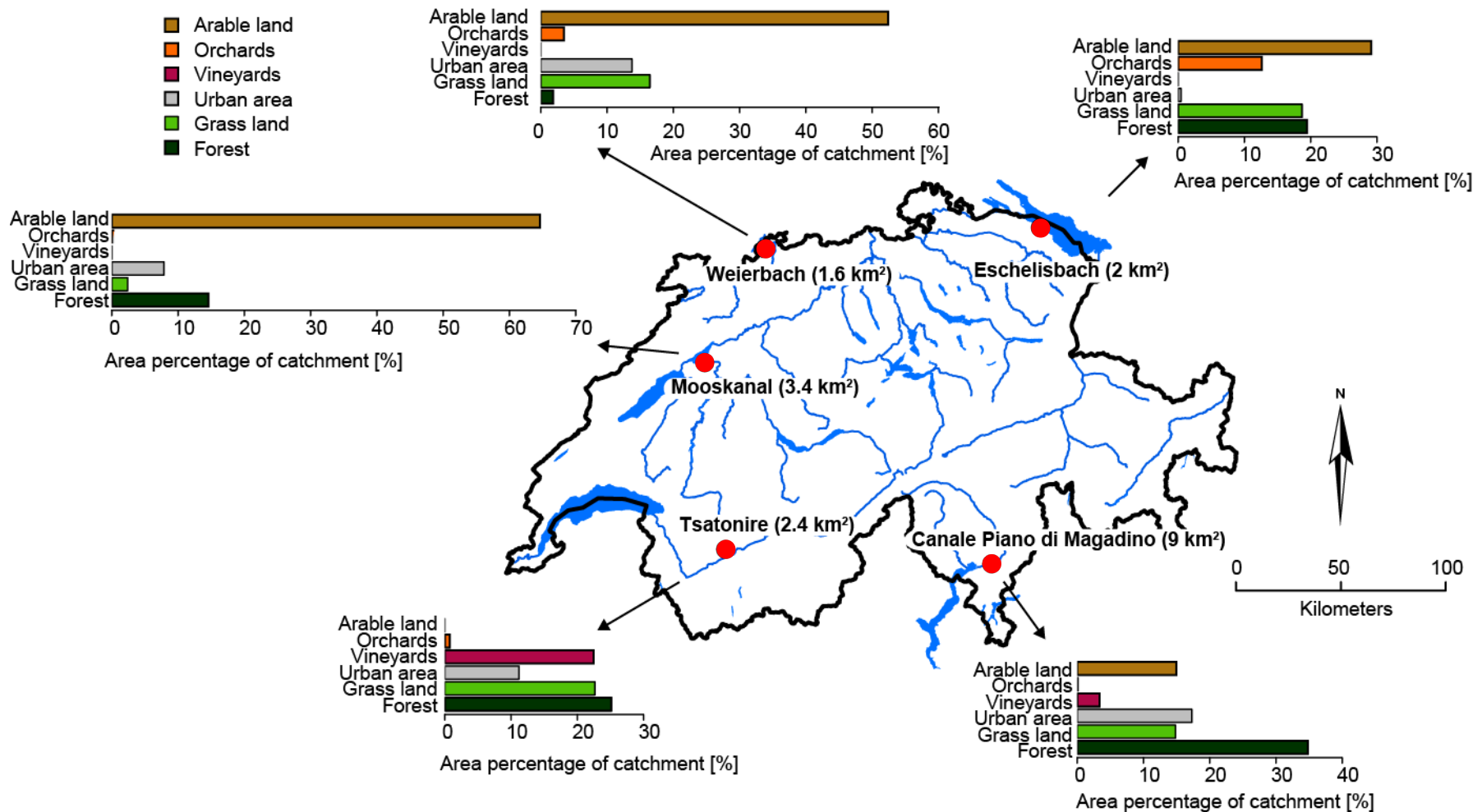
Cantons: BE, BL, TG, TI, VS

VSA: Tobias Doppler, Irene Wittmer

Getting closer to exposure relevant for aquatic organisms in small streams

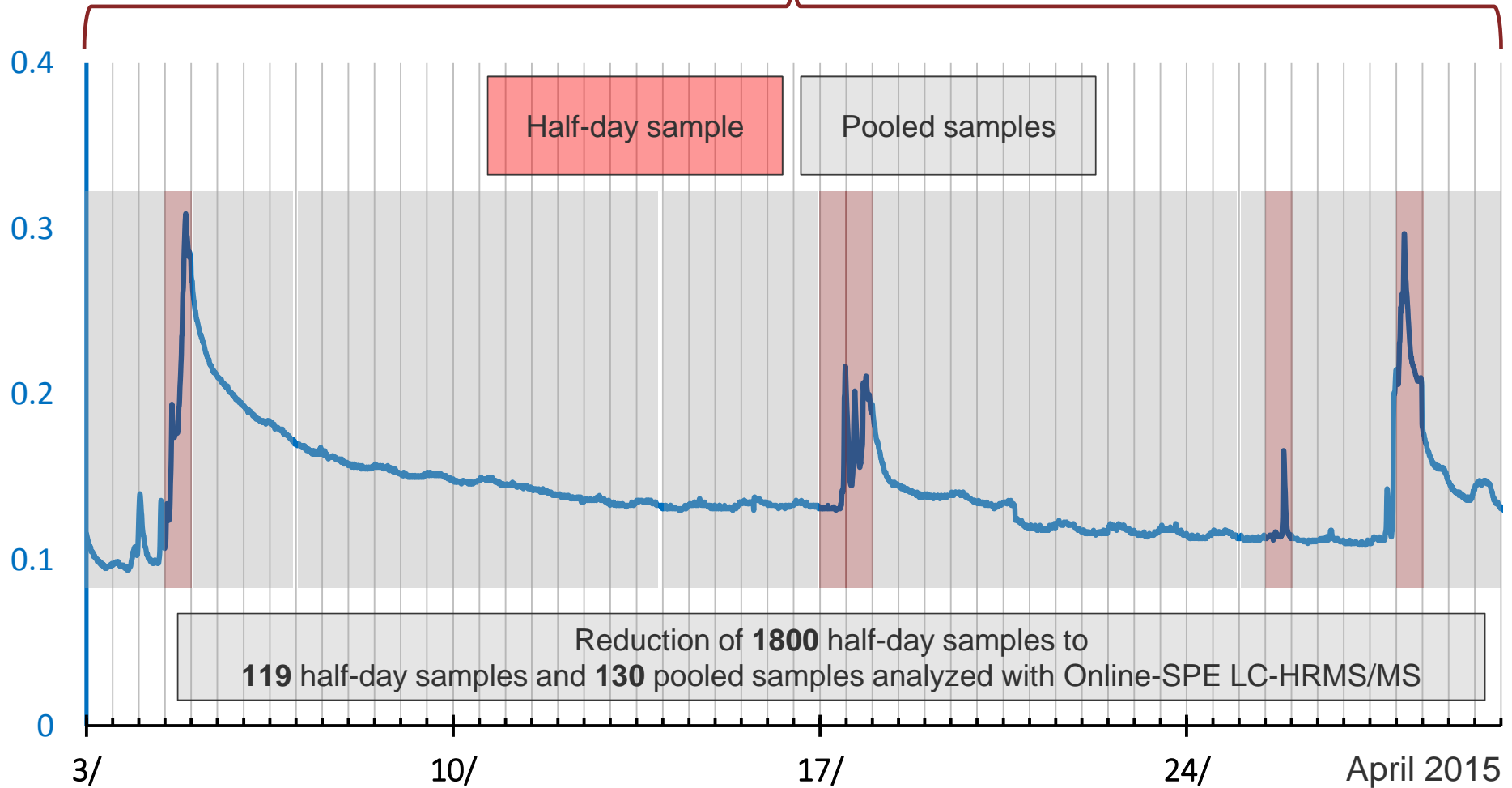


Location of 5 Small Streams

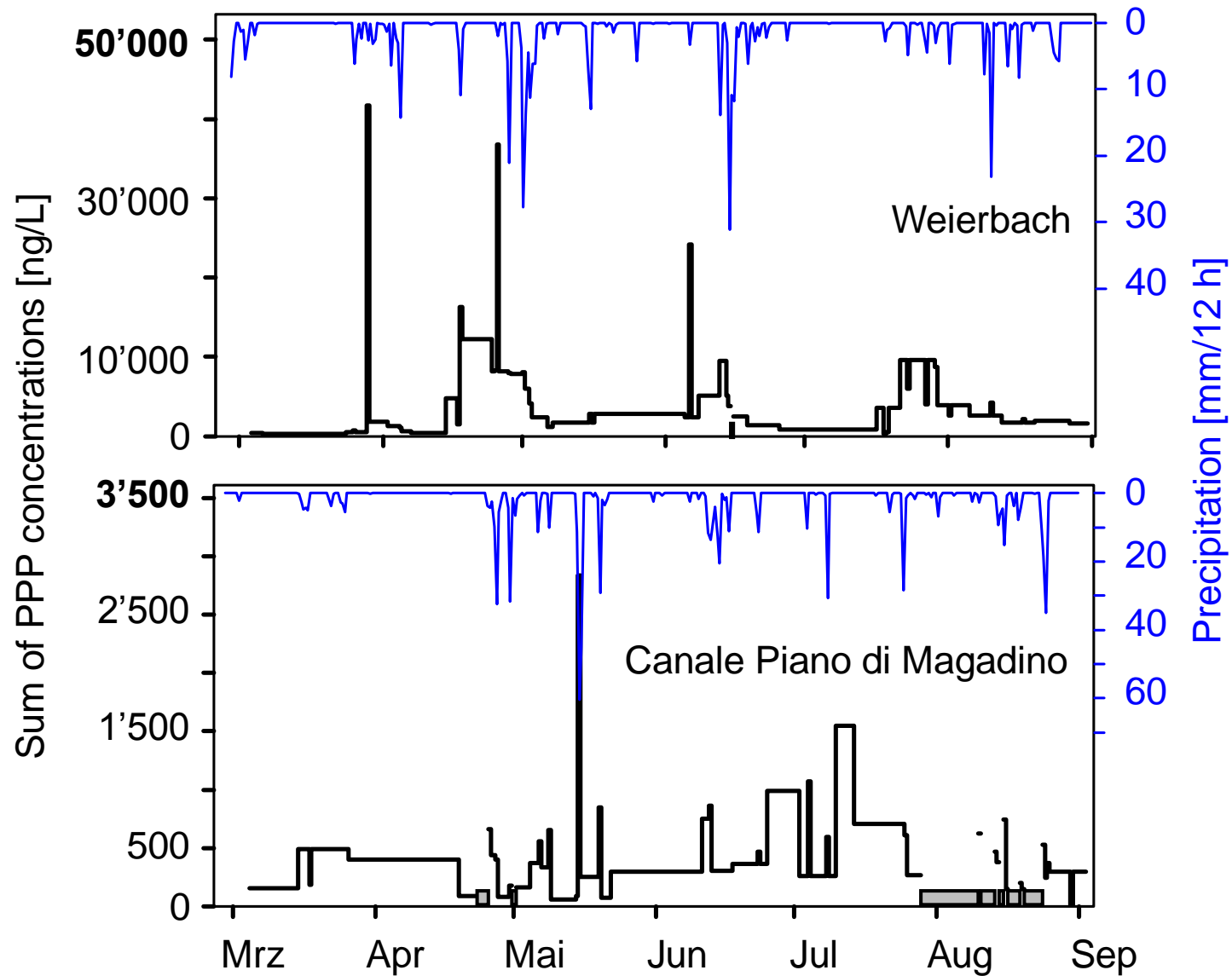


