Reviewer 1:

Steyaert et al. present an approach to deriving reservoir operations for global scale hydrologic models. The study is of value to the water resources modeling community, but requires major revisions before being accepted for publication in HESS. Some elements of the method are not well justified, including the categorization of dams into “irrigation-like” and “hydro-like”, as well as use of a release decision approach based on downstream demand aggregated across an arbitrary command area. Use of a random forest model to extrapolate curves is a nice idea but is not evaluated fully (i.e., using a cross-validation scheme) and appears quite ineffective based on the results shown. Although the level and depth of analysis conducted is impressive, the quality of results/figures is quite poor, and often confusing. The study can be simplified and reworked to deliver more clear and compelling results (with more impactful figures) on improvements offered by a data-derived storage scheme. The paper would also benefit from a significant reduction in number of words. The introduction is 13 paragraphs long and contains a lot of general detail. I encourage the authors to rewrite the introduction in a way that brings immediate focus to the problem area, most recent literature addressing that problem, and aims of the study. Three or four paragraphs will suffice. The abstract, currently almost 400 words, can be halved without loss of essential information.

Thank you for your comment and for noting the importance of our work within the larger reservoir modelling community. We agree that the introduction and abstract can be shortened. We will shorten the abstract to 300 words or less and limit the total number of paragraphs in the introduction to seven that are focused on the following key points:

- **The large number of dams and their impacts**
- **The multiple ways of modelling reservoirs and their current advantages and limitations**
- **How remotely sensed data can support the derivation of operational schemes.**
- **Our main research goals for this publication.**

Comments:

Title: Awkward repetition of "reservoir operations". Did you mean "A data derived workflow for simulating reservoir operations in a global hydrologic model" ? Also, this wording suggests that it is the *workflow* that is data derived, rather than the reservoir operation. So, did you actually mean something like "Data derived reservoir operations in a global hydrologic model" ?

We agree that the repetition of reservoir operations leads to an awkward sentence and that the title sounds like the workflow is data derived. Therefore, we suggest to use your proposed title: “Data derived reservoir operations simulated in a global hydrologic model.”

Abstract L2. "most of the data was not openly accessible". I would suggest that this remains true. Specify the type of data.

We will include the following change: "Globally there are over 24,000 storage structures (e.g. dams and reservoirs) that contribute over 7,000km^3 of storage, yet until recently, most of these data was not openly accessible until recently."

L27. water supply reservoirs, flood control reservoirs, and hydropower dams are found in all climate types.

Thank you for this comment, we will remove the regionality in this sentence. The sentence will read as follows: "With this loss of river connectivity comes a large amount of water storage (over 8,000,000 m^3 (Lehner et al., 2011) that provides water for a variety of purposes ranging from water supply and irrigation to hydropower and flood control."

L187. Do you mean: "...to determine reservoir rule curves that specify seasonal flood and conservation pools..." ?

Yes, this is a more clear and concise way to state what we are referring to. We suggest the following modification to the manuscript: "We input this weekly data into the STARFIT model developed by Turner et al. (2021) (Section 2.4.2) to determine reservoir rule curves that specify seasonal flood and conservation pools. After obtaining seasonal flood and conservation pools for 1752 reservoir, ..."

L205. Not clear what is meant by "yearly maps of static reservoir characteristics".

This refers to the reservoir characteristics used as inputs for PCRGLOBWB2. These maps are used to determine 1) where reservoirs exist and 2) the necessary hydrologic characteristics (outlet points, storage capacity, reservoir id, and surface area) that are used to calculate storage within the model. This input is given to the model as they do not change frequently, however, this also means that new reservoirs will always appears on January 1st and will only contribute to the river management from that day until they are removed (if this occurs during the simulation period). To make this clearer, we propose the following change: "From this updated table, we created annual maps of static reservoir characteristics (e.g. outlet points, storage capacity, reservoir id, and surface area), which are used as inputs to model reservoir releases and to distinguish between two operational policies *hydropower-like* and *irrigation-like*."

Also, since L180 I have been reading and wondering the motivation and reasoning behind these two categories ("hydropower-like" and "irrigation-like"). Please try to clarify the role of this categorization early in the study.

Thank you for your comment. We agree that explaining this classification earlier in the manuscript is useful. We will add a description at line 180 to clarify what these two groupings are. The updated sentence reads as follows: "Using these operational bounds, we derive two main reservoir models *for irrigation-like (*dams that are focused on meeting downstream demand) and *hydropower-like* dams (dams that are focused on holding storage stable). We will also edit the following description at line 205 as follows: "We separated our operations into these two categories as Steyaert and Condon and Salwey et al. noted differences in operational patterns between storage reservoirs (noted as irrigation and water

supply main uses) and non-storage reservoirs (such as hydropower, navigation and flood control uses)."

L250. Please add further detail here on whether any efforts were made to ensure reservoirs were placed on correct streams. From what I read, it seems the lat/lon of the reservoirs are snapped to the PCR-GLOBWB grid then assigned that grid cell.
To correctly match the dams, we calculated the closest grid cells in PCR-GLOBWB 2 to the latitude and longitude reported in GeoDAR and the catchment areas of each grid cell in PCR-GLOBWB 2. We then minimized the eucludian distance between the grid cell and the location of the dam and the difference between reported catchment area and the catchment area on the PCR-GLOBWB 2 domain. This ensures that the GeoDAR dam is mapped to the correct stream and that the entire reservoir sits within a single catchment. In some cases, this information is missing from GeoDAR and we therefore spatially snapped the reservoirs to the nearest latitude and longitude point on the river network. While this could lead to inaccuracies, the 5 minute spatial resolution (approx. 10km) typically contains the largest rivers in the network, so it is not likely that we are mapping large dams to very small rivers. To clarify this in the manuscript we will include the following description on line 250: "We then ensured that the mapped location based on the latitudes and longitudes from GeoDAR also aligned with other reservoir characteristics such as catchment area. We compared the catchment areas reported in GRanD, iCOLD and GeoDAR to the calculated catchment area at the dam location calculated from the PCR-GLOBWB 2 DEM. For each potential location, we minimized the difference in catchment area and the distance to the reported latitude and longitude of the dam."

