RESPONSE TO REVIEWER 2

Reviewer's comments are inserted in italics and blue, and responses in regular font.

Many thanks for these comments.

SPECIFIC COMMENTS

I generally find the paper and topic interesting but in many ways the paper is positioning itself between two chairs. One describing the result of the numerical modelling (not the numerical model) and the second the effect of lake level change. So given the title of the paper this was a bit of surprise to me.

So I would very much like to se the title reflecting this better like "ocean tides under changing lake level". In general I find the scientific approach and the applied methods valid though I have the same problem as the first reviewer that no information of the presented model is given as this is given in previous work. (Medvedev et al. 2017, 2019: tide gauges). I find the investigation of love numbers misplaced in this context as this is likely dealt with in the reference work, and I suggest this is substituted with more quantitative discussion on the quality of the model.

Our paper describes the result of the numerical modelling. We added in new version of manuscript information about the confrontation of the presented model with tide gauge data.

We believe that the main results of presented paper tidal charts for amplitudes and phase lags of the major tidal harmonics, form factor, tidal range and velocity of tidal currents. The numerical results with the changes of the mean sea level are secondary. Therefore, we believe that the current title of the article reflects well the results presented in it. We didn't do the investigation the Love numbers, but simply describe the model parameters.

TECHNICAL

Figure 1 is nice but identical to another publication by the leading author. As the evaluation of the ocean tide model in Table 2 is done for a number of cities surrounding the Caspian it would be much more appropriate if Figure 1 was changes to represent the location of these cities and I personally have no clue to where the cities are located. This would make reading easier.

We corrected Figure 1 and added some names of bays and cities from Table 2.

Of interest I am very puzzled about the >21 cm tides in the TB described in Figure 3 because it does not relate very well to the amplitudes of the two major constituents in Figure 2 and the 4 major constituents in Table 2. the major semi-diurnal constituents explains a maximum of 7 cm or 1/3 of the tidal range in TB and the Maximum tidal range (R) for the 4 major explains less than 1/2 of the signal. Consequently there must be other major constituents not mentioned in this paper that is responsible and likely dominating?. Again the fact that I do not know the location of the cities in Table 2 makes it hard to determine the location of maximum amplitudes. The paper deserves an detailed explanation of this phenomena (is it astronomical constituents, overtides???).

We think that there is no surprise in the estimates of the tidal range. The tidal range was calculated as the maximum range of tidal sea level oscillations during one lunar day (~25 hours). This is approximately equal to twice the sum of the four major constituents (M2, S2, K1, and O1). For example in Table 2 for Fort Shevchenko we have H(M2)= 2.47 cm, H(S2)= 0.92 cm, H(K1)= 0.56 cm, H(O1)= 0.30 cm. The twice sum of these constituents is 8.5 cm, that is relate

well to the tidal range in Table 2 for this city (8.9 cm). In Turkmen Bay (see Fig. 3 in new version of paper) we have *H*(M2)= 6 cm, *H*(S2)= 2.6 cm, *H*(K1)= 0.73 cm, *H*(O1)= 0.47 cm. The twice sum of these constituents is 19.6 cm, that is relate well to the tidal range = 21 cm in Fig. 4. The differences in the magnitude of the tidal range in paper and presented twice sums are caused by the contribution of semidiurnal constituents N2 and K2 with amplitudes of about 0.5-1 cm.

The paper briefly mentions the form factor F in Table 2 and later in the paper gives one sentence about it. The form factor is detailed in previous publications by Medevedev, and I would leave it out of describe it much more detailed in this publication.

In current paper, we show for the first time a map of form factor for the Caspian Sea. Consequently, we will keep the short description of it.

When discussing numerical experiments with different MSL more information on the accuracy of the bathymetry used must be provided. The discussion on Page 13 following Figure 6 is interesting but again I question on the Turkmen Bay.

Figure 4 could benefit from names on the regional features

Figure 5 6 and 7 should be reconsidered an redrawn for consistency.

Figure 5 used 26 28 and 29 meters, Figure 6 25, 27 and 29 meters and Figure 7 25-30 meters. so they all are consistent. Figure 5 also needs a bit of "regional" explanation for the reader. How can two cities 300 km apart. Exhibit sea level changes differing by 0.5 meters from 1900 until now.

Since 1980 the sea level curve matches but before it differs up to 0.5 meters?-

We added some information on the accuracy of the bathymetry.

We added names on the regional geographical features.

We redrawn Figure 5. We done new bathymetry maps for MSL = -25, -27, -29 m. The difference in the mean sea level of 0.3 m in Baku and Makhachkala caused us questions too. We wanted to show the mean sea level of the whole Caspian Sea, but since it is different depending on the station, we decided to show two stations in the figure. We checked several sources of data on the Caspian level (http://www.caspcom.com/ и http://caspi.ru/). In both databases the data shown in Fig. 5 differences in the average level at 0.3 m in the first half of the 20th century. We believe that this feature in interannual sea level variability is caused by the local conditions of these stations (for example, tectonic movements), which led to a relative change in the absolute height of the tidal pole. But since these questions are not the purpose of this study, we decided to show in this figure only one station (Makhachkala).

Figure 8 is interesting in attempting to explain the spectral density at different MSL regimes. I guess this is the key to the large tides in the Turkmen Bay, and the key to which constituents are responsible for the large tides. This deserved more attention and investigation and explanation in my oppinion.

We have added a few more words to this section.

In the discussion there is a bit of uncertainty to the discussion of the large tides in the Turkmen Bay. The height of the island is in the paper claimed to be 3-5 meters by the author and 5-8 meters from the SRTM. SRTM was measured in the Early 2000's where sea level was -27.5 meters, so there is inconsistency here.

We agree with the reviewer that there is inconsistency in the height of the Ogurja Ada Island. The SRTM was in February 2000 where sea level was -27 m. When we took the SRTM data we expected to see the height of the island about 1-3 m, but it turned out to be higher. Because of this difference between the results of Badyukova, 2015, GEBCO database and SRTM data we put this paragraph in the discussion. We have not yet found more reliable information about the height of the island and now we can't say who is right. We will try to study this in more detail in the subject of upcoming future researches.

Many thanks.