Continuous series of half-day composite samples

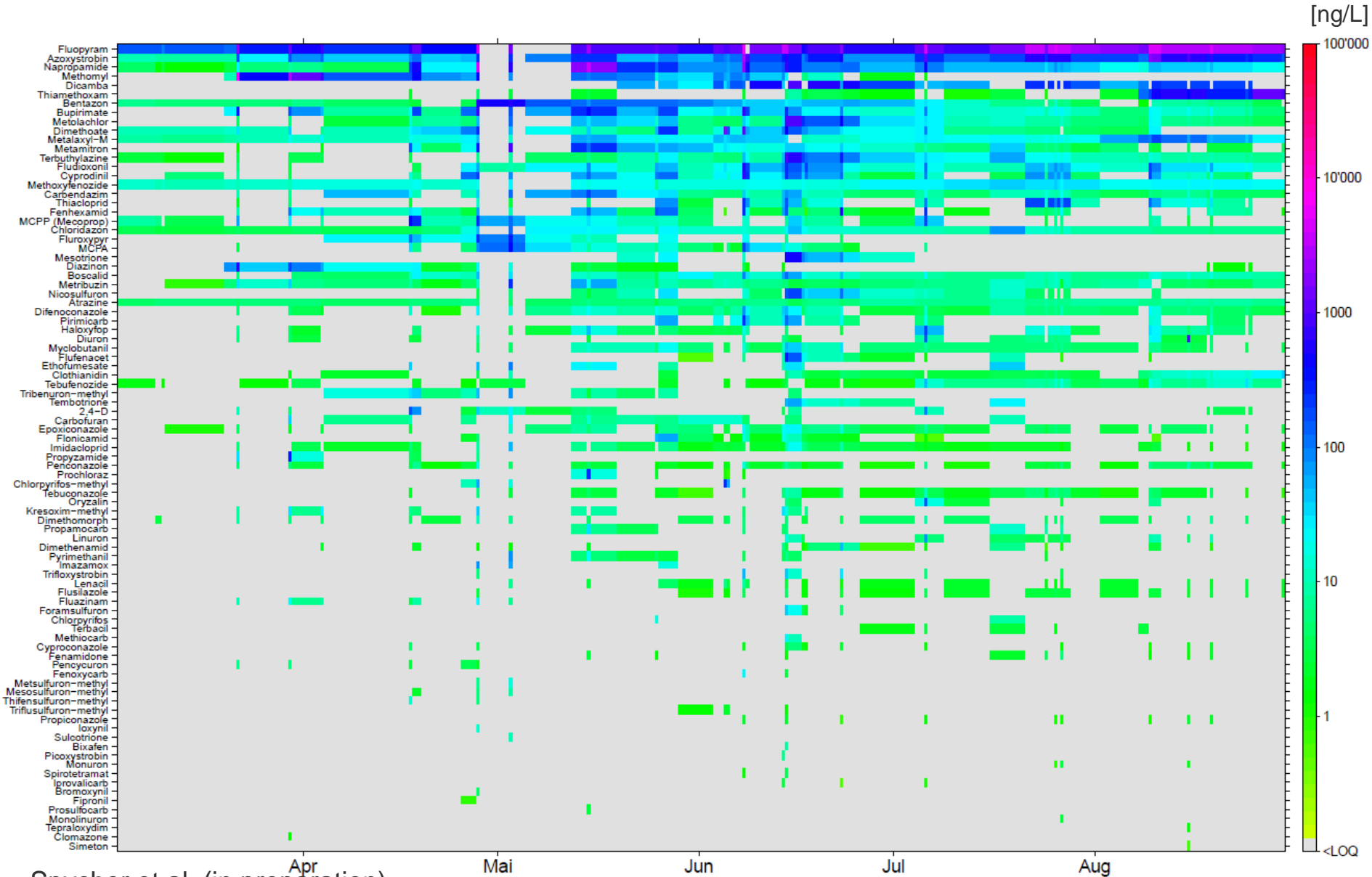
Water level [m]



High Concentration Peaks, High Variance



Comprehensive View on Eschelisbach



Environmental Quality Standards (EQS)

- Acute and Chronic EQS based on exotoxicological data
- Chronic EQS compared to 14 d time weighted averages (twa)
- acute EQS to measured concentrations

- $RQ = \frac{C}{EQS}$ $RQ > 1 \rightarrow$ Risk for sensitive organisms

- **32** different PPP exceeding EQS (from a total of 128 detected compounds)

