Would short term online monitoring improve the WFD-sampling strategy? Subsampling of high frequency data from four watersheds in Saxony

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ABSTRACT

The European Union Water Framework Directive (European Commission, 2000) aims to achieve a good ecological and chemical status of all bodies of surface water by 2027 and has developed an integrated guidance on surface water chemical monitoring (e.g. WFD Guidance Document No. 7/19, Hanke et al. 2009; WFD-CIS 2003) which is transferred into national German law (Ordinance for the Protection of Surface Waters, OGewV, Bundesministeriumder Justiz und für Verbraucherschutz, 2016). For the majority of compounds, this act requires a monthly sampling frequency to assess the chemical water quality status of a surface water body.

To evaluate the representativeness of the sampling strategy under the OGewV, high-frequency online monitoring data is investigated under different sampling scenarios and compared with current, monthly grab sampling strategy. About 23 million data points were analyzed for this study, three chemical parameters (dissolved oxygen, nitrate-nitrogen, chloride concentration) and discharge data were selected from four catchment of different sizes ranging from 51 391 km² to 84 km² (Elbe, Vereinigte Mulde, Neiße and two stations at Lockwitzbach, see Figure 1).

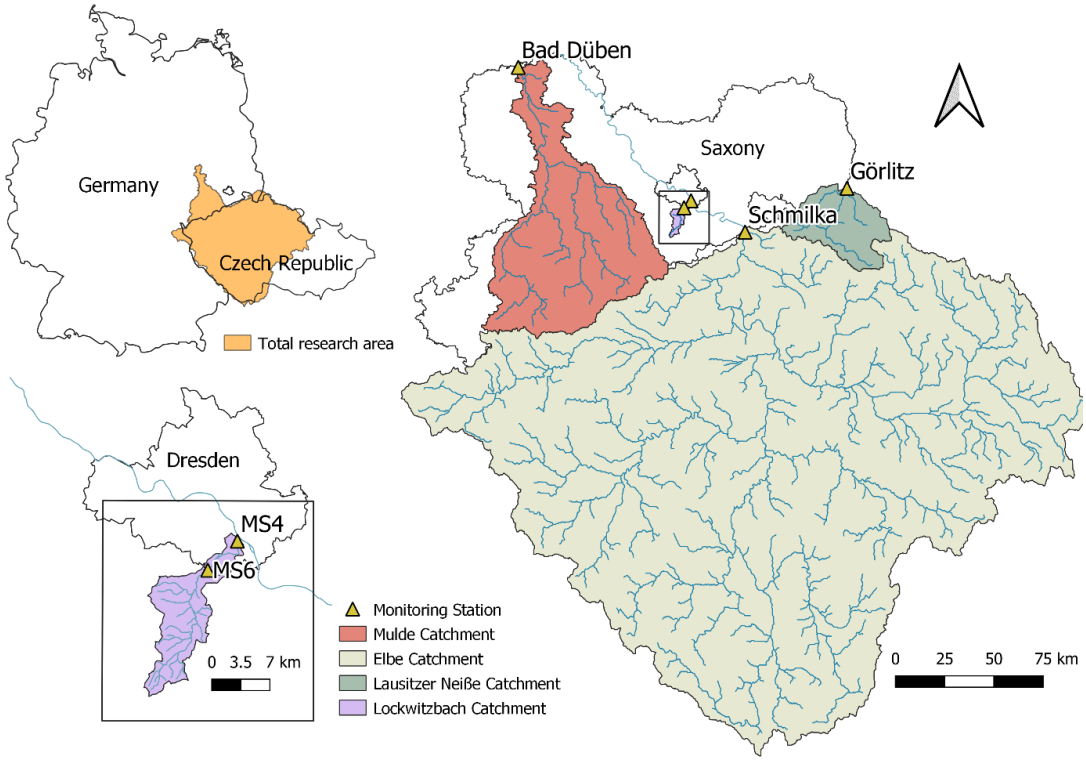

Fig. 1: Catchments of the investigated streams and location of the monitoring stations

In this contribution we want to (I) compare the results of conventional grab sampling with short-term online-monitoring (STOM), where online sensors are applied over a limited duration and return interval in the

investigated rivers, (II) to use discharge data as proxy for the event mobilized pollutants to investigate the different performance of STOM, the procedure is summarized in Figure 2.

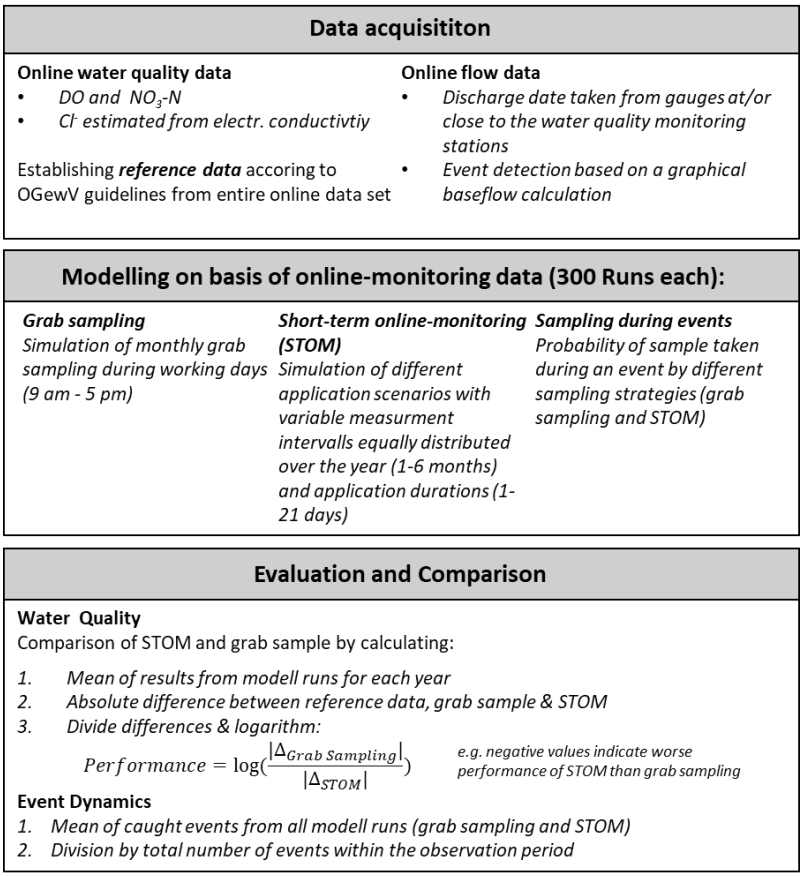

Fig. 2: Scheme for comparing different sampling approaches

Results show, that STOM outperforms grab sampling for parameters where minimum/maximum concentrations are required by law as the probability to catch a single extreme value is higher with STOM. Furthermore, parameters showing a pronounced diurnal pattern, like dissolved oxygen, are also captured considerably better. The performance of STOM did not provide improvements for parameters with small concentration variability, as Nitrogen-Nitrate and Chloride showed no substantial improvements by STOM monitoring. The analysis of discharge events as surrogate parameter for event-mobilized pollutants proved that the probability of capturing samples during events is significantly increased by STOM.

Literature

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