

Ocean Sci. Discuss., author comment AC1  
<https://doi.org/10.5194/os-2021-92-AC1>, 2021  
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## Reply on RC1

Amin Shoari Nejad et al.

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Author comment on "A newly reconciled dataset for identifying sea level rise and variability in Dublin Bay" by Amin Shoari Nejad et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-92-AC1>, 2021

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Dear Prof. Woodworth,

Many thanks for reviewing the paper. Your reviews are very constructive and appreciated. Below I will try explaining the issues you raised:

***1<sup>st</sup> major comment: One major comment is that there is no technical information or history provided on each gauge ...***

We will add Table 1 in the supplement file (attached here) including the information on the tide gauges installed at Dublin port. However, please note that we do not claim with certainty that the tide gauge at Dublin port is faulty or has been faulty since 1976. We report the results of the comparison of monthly MLW, MSL, and MHW of Dublin Port, Howth Harbour and Arklow in Figure 3 and Table 3 of the paper. According to the comparison, it seems clear that the MLW time series are in higher agreement with each others compared to MSL and MHW. We have not investigated the cause behind this lack of agreement, and we only suggest that drift in the pressure sensor is a possibility worthy of further investigation. Regardless of what caused the apparent divergence in the high waters, we have shown that it is possible to re-create the MSL using MLW to correct for the bias (Figure 5-6 suggest that the output of our model is more aligned with MSL in Arklow, Howth Harbour, Brest and Newlyn compared to the original MSL data). To build the regression model we needed to validate the training MSL data and for that we compared the MSL of Dublin Port to those of Newlyn and Brest in Figure 4 and, based on this comparison, we decided to choose 1938-1976 as the period for training the regression model. The change point model gives additional support for choosing the year 1976 as the end point for the training period of the regression model and is not introduced for any other purposes. Hence, we neither claim that the drift has started in 1976 nor that the data during 1976-2003 (approximately) are incorrect. In fact, according to Figure 5, the original MSL and the modelled MSL are in good agreement in that period which suggests that a possible drift in high waters was not significant during that period. Otherwise it would have been corrected by the model as can be seen in the period 2003-2016.

***2nd major comment: A second comment is that Table 1 is missing a line? ...***

Thank you for pointing out to the issue with Table 1. We will replace it with Table 2 in the supplement file.

**3rd major comment: A third comment is that on line 1 of the abstract it says the new composite record for Dublin will be for 1938-2016, but from Table 1 we see there is Dublin data to 2019 ...**

We excluded data post 2016 because the data exhibit very large variations and cannot be validated against Howth Harbour and Arklow even for MLW (shown in Figure 1 of the supplement file). We will clarify this issue in our revised manuscript.

**4<sup>th</sup> major comment: A fourth comment relates to the regressions at lines 116 and 140 ...**

We ran the model both with the perigeon correction and without it, and there is no significant difference between the two, except for 1953-2016. However, the SLR rate has slightly reduced uncertainty when including the perigeon terms. We will remove the perigeon following your comment as the model is simpler and the results are nearly identical to the current estimates (results in Table 3 of the supplement file).

**Minor comments:**

We will fix the typos and ensure the text is more consistent and clearer throughout the paper.

Specific responses to your inquires in the minor comments:

**Line 80 - There is found to be a systematic .. dataset presumably due .. [presumably because do you know that for sure? i.e. did they round in one way?]**

There was an overlap of 5 years between the lower vertical resolution data and higher resolution data. We calculated the mean high water and mean low waters for each and computed the offset. Hence we were able to be sure of the difference.

**Line 200- the model output as such is not shown in Figure A1, simply the difference Dublin minus Newlyn from which the model decides 1976 is a change point. And should that be difference and not absolute difference? ...**

We use the absolute difference because we are not interested in whether the changes are positive or negative but rather are looking for any changes in the MSL difference between sites. A model which uses the raw rather than absolute difference suggests multiple change-points throughout the time period, and would require a multiple change-point model. Such a model seems unnecessarily complex for this situation.

References:

Murphy, J., Sutton, G., O'Mahony, C., and Woodworth, P.: Scoping Study to Assess the Status of Irelands Tide Gauge Infrastructure and Outline Current and Future Requirements, Tech. rep., 2003.

Please also note the supplement to this comment:

<https://os.copernicus.org/preprints/os-2021-92/os-2021-92-AC1-supplement.pdf>