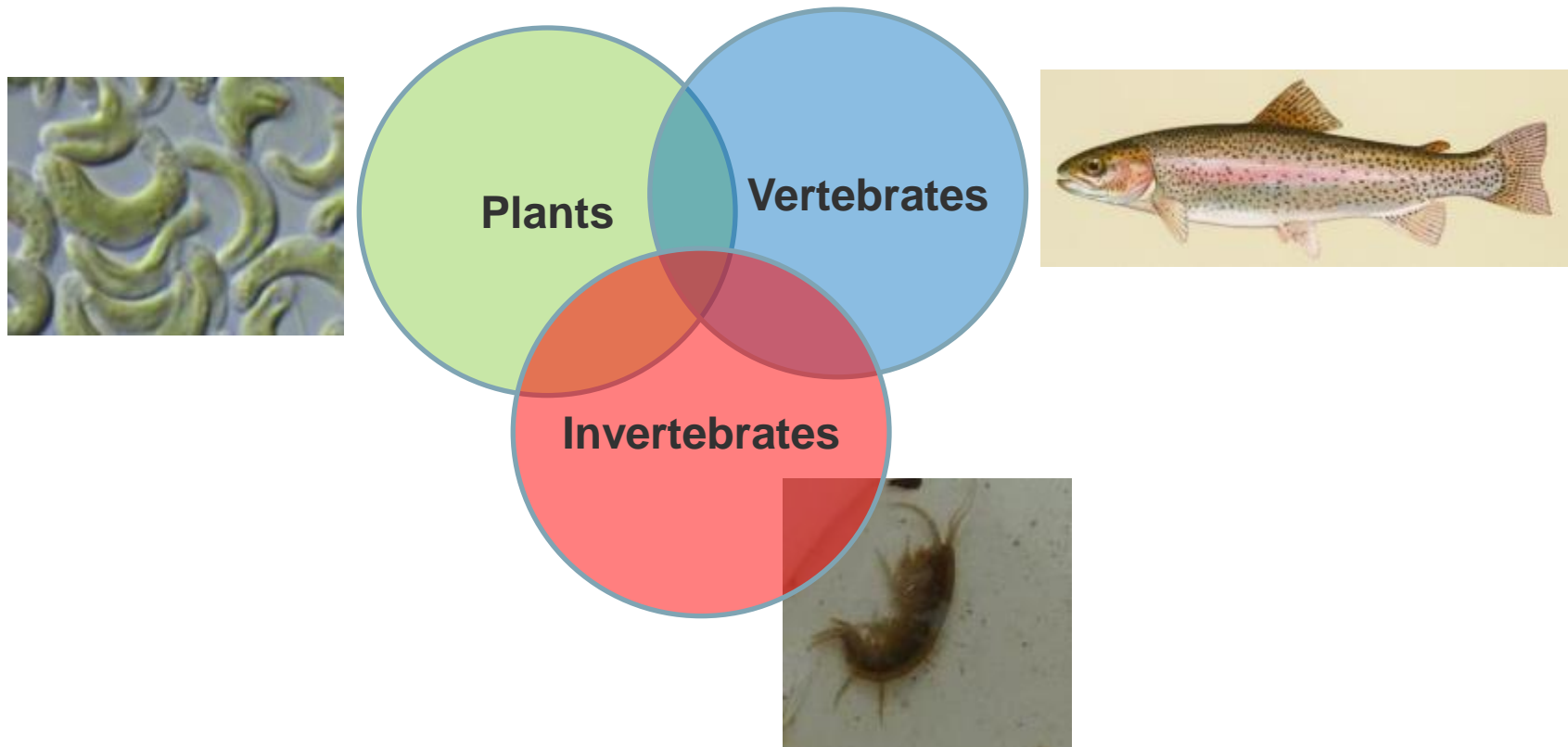
of half-days with single substance concentrations > **acute** and chronic QS

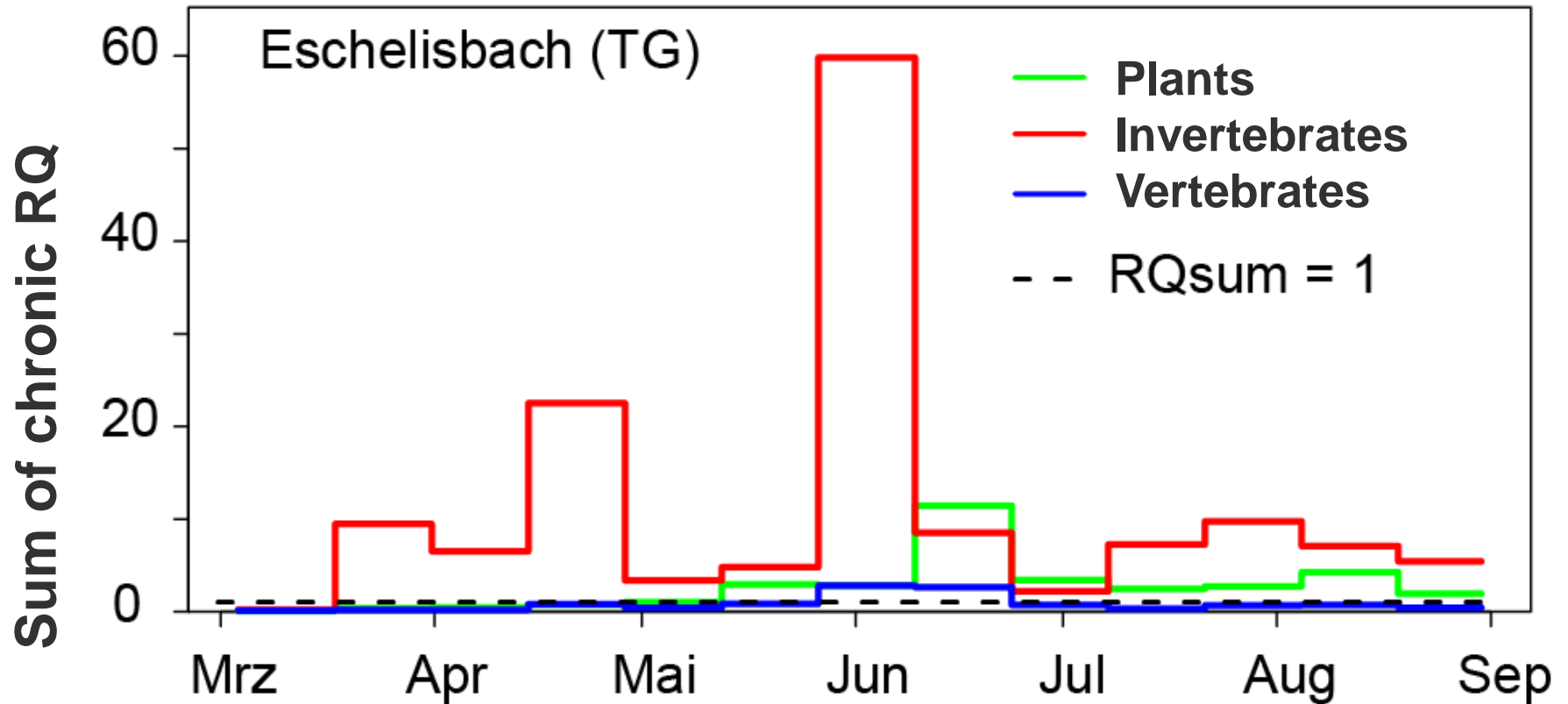
	Mooskanal		Weierbach		Eschelis- bach		Canale P. di M.		Tsatonire	
	Ac.	Chr.	Ac.	Chr.	Ac.	Chr.	Ac.	Chr.	Ac.	Chr.
Herbicide	0	140	64	868	7	112	0	28	134	420
Fungicide	0	0	35	168	25	140	0	0	17	56
Insecticide	19	84	39	476	61	504	0	0	2	168
% of time ≥ 1 exceedances	6	43	24	92	22	92	0	10	41	86