L270. Ok—here I am now realizing that irrigation-like and hydropower-like categories are used to inform releases, with the starfit approach solely defining storage curves. Doesn't this mean the operations are not full data-driven but rather half data driven (storage curves) and half "generic" (release policy based on command area demand and reservoir purpose)?
Unlike Turner et al., 2022, we were unable to gather enough reservoir data to fully derive the reservoir releases using a purely data derived method as in most cases data for reservoir releases is missing. Therefore, we opted to only derive reservoir storage bounds using static reservoir characteristics described in Section 2.5. These reservoir storage bounds denote the active area within which reservoir release is defined by the equations in Section 2.4. We, therefore, use the two main groupings, *irrigation-like* and *hydropower-like*, to steer the release equations. Both of these groupings take into downstream demand that has been aggregated along the downstream areas of 250, 600, or 1100. We opted to use this instead of a generic scheme as Steyaert and Condon (2024) noted that hydropower and navigation dominate regions in the United States have a more stable reservoir storage compared to regions dominated by irrigation and water supply uses.

In order to clarify this, we plan to update Line 270 – 272 to include the following: "As our analysis is done globally, we use data from the 1752 dams in data from 1752

dams in GloLAKES (Hou et al., 2024) and derive the operational bounds for the STARFIT using a combination of observations and machine learning. To compliment these operational bounds, we employ two main sets of equations based on two main groupings of reservoir main purposes: *irrigation-like* and *hydropower-like* (Section 2.4.4 and Section 2.4.3). We use these two groupings to denote how releases change based on the level of storage. In *irrigation-like* dams, the goal is to meet downstream demand and therefore the equations in Section 2.4.1 prioritize this goals by meeting all downstream demand when reservoir storage sits between the data derived operational bounds and proportionally less when storage sits between the conservation bound and 10% of the maximum storage capacity of the reservoir. For *hydropower-like* dams, the goal is to hold storage as stable as possible. Therefore, the equations in Section 2.4.2 prioritize meeting downstream demand when the storage in the hydropower-like reservoir sits between the data derived operational bounds. However, if meeting this downstream demand causes the reservoir storage to drop below the conservation bound, then the reservoir can only meet a portion of demand to allow storage to stay in the active zone (zone between the operational bounds). For both types of reservoirs, we employ an additional flood release and account for environmental flow requirements as described in Gleeson and Wada (2013)."

L313 – missing reference to equation 5.

We will add the requested reference. Please see the following edits: "To do this, these daily storage, release and inflow values are aggregated into weekly time series and a combination of sine and cosine curves (described by equation 5 below) are fit to the upper and lower percentiles of each time series."

L325-330. I would be very unsure about labels of water supply / irrigation vs hydro etc within GranD leading to a neat splitting of dams respectively operated for downstream demand versus maintaining high storage levels. Apart from the issue of inaccurate reservoir purposes in the available global datasets, one rarely finds such simple distinctions in reality. Are you able to show that two categories of operations actually exist, e.g., by comparing the starfit curves for irrigation-like versus hydropower-like dams in the set of 1752 observed dams? I would be surprised if you find a clear distinction. If this is the case, I don't see strong justification for the splittling—which in a way complicates the study.

We kindly thanks the reviewer for this comment. We do agree that there may be inaccuracies in the main uses in GranD. This said, GRanD is still the leading dataset for determining reservoir main uses. As shown in Figure 3 in the manuscript, there are differences in the two main categories of reservoirs we used, however, we agree that analysis of the StarFIT curves for differences in the operations is useful. In the following figure (Figure 1), we plot the average, maximum and minimum value of the derived STARFIT curves for the *irrigation-like* (blue) and *hydropower-like* (red) dams for both the flood (Figure 1, top row) and the conservation (Figure 1, bottom row) bounds. While the average and maximum flood and the maximum conservation values do not differ much between the dams, we do see large differences in the average conservation and the minimum flood and conservation curves which could be a result of the differing operations at the lower end of storage. Specifically, the

flood minimum peaks in irrigation type dams in the spring and summer months to potentially support downstream demands in more drier periods, while the *hydropower-like* dams have lower flood minimum values. The conservation curves experience the most changes in part due to the *hydropower-like* dams holding storage much higher across the year while the *irrigation-like* dams are meeting downstream demand in the autumn months. For the minimum conservation values, the *irrigation-like* dams have higher storage fractions compared to the *hydropower-like*. Due to the differences in the seasonality of the lower bounds for the flood curve and the differences in the conservation curves, we still think that the distinction in operational schemes is useful. We will include this figure in the supplemental as well as the above description.

