

Significance and major comments

- The authors evaluate new observations of gas transfer velocity calculated using the dual tracer method in the Baltic Sea and compare their findings to previously established gas transfer velocity equations for the open ocean, coastal regions, and the Baltic Sea.
- Overall, the manuscript contributes meaningfully to the large body of work investigating air-sea gas transfer velocity. The manuscript clarity needs major improvement. The introduction does not adequately set up the background and knowledge gap that this study is investigating and the methods are not described in enough detail for reproducibility. There are several instances in the results and discussion where the text does not fully state the result. A few of instances are identified in specific comments below.
- It is mentioned that EC fluxes were measured on this cruise but they do not seem to be reported here or used for comparison to the dual tracer results.

Comments

- Table 1 – recommend adding lines to separate columns (currently there are floating + that I assume belong in the equations for column 2). It also would be helpful to add a marker in column 1 to differentiate the method used by each of the studies (for example: *Ho et al. (2006), with key at the end of the table indicating that * means dual tracer experiment).
- Section 1.2 the introduction would benefit from including the role of inverse wave age, surfactants, and bubbles (and the role of salinity) on gas transfer velocity. The introduction does not adequately address why the Baltic Sea is a region of interest. The first sentence of the paragraph does not connect to the rest of it.
- Line 75: it would be helpful to the reader to note that CTD stations are referenced based on what Year day they were collected on.
- In Section 2.1 the authors state that the cruise was equipped to measure k using dual tracer and EC methods but do not report EC results.
- Line 100: adjustment of ship observed winds using ERA-5 needs to be explained in more detail. (for example: Does the ship U10 get adjusted to match the ERA-5? Is the correction only done when the wind is blowing from specific directions? How is the time mismatch accounted for between ERA5 and 1-min ship observations? Is the amount of flow distortion known for this ship? What percentage of observed winds were from the direction of minimum distortion?)

- Line 105: Was flow distortion accounted for in the 3D sonic anemometer winds? What metrics were used to compare the measured vs calculated u^* (please report the results in the main text).
- Line 119 seems out of place. This section described physical parameters that were measured in the field campaign and this sentence is a log of cruise activity- It might fit better in Line 60. It is not clear that ERA5 winds are used after YD 193 because the ship was out of the study site.
- Line 160 are the environmental conditions observed during the observational campaign representative of the mean conditions?
- Line 169 the measured $k(660)$ is the same as observed $k(660)$ – recommend using consistent terminology to avoid confusion.
- Line 179 I think it should be acknowledged that two of the Baltic Sea parameterizations were derived using EC methods, since you talk about these separately. Based on this analysis, it seems to me that EC methods consistently produce higher estimates of gas transfer compared to dual tracer methods.
- Line 186 can you expand on the analysis of the ratio of observed $k(660)$ compared to Ho et al. (2006). How do the authors interpret the value of 0.65?
- Line 215 this section made me wonder if the differences of u_{10} from observations compared to ERA5 reported in the methods section could partially contribute to the discrepancy between the dual tracer results and EC results.
- The observations from this field campaign were collected in a seemingly narrow range of inverse wave age compared to the other Baltic GasEx observations. The authors do not acknowledge whether this is expected for the time of year of the field campaign or if it is the result of a distinctly different part of the Baltic Sea compared to the GasEx region.
- Reference list missing Wanninkhof (2004)
- Table 3 are there row labels missing?