

Comment on os-2021-49

Anonymous Referee #2

Referee comment on "Mean Sea Level and Tidal Change in Ireland since 1842: A case study of Cork" by David T. Pugh et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-49-RC2>, 2021

Review of 'Mean Sea Level and Tidal Change in Ireland since 1842: A case study of Cork'

In this paper, the authors present the results from a tide-gauge data digitization effort in Cork, Ireland: data from a large field campaign in 1842 is digitized, and a levelling campaign has been undertaken to compare the historical measurements with present-day observations. The authors find a sea-level rise of about 40 cm over 177 years and a small but significant change in the amplitude and phase of the semi-diurnal tide.

I have enjoyed reading the paper, and the manuscript has taught me a lot on all the processes and uncertainties that are involved in tide-gauge data rescue efforts. I recommend publication in Ocean Sciences, and I'm convinced that the digitized records will have many use cases in the oceanic and geophysical community.

We would like to thank the reviewer for taking the time to read and review the manuscript and for their generous comments.

I have some (very) minor comments:

L41: The word 'Marigraphs', which I think refers to automatic tide gauges, might need a quick explainer.

We will add the phrase "(traces recorded from automated tide gauges)" to the line in the revised manuscript.

L420ff: an alternative to estimating the range of inter-annual variability could be to exploit the coherent interannual and decadal variability around the British Isles, as shown in Hogarth et al. 2021. The surveying period might have been during a period of below- average MSL values around the British Isles, or the other way round. Not sure how large this effect is though.

The common mode developed by Hogarth et al. was developed on the basis of UK tide gauges. Their examination of satellite altimetry data certainly indicates that this is a common mode to both Britain and Ireland. However, the satellite data is only available from 1993 onwards. For our purposes, we don't think it is a robust index to consider the adjustments to Irish sea level data from 1842.

This is a very interesting mode of variability and it is our intention to analyse it in an Irish context but we believe the more conservative estimation of interannual variability that we have used here is more understandable in this context.

L474: GIA uncertainty might be large in this region. For example, the GIA model from Caron et al.(2018) predicts a relative sea-level rise of 0.6 mm/yr for the region around Cork. This model is far from optimized for this region, as it's not using a sophisticated local deglaciation history, but the GIA signal might be a major reason for the difference between the rate from Hogarth et al. 2021 and the number found here.

We have utilised the most recent GIA model tailored for this region updated from Bradley et al. as part of the BritIceChrono project. This is a variation in the choice of GIA that was investigated in the PhD of Peter Hogarth. However, in terms of explaining the observed sea-level rise. Alternative GIA estimates such as the global estimates of Peltier give lower rates of relative sea level rise in the Cork region. Thus other models are less tuned for the region and explain less of the signal.

We envision that our follow up study that will cover the whole island of Ireland will allow a more detailed comparison of the various GIA models and their strengths and weaknesses.

We've added the revised text: "Other GIA models such as the global model of Peltier and Tushingham (1991) results in an even lower contribution from GIA as would be expected for a model not tuned for the region."

Figures 1 and 6: R. Lee, does that refer to the river Lee?

Yes, we will add (R. Lee = River Lee) to first caption.

Finally, I'd encourage the authors to deposit the digitized time series and levelling information in a public repository, for example PSMSL or Zenodo.

We welcome this suggestion. We will deposit the final data to Zenodo + add code to a github repository to recreate Figure 8. As a note, PSMSL are currently developing a format for submission of rescued data but this is not standardized at this stage.