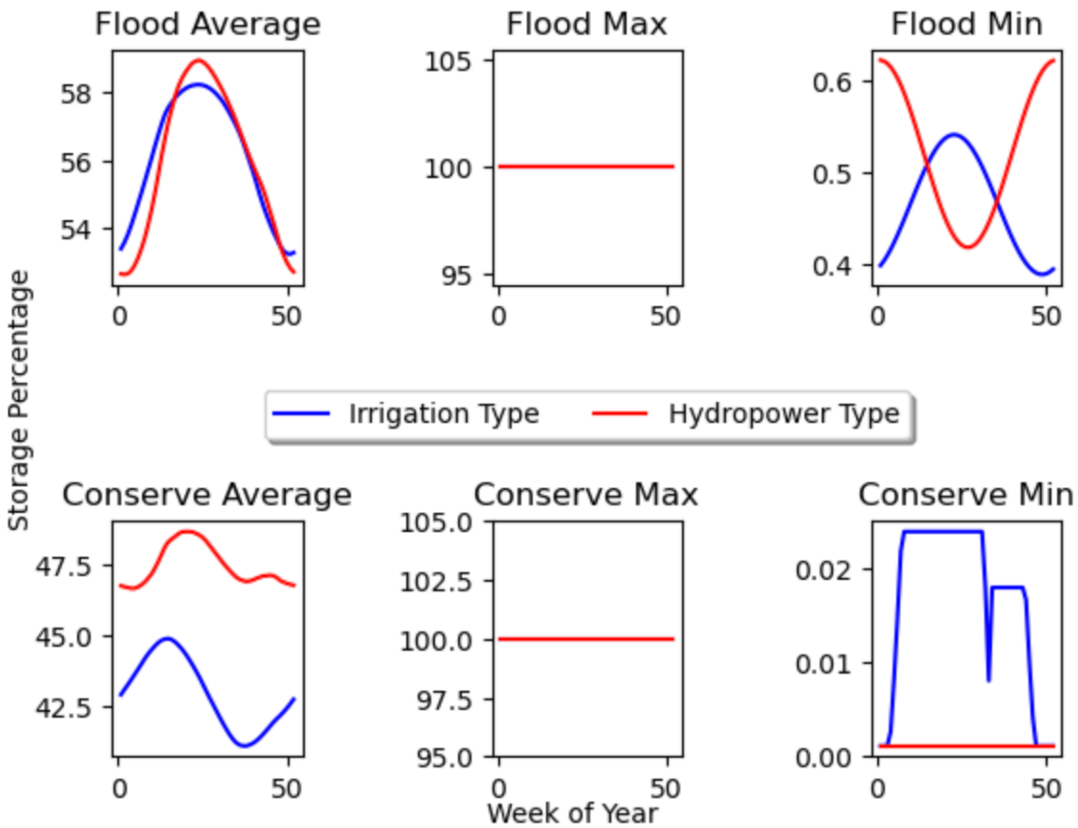

Figure 1: Depicts the average, maximum and minimum flood (top row) and conservation (bottom row) curves that are used in PCR-GLOBWB2

L335. It's unclear to me what the command area offers. The storage curves can guide the release without a downstream demand. Were any tests performed to evaluate whether this downstream demand actually improves on accuracy?

The storage curves are able to guide a release without a downstream area, however, we wanted to include the downstream water demand dependencies. In addition, we wanted to test the sensitivity of streamflow to difference in these three command areas typically described in the literature. We did not solely isolate the downstream command areas in our analysis; however, we do show in our results that the curves separated by reservoir use and using a command area do provide a more accurate representation of reservoir storage globally (Figure 6 and Figure 7 in the submitted manuscript). We acknowledge that it would be useful to

perform a more comprehensive test to see if differences in the command area do contribute to changes in our operational scheme. To do this, we re-ran our model set up for the Mississippi basin and set the downstream command area to 0 which, when multiplied by the downstream demand, removes the demand. We then evaluated the daily streamflow KGE values (Figure 2) to observe the differences between the previous model runs and the model run without the command area. We therefore suggest adding the following figure showing the CDF of the daily KGE values plotted for the Baseline (Figure 2, black), vanBeekGeo (Figure 2, grey), Turn250 (Figure 2, pink) and the Turner operations without a command area (Figure 2, purple) for the Mississippi Basin to the supplemental. From Figure 2, we do see that the addition of the command area and accounting for downstream demand does improve streamflow dynamics when using the two reservoir groupings (*hydropower-like* and *irrigation-like* dams).

To clarify this in the text, we will add the following: "If during this process, another dam intersects the river network before the full command area is created, we assume that this is the maximum distance that is served by the upstream reservoir. This command area is used to aggregate the total downstream demand that could be met by the reservoir. We use this aggregated downstream demand in both the *hydropower-like* and *irrigation-like* dams as both dam types can meet the downstream demand when storage sits between the data derived operational bounds. We found that while our model was not sensitive to the downstream area (Supplementary A1), we did observe that the addition of a command area increased our model performance." We will include a reference to Figure 2 in the text and the figure in the supplementary.

