

Dear Reviewer:

Thanks for your suggestions and comments. According to your suggestions, we have made major revision to the paper. Your opinions are reasonable, greatly helping me improve my article. The response to the reviewer's comments is as follows:

Major Comments

Point 1 : The reviewer pointed out that the hybrid DEM/DBM and Earth2014 have different data sources, which might introduce inconsistencies, and suggested generating the reference topography from the hybrid DEM/DBM using a spatial filtering approach.

Response 1: We sincerely appreciate your insightful and critical comment. Indeed, the sources of the hybrid SRTM–GEBCO detailed topography/bathymetry model and the reference topography model (Earth2014) used in this study may differ, particularly between GEBCO_2024 and Earth2014. Such source inconsistency could introduce additional errors into the modeling process.

According to your valuable suggestion, we have abandoned the use of Earth2014 as the reference topography model. Instead, a new reference topography model was generated from the SRTM–GEBCO dataset using the spatial filtering approach based on the moving average (MA) method. This modification ensures that both models share the same data source and remain consistent.

Consequently, the revised residual terrain model (RTM) was reconstructed using the newly generated reference topography. Therefore, almost all subsequent experimental results and statistical analyses have been recalculated and updated based on this improvement.

Point 2: The reviewer raised concerns about the procedure and steps for constructing the RTM, as well as the description of the mass center offset correction.

Response 2: (1) We sincerely appreciate your valuable comment regarding the procedure for constructing the RTM. In coastal areas, the correct RTM construction procedure should be as follows: first, the SRTM v4.1 DEM and the GEBCO_2024 DBM are combined to generate a hybrid SRTM–GEBCO model; second, the RET method is applied to produce a unified SRTM–GEBCO dataset with a consistent rock density; third, a spatial filtering method is used to generate the reference topography; and finally, the RTM is derived. In fact, this is exactly the procedure adopted in this study. However, due to my carelessness, the workflow was incorrectly illustrated in Figure 7. I sincerely apologize for this mistake, and the figure has been corrected in the revised version.

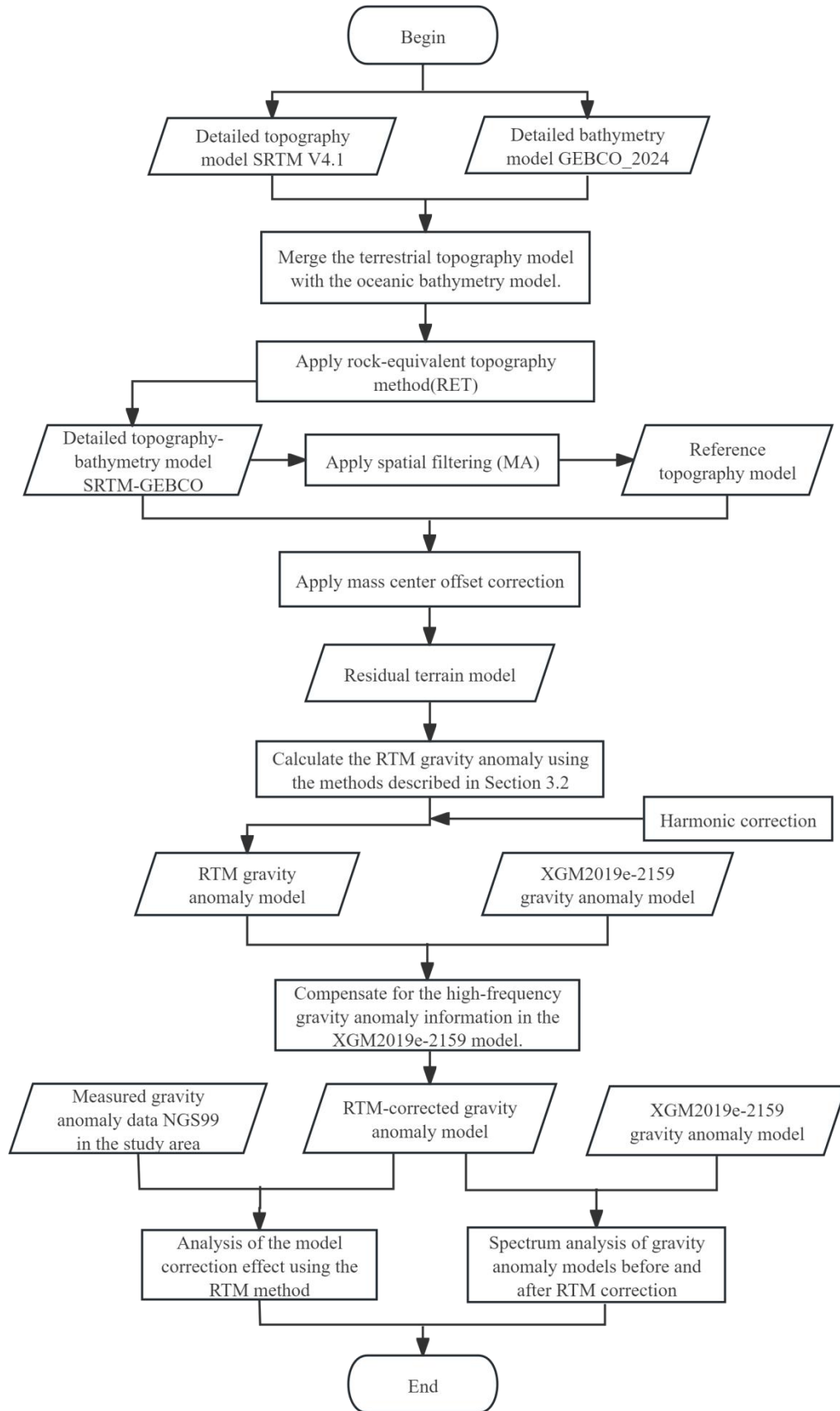


Figure 7: Workflow of the coastal XGM-GA model refinement based on RTM

(2) Regarding the mass center offset correction, it is known that in RTM forward modeling using the RET method, both land and the condensed seawater masses can be represented using a single constant rock density. Therefore, it is unnecessary to distinguish between the density differences of land and ocean prisms.