- Acute EQS-exceedances not only due to higher time resolution, because with 14-d time weighted averages 8 a.s. > acute QS

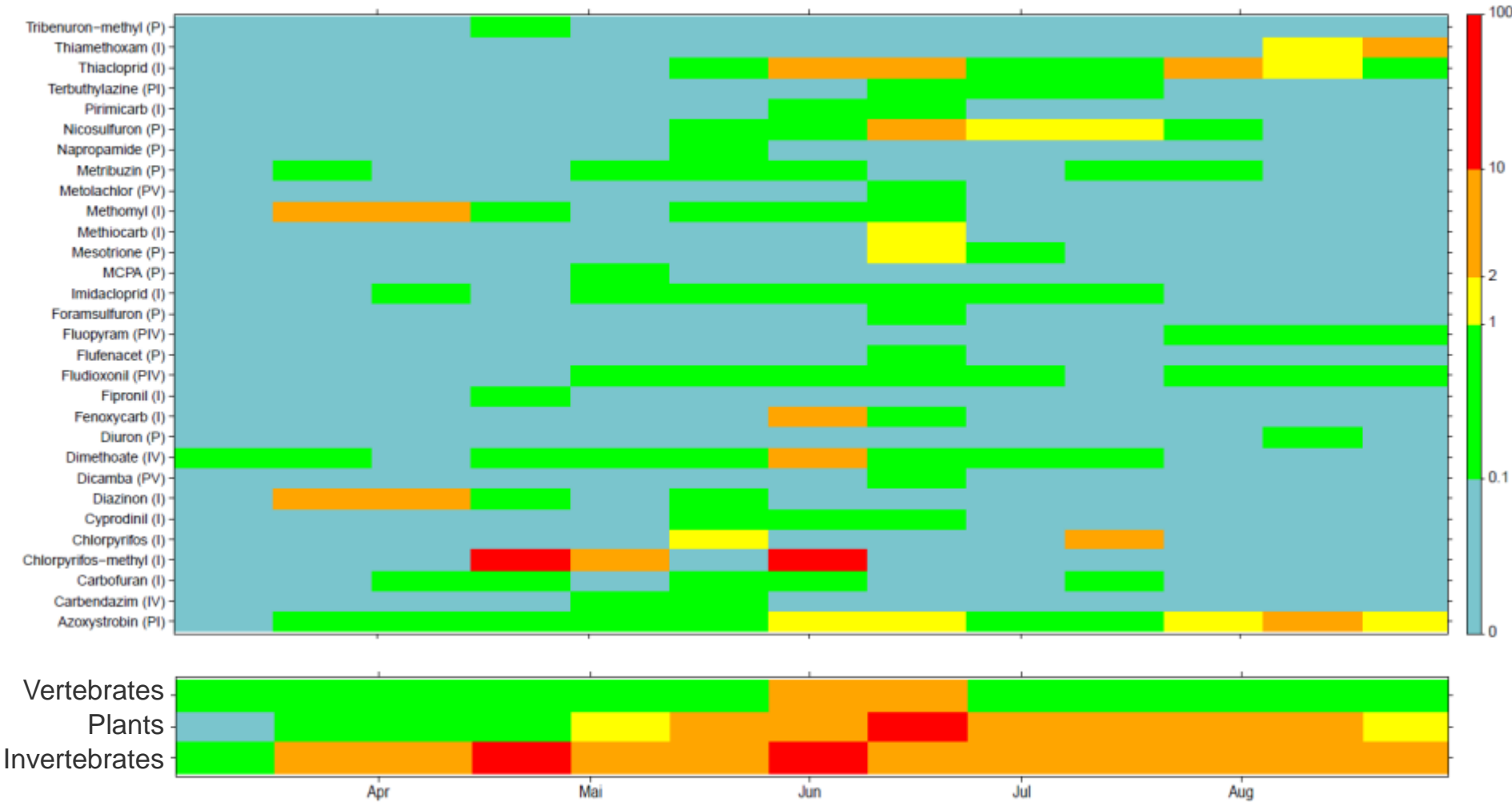
Classification of substances by primarily affected group of organisms (i.e., trophic level)

