Ocean Science Discussions

Ocean Sci. Discuss., referee comment RC2
https://doi.org/10.5194/os-2021-3-RC2, 2021

Comment on os-2021-3

Anonymous Referee #2

Referee comment on "Long-period solar annual and semiannual tidal contributions to the lowest normal low water in seas surrounding China" by Yanguang Fu et al., Ocean Sci. Discuss., https://doi.org/10.5194/os-2021-3-RC2, 2021

Overall, this paper aims to evaluate the importance of the SA and SSA tide in tide gauge observations and satellite altimetry. This study presents an idea of the importance of these long-period tides in understanding ocean tides particularly for the use in the LNLW, which can become valuable for estimations of sea-level trends and extreme events.

A general comment to this study: the results need to be more fully explored and explained in this paper. In some stages, it feels like the paper was rushed and ideas were presented in one sentence and the story moved on in the next. For example, in line 170 - 172, the results of the comparison between the tide gauges and altimetry is presented in three lines. Although the ideas and discussions of this paper are important, I think more time should be taken to properly formulate this paper to make it easier to follow and allow for the full exploration of the results.

This paper also lacks references to some statements that are made. I counted zero references from page 7 to 14 but statements were being made that were not clearly seen or explained in the results. This makes it difficult to confirm the statements and ideas being presented in the paper as well as making the paper a bit difficult to follow.

There are several areas where this paper can be improved and I recommend that the following items be addressed.

Major Item 1:

The authors discuss the limited availability of the SA and SSA tides in models, and mention that the FES2014 and NAO99b are the only available models and that they are limited by being numerical models. In fact, the EOT11a and the recently updated EOT20 model also includes these tides based on altimetry analysis.

These models, as well as the FES2014 and NAO99b models may provide suitable insight into the model estimations, why are these models not also evaluated and compared in your analysis? Although there may of course be limitations in their computation techniques and your own estimations directly from altimetry may be more accurate, I think this study would also benefit from the comparisons with the modelled estimates as they may provide insight into the coastal region and their maps are readily available for comparisons. It might also help understand the regional variability of these tides as well

as explain why the altimetry products differ from the tide gauges (for example in Figures 2 and 3).

Major Item 2:

The authors present that the amplitude differences in the SA tide is larger in the higher latitudes in line 214. Is this really a function of latitude or is it a function of distance to coast? This could be easily presented as a subplot in Figure 7. I think this is an important result to be shown, as the altimeter results are likely poorer closer to the coast, thus explaining discrepancies between tide gauges and altimeter. Along these lines, which geophysical corrections are used? As we see in Figure 2, the values for both SA and SSA are higher in the coastal region and I wonder whether this is realistic or whether some of these values can be influenced by the corrections used. This could also explain relative errors in the coastal regions. Furthermore, the limitations of the altimetry in determining these tides is also important, particularly closer to the coast. Does aliasing period have an impact on the estimations here?

Major Item 3:

In line 207 - 208: *"The long-period tidal constituent amplitude is the main cause of differences in the tidal contributions."* This was not shown in this study or is there a reference to this? Of course, the overall tidal correction as well as equation (1) - (4) is influenced by both the amplitude, but also the phase. What are the differences between the phases estimated from the altimeter and the tide gauges? Is this a source of some of the errors in the LNLW? This should be discussed as difficulties in estimating the tides' phases' or errors in the phases may have a strong influence on the results which has been neglected in this study.

Major Item 4:

The authors suggest and conclude that the relative contribution of the long-period tides is highly influenced by the M2 and the 'major' tides. This is not explained in the text as to why this is the case. Its not fully clear as to why the ***relative*** contribution would be influenced by the amplitude of the M2 tide?

Major Item 5:

As I stated in the introduction, the comparisons between tide gauges and altimetry derived SA and SSA needs to be discussed and explored further. For example, the authors state the main difference between tide gauges and altimetry is due to the behaviour in the Bohai Sea. Looking at Figure 2 and 3, this does appear to be the case for the SA tide but do the authors have any explanations as to why this is happening? Looking at modelled data, such as FES2014 and EOT20, the models also show this higher amplitude seen in the tide gauges of the Bohai Sea, and it is therefore interesting that the altimetry really doesn't replicate this.

Minor items / Suggestions

The authors need to really provide proper references to section 2.2. It was only after intensely looking through the CTOH website and reading your acknowledgements that I understood that the tidal constants were in fact not estimated by the authors. I think this is somewhat misleading as it gives readers the impression that the harmonic analysis was done in this paper, but the fact that it is done and referenced by CTOH is also a good source to help understand how this was done.

What is meant by the ‘negative’ long-period tidal correction values shown in Figure 5 (top) and discussed later on? Are the correction values always negative, or are these the absolute values just made negative to mean they are subtracted from the overall tidal correction? In line 235, what is meant by the negative percentage (-4.20%)?

Can you add the regions described in line 149 to 151 into Figure 2?

Please add references to Line 179 "*anti-distance weighted method*"

It may be beyond the scope of this study, but at least a mention of the existence of additional long-period tides is needed, for example in line 122. Have additional tidal constituents been included in eq (1) - eq (4) or is this planned at a later date?

Line 229 - 231. Here the authors argue that these tides will be influenced by atmospheric corrections. As I explained earlier, the corrections and factors used to estimate the tides from the altimetry should be explained or at least referenced.