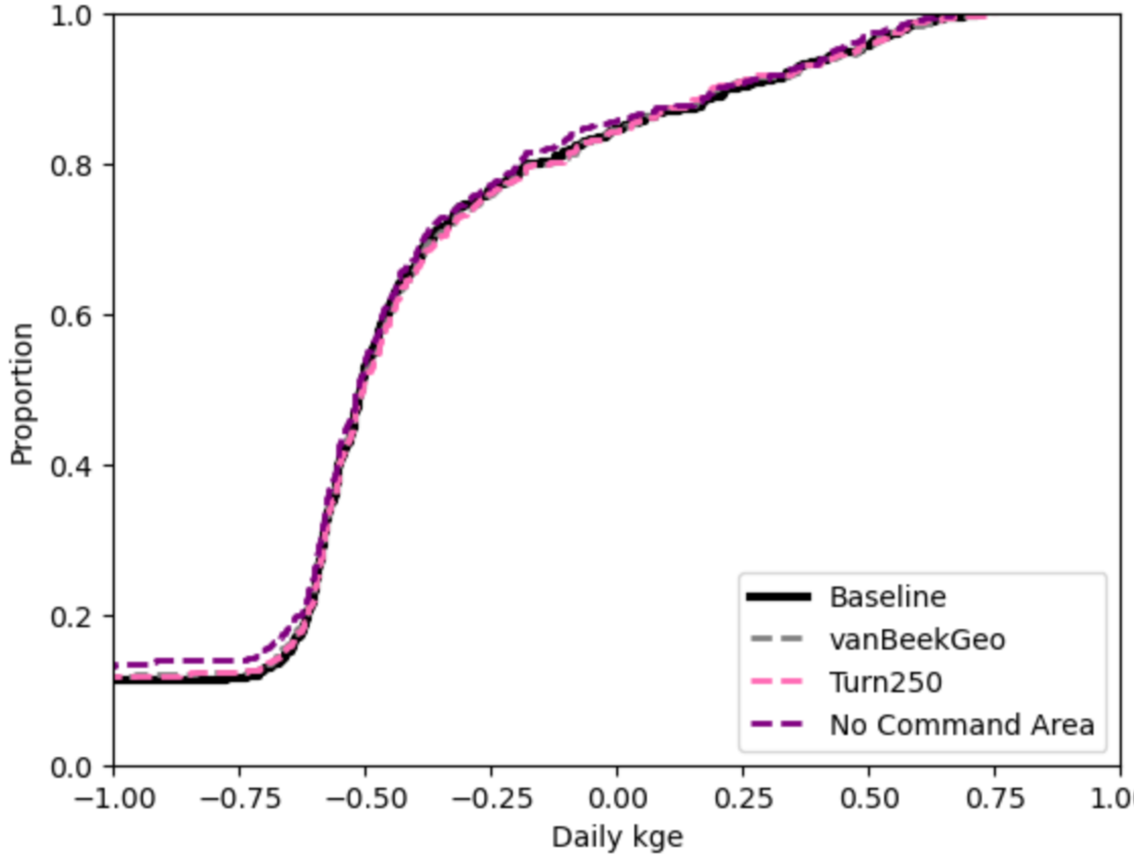

Figure 2: Cumulative distribution function of the daily KGE values for the Mississippi Basin. The colored lines depict the three original scenarios: Baseline (black), vanBeekGeo (grey) and Turn250 (pink), with an additional line (purpl and labelled No Command Area) that depicts the streamflow distribution if there were no command areas.

L342. How are surface water abstractions considered? Is this based on demand within the same grid cell as the reservoir?
In PCR-GLOBWB 2, surface water is abstracted from the closest water body or river to the grid cell within a 100km radius that has demand. We updated this scheme to only abstract water from the reservoir if it is in our *irrigation-like* category and if the abstraction would not cause the dam to drop below the conservation level. We will include the following lines to explain this further: "In PCR-GLOBWB 2, surface water is abstracted from the river or lake cell closest to the cell with a demand. We changed this scheme to limit surface water abstraction to *irrigation- like* dams, and only to the extent that the abstracted volume of water would not drop the reservoir storage below the conservation curve."

Equation 6. Maybe I missed this, but how is Env defined? Also, how is the flood release defined? Is this just spill required to draw the reservoir back to the active zone?
Thank you for noticing this. We left off the description of Env. We will edit the section as follows: "Lastly, we implement a piecewise function for releases based on the current reservoir storage (Sc) where Rf is the flood release, Env is the environmental flow requirement defined in PCR-GLOBWB 2 as 10% of the naturalized flow (Gleeson & Wada, 2013). Ri and Rh are the irrigation and hydropower releases in the active zone and are described in by equation 9 in Section 2.4.4 and by equation 8 in Section 2.4.3 respectively."

Yes, this flood release is the release needed to draw the reservoir back to the active zone.

L350. Unclear what is being done here. Are you creating an active zone per dam type and country? Why? I thought the random forest provides full parameterization for each dam.
We are not providing an active zone per dam type and country, but an active zone per dam based on a random forest algorithm, where type of use, socioeconomic and climatic variables are used as features (predictors). We then use a set of equations to simulate release based on downstream demand. While it is ensured that the reservoir storage stays within the active zone defined by the random forest algorithm (Equations 6-9). We define two main categories of equations for *irrigation-like* and *hydropower-like* reservoirs to simulate the different dynamics within each. For *hydropower-like* reservoirs, the equations assume that the operator is attempting to keep reservoir storage in the active zone as much as possible and there are no releases if the reservoir is below the active zone. For *irrigation-like* reservoirs, the goal is to meet all the downstream demand within the command area.

To clarify our workflow, we have added the following paragraph explaining the differences at Line 270. "To compliment these operational bounds, we employ two main sets of equations based on two main groupings of reservoir main purposes:

irrigation-like **and** ***hydropower-like*** **(Section 2.4.4 and Section 2.4.3). We use these two groupings to denote how releases change based on the level of storage. In** ***irrigation-like*** **dams, the goal is to meet as much downstream demand and therefore the equations in Section 2.4.1 prioritize meeting downstream demand with more downstream demand met when the storage sits between the data derived operational bounds and proportionally less when the storage sits between the conservation bound and 10% of the maximum storage capacity of the reservoir. For** ***hydropower-like*** **dams, the goal is to hold storage as stable as possible. Therefore, the equations in Section 2.4.2 prioritize meeting downstream demand when the storage in the** ***hydropower-like*** **reservoir sits between the data derived operational bounds. However, if meeting this downstream demand causes the reservoir storage to drop below the conservation bound, then the reservoir can only meet a portion of demand to allow storage to stay in the active zone (zone between the operational bounds). For both types of reservoirs, we employ an additional flood release and also account for environmental flow requirements as described in Gleeson and Wada (2013)."**

We also suggest combining Sections 2.4.2, 2.4.3 and 2.4.4 to one section titled "Data Driven Reservoir Operations-STARFIT," with three subsections defined as 1) Operational curves by STARFIT, 2) operations for ***hydropower-like*** **dams, and 3) operations for** ***irrigation-like*** **dams. We also plan to add the above text to the beginning of Section 2.4.2. Lastly, we also suggest adding the follow text to line 350: "We use these operational bounds to denote the active zone and therefore the release factor (Equation 4) for the hydropower dam. We opted for different hydropower and irrigation operations as the main goal of each type of reservoir is slightly different. For example, a hydropower dam in Switzerland could have slightly different operational bounds than a hydropower dam in Vietnam, however the main purpose: hold enough water to support electricity generation, would be the same."**

L381. After validating the model and demonstrating effectiveness with the 25% out validation, why not re-train with all 1,752 structures before extrapolating? Also, given the importance of the random forest to the overall framework, I strongly suggest the authors pursue a k-fold cross validation scheme rather than single training and test samples.

Thank you for the comment. We did retrain all the structures as well as the 1,752 before extrapolating. We will update line 381 to read: "The obtained RF was then used to extrapolate the 10 parameters to all 24,000 structures." We also think a k-fold cross validation could be useful to validation. We ran a test with the 1752 dams with the same 75% training and 25% testing split as the single RF method, meaning we put 75% of the data through the k-fold validation and kept 25% out to validate and test our method. The k-fold cross validation splits the data into 10 equal portions. We then created a composite score of the MAE and MSE to determine the overall best model from the k-fold using the 25% of the data we left out for validation. For all 10 models we received the following results for the mean

squared error, mean absolute error and the r squared comparing the random forest models predictions to the Turner values.