For each sample RQs are summed according to the classification



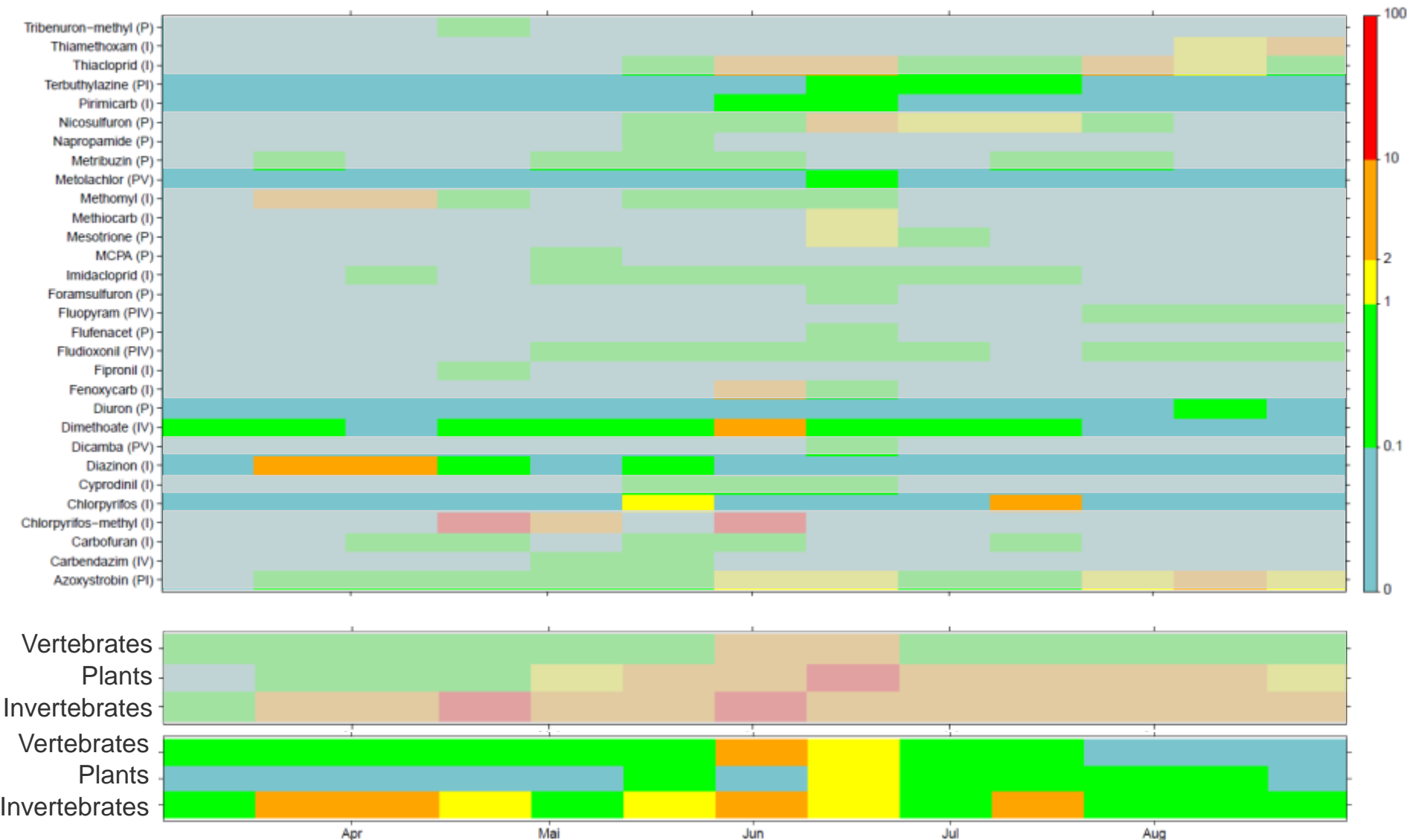


Eschelisbach: Active ingredients with RQ > 0.1



Different Perspectives: Active ingredient (< 1% of measurements with exceedance)
vs.
stream (92% of time with elevated risk)

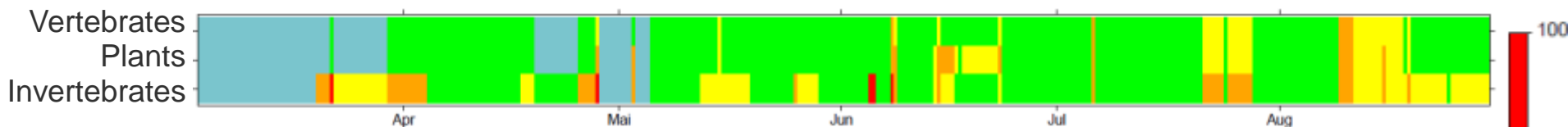
"Historic" View (2005-2012)



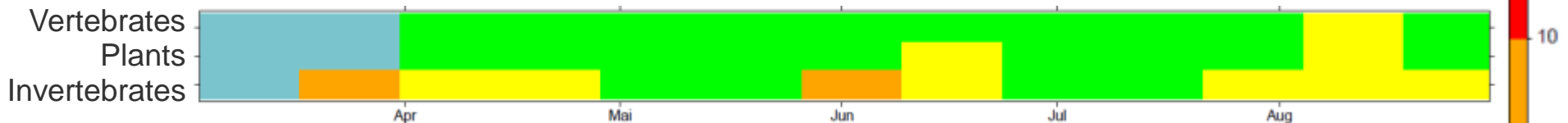
28 most frequently sampled a.s. in Switzerland (Moschet et al. 2014: ES&T, 48, 5423-5432)

Scenarios for Acute Risk Quotients

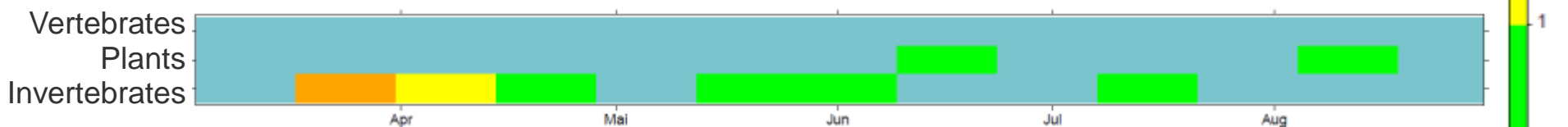
All active ingredients (89 compounds)



