ANSWERS TO REVIEWER #1

The reviewer's comments are in **black** and our answers in **blue**.

Reviewer's general comment: The paper relevantly discusses the potential effects of climate-change-induced changes in reservoir evaporation in a region where water supply critically depends on reservoirs. The paper is clear in its methods, transparent in results and conclusions. Still, some concerns remain, partly on the clarity of the research goal and on some methodological choices.

We are grateful for the reviewer's comments, which are very constructive. Indeed, we agree that some aspects need to be better outlined and that the suggested adjustments will add clarity to our approach and methods.

Reviewer's comment: Where the goal of the paper is, to assess the uncertainty in climate change impacts on reservoir evaporation and water availability from reservoirs, it is important to observe that direct climate change effects on evaporation are studied, but climate change effects on hydrology and runoff (reservoir inflow) are not; the character of the study therefore is a sensitivity study on a specific process rather than a more integrated climate change assessment. That does not make the study less relevant, but this difference is important for water availability impacts and should be explicit in the description of the scope or even the title.

Response: We agree with the reviewer that the focus of the study is only one hydrological process (open-water evaporation), and possible effects of changes in the evaporative pattern by different future climate scenarios. We highlight that similar analyses are found in the literature, more recently observed in works such as Althoff et al. (2020) in tropical savannah, Andrade et al. (2021) in northeastern Brazil, Viola et al. (2014), Oliveira et al. (2017) in an oceanic temperate climate. The impact of evaporative changes in terms of water availability in a drought-prone overpopulated region. This is relevant because it allows for better adaptation strategies. This is achieved by simulating the evaporation driven by Eta model (Mesinger et al. 2012) outputs from the downscaling of two regional models. Although a similar approach was used in the above-mentioned studies, none of them evaluated water availability impacts influenced by evaporation in a region where there is water pressure. We emphasise the use of the Vyelas model (de Araújo, Güntner, Bronstert, 2006) in estimating water availability, which is a physical model and based on measured data that has been thoroughly monitored for at least 20 years, which endorses the quality of the modelling. We also emphasise the use of the remote sensing algorithm calibrated with field measurements taken at the reservoir.

It was not within the scope of this work to also study the effects on the general hydrology of the region and reservoir inflow, yet we do understand that analyses of the impacts of climate change scenarios on regional hydrology are required to design effective adaptation strategies for specific basins. It is worth mentioning that we are studying other aspects and factors influencing the evaporation rate in reservoirs (such as the effect of sedimentation and reservoir inflow) in an ongoing research project.

Based on the above, we would like to highlight the insertion of the following text in section 3 Methodology:

"It is outside the scope of this work to study the effects on the general hydrology of the region, but rather focus on a single hydrological process, which is a major cause of water losses in the region."

We would like to refer to the text already present in the submitted version, in section 6 Conclusions and outlook:

"The present research assessed the impact of evaporation from reservoirs on water availability, although the impact of water quality, silting, and increase in per capita consumption should also be taken into consideration in future investigations. It is necessary, therefore, that water management agencies propose adaptation measures for different scenarios, and this study contributes to decision-making aimed at water security during the dry season. Further investigations in densely-populated areas situated in dry regions may find in these results a reference for studies that take into account other variables which were not addressed in our study."

Reviewer's comment: In the research methods, choices for climate scenario data are partly unexplained and partly limitedly connected to the research aims. Results from two GCMs is used; the choice of GCMs is implicit, where an explicit choice was expected, relating to the uncertainty envelope of simulated evaporation trends under climate change: extended the explanation of the choice may resolve this issue. The choice of RCP scenarios (RCP4.5 and RCP 8.5) covers the median to upper range of climate change, where the uncertainty envelope does include more modest changes too. Here an addition of e.g. RCP 2.6 seems to remain consistent with the goal.