Model	**k-fold with cv = 10**	**Best K-fold cross validation model**	**Single RF method**
MSE	**359.77 (stdev = 47.13)**	**291.15**	**288.39**
MAE	**12.96 (stdev = 0.83)**	**11.74**	**11.65**

From these results, we see that the current random forest setup has a lower MSE and MAE values suggesting the single RF method is performing well. The k-fold cross validation does show us that there is some sensitivity to our testing and training dataset due to the standard deviations of the MSE and MAE. Our initial setup performs slightly better when looking at the MSE and MAE as the errors associated with the single RF methodology are lower. Therefore, we think it is justified to use the full dataset for the RF, however we already noted in the discussion that the extrapolation of parameter values is an area of uncertainty that could be further reduced by using different techniques or more data and we will provide the above table depicting the results of the cross validation in the appendix.

The addition to Line 588 will read as follows: "Additionally, we may find that by using a different validation scheme, our operational curves may also change as our random forest is sensitive to the input data."

L385. How many reservoirs end up being constrained to these bounds? Also, it's not clear what is meant by flood peak here. Do you mean upper bound of active storage?
Table 2. Here would be very interesting to see a version that drops the command area and demand parameters (as well as hydro/irrigation split) entirely. I can't see a strong justification for the demand-based release or the command area (or the hydro / irrigation split for that matter). A simple way to test this would be to take the mid-point of the active zone (i.e. assume just one curve to target) and operate toward that at all times (giving you a very simple release function).
Thank you for your comment. We decided to implement a simple rule curve for the Mississippi Basin that accounts for the downstream demand (the green line in Figure 3 and Figure 4). This simplified operational policy still accounts for downstream demand according to the 250km distance and can meet this demand and surface water abstractions if storage is within the active zone (definied as the area between the flood and conservation curves) and includes environmental flow and flood releases. We ran the model for the Mississippi basin without the command area (by setting the downstream demand to 0) but including the two operational schemes (purple line). In analyzing the longterm monthly storage for the simple rule curve we observe that we hold less water on average, but the seasonal dynamics are similar to the other models (Figure 3). This suggests that the biggest difference is the overall storage fraction levels and in fact this simplified rule curve decreases the overall water availability in the Mississippi region.

We then computed the daily KGE values for these two models as well as the Turn250, Baseline and vanBeekGeo against the streamflow observations in GRDC. While the addition of the command area slighlty improves the model (Figure 4, purple vs pink lines), we do see large improvements in using two different operational schemes (green vs pink lines in Figure 4). This suggests that creating two different release rules for irrigation-like and hydropower-like dams enhances model performances compared to a single simplified scheme. We also saw there are operational differences in the average conservation curves and the flood and conservation minimum curves when looking at the two typologies we defined (Figure 1 above and copied below). This, in conjunction with Steyaert et al., 2024 and Salwey et al., 2023 noting that there are differences in irrigation, water supply and hydropower dams, further supports our conclusion that having two main types of reservoir operations better represents the observed dynamics. We plan to include these two figures (Figure 3 and Figure 4) as well as the above explanation in the supplementary.

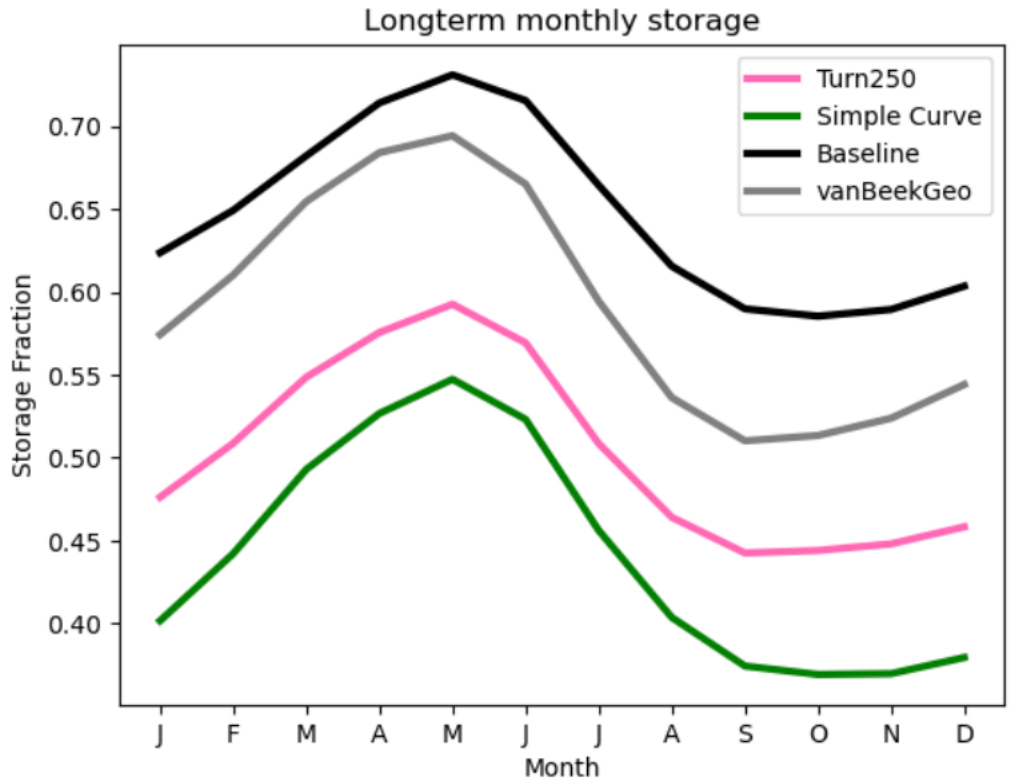

Figure 3: Longterm storage fraction of the different models in our analysis (Turn250 in pink, Baseline in black, and vanBeekGeo in grey) as well as the simple rule curve (green).

