The model estimates that biogenic reduction can decrease average water column Hg above the mixed layer depth by 7% in the Gotland Deep, due to the transfer of soluble Hg2+ to volatile Hg0, which increases the evaporation of Hg out of the water to the atmosphere. In Fig. 7 we can see that there is still an increase in tMeHg (13%) above the oxycline without bioaccumulation and biogenic reduction, while there is no increase (<0.5%) below the oxycline. This means that biogenic reduction decreased tMeHg, but the increase caused by bioaccumulation is higher above the mixed layer depth. Figure 8 shows the seasonal difference in the tHg and tMeHg in the 3D MERCY v2.0 model between runs with and without biogenic reduction and the cyanobacterial biomass in the surface layer. Note that we isolated the effect of biogenic reduction in these setups so bioaccumulation does still occur. The MERCY v2.0 model shows a similar decrease in the Gotland Deep as the 1D GOTM setups, but it shows a higher decrease in tHg in coastal areas of up to 0.8 pM during autumn~~20%~~. Additionally, it shows that while cyanobacteria are most abundant during autumn (Fig. 8 g), they decrease the tHg content throughout the year (Fig. 8 b, e, h, k), there is an average decrease of -0.2 pM~~16%~~, which is highest during the autumn bloom (-0.5 pM)~~(-17%)~~ and lowest in summer before the bloom (<-0.1pM) in the open Baltic Sea~~-15%)~~.

Finally, cyanobacteria and biogenic reduction only occur in the Baltic Sea in the model, but we can see a decrease in tHg in the Southern North Sea of up to -0.6pM ~~7.5%~~ in summer and autumn and -0.5pM~~5%~~ in winter and spring. The difference in tMeHg ~~is, however, less pronounced~~ follows a similar pattern with a decrease of up to -0.05pM~~3%~~ in tMeHg during autumn ~~and winter~~ and~~with~~ a smaller decrease of -0.02pM~~-1%~~ during the rest of the year~~spring and summer~~ in the Gotland Deep. There appears to be a small ~~no noticeable~~ decrease in tMeHg in the Southern North Sea during summer and autumn of up to -0.03pM~~Southern North Sea (<-1%)~~.

This demonstrates that cyanobacteria can have a very large impact on the tHg budget of the Baltic Sea, even in areas where they are less abundant, and this effect is relevant throughout the year. Kuss et al. (2017) finds that cyanobacterial-induced biogenic reduction causes approximately 30% of all Hg evaporation during summer, since we have cyanobacteria in our model for months, a year-round average decrease of -9% of tHg above the mixed layer depth and a total decrease of up to -20% during summer and autumn is in line with these observations. Since Hg evaporation equilibrates the ocean with the atmosphere, the annual average flux is not changed dramatically (-0.3%, or -0.42 nmol m-2 y-1) as seen in the Fig. 7. Rather, the aquatic Hg concentration that leads to this evaporation is lower, due to a higher Hg0/Hg2+ ratio. In addition to the decrease of aquatic Hg, it also changes the seasonality of the evaporation of Hg0. The cyanobacteria cause an increase in evaporation of Hg0 during late summer and autumn facilitated by the cyanobacterial bloom, which is compensated by a small decrease in evaporation when the bloom is over, resulting in a similar yearly average evaporation of Hg0. The cyanobacteria-facilitated reduction in tHg in our model does not mean that an abundance of cyanobacteria would automatically lead to a decreased Hg concentration in other regions. Cyanobacteria are a very diverse group, and not all cyanobacteria will decrease Hg2+ to Hg0 (Kuss et al., 2015). This is visualised in more detail in Fig. S4, where we show the 10-year average daily evaporation and 30-day running average of the relative difference between the 10-year average of the base case and scenario C (no bioaccumulation nor biogenic reduction).