

Interactive comment on “Sea-to-air and diapycnal nitrous oxide fluxes in the eastern tropical North Atlantic Ocean” by A. Kock et al.

Anonymous Referee #2

Received and published: 18 January 2012

This paper described and compared the sea-to-air and diapycnal fluxes of N₂O in the upwelling region off Mauritania. They found that the discrepancy between these fluxes can't be explained by biological N₂O production in mixed layer or vertical advection alone and attributed to a significantly reduced gas exchange due to the occurrence of surfactants. Although there is no direct evidence for a correlation between surfactants and reduced N₂O fluxes, it is nevertheless a worthwhile contribution to the nitrous oxide literature and should therefore be published. There are however a few issues that should be attended to in order to improve the clarity of the manuscript:

1. Sea-to-air fluxes are shown in Table 1. I think it would be more valuable if more information (i.e. wind speed, temperature and Δ N₂O) was given. The significant figures of fluxes shown in Table 1 should be checked and keep consistent. Since the sea-to-air

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N₂O fluxes estimated from the Tsai and Liu (2003) parameterization are much lower than those estimated by other more frequently used parameterizations, but still were thought as reasonable, more information about this parameterization should be given in the text. In particular more discussion on its reasonability and reliability should be addressed. It is not reasonable to attribute the discrepancy to surfactant only because Tsai and Liu (2003) parameterization yield an appropriate flux to close the budget. How were the uncertainties to estimate diapycnal N₂O fluxes and vertical advective fluxes in this manuscript? The choice of winds peed parameterization introduces considerable uncertainty into the estimate of N₂O air-sea fluxes as shown in Table 1. Will all these uncertainties contribute much to the discrepancy between the sea-to-air and diapycnal fluxes of N₂O?

2. The authors should compare their estimated sea-to-air fluxes and diapycnal N₂O fluxes with published results from other upwelling regions.

3. Wind speeds: This is important for the calculation of the air-sea fluxes because they heavily depend on the applied wind speeds. It was mentioned in the method section that wind speeds were obtained from the ship's underway observations (page 10232, lines 22-23). However, in section 3, the sea to air N₂O fluxes were mentioned to be calculated from 3 day mean QuikScat wind speed (page 10235, lines 5-7). Does that mean different types of wind speeds were used for different parameterizations? The authors do not make this clear. Please give more details of the used wind speeds.

4. Figure 2: The symbol used in this figure is not clear enough, hence I suggest changing to other symbols.

5. Figure 4: Box plot may be better to show the variations and average of N₂O fluxes for different regions.