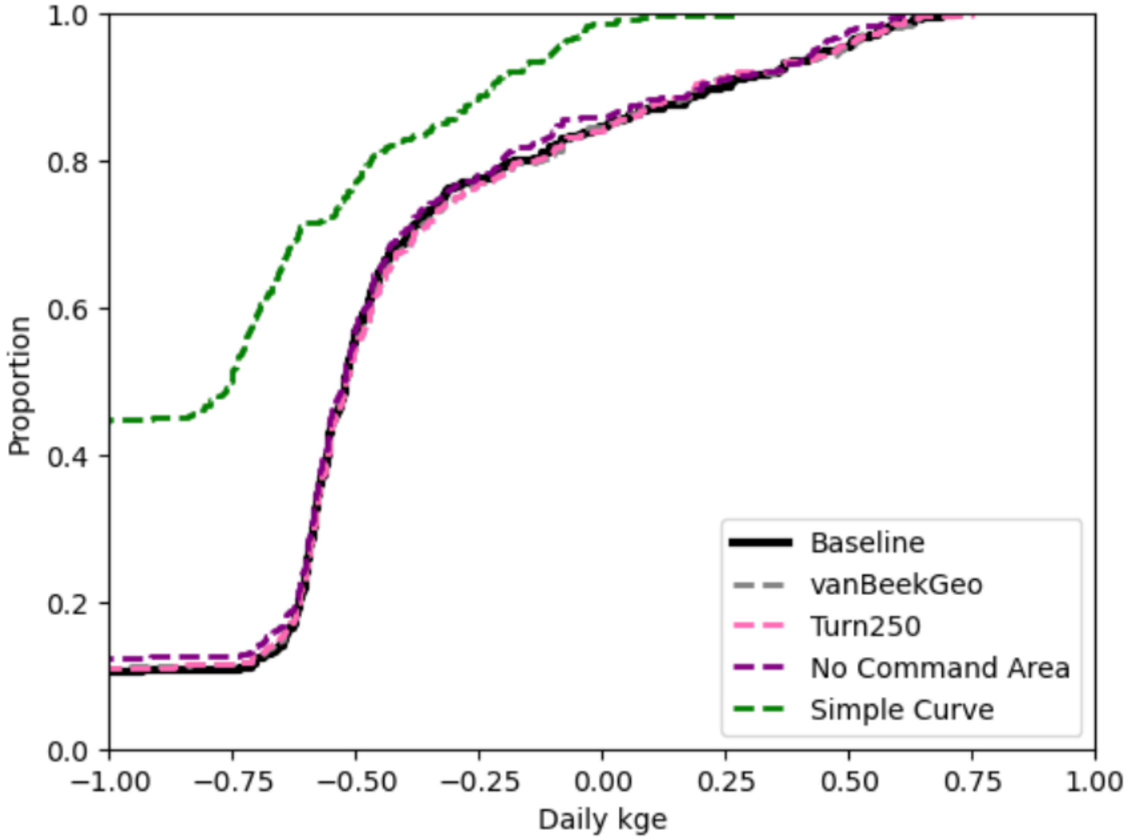

Figure 4: Depicts the cumulative distribution function of the daily streamflow KGE values for the original model scenarios: Baseline (black), vanBeekGeo (grey) and Turn250 (pink) and the simplified rule curve (green).

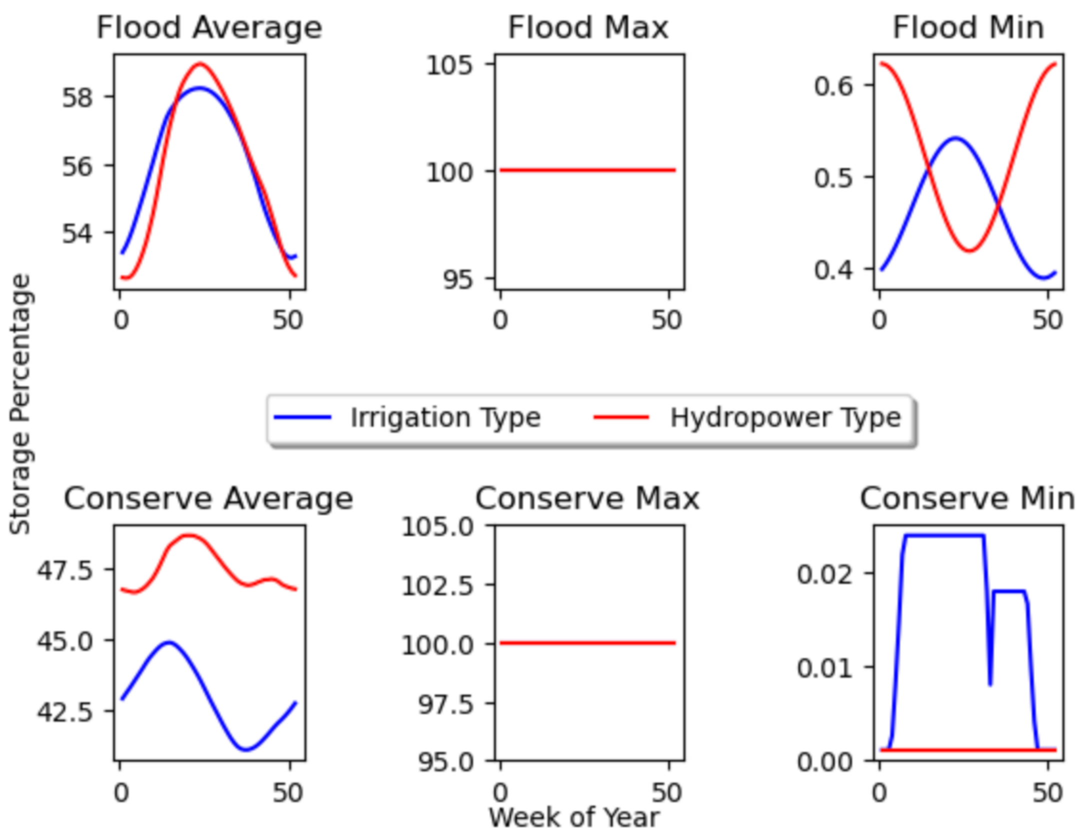

Figure 5: Depicts the average, maximum and minimum flood (top row) and conservation (bottom row) curves that are used in PCR-GLOBWB2

L503. Above you state that Clinton dam has a hydropower main purpose.
You are correct. We initially used the Clinton dam here, but changed the dams in the final version of the code but did not account for these changes in our mansucript. Figure 3 in the manuscript shows Butt Valley dam in California for hydropower use and Figure 4 in the manuscript shows Clinton Lake Dam which has a water supply main use and Koelnbrein dam which is a hydropower main use. We will correct the manuscript accordingly.

