

AC: We thank the reviewers for taking time to review this manuscript. Their insightful remarks have helped us to identify parts in the manuscript which needed clarification and certainly allowed us to improve the quality of this paper.

Anonymous Referee #1

Review about the paper

HUST-Grace2024: a new GRACE-only gravity field time series based on more than 20 years satellite geodesy data and a hybrid processing chain

submitted to Earth System Science Data (<https://doi.org/10.5194/essd-2024-39>)

Authors: Hao Zhou, Lijun Zheng, Yaozong Li, Xiang Guo, Zebing Zhou, and Zhicai Luo

General Remarks:

The manuscript outlines a data processing strategy, yielding impressive improvements in its recovered temporal gravity solutions

AC: We thank the reviewer for their insightful comments, which helped us to identify parts in need of clarification and undoubtedly allowed us to improve the quality of the manuscript. Below is the point-by-point response to the specific remarks.

1. Please specify the time interval used for constructing the observation equation, considering the differing sampling rates between the kinematic orbit (10 seconds) and other L1B data (5 seconds). Additionally, please elaborate on the error assessment strategy for kinematic orbits, including the criteria

for error identification, and whether interpolated epochs are included in constructing the observation equation.

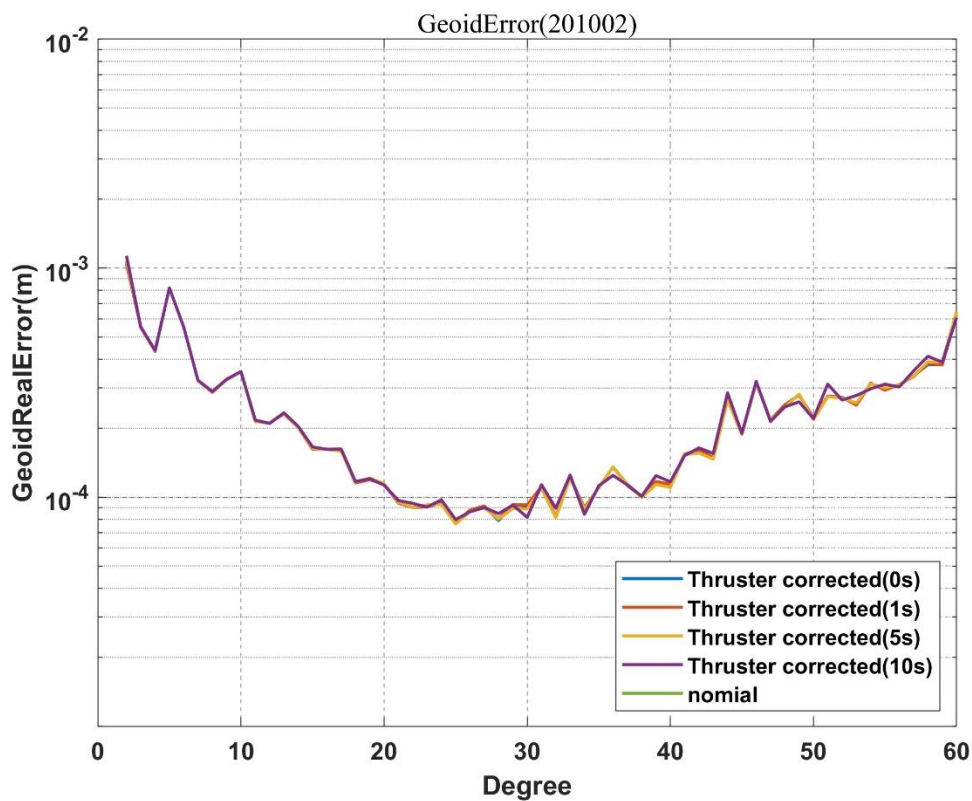
AC: Thank you for insightful comments. During the HUST-Grace2024 temporal gravity field determination, the integration time interval is 5 seconds and the original observation equation is build based on 5 seconds for orbit and range-rate observation. As your comments stressed, the kinematic sample rate is different from the other L1B data and we simply truncate the original observation equation for integration orbit according to the GPS time tag in the kinematic observation. Actually, during the kinematic preprocessing, we use the reduced dynamic orbit as the criteria for error identification, and when the difference between the reduced dynamic orbit and the kinematic orbit exceeds 20 cm, we will give a quality flag to the kinematic orbit at a specific GPS time and will not use the kinematic observation for the temporal gravity field determination later on. As for the gap in the kinematic observation, we fill the gap by zero value and don't use the observation to construct the observation equation.

2. Please quantitatively analyze the accuracy improvement of the temporal gravity recovery by kinematic orbit and GNV 1B.

AC: Thank you for insightful comments, it really helps us to improve our research work furtherly. We have added some comparison results for kinematic orbit and GNV 1B. Please refer to the modified result section in the revised paper.

3. Is the influence of the thruster accounted for in preprocessing? If so, please clarify whether THR 1B data is utilized and provide details regarding the number of epochs affected by thruster start-up time.

AC: Thank you for your valuable comments, actually we don't account the influence of the thruster in our HUST-Grace2024 processing. However, we also do some experiment about this influence magnitude on temporal gravity field determination (not shown in the paper) and the following figure is our experiment result. The experiment is designed as: (1) Finding a thruster start-up time tag in the THR 1B data (2) Building a margin time interval at 0 second, 1 second, 5 second and 10 second based on the thruster start-up time tag, regarding the thruster start-up time tag as a center time tag. (3) Removing the thruster active accelerometer observation value from the original observation, and the gap due to thruster active is filled by the interpolated value. Generally, the thruster last less than 1 second, and we think the thruster has little effect in our HUST-Grace2024 data processing.



4. I would like to know the performance of your products in the later stage of GRACE. Please extend the time period for comparing GRACE results from 2005-2010 to 2005-2015.

AC: Thank you for this useful suggestion, Reviewer #3 has some similar comments with you. We have added some comparison result in our revised paper.

5. Correct a typographical error on Page 12, Line 18, where 'equation (9)' should be amended to 'equation (6)'.

AC: Thank you for this careful observation, we have corrected this error in our revised paper.

6. On Page 20, Line 7, consider rephrasing "indicating a reduction of -12.8%, -33.2%, and -34.7%" for clarity.

AC: Thank you for this careful observation, we have corrected this error in our revised paper.

Modified sentence:

“... indicating an average cumulative geoid height difference reduction of -12.8%, -33.2%, and -34.7%...”