

## ***Interactive comment on “Measuring rates of present-day relative sea-level rise in low-elevation coastal zones: A critical evaluation” by Molly E. Keogh and Torbjörn E. Törnqvist***

**Anonymous Referee #2**

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General comments:

This study seems closely related to the work published in GSA Today (Nienhuis et al. 2017) in which the authors were involved. But it is not clearly stated how both relate together. Nienhuis et al. is quoted towards the end of the manuscript, just before the conclusions. The findings on the underestimation due to shallow subsidence are already present in Nienhuis et al. Hence, should this manuscript be considered as supplemental information to the GSA Today one? I think it is important that the authors clarify how both studies relate together from the beginning (introduction). In addition, the introduction and the conclusion (“we present”, “we propose”) suggest the approach

C1

is novel. However, later on we find expressions and references which suggest it is not. Overall the authors need to make an effort to unambiguously set their study in the scientific context.

In my opinion, the manuscript suffers from a perspective bias “against” tide gauges. That is, the authors show that both the tide gauges and GPS antennas are similarly anchored deep below the surface (at almost equivalent depths). Thus, none of them can actually capture the shallow subsidence. The combination of satellite altimetry and GPS data or the use of tide gauges suffer from the same drawback. Consequently, the statement that the novel approach eliminates the need for tide gauge data (repeated several times in the manuscript) is not objectively supported, because the same criticism applies to GPS antennas, and hence to the combination of satellite altimetry and GPS data. From my understanding, tide gauges + RSET-MH can work as well as satellite altimetry + GPS + RSET-MH. The authors need to think about it, and provide arguments to support their claim in a more convincing way, or reconsider the presentation of their findings (which are anyway interesting, in my opinion).

The manuscript (introduction) suggests an assessment of their findings in LECZs worldwide, but the authors do not provide evidence that the findings apply beyond their case study zone, except for some general considerations (sediment thick in different coastal areas of world from the literature). The authors should be aware that different countries (agencies) have different practices in building infrastructures (tide gauges or GPS antenna monumentations). The US case study is likely not representative of the wide range of practices elsewhere. They should consider reducing the scope of the claims, and develop a cautious discussion in extending the findings in LECZ worldwide. The title may be revisited too.

In line with the above comment, I would suggest a search in the literature about GPS station monumentations to support the worldwide extension. I vaguely remember a talk a decade ago or so about GPS antenna monