Point-by-point reply to Referee #2

C1: This study performed the reconstruction of coastal sea level variability of the Mediterranean Sea from tide-gauge datasets using an optimal interpolation method. The authors showed that the reconstruction provides better estimate of coastal sea level variability than the altimeter data. The topic of the study is important, and the method is well thought out. Hence, this manuscript is acceptable after revisions.

R1: We thank the referee for his/her comments as well as for the effort in revising our work. All his/her comments have been taken into account and addressed in the present document. An improved version of the manuscript has been resubmitted, thanks to this discussion.

Major comment:

C2: L327-328: As the authors mentioned, there are large differences of the sea level trends between the tide-gauge data and the reconstruction at Algeciras, Barcelona and Tarifa (Table 3). What is the reason of these differences? In addition, the trend of the tide-gauges is more heterogeneous than that of the reconstruction (Table 3). The optimal interpolation method for the reconstruction might not be suitable to capture small-scale coastal processes. Please discuss this point.

R2: The lack of coherence between the trends calculated through the historical series of tide gauges located in the region close to the Strait of Gibraltar has been reported by several authors (e.g., Ross et al., 2000; Marcos and Tsimplis, 2008). This lack of coherence is maintained during the period covered by altimetry, and important discrepancies have also been reported between the trends provided by altimetry and those shown by some tide gauges, such as Tarifa or Barcelona (Taibi & Haddad 2019: https://doi.org/10.1007/s00343-019-8164-3). In absence of clear errors in the series, we agree with the reviewer in attributing the observed lack of coherence to the presence of local forcings which are not shared with the neighbouring stations.

The statistical interpolation applied in our work relies on the existence of meaningful spatial correlations, obtained in our case from a numerical model. If a given station is submitted to local forcings that are not well captured by the model, the elements of the correlation matrices affecting that station will not be accurate and the interpolation will fail in the vicinity of that station, as stated in in the last paragraph of Section 4.1: *"For these frequency bands, the differences between the original and the reconstructed series are larger than the statistical interpolation error given by the Optimal Interpolation formulation (Eq. (4)); this suggests that for some stations the correlation elements of the Optimal Interpolation matrices are not correctly represented".*

In summary, we agree with the reviewer in that the optimal interpolation method used for the reconstruction might not be suitable to capture small-scale coastal processes. Consequently, we have highlighted this in the new version of the conclusions (lines 461 - 466): **"*The accuracy of the reconstruction has been shown to vary regionally. The level of accuracy depends on the number of available stations and also on the accuracy of the representation of the correlation elements of the Optimal Interpolation matrices which in our case are provided by a numerical model. The applicability and performance of the method to other regions is conditioned, first, by the availability of long enough sea level datasets with the required spatiotemporal resolution to compute reliable correlation functions, and second, to the number of available tide gauge observations and their spatial distribution*".**

Minor comments:

C3: Section 2.1: How do you remove the astronomical tide from the tide-gauge data?

R3: We do not remove the astronomical tide from the tide-gauge data, but by using daily averages we assume that the tidal signal has mostly been filtered out.

C4: L264: "interdecadal"?

R4: In the new version of the manuscript, line 271 now read: **"*For the interannual to decadal frequency band (1y<T<10y) the reconstructions explain…*"**

C5: L388-389: In this paragraph, the authors compared your result in summer with the result of the barotropic model by Martinez-Asensio et al. (2014). This comparison does not make sense. The authors should compare your result with the result of the tide-gauge data by Martinez-Asensio et al. (2014). The authors have to mention the difference of the results and advantages of your reconstruction.

R5: The reviewer is right, thanks for the suggestion. In the new version of the manuscript, the last paragraph of section 5.3. reads: **"*In summer, the correlation patterns obtained from our reconstructions differ slightly from those obtained from tide gauge series in the western Mediterranean by Martínez-Asensio et al. (2014). Our results show that, during summer, the EA is the dominating index, with positive correlations up to 0.5 basin-wide, while the EA/WR index shows negative correlations of around -0.3. Martínez-Asensio et al. (2014) also obtain positive correlations between the tide gauges and the EA index, but always lower than 0.5, and often not significant; for the EA/WR index they obtain non-significant negative correlations. Overall, the sea level reconstruction suggests a greater influence of the EA and EA/WR indices (mainly related to freshwater and heat fluxes) on western Mediterranean sea level variability in summer than what is obtained from pointwise observations. Finally, in autumn it is the NAO index that seems to dominate the variability, with correlations around -0.5, followed by EA, with values up to 0.4.*"**

C6: Legend of Fig. 5: "serie" => "series"

R6: The legend of Figure 5 has been corrected, thanks.