Figure 4. Is this average monthly discharge over a number of years, or are you showing a single year's output?

We are showing the longterm monthly average discharge over the model period. We will update the caption accordingly

L588 – this is an inadequate way to evaluate storage dynamics improvement. You have observation and results. Compute NSE / RMSE / KGE or similar for each dam (sim vs obs) and show the difference across a distribution (perhaps splitting by continent or large basin).
Thank you for this comment. We agree that adding a plot showing the improvement by calculating the KGE, NSE or RMSE between our observations and simulations would be a useful addition. Instead of including all three, we opted to show the KGE and RMSE between the modelled values and the observations as global CDFs (Figure 6). The KGE plot shows that the Turn250 model has relatively more negative KGE values, however, these negative performances are typically in wetter periods where PCR-GLOBWB 2is already underestimating streamflow. This model also has larger KGE values. As for the RMSE we do see that the Turn250 has more values closer to 0 suggesting the Turn250 model is more aligned with the observations. We also opted to plot the KGE components (Figure 7). The alpha and R components show slight improvements in modelled storage with the Turn250 operations, while the beta shows that the Turn250 has more bias, which is most likely occuring in the wetter periods. To supplement this, we will include the above description and the following figures to the supplementary.

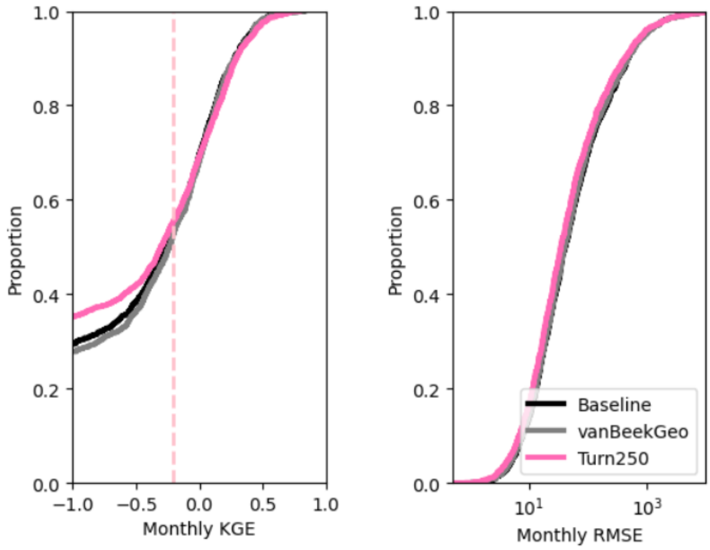

Figure 6: Cumulative distribution plots of the monthly storage KGE and monthly storage RMSE for the Baseline (black), vanBeekGeo (grey) and the Turn250 (pink) models

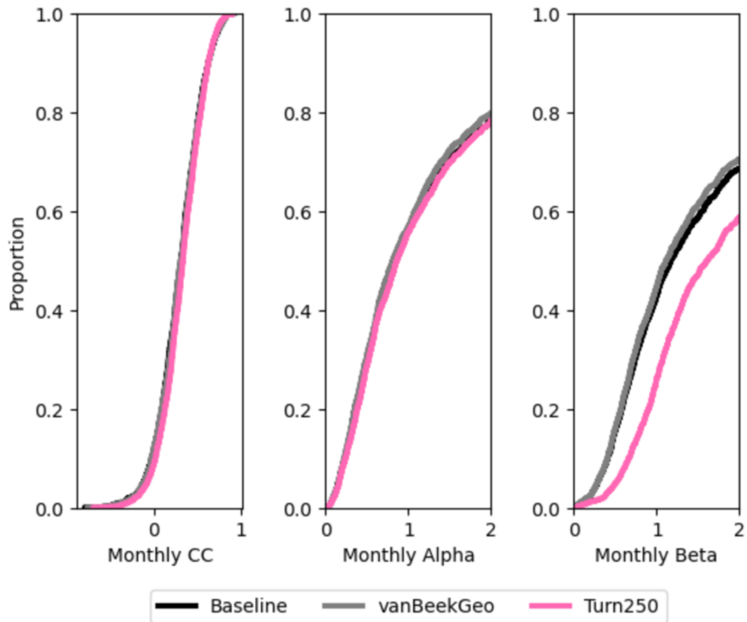

Figure 7: Cumulative distribution plots of the storage KGE components: alpha, beta and the cross correlation (CC), for the three models in our analysis: Baseline (black), vanBeekGeo (grey) and Turn250 (pink).

Figure 7. It's not clear why the data-derived storage curves result in a different seasonal storage pattern than GloLAKES for North America. Aren't the curves based on GloLAKES data?

Yes, the curves are based on the data in GloLAKES and therefore should align, however, the number of US dams in GloLAKES (1752 with 543 or 31% in the US plotted in red in Figure 9) differs from the total number of dams (over 20,000 with 8214 or 40% in the US plotted in blue in Figure 10). Additionally, the random forest algorithm looks for similarities and differences across all the dams in the training set. This training set (75% of all the data) is chosen randomly and, while it includes dams from the US, we make sure to choose multiple regions. Therefore, this could account for the regional differences in our storage patterns compared to the GloLAKES observations. When plotting the monthly KGE and monthly RMSE (Figure

8) for each of the models, we do see that the RMSE in the United States are much higher and the KGE is slightly worse. This suggests that the issue in performance is perhaps due to the underlying model dynamics in PCR-GLOBWB 2 as well as the inclusion of other regions in the training dataset to create the Random Forest algorithm. We will include the following figures as well as the above description in the supplement.

