

## ***Interactive comment on “Gas exchange estimates in the Peruvian upwelling regime biased by multi-day near-surface stratification” by Tim Fischer et al.***

### **Anonymous Referee #1**

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#### **1 General Comments**

The article by Fischer et al. is concerned with the impact of stratification on the air-sea gas exchange of  $N_2O$ , which leads to gradients of dissolved nitrous oxide which diminish as the surface is approached.

This type of study has been carried out for  $CO_2$ , but this is the first time that such a study has been conducted for  $N_2O$  in an upwelling region, which are recognised as hotspots for  $N_2O$  emission. It is important to better constrain the air-sea exchange of  $N_2O$  as it is thought that the ocean is a strong source of  $N_2O$ .

C1

The authors provide reasonable and justifiable arguments for the effect of stratification on  $N_2O$  gas exchange, and with some further effort the article could be published.

#### **2 Specific Comments**

P3L28: Add references to Sutherland et al. 2014 and Sutherland et al. 2016

For figure 4, can you add a mean diurnal cycle of temperature. I would like to see the extent of the thermal stratification.

section 2.2.5: can you add a histogram of the wind speed data used

section 2.2.7: I did not fully understand your model. Can you please elucidate with a schematic? I also did not understand why the model was constrained by the glider data only.

#### **3 Technical Corrections**

P5 L2: define OMZ

P5 L5: and will be called ‘oxygen interface’ in the following – > henceforth referred to as ‘oxygen interface’

P5 L6: express 0.5 nm in meters

P5L7: ship-caused – > ship-induced

P7L27: Fig 4 comes before fig 2

P9L1: It is to be investigated – > Here we investigate

P10L18: you cannot start a sentence with I.e.

C2

#### 4 References

Sutherland, G., L. Marié, G. Reverdin, K. J. Christensen, G. Bröstrom, and B. Ward, 2016. Enhanced turbulence associated with the diurnal jet in the ocean surface boundary layer. *J. Phys. Oceanogr.*, 46:3051–3067.

Sutherland, G., G. Reverdin, L. Marié, and B. Ward, 2014. Mixed and mixing layer depths in the ocean surface boundary layer under conditions of diurnal stratification. *Geophys. Res. Lett.*, 41:8469–8476

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