Response: The **database used** in this research was the one made available by INPE on the PROJETA platform (see https://projeta.cptec.inpe.br), on which almost all climate studies carried out in Brazil are based (see the references in the previous answer). The platform provides parameters downscaled by three global circulation models (CanESM-2, MIROC5 and HadGEM2-ES) forced with the Eta Regional Model, with a spatial resolution of 20km for the study area, and 5km for some regions of Brazil. The products of this database have been successfully validated in several studies for at least 15 years. The **choice of models** was therefore based on previous studies analysing the uncertainty of the models and confirming their suitability for use. In addition, although Eta's spatial resolution is not ideal, it is reasonably sufficient and the best we currently have for the study area. There is a dataset based on an ensemble of 19 bias-corrected CMIP6 climate models projections for the Brazilian territory (CLIMBra - Climate Change Dataset for Brazil, Ballarin et al (2023)). This is an up-to-date and robust dataset; however, it is based on SSP2-4.5 and SSP5-8.5 scenarios. The impacts and vulnerability at regional scale require more detailed climate information. Other global circulation models have lower spatial resolution for the area studied here, and we favoured using the products scaled by Eta. Furthermore, in accordance with the research objectives, we believe that analysing four possible future **scenarios** is sufficiently effective. However, we agree with the reviewer that the addition of RCP 2.6 would make the results even more robust and perhaps include a third climate model in the assessment. For more detailed information concerning the Eta model we recommend the readers to refer to Chou et al (2014). We expect this to justify to the reviewer the choice of scenarios, models, and RCPs.

The following text will be inserted in Section 3.1 of the paper:

"The database used in this research is provided by Brazilian National Institute for Space Research (INPE) on the PROJETA platform (see https://projeta.cptec.inpe.br). That is the official source of downscaled climate data for the Brazilian territory with the Eta Regional Model (Mesinger et al., 2014). The latest version of the platform provides parameters downscaled from three global circulation models (CanESM-2, MIROC5 and HadGEM2-ES) forced with the Eta Model with a spatial resolution of 20 km for the study area. The Representative Concentration Pathways available on the platform are 4.5 and 8.5. According to Chou et al. (2014), the Brazilian model has been used operationally at INPE since 1997 for weather forecasts, and since 2002 for seasonal climate forecasts."

Reviewer's comment: One specific assumption in the research methods requires more attention in the form of more discussion or reconsideration. Evaporation over land and over water are linearly related, based on an average of their ratio from (well-)analysed periods. The periods do show a very wide range in that ratio however, and it is likely that the ratio per period analysed depends on drought conditions. Therefore, the relation, if expressed in a stationary ratio, can be expected to be sensitive to climate change. Here at least an extensive discussion is expected; an analysis and possible reconsideration is advised: results may be expected to significantly change.

Response: In section 4.2 we present a comparison between on-land (EL) and on-water (Ew) evaporation rates. We made use of images exclusively from the dry season (June to December) due to the following reasons: (i) cloud-free images are easier to obtain in these months; (ii) the water-availability model (Vyelas) only considers evaporation of the dry period; and (iii) this is the period when evaporation is more intense and, thus, more relevant for water management purposes. Average daily evaporation rates generally differ by 27% with on-land evaporation rates being constantly higher than on-water evaporation rates; the correction value KR averages 0.73 (median 0.74). Studies report (Gokool et al., 2017; Rodrigues et al., 2021) that remote sensing algorithms tend to underestimate evaporation in high-temperature areas, such as tropical-coastal Northeast Brazil. This feature may have influenced on-water evaporation which was assessed with the help of AquaSEBS algorithm. We also examined the data in order to detect a possible correlation of KR values with the period of the year when evaporation rates were estimated (for example, higher ratios at the end of the dry season). No correlation was found between the coefficient and the period of assessment, though. Most of the highest KR values (above 0.85) were registered in the first years of monitoring; six of the seven ratios at this threshold are from before 1999. We understand that the revisor suggests that we investigate the influence of drought on the KR ratio. Would you recommend relating KR to a drought index, such as the SPI (Standardized Precipitation Index)? KR might be sensitive to climate change, but at the moment, our field experiments have provided this value, which will be used hereafter.

Cited literature, in alphabetic order:

Althoff et al. (2020): https://doi.org/10.1007/s10584-020-02656-y

Andrade et al. (2021): https://doi.org/10.1002/joc.6751

Ballarin et al. (2023): https://doi.org/10.1038/s41597-023-01956-z

Chou et al. (2014): http://dx.doi.org/10.4236/ajcc.2014.35043

de Araújo, Güntner, Bronstert (2006): https://doi.org/10.1623/hysj.51.1.157

Mesinger et al. (2012): https://doi.org/10.1007/s00703-012-0182-z

Oliveira et al. (2017): https://doi.org/10.1002/joc.5138

Viola et al. (2014): https://doi.org/10.1002/joc.4038