

Interactive comment on “Uncertainties in wind speed dependent CO₂ transfer velocities due to airflow distortion at anemometer sites on ships” by F. Griessbaum et al.

Anonymous Referee #2

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General Comments:

The paper is well written and addresses the effect of flow distortion on gas exchange parameterization, which has largely been neglected till now. Their important conclusion is that the effect, while significant, is insufficient to reconcile different gas exchange parameterizations. The paper is worthy of publication.

The paper builds on earlier publications on airflow distortion and contains valuable guidance to the placement of measurement sites on ships for researchers planning marine wind and flux measurements. In particular, the modelling indicates how local obstacles can be as important as the flow distortion over the hull; a factor which is often

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overlooked.

A significant omission of the paper is the lack of reference to satellite scatterometer wind data. Reading the paper one would think that all gas exchange parameterizations are based on ship- or platform-based wind measurements. In fact many studies, including ones cited in the paper, are based on satellite scatterometer winds which are not subject to the flow distortion errors. However the point can still be made that in order to compare ship-based wind speed parameterizations with satellite-based ones, it is necessary to address the airflow distortion effect.

Specific comments:

The opening sentence of the Abstract should be expanded to include platforms (as well as research vessels and merchant ships), since 3 of the 4 parameterizations in Table 1 and Figure 5 are based on platform rather than vessel measurements.

p 18841 line 3: The description of the gas flux equation is somewhat loose. $p\text{CO}_{2\text{sw}}$ is described as the concentration of CO₂, but technically it is the partial pressure of CO₂. The convention is to use C for concentration, ie $k = F/(C_w - \alpha C_a)$.

p 18842/3 There are several paragraphs of discussion concerning voluntary observing ships (VOS). While the airflow distortion aspects are well referenced, there is a lack of reference to their use for measurement of CO₂ fluxes, which is the novel theme of this paper. How widespread is the use of VOS for CO₂ fluxes, or what is the likely use in the future? e.g. Padin et al. (2007) J. Mar. Sys.

In the Methods section it is stated that the initial conditions of the simulation include a turbulent regime downstream. If this was the case, then could the authors elaborate on the turbulence parameters used to initialize the simulation? Commonly, simulations are started with laminar flow, and allowed to evolve into a turbulent regime.

The Summary and conclusion section provides valuable advice for minimizing the impact of flow distortion effects around the hull. I would like to see some guidance on

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avoiding flow effects from pedestal effects which the authors have shown to be important, based on the modelling.

Technical corrections:

p18852 l 23: The wording says that k will be biased by a factor of 2 or 3 (i.e. 200% or 300%). I think what is meant is that the percentage bias is increased by a factor of 2 or 3.

p18853 line 13 cubical -> cubic

Table 1 caption: ist -> is

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 18839, 2009.

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