Reply on RC2

Chinchu Mohan et al.

Author comment on "Poor correlation between large-scale environmental flow violations and freshwater biodiversity: implications for water resource management and the freshwater planetary boundary" by Chinchu Mohan et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-87-AC2, 2022

Authors sincerely thank Anonymous Referee #2 for their constructive comments which have helped to improve the article. We address each comment in turn below.

Note: All line numbers in responses correspond to revised manuscript.

Comment 2.1: This manuscript is mostly about correlation analysis. However, it is not clear to me from the manuscript what correlation analysis method was used by the authors and justification was not provided.

Response 2.1: None of the datasets used in this study exhibited nonlinearity. Therefore, this study uses first-order linear regression analysis to evaluate the EF-biodiversity relationship. Additionally considering the suggestion from Referee 2, a multivariate regression analysis was also carried out to evaluate the combined impact of different EF violation indices.

An explanation of the choice of regression analysis is added in the methodology section of the paper.

Line 278 - 281: 'The relationship between freshwater biodiversity and EF violation was evaluated using regression analysis. None of the relationships explored in this study exhibited any nonlinearity and hence first-order single variate and multivariate linear regression analysis was opted for this study for reasons of parsimony and to achieve reasonable correlation accuracy. '

Comment 2.2: A second comment is on the use of correlation only. Why look at this on a one vs. one variable basis? Why not develop appropriate statistical approaches to look into the effects of the explanatory variables at the same time. which can also provide statistical significance?

Response 2.2: Considering the suggestion from Referee 2, a multivariate regression analysis was carried out for each G200 ecoregion when revising the paper. These new results were added to the manuscript (See section 3.2, Fig. 5). The results are in line with the single variable linear regression analysis given in the main manuscript. The mean

coefficient of determination (r^2) is approximately 0.1.

The following explanation of the multivariate regression is also added to the manuscript

Line 380-384: In addition to this, the multivariate regression analysis results (Fig. 5) also show a very low correlation between EF violation indicators and biodiversity indices in most G200 ecoregion, except in small lakes where the coefficient of determination is between 0.25 - 0.4 for the richness indicators (TR, FR, PR). The mean coefficient of determination (r^2) is approximately 0.1.
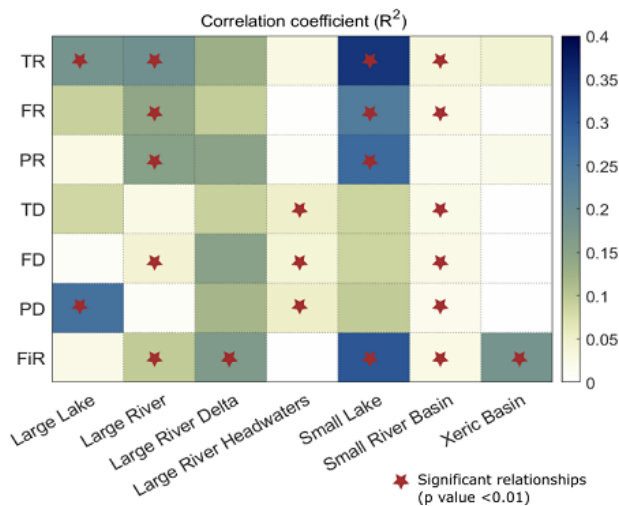

Fig. 5 Coefficient of correlation (r2) for multivariate regression. Each row represents on biodiversity indicator and each column represents one G200 ecoregion

Comment 2.3: I am not sure if Box 1 is needed or if it follows the HESS journal guidelines. Why not just provide these paragraphs in the manuscript text?

Response 2.3: Adding the information in Box 1 could disrupt the overall flow of the manuscript. The information in Box 1 could however aid the readers who are not very familiar with the planetary boundary concept or who want to know more about it. The HESS manuscript format mandates do not explicitly say that boxes are not allowed.

Comment 2.4: Data: While Table 1 provides a nice summary of the various data in this study, a flowchart diagram is strongly recommended to help readers to understand the different underlying layers, e.g., the different variables, the different EF calculation methods, the different GCM models, etc.

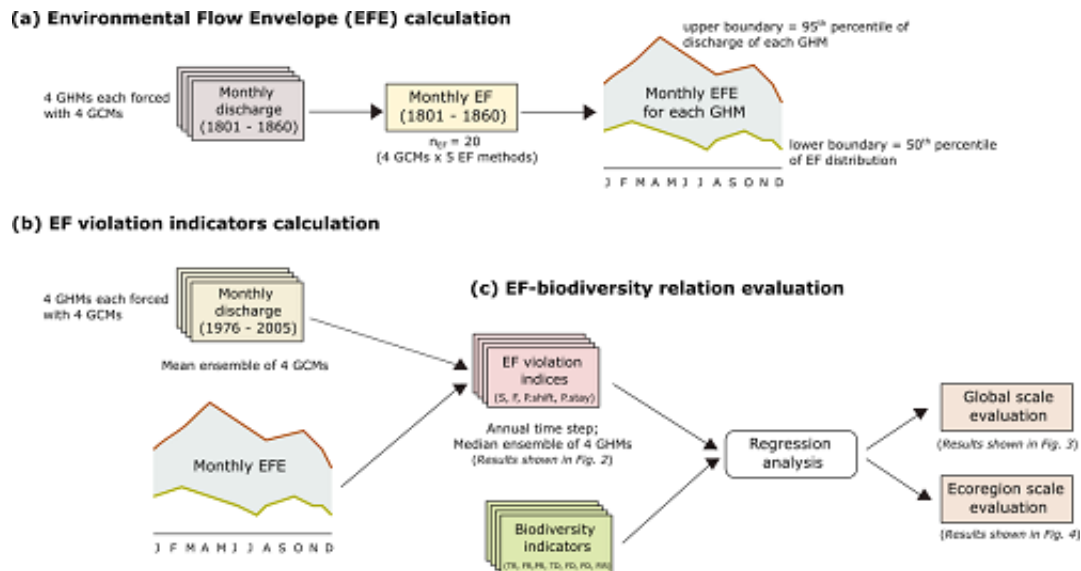Response 2.4: A flowchart summarizing the EF violation indicators calculation is added (see new Fig. 1)

Fig. 1 Methodology outline for (a,b) EF violation indicators calculation and (c)EF-biodiversity relationship evaluation

Comment 2.5: Data: For S and F, the authors says that these variables are normalized. Please be more clear on the normalization.

Response 2.5: In order to make the different EF violation indices comparable, the values of violation indicators (F and S) were scaled (or normalized) between 0 to 1 using the following formula

$$X_{normal} = \frac{X - X_{min}}{X_{max} - X_{min}}$$

where, X_{normal} = normalised value; X = actual value; X_{min}= minimum value in the dataset; X_{max} = maximum value in the dataset.

Please refer to Response 1.5 to referee 1 for more information

Comment 2.6: Line 294: Is it redundant to list Middle East, Iran, and Iraq?

Response 2.6: Thanks for pointing this out. Iran and Iraq are removed as those are indeed part of Middle East (Line 319-321)

Comment 2.7: Line 327: I don't think "negative trend" is the right word choice.

Response 2.7: We agree. The word negative trend is replaced with negative correlation (Line 353 and Line 377).

Additionally, all the reference formatting errors are fixed in the revised manuscript.

Please also note the supplement to this comment:
https://hess.copernicus.org/preprints/hess-2022-87/hess-2022-87-AC2-supplement.pdf