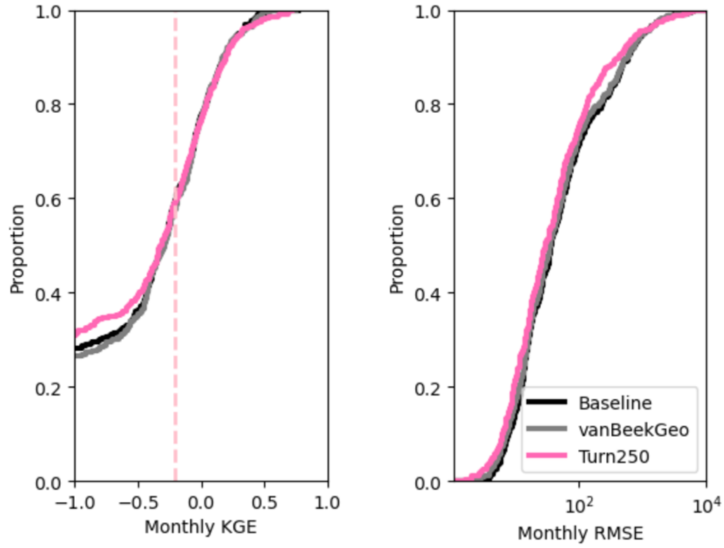

Figure 8: Cumulative distribution plots of the monthly storage KGE and monthly storage RMSE for the Baseline (black), vanBeekGeo (grey) and the Turn250 (pink) models across the United States.

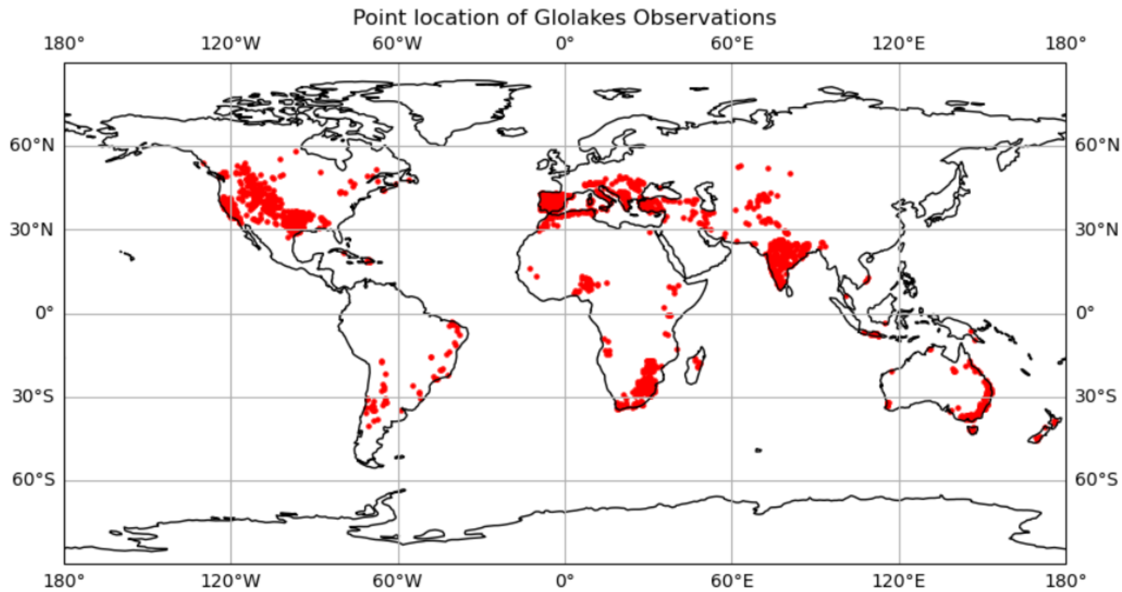

Figure 9: Map of the point locations of the Glolakes observations used to train our random forest algorithm and validate our analysis.

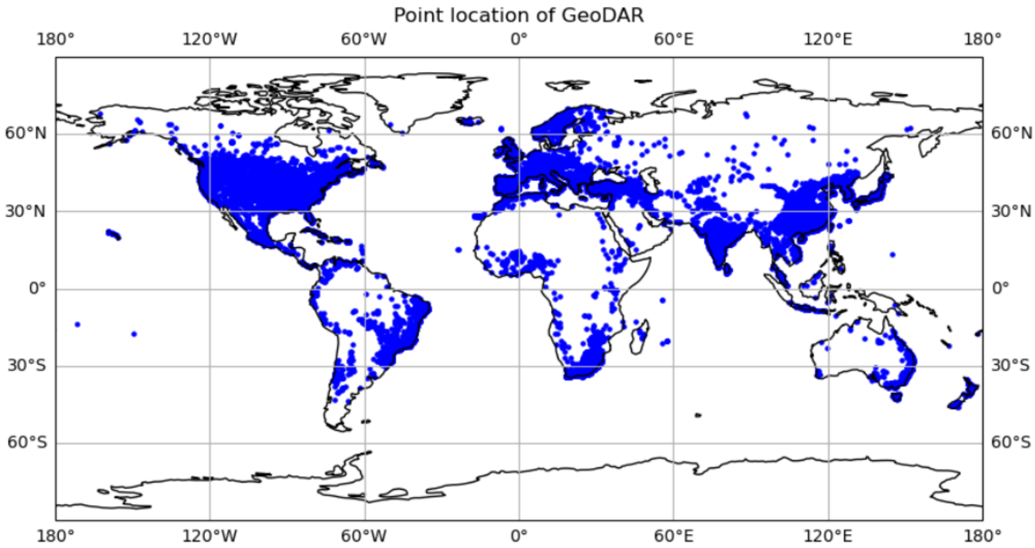

Figure 10: Point location map of all the dam locations in GeoDAR that are included in our analysis.