Same but with 2-week composite samples



Historic view (28 most frequently measured) with 2-week composite samples

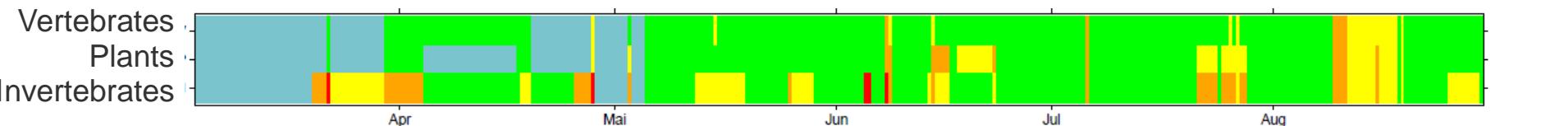


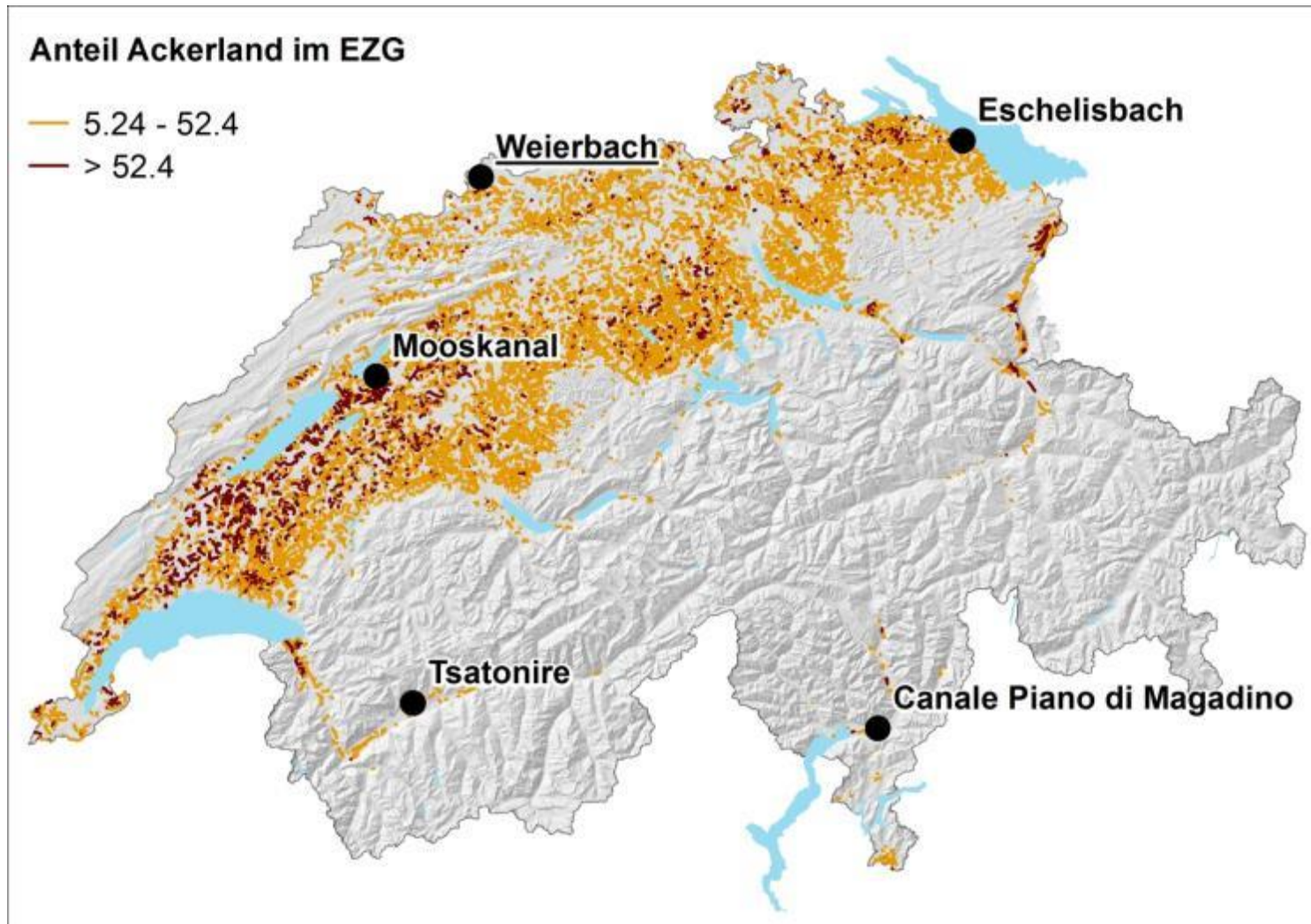
WFD with 2-week composite samples (3 PPP detected)



Substance Selection by Guideline for diffuse sources (38 a.s.)

Wittmer, Stamm, Singer, Junghans 2014: Beurteilungskonzept für Mikroverunreinigungen aus diffusen Einträgen





Conclusion

- Large variety of a.s. and high concentration peaks in small streams
- Chronic EQS exceeded in all examined streams, in some cases almost during entire monitoring campaign. Considerable variability among streams
- The pollution we «see» depends on the choice of substance AND the sampling strategy
- A suited monitoring strategy can provide ecotoxicologically relevant information and help to reduce the variability of PPP-monitoring data

Acknowledgements

Special thanks to all colleagues from cantonal authorities and Federal Office of the Environment for funding.



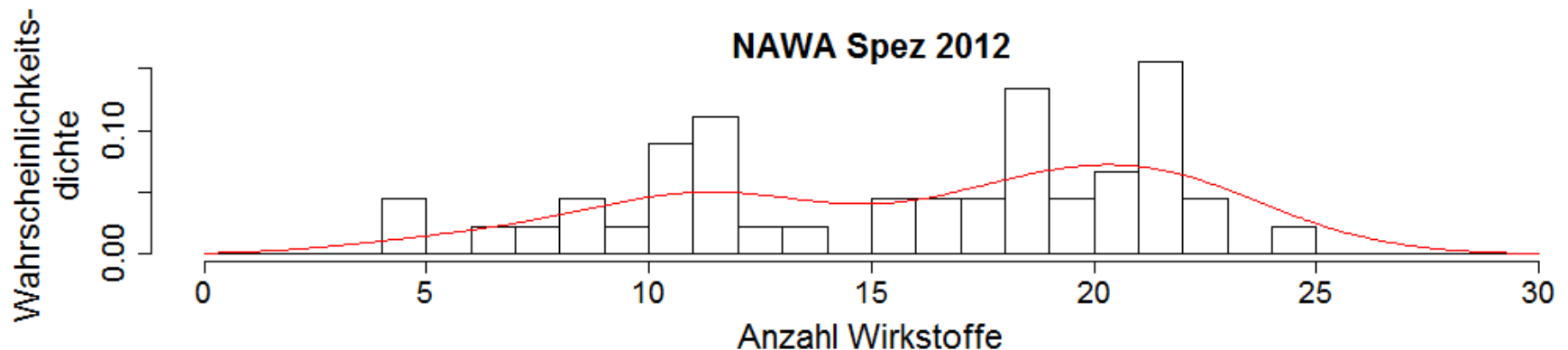
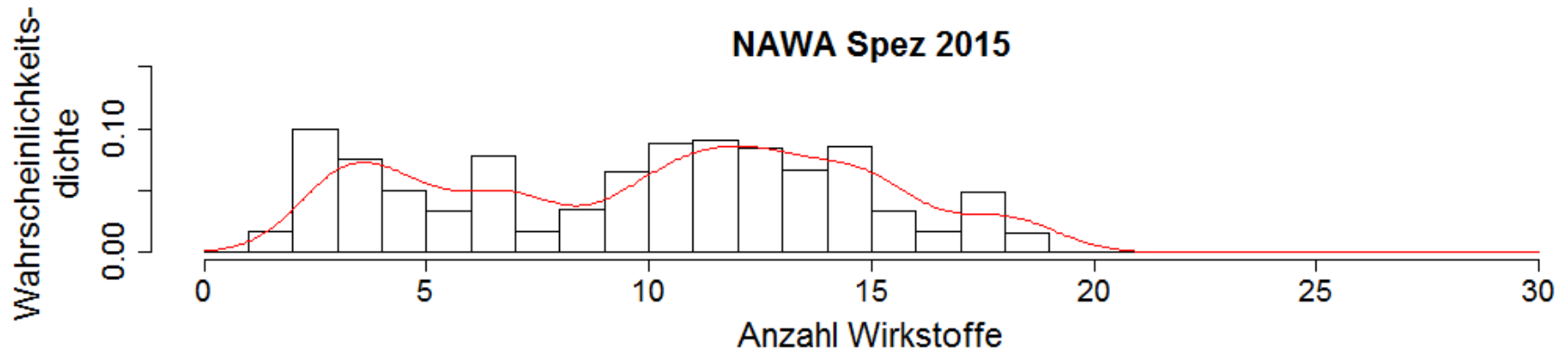
Photograph: Kim Jae-Sun

