Thank you for your valuable comments; we appreciate your insightful feedback. Here are the responses:

RC1: 'Review of essd-2023-72', Henryk Dobslaw, 04 Jul 2023
The manuscript „AIUB-GRACE gravity field solutions for G3P: processing strategies and instrument parametrizations“ summarizes the analysis decisions taken at the Astronomical Institute of University of Bern (AIUB) for deriving monthly-mean gravity fields from sensor data collected by the GRACE and GRACE-FO satellite missions. Calculating gravity fields is a complex task involving the careful consideration of data from a range of different sensors (i.e., range-rate tracking, accelerometers, star cameras, GNSS navigation signals, etc.). Besides common standards & conventions, a number of choices are available to the processing centers like AIUB for individual aspects of the data pre-processing, screening, and integration. Documenting those choices as done in the current manuscript is important to foster international collaboration in order to identify the most promising ways to calculate GRACE-based gravity fields. The manuscript is generally well written and certainly fits the scope of the journal. Nevertheless, a number of comments might be considered before eventually accepting the article.

More details are needed on the outlier handling (P6L3). It seems to me that complete daily arcs are flagged and ignored, is that true at this point already? Do you have an idea about how much (potentially valid) data is removed by this step? What about options to calculate arcs that span over shorter periods of time, or that are shifted by 6 (or 12) hours?

The paragraph was revised:

For AIUB-G3P, a novel screening strategy has been developed. This approach involves scrutinizing the GRACE L1B data product, specifically KBR1B and ACC1B. When an outlier is identified in the daily KBR1B and ACC1B, the corresponding day is flagged. Subsequently, the epoch of the outlier is excluded using monthly session tables in the Bernese software.

The AIUB GRACE gravity field solutions are constructed by estimating orbital parameters for each 24-hour arc. The epochs of these daily arcs are recorded in the session tables. In the presence of an outlier, the affected epoch is removed, leading to the segmentation of the daily arc. New orbital parameters are then estimated for the revised arcs. As a result, while the general AIUB monthly gravity solution is typically based on daily arcs, months with outliers in the instrument exhibit shorter arcs in the monthly gravity solution.

The question above is also related to your statements on p10, where the elimination of whole days is described as the last stage of data screening. From the text, it is not immediately clear which approach exactly is taken for the most recent G3P release from AIUB. AIUB-RL01 does not need to be discussed again at this stage. If there are no changes with respect to AIUB-RL02, this should be stated so.

The sentence was revised:

The empirical elimination of entire days has been incorporated as the final stage of data screening in generating the AIUB-RL01, AIUB-RL02, and AIUB-G3P solutions.

Results presented in Figure 7 need further analysis, in particular with respect to the months that appear to be worse than in previous releases. I suggest to explicitly map (i) the monthly-mean background model, (ii) the mean from Peter et al. (2022) and the residual obtained with both AIUB releases leading to the RMS values presented in the time-series for those months in question. Please exclude continental signals and choose a color range & spatial smoothing that amplifies signals in the oceans.

This paragraph was added and the reference to Peter et al. 2022 was eliminated.

To maintain consistency, all comparisons in this section are referenced to a 'mean model'. The 'mean model' was computed by averaging monthly gravity field solutions from the Center for Space Research at the University of Texas, Austin (CSR Release 06), the German Research Centre for Geosciences (GFZ Release 06), the Centre National d'Etudes Spatiales/Groupe de Recherche de Ge\'ode\'sie Spatiale (CNES_GRGS_RL04) and the Institute of Geodesy at Graz University of Technology (ITSG-Grace2018) for the time period 2004-2017.

The paragraph was changed into:

One approach for evaluating GRACE gravity monthly solutions involves calculating the standard deviation (STD) of variability over the oceans, where hydrological signals are not expected. The discrepancies between the monthly solution and the 'mean model' are assessed on a grid with a cell size of 3 degrees, corresponding to a spherical harmonic expansion up to degree and order 60. Secular and seasonal variations are fitted to all grid cells and subtracted to eliminate long-periodic signals of oceanic origin. The grid cells are weighted by the cosine of the latitude to account for their different sizes, and the standard deviation over all ocean cells is computed. To prevent contamination from continental signals, the shoreline is shifted by three grid cells (equivalent to 9 degrees) into the oceans. Figure 7 shows the standard deviations computed in this way for AIUB-RL02 and AIUB-G3P GRACE gravity field solutions.

P1L5: RL06 is not the latest release of AOD1B anymore, since release 07 is already available (https://doi.org/10.1093/gji/ggad119). I suggest to skip the word „latest“ and mention only that RL06 is now incorporated instead of RL05, which makes this processing choice consistent with the RL06 gravity fields of both the SDS and many other contributors to Cost-G.

The word “latest” was eliminated and the following sentence was added to the table 1.

update the input observations and background models for GRACE gravity field recovery to be consistent with the other contributors to the COST-G (see section 2).

P3L1: „non-unit“ diagonal elements sounds odd. Please revise.

“non-unit” was eliminated.

P4L1: we can not see the star camera data in eq. 1 -> star camera data is not explicitly identified in eq. 1

The sentence was revised:

Although we can not see the star camera data in the equation (1) explicitly, they appear implicitly in two ways in GRACE gravity field recovery:

P21L1: Author contributions of AJ and UM might be elaborated a little further in view of, e.g., software heritage used for this work.

The sentence was revised:

Ulrich Meyer and Adrian J{\"a}ggi have made contributions to the software heritage utilized in this project and reviewed the article.