However, in the RET process, the oceanic depth ($H < 0$) is multiplied by a coefficient factor of $(1 - \rho_w / \rho_c) \approx 0.614$ to compress the seawater into equivalent rock masses. Although this operation ensures that the densities of oceanic and land prisms are consistent, multiplying both the upper and lower surfaces of the ocean prisms by a compression factor causes a vertical displacement of the prisms, leading to a mass center offset. Since the gravitational effect of each prism at the computation point is closely related to their relative distance, such a displacement may introduce a small error, which was also acknowledged by Hirt (2013).

To address this issue, a mass center offset correction was implemented in this study to adjust the position of the compressed oceanic prisms, ensuring that their centers of mass remain unchanged after applying the RET method. The corresponding section of the manuscript has been revised to make this explanation clearer for readers. In addition, we found that the explanation of the mass center offset correction in the original Figure 6 might be somewhat inaccurate; therefore, Figure 6 has been removed.

The revised content of this section in the manuscript is as follows:

“However, when using the RET method to obtain the RTM-GA at computation points in coastal land areas, the process of “compressing” seawater into an equivalent rock mass by multiplying the ocean depth ($H < 0$) by a coefficient factor of 0.614 causes a vertical shift in the mass center of the marine prisms. The gravitational effect of a prism at a computation point is closely related to their relative distance and position. Therefore, the displacement of prism positions caused by the RET method introduces corresponding errors. Hirt (2013) also acknowledged the existence of this error and considered its effect acceptable in shallow coastal areas, hence no correction was applied. In this study, a mass center offset correction was applied to the marine prisms compressed by the RET method.”

Minor comments:

(1)Figure 4: Is this RTM the one obtained after applying RET? If it is not, this RTM is not the exact model that is used for computing RTM gravity anomalies. Therefore, its presentation makes no sense.

Response 1: Thank you for your question. In this study, the RTM model constructed for computing the residual gravity anomalies in the coastal areas was indeed obtained after applying the RET method.

(2) Page 7, line 170: “disturbance gravity” should be “gravity disturbance”, “disturbance potential” should be “disturbing potential”.

Please revise similar descriptions in the other places of the manuscript.

Response 2: Thank you very much for your correction. The corresponding modification has been made, and similar expressions throughout the manuscript have also been revised accordingly.

(3) Page 7, line 173: I do not see any (x_i, y_i, z_i) in Equations (3) and (4).

Please revise it to make it more readable.

Response 3: Thank you very much for your correction. We agree that the original expression was not sufficiently precise, and we have made the corresponding revision in the manuscript.

(4) Figure 5: (x_2, y_1, z_1) should be (x_1, y_1, z_1) , (x_1, y_2, z_2) should be (x_2, y_2, z_2) .

Response 4: I apologize for my oversight. Figure 5 has been corrected accordingly. Thank you very much for your valuable comment.

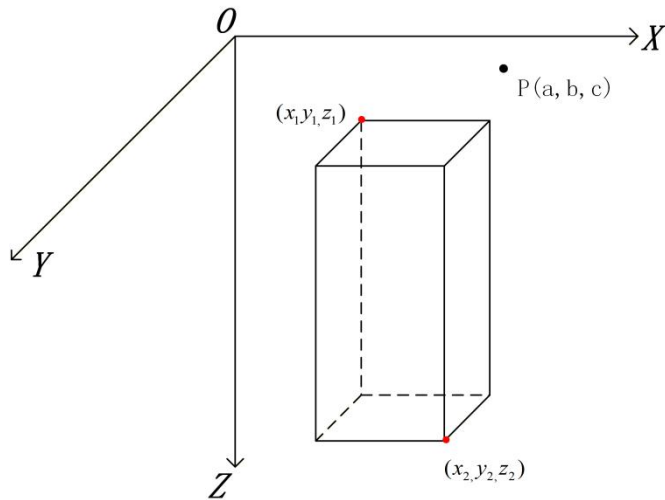


Figure 5: Prism element model.

(5) Equation (7): I suggest to revise $\Delta g^{RTM} = \sum_{i=1}^k \Delta g(i)$ to $\Delta g^{RTM} = \sum_{i=1}^k \Delta g^{RTM}(i)$.

My reason of doing so is that each prism represents the mass element of the residual terrain. So the corresponding effect is better to be marked as the RTM effect.

Response 5: Your comment is very reasonable, and I have revised Equation (7) accordingly.

(6) Page 8, line 189: If my understanding is correct, “After incorporating Δg^{XGM} ” should be “After incorporating Δg^{RTM} ”.

Response 6: Yes, your understanding is completely correct. The error in my expression was due to my carelessness. Thank you for your comment; I have made the necessary corrections.