Thank you for your attention!

Additional Slides

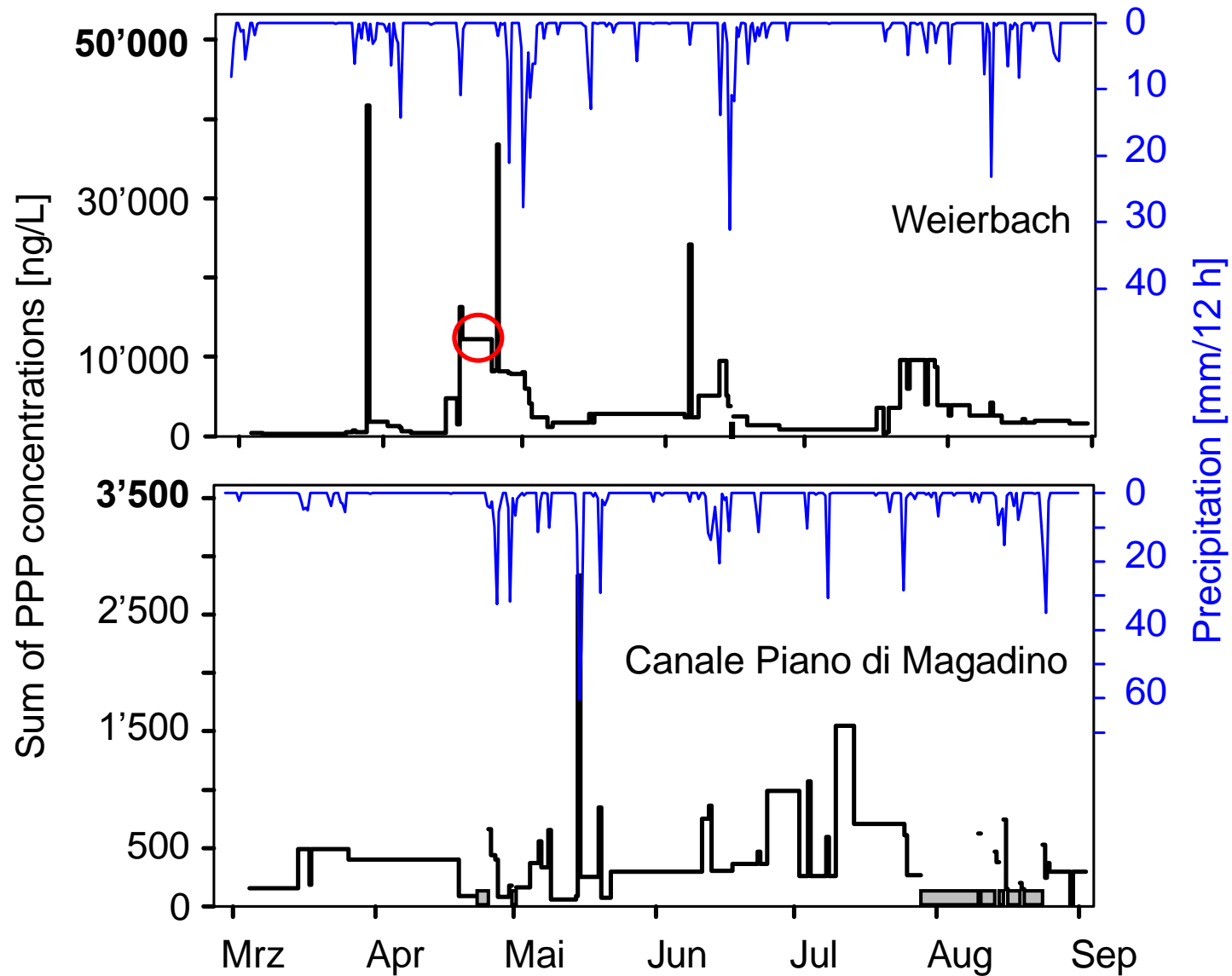
Small vs. medium sized streams

Number of active ingredients required to cover 90% of sum of concentrations



- NAWA Spez 2015: ≈ 10 a.i
- NAWA Spez 2012: ≈ 15 a.s.
- RÜS ?

High Concentration Peaks, High Variance



Occasionally Elevated Concentrations without Rain Event

