

Interactive comment on “A multilayer approach and its application in modeling QGNSea V1.0: a local gravimetric quasi-geoid model over the North Sea” by Yihao Wu et al.

Anonymous Referee #1

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Authors present elegant and well-written numerical study for the SRBF gravimetric quasigeoid modelling using the multi-layer approach and compared results with a single-layer approach. This case study is very suitable for geodetic proceedings, but the modelling of quasigeoid surface is out of geophysical interest. This is main reason I recommend rejection of this article. Authors attempt to add some geophysical content (page 12/ line 14 to page 13/ line 5) is irrelevant. This is also evident from gravity signal decomposition in Fig. 2 that does not reflect any real geological features, rather than reflects the properties of kernel for different depths. There are additional major issues to be addressed by authors before considering further publication.

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1/ The values of variance factors for different types of observations are not given, so final accuracy and -most importantly - the claim that multi-layer approach provides better accuracy is not justified. This is especially evident from Table 5, where achieved accuracy in terms of gravity residuals is much too optimistic, because errors of gravity observations (especially for ship-borne data) are larger.

2/ Another aspect related to validation of results is the ability of realistically extrapolating the gravity field. For this purpose sets of control point is chosen with given values that are not incorporated into gravimetric solution, but used to independently validate the result. Authors do not offer such validation.

3/ Even if the geophysical application of this study is not substantiated, it is clear that the geodetic relevance is also not fully fulfilled. This is evident from Fig. 7, showing differences between the gravimetric and geometric (GPS/levelling) quasigeoid heights that are biased differently for each country. In gravimetric quasigeoid modelling, the final step is required to combine gravity and GPS/levelling data to remove such systematic bias. This step is missing and study is therefore not completed.

Overall, the application of multi-layer instead of single-layer approach cannot justified the publication in research-focused journals mainly due to a low scientific impact.

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