

Reviewer 1:

The authors have dealt with most of my prior comments comprehensively. My final recommendation is on the interpretation of the new result relating to the command area (shown in appendix 4). This limited analysis (only daily KGE) over the one basin (Mississippi) shows that the command area adds only very marginal value, and gives the reader no strong sense of the value of command area in general. Instead of further trying to defend the use of a command area without strong evidence of its value, the authors may instead reflect on this result and ask whether downstream demand areas are really worth adopting in global hydrologic models with reservoirs. Better yet (and this is something I strongly encourage), run the global simulation (all basins) without the demand area in place so there is a definitive answer on whether this feature is worthwhile. If the Mississippi result is reflected elsewhere, the authors can make an impactful statement on the real drivers of reservoir operations globally--i.e., set by storage curves and generally uninfluenced by downstream demand, at least if demarked by an arbitrary command boundary. This would be useful information to inform future efforts and new approaches to representing dams at global scale, as it would suggest efforts ought to be placed on better understanding storage curves and operations with respect to storage conditions, which are increasingly available with satellite data and related approaches.

Thank you for comment regarding further evaluation of the command areas. We have opted to run the global simulation with all 53 basins using the updated reservoir operations but have left out the command areas. We then evaluated the daily KGE values of this model in conjunction with the previous modelling setups both via CDFs (Figure 1) and through the boxplots (Figure 2). The analysis of the daily KGEs in the CDF show slightly decreased performances for all the stream gages (Figure 1a), while the 6000 stream gages downstream of dams show limited improvements in some regions (Figure 1b). Aggregating these performances into the boxplot in Figure 2 shows that while the variance in KGE values is lower, the average performance without a command area is actually slightly below that of the other command areas. Therefore, we opted to continue our analysis with the Turn250 model.

In addition to including these two figures and the above rational in the Appendix, we have also amended the following lines to include these changes.

- 1. In the abstract on lines 16 – 18, we include the following: “We also evaluate the sensitivity of our modelling framework to different downstream operating areas (i.e. 0 – 1100km) and found that there were slight improvements when including downstream demands.**
- 2. Lines 528 – 532 now read as follows: Additionally, the addition of no command areas (Appendix Figure A5a and b) demonstrated very small KGE differences. For the rest of our analysis, we decided not to include the other command areas as a boxplot of the KGEs per command area (i.e. Turn250, Turn600, and Turn1100) depicted little to no variations (Appendix Figure A1)**

and the boxplot of KGEs without the command area (Appendix Figure A1) did not show improvements in KGE.

3. Lastly, lines 737 – 739 now read as follows: We did however observe slight improvements when using command areas compared to without command areas. This suggests that reservoir modelers should use a command area, but can opt to use the command area that makes the most sense to their domain (we opt to use 250).

We have made some minor edits for increased readability and edits to the location of the captions.

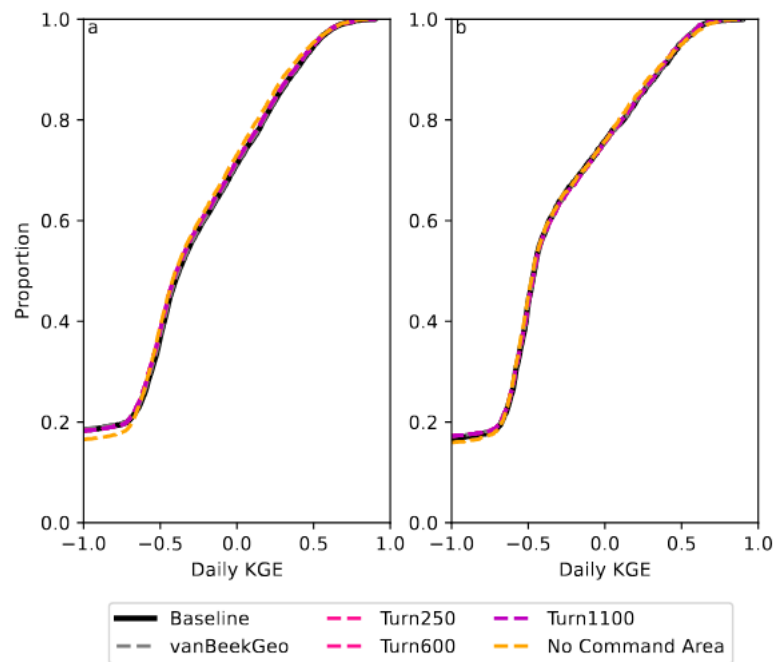


Figure 1: Depicts the cumulative distribution function of the daily KGE values of the three main models in our analysis: Baseline (black), vanBeekGeo (grey), Turn250 (pink), and the run with no command areas (orange). Panel a shows the cumulative distribution of the daily KGE for all the GRDC gages, while panel b shows the daily KGE for the 6,000 gages that are downstream of dams.

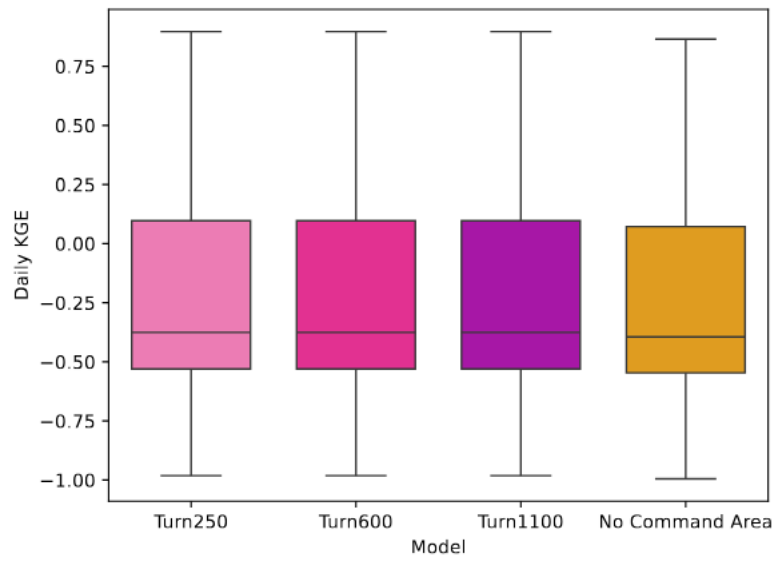


Figure 2: Shows a boxplot of the data derived operational scheme with the three main command areas: 250, 600 and 1100, in different colors. The Turner scheme with no command area is shown in orange.