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Interactive comment on "Nitrous oxide and methane in two tropical estuaries in a peat-dominated region of North-western Borneo" *by* D. Müller et al.

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We thank Anonymous Referee 2 for the positive evaluation of our manuscript. Our replies to the detailed comments can be found below.

This paper presents new information on seasonal differences in N2O and CH4 fluxes in mangrove environments. It furthers our understanding of the role of natural factors such as salinity, DO and DOC on greenhouse gas production in a generally sparsely-sampled region. There are a few minor issues to address:

Spelling/Grammar: This paper is very well written, there were only a few issues that I could find.

1. Page 8, line 10: "N2O was correlated with DOC (Fig. 2a), whereas this correlation was strong..." I think this should be "N2O was correlated with DOC (Fig. 2a), *and* this correlation was strong..." or just "N2O was correlated with DOC (Fig. 2a); this correlation was strong..."
This will be corrected in the revised manuscript (suggestion 2).

2. Page 9, like 17: "...the Lupar and Saribas rivers are no blackwater rivers..." Is this meant to say "...are *not* blackwater rivers..." It's technically correct either way, but the first phrasing sounds more colloquial.
We will change this to the more formal phrasing in the revised manuscript.

3. Page 10, line 15: "Either, a source of N2O exists on the continental shelf..." This comma is unnecessary.
The comma will removed from the sentence in the revised manuscript.

Other Comments:
1. This paper refers to k-value calculations derived from floating chamber experiments (covered in an earlier paper, Müller et al., 2015). It might be a good idea to make it clear in the methods section that these k values are from floating chambers, to distinguish this k calculation from the more common technique of estimating k-values from equations well-known in the literature.
We agree, we will replace the following sentence:
For k, we used k600 values that were reported for the Lupar and Saribas estuaries in Müller et al. (2015a).

with

For k, we used k600 values that were derived for the Lupar and Saribas estuaries using the floating chamber method (Müller et al., 2015a). Floating chamber measurements were conducted at several locations along the estuaries during the wet season campaign and averaged over the spatial extent of the individual estuaries. We argued in Müller et al. (2015a) that the k600 values determined in this way are more appropri-

ate than commonly used wind speed parameterizations, which neglect the influence of tidal currents and the water flow velocity.

2. On a related point, gas transfer velocities can be temporally and spatially heterogeneous. Were the floating chamber measurements made near the field site? Were they made upstream, downstream, or along the length of the estuaries? A brief mention of the location or timing of the floating chamber measurements might give a better idea of the precision of this approach to k-value calculation.
We will add this information in the methods section as indicated in the reply to your comment above.

3. The authors thoroughly document the source of the atmospheric mixing ratios of N2O and CH4 (which are needed in order to calculate water-to-air fluxes). However, from what I understand, the N2O flux totals are likely going to be much more sensitive to the choice of k-value. Is there some reason why the k-value would be particularly sensitive to the atmospheric mixing value (say if it were 325.25 ppb rather than 325.15 ppb)? Considering that the local air mixing ratio could be slightly greater or less than the Mauna Loa value, it might be good to mention that this isn't a large source of error in the calculation.
The k600 values were derived from CO_2 fluxes measured with a floating chamber and simultaneous measurements of the pCO_2 in water and in the air. That is, when we determined the k600 in the first place, we used atmospheric concentrations measured at the site and not mixing ratios determined elsewhere. Therefore, for the k600 values themselves, the error for $pCO2^{air}$ is not significantly larger than the instrument's uncertainty. Nevertheless, as you mentioned in comment 2 as well, the k600 can be temporally and spatially variable. Therefore, with respect to the calculated N_2O and CH_4 fluxes, k600 still causes the largest uncertainty. We did a simple error propagation calculation on the average values, assuming an error of 60% for k, 0.5% for K_0, 2% for $pCH_4{}^{water}$ and 0.2% for pN_2O^{water} (disequilibrium error, Johnson 1999) and 1% for pCH_4 and pN_2O in air. As a result, the uncertainty in k accounts for 96% of the flux un-

certainty. Therefore, we think our approach of reporting the flux with the % uncertainty of k600 is justified. We will change the caption of Table 4 to

k600 values and median N_2O and CH_4 areal and total fluxes from the Lupar, Saribas and the Saribas tributary. The uncertainties relate to the maximum variability of the k600 value, as the k600 uncertainty propagation was responsible for approximately 96% of the flux uncertainty. Values are given for the spatial extent of the rivers that was covered in 2013.

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