This is a rather lengthy manuscript for a study in a small area lasting only one year. There is little new information (besides the site-specific data), and the manuscript should be significantly shortened.

Thank you for your comment, though we naturally do not agree that there is little new information provided in our manuscript. However, we see the point and will shorten the manuscript in the results and discussion sections in the final version.

The abstract is way too descriptive and has little useful information for readers. Quantitative ones in the abstract and the conclusions should replace qualitative statements.

Thank you for this comment. We will add quantitative values in the abstract and conclusion sections. However, since the annual estimates are near zero, we prefer to keep the last sentence without a quantitative value.

Abstract. Significant research has been carried out in the last decade to describe the CO_2 system dynamics in the Baltic Sea. However, there is a lack of knowledge in this field in the NE Baltic Sea, which is the main focus of the present study. We analysed the physical forcing and hydrographic background in the study year (2018) and tried to elucidate the observed patterns of surface water CO_2 partial pressure (pCO_2) and methane concentrations (cCH_4). Surface water pCO_2 and cCH_4 were calculated from continuous measurements during six monitoring cruises onboard R/V Salme, covering the Northern Baltic Proper (NBP), the Gulf of Finland (GoF) and the Gulf of Riga (GoR) and all seasons in 2018. The general seasonal pCO_2 pattern showed oversaturation in autumn-winter (average relative CO_2 saturation 1.2) and undersaturation in spring-summer (average relative CO_2 saturation 0.5), but it locally reached the saturation level during the cruises in April, May and August in the GoR and in August in the GoF. cCH_4 was oversaturated during the entire study period, and the seasonal course was not well exposed on the background of high variability. Surface water pCO_2 and cCH_4 distributions showed larger spatial variability in the GoR and GoF than in the NBP for all six cruises. We linked the observed local maxima to river bulges, coastal upwelling events, fronts, and occasions when vertical mixing reached the seabed in shallow areas. Seasonal averaging over the CO_2 flux based on our data suggest a weak sink for atmospheric CO_2 for all basins, but high variability and the long periods between cruises (temporal gaps in observation) preclude a clear statement.

6 Conclusions

Spatial patterns and seasonal dynamics of CO_2 and CH_4 were studied in the north-eastern Baltic Sea area. We observed that the southern GoF and GoR have considerably higher spatial variability and seasonal amplitude of surface layer pCO_2 and cCH_4 than measured in the Baltic Sea offshore areas (pCO_2 50-1200 µatm vs 100-550 µatm, respectively; cCH_4 80 vs 22 nmol L^{-1}, respectively). The main processes behind this high variability are coastal upwelling events, hydrographic fronts (e.g. Irbe front), mixing reaching the seabed and possible shifts in the timing of bloom events influenced by hydrography. On average, the CO_2 air-sea fluxes in the north-eastern Baltic Sea are similar between the sub-basins but with larger amplitudes in the coastal areas. However, regional variations in CO_2 dynamics also result in differences in annual flux estimates between the sub-basins.

Due to the observed high variability, it is recommended to continue similar high-resolution measurements in the coastal and offshore areas at least every season during the regular environmental monitoring cruises. It is essential for accurately evaluating the role of this region in the Baltic Sea carbon budget and to predict potential future changes due to anthropogenic/climatic pressures. Additionally, high-resolution pCO_2 measurements have a strong potential to contribute to eutrophication monitoring, enabling quantitative assessment of organic matter production and mineralisation (Schneider and Müller, 2018), and can be used as a pivotal parameter to trace acidification.

Minor points:

1. It may be confusing to state that pCO2 and cCH4 were calculated from continuous measurements. They were indeed measured, albeit with an intermediate step of converting xCO2 and xCH4 to pCO2 and cCH4.

Thank you for the comment. To make the sentence in the abstract more clearly understood, we will modify it accordingly: Surface water pCO_2 and cCH_4 were continuously measured during six monitoring cruises onboard R/V Salme, covering the Northern Baltic Proper (NBP), the Gulf of Finland (GoF) and the Gulf of Riga (GoR) and all seasons in 2018.

2. The pCO2 vertical scale should be modified to eliminate the empty space below 350 in Fig. 4 so that the signals are enlarged.

Thank you for the comment. The scales between Figs. 4-9 are identical (unless stated otherwise in the figure caption) and were compiled so that the six cruises of the year could be compared more easily. Therefore, we prefer not to modify the scale in Fig. 4, acknowledging that this leads to reduced resolution in some cases.