The authors have introduced the Global Gravity-based Groundwater Product (G3P), a satellite observation-derived dataset of monthly groundwater storage variations from 2002 to 2023 at 0.5° of spatial resolution. The authors underlined the challenge of monitoring global groundwater changes due to the limited groundwater in situ data and the need to have such a product. They used observations from the Gravity Recovery and Climate Experiment satellite mission which provide total water storage anomalies (TWSA), unique means of quantifying groundwater storage anomalies (GWSA) at large spatial scales. To derive the changes in GWSA, they subtract the storage anomalies of surface water storage anomalies (SWSA), soil moisture in the unsaturated zone (UZS), snow water equivalent (SWE), the mass of glaciers (GM) and ice sheets (ISM) from TWSA, following a water budget approach. For these different storage anomalies, they have estimated the uncertainties which they propagated to get the one of GWSA. The findings cover the development and the assessment of the global GWSA dynamics which revealed regional variations indicating both depletion and recovery in different areas.

This is an important paper in the sense that the developed G3P data set which relies mostly on the observed datasets of different water storage compartments serves as a prototype for an operational global groundwater service, crucial for sustainable water management. The paper is impressive in its scope and thorough in its analysis.

While the results look convincing, well-written, and nicely presented, I have suggested a few minor changes that might be helpful for the authors to further improve the manuscript. Other than these small typos, there is a lot to recommend publishing this paper.

Line 32 - 35, could you consider inserting a brief statement of the results itself of the evaluation. Abstract should briefly provide the main results (e.g., number on statistics). The way this sentence is presented, it just describes the step followed in the paper without highlighting the main results.

Line 40, in the sentence below, there is a typo error. The verb "are" should be replaced by "is" I think. The authors could also consider changing the verb "weigh" to an usual verb such as "measure" for fluidity in the comprehension. Here is the sentence: "A main source of the data are observations with satellites 40 that weigh the changing amount of water by its mass attraction effect".

Line 44 - 49, there is no reference in these sentences. Please could the authors consider inserting some references at different sentences.

Line 113 - 127, this part did not reference some recent relevant papers which also point out the origine of uncertainties related to GWSA estimation using the mass balance equation: 1) Getirana et al. 2025 (https://doi.org/10.1029/2025GL119197) and Arifin et al. 2025 (https://doi.org/10.1029/2025GL118580). I suggest the authors include these references as this part is dedicated to a kind of literature review.

Line 137, many acronyms have been already defined in the upper part of the text. Why are the authors continuing using the expanded form and keep putting their acronym in brackets? Just use the acronym provided above. e.g., "…. Monthly groundwater storage anomalies (GWSA)……".

Line 168 - 170, For the GWSA data set that covers the period 04/2002 to 09/2023, the anomalies are calculated with the same long-term mean over 04/2002 –12/2020? or the long-term mean has been updated to the period 04/2002 to 09/2023? I will suggest to the authors to make it clear in the text in this paragraph as done further in the text (Level-2B Processing section)

Line 180, for consistency and uniformity in text, I will suggest the authors change " The TWS anomaly" to "The TWSA".

Line 255, I guess this acronym "RMSE" stands for root mean square error, but its extended form is not provided anywhere in the text. Please, the authors should consider providing this.

Line 302 – 304, in the equation (4), SWI and K stand for what? They are not defined. Please, could the authors consider defining these variables.

Line 310, Considering the different T-values of the EF corresponding to the four depth layers, and given that this depth layers depend on plant species (Martens et al., 2017), how were the T-values implemented? Did you use the mean value of the reported range, or did you differentiate the T-values according to plant or vegetation species for example?

Line 324, there is a typo error in this sentence " The here developed RZSM data…", please, kindly remove " here" in the sentence.

Line 406, typo error " …geodetic surveys.,", kindly remove the comma from this sentence

Line 417, Why the mean annual mass change time series uncertainty is multiplied by "1.5" only. How did this number come in? could the authors insert a bit of explanation on how "1.5" was chosen to get the relative monthly uncertainty.

Line 636 – 639, For comparison purpose and to check if current results align with existing knowledge, I suggest the authors to compare their results for the major basins (e.g., Amazon, Congo, Mississippi, Nile, etc) with the results of Figure 2 of Getirana et al. 2017 (https://doi.org/10.1002/2017GL074684). This could be inserted in the text as an additional table reinforcing the results of an observed GWSA compared to a modeled GWSA.

Line 773 – 776, I suggest that the authors refer to the recent paper by Getirana et al. 2025 (https://doi.org/10.1029/2025GL119197) in this paragraph. The paper deals with inconsistencies in GRACE-Based Groundwater Storage Estimation.

Line 781 – 793, I will suggest the authors to refer in this discussion paragraph to a recent study on the Congo Basin by Kitambo et al. 2025 (https://doi.org/10.1016/j.ejrh.2025.102810) where G3P groundwater dataset was compared with another groundwater dataset. The use of observation-based surface water storage in this study was the game changer which enhances the temporal dynamics of the derived groundwater. This was assessed indirectly with in situ discharge data.

Line 837 – 839, I will suggest the authors to mention in this paragraph the recent advances in the estimates of SWSA from satellite observations in different environments worldwide. Many have been done to measure observed-SWS changes over all types of water bodies in major river basins and there is ongoing effort for the development of such SWSA datasets at the global scale. Kindly refer to Papa and Frappart, 2021 (https://doi.org/10.3390/rs13204162). There is also this paper, Lin and Song, 2026 (https://doi.org/10.1016/j.jhydrol.2025.134458). For lakes, there is Yao et al. 2023 (DOI: 10.1126/science.abo2812).

Line 900, there is a typo error here "… due climate variability and/or climate change…". Please, kindly add "to" between due and climate.