

Interactive comment on “CO₂ emissions from German drinking water reservoirs estimated from routine monitoring data” by H. Saidi and M. Koschorreck

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Reply to reviewer 3

We thank reviewer 3 for this really careful review. We are also thankful for the language corrections. Germans are used to rather long sentences and we are always trained that writing short sentences is good style in scientific English. Here we address those points which are not included in our replies to the other reviewers. If not stated different in this reply we will follow the reviewers advices. We will widen the introduction and elaborate better our hypothesis. We will also widen the method section, especially the part about budget calculations. Our different ways to calculate fluxes obviously caused some confusion. In a revised manuscript we would focus on monthly data,

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because that scale fits best to the temporal resolution of our CO₂ data. We would then use the hourly data only to estimate the potential error when ignoring short term wind fluctuation.

P1, L19: Yes, we will add “individual”

P2, L10: In this and the following sentences we would like to express that there are case studies about single reservoirs but not studies covering a larger number of drinking water reservoirs.

P2, L13-14: Upscaling on a regional/national scale is challenging, because it is difficult to find the right balance between detailed information on particular sites and using simplifications and means. In global studies, for example, you may apply mean wind speeds on a larger area. In detailed case studies you need wind measured continuously on the reservoir. What is the best way on a regional scale?

P5, L13: Yes – wind speed data were measured at 10 m above open flat ground.

P5, L19-20: The temporal resolution of our data was quite heterogeneous. For one reservoir we indeed had nearly daily data for some time. For one reservoir we had weekly data. The most common case was that we had about one data point per month. 12 is the average data point number per reservoir and year.

P6, L1-6: We think it is justified to calculate hourly data even if only few annual pCO₂ values are available. From continuous measurements of pCO₂ in a reservoir we know, that diurnal fluctuations of are not very high in these nutrient poor systems and short term “jumps” of pCO₂ are rare. Thus, we think we are doing a minor error when using the pCO₂ measurements as being representative for a period of some weeks. It was one of our main aims to check whether ignoring short term wind dynamics results in different results. That was also the reason why we first present the low temporal resolution data, then switch to high resolution (to check that question) and finally went for an annual budget. However, in a revised manuscript we would calculate our annual

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budget from the monthly rather than hourly data.

P6, L8: No, reservoirs were not always ice covered. Unfortunately, ice data on ice coverage are not readily available. We will also add this point as a suggestion: It would be nice to have the information about freezing data or ice off date for all the reservoirs.

P6, L17: The CO₂ concentrations given here do not match table one, because here we state the maximum and minimum values of all our combined datapoints. In Table one, we compare annual median data for particular reservoirs.

P6, L20: Under saturation is not visible in fig.1c, because the figure shows annual median values. As stated somewhere else, all reservoirs were annually net CO₂ emitters.

P6, L30: The median for spring and summer was both 0.63 m/d

P7, L13-17: We will check the alternative approach to calculate annual fluxes proposed by the reviewer

P7, L19-25: We used the median annual flux as mentioned in figure caption (not the mean annual as mentioned by the reviewer). Yes - in Fig.5 we took the median of the available yearly data for each reservoir. As stated above, in a revised paper we will primarily rely on monthly data. Thus, we have to recalculate Fig.5 (which is actually based on hourly calculations). We think that the fact that the fluxes from individual reservoirs have a correlation with K is independent from the resolution (hourly or daily wind speed). Just four hourly resolution we have some higher fluxes. The K correlation, if it is verified for individual reservoir, is real and it is not depending on the way of calculation.

P8, L10: We think that the hourly calculated values are probably nearer to reality, because they consider wind fluctuations.

P8, L18-20: We want to acknowledge the work of Striegl and Michmerhuizen who found that shorter residence time (a feature also of small reservoirs) favors CO₂ emission.

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P8, L30-31: We calculated a hypothetical residence time of CO₂ by dividing the TIC content by the CO₂ flux. We will explain that more specifically in the text.

P9, L15: We will check discharge data in our database to verify high flow in winter

P11, L4-5: We want to say that the flux was different between reservoirs primarily because the CO₂ concentration was different.

P11, L6-7: We agree that both CO₂ concentration and k are important to know. However, as our comparison of calculation with and without high resolution wind data shows, ignoring hourly wind fluctuations gave only 22% different total annual fluxes. Thus, uncertainties in k are probably less critical.

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