bg-2018-278

Author response to RC1

The manuscript bg-2018-278 by Jin et collaborators explores Vannote's (1980) river continuum concept in the light of river damming and urban effluents. The dataset is consistent and the statistical approaches (nonparametric tests) seem appropriate. Nevertheless, I would recommend replacing the fitting (R2, p-value) by discriminant/cluster analyses. There is no physical meaning in R2 values that, despite the p<0.001, evidence weak correlations (coefficients of determination ~<50%). Those plots are more suitable for discriminating spatial variability than fitting meaningless polynomials.

<Response> We thank you for your positive evaluation of our manuscript. Results of reach-based data clustering (Fig. 4) and PCA (Fig. S3) have been included in the revised manuscript in response to your and the second reviewer's suggestions. Descriptions of used statistical analyses and data interpretations have been provided in relevant sections (Lines 257-264: When all measurements of three GHGs and water quality were pooled for the whole river basin, at least one of three GHGs exhibited an overall negative relationship with pH (pCO_2) and DO (pCO_2 and CH_4) and a positive relationship with DOC (all three GHGs) (Fig. 4). Regression analysis conducted with separate data sets clustered for each of three reaches and urban tributaries showed several significant negative or positive relationships (Fig. 4). A positive relationship between DO and N_2O in the lower reach was noticeable compared with no significant relationship found for the other reaches. Reach-specific clustering of data was also found on a PCA scatter plot with two primary components accounting for 57.5% of variations (Fig. S3). While the upper and middle reach data were overlapped considerably on the PCA scatter plot (the upper reach with a wider scatter), the majority of the lower reach data were separated from the overlap of the upper and middle reaches.**).**

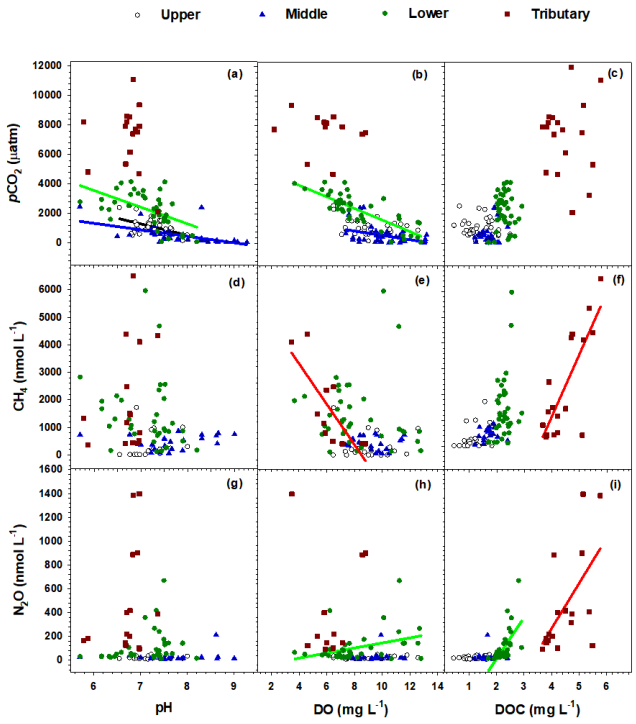

Figure 4. Relationships between water quality (pH, DO, and DOC) and dissolved concentrations of three GHGs (pCO_2, CH_4, and N_2O) measured in the Han River basin. Regression analysis was conducted with data clustered for each of the upper, middle, and lower reaches, and three urban tributaries (TC, JN, and AY). Only significant ($P < 0.05$) relationships are indicated by the regression line through the plot.

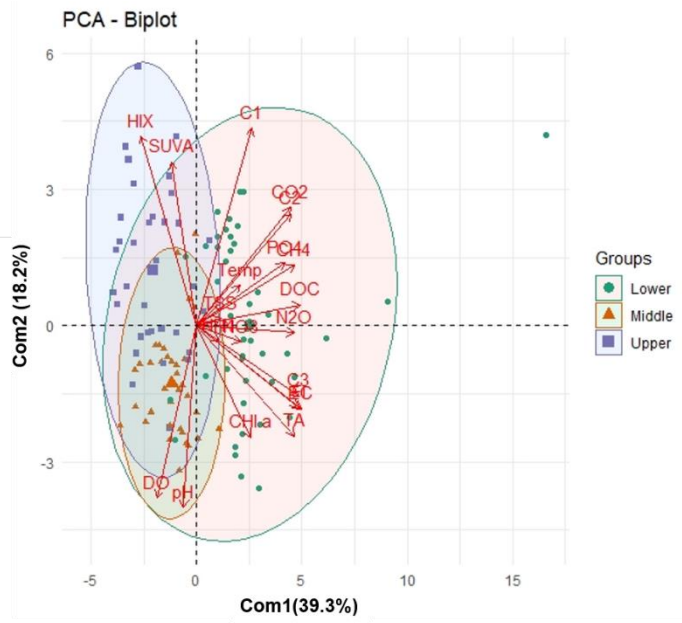

Fig. S3. Reach-based grouping of all measurements in the upper, middle, and lower reaches of the Han River alonng two components identified by principal component analysis (PCA).

On the other hand, the authors should also consider references for broadening the systemic understanding of the focused problem. I recommend to the authors to: 1) Explore/discuss your data under the Riverine Ecosystem Synthesis (Thorp, J.H., J.E. Flotemersch, M.D. Delong, A.F. Casper, M.C. Thoms, F. Ballantyne, B.S. Williams, B.J. O'Neill, C.S. Haase. 2010. Linking Ecosystem Services, Rehabilitation, and River Hydrogeomorphology. BioScience 59(1): 67-74. https://doi.org/10.1525/bio.2010.60.1.11), which extends the river continuum approach with the flood pulse and space-time scaling; 2) Explore/discuss your data under the ecohydrology perspective (Bergier, I., Ramos, F.M. & Bambace, L.A.W. Environ Monit Assess (2014) 186: 5985. https://doi.org/10.1007/s10661-014-3834-2) that regards the land-use in the landscape as fueling GHG emissions; and 3) Finally, also consider the study provided in Abe et al (2009) (https://www.tandfonline.com/doi/abs/10.1080/03680770.2009.11902248) regarding wastewater, algal bloom and GHG emissions from dams.

<Response> Thanks for recommending these useful references. Two papers have been cited in L 500-503 (following sentences stressing the limitation of the conventional river continuum concept): The observed reach-specific patterns of altered water quality and GHG dynamics provide empirical evidence for ecosystem structural and functional responses to anthropogenic changes in hydrogeomorphic patches of the fluvial landscape, which have been emphasized in recent conceptual models integrating fluvial geomorphology and ecosystem processes at the valley to reach scales (Thorp et al., 2010).

Also in L 366-367 (following a discussion of DOC-CH4 transformation): As noted by Bergier et al. (2014), organic wastes released from local sources might have contributed to the transformation of DOC to CH_4.