

A response to the Interactive comment on “Impact of terrestrial reference frame realizations on altimetry satellites orbit quality, global and regional sea level trends: case ITRF2014 versus ITRF2008” by S. Rudenko et al.

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Dear Reviewer,

thank you very much for your comments that allowed us to improve further the quality of our manuscript. Please find below our responses to your comments and the description of the changes made in the revised manuscript (in blue) following your respective comments (in black). The page (P) and line (L) numbers refer to those given in the discussion paper.

Sincerely yours,

Sergei Rudenko (on behalf of the co-authors)

This article is presenting an important piece of work that even though it is not groundbreaking research, it is of great value to the users of altimetry data and products. When one reads this article one has the feeling that the intent of the authors is to record in high detail the work that was done to compare the difference in the “products” of the authors’ lab between two reductions of the same (or nearly so) data with two different reference frame models. The analysis though is over different periods of time, something quite natural, since you only change reference frame models once the prior version becomes obsolete. However, the presentation herein would have benefited from a slightly modified presentation of the differences: the one that is already in this version of the article, and a parallel one where the metrics are formed, presented and evaluated over exactly the same time period. This arrangement would remove the effect of the additional data used to develop the products beyond the validity period of the old TRF, along with any issues that that additional data might have. On the other hand, the current presentation demonstrates how the additional data used to develop the new TRF model have extended the expected quality of the TRF model for several additional years over which the old model is clearly not performing nearly as well as during the years used for its development. This proposed rearrangement may or may not be easily achievable, so I would not make it a prerequisite for the acceptance of the article, but it would certainly make it a lot more useful.

This is an interesting idea. In fact, the analyses and statistics for the TOPEX/Poseidon mission show the differences between the two ITRF realizations till 2005, which is still in the period from which the data for the generation of ITRF2008 were used. On the contrary, the results for the Jason-2 mission (since 2009.0) are outside this period. The temporal behavior of the parameters before 2009.0 and after this time instant is good visible in Fig. 1, 3, 4, 6, and 7.

To stress that, we have replaced the text on P17, L15-16 with the following text: “Our analyses show that the use of ITRF2014 instead of ITRF2008 slightly improves the satellite orbits as well as the derived sea

level values since 1993. The analyses and statistics for TOPEX/Poseidon show the differences between the two ITRF realizations till 2005. More evident improvements are found from 2009.0 for Jason-1 and, in particular, for Jason-2.”

In general the article is written in very good English, but another read by a separate reader would help correct a few minor issues and make it perfect in that respect.

We have fixed a few errors in English and improved English in the manuscript.

A comment on Fig. 3 is that it is missing a legend, and the caption does not explain what the different colors mean. Adding the values of the displayed slopes would also be nice.

We have added a legend, the values of the displayed slopes, as well as the description of the X axis in Fig. 3. We hope, the quality of the figure improved.

Finally, I am chagrined that the authors have left out the required acknowledgements for the SLR and DORIS data that are used to produce the wealth of results that they are presenting! Both communities, ILRS and IDS, depend on getting these acknowledgements and they even have made it simple for the authors to show them exactly how to do it. For example, for the ILRS see:

<https://ilrs.cddis.eosdis.nasa.gov/about/cite.html>

We have added the following citations for ILRS and IDS, respectively:

Pearlman, M.R., Degnan, J.J., and Bosworth, J.M.: The International Laser Ranging Service, *Adv. Space Res.*, 30 (2), 135--143, doi:10.1016/S0273-1177(02)00277-6, 2002.

Willis, P., Fagard, H., Ferrage, P., Lemoine, F.G., Noll, C.E., Noomen, R., Otten, M., Ries, J.C., Rothacher, M., Soudarin, L., Tavernier, G., Valette, J.J.: The International DORIS Service (IDS): Toward maturity, in *DORIS: Scientific Applications in Geodesy and Geodynamics*, P. Willis (Ed.), *Adv. Space Res.*, 45(12),1408-1420, doi: 10.1016/j.asr.2009.11.018, 2010.

Additionally we made the changes described at the end of our rebuttal letter to the interactive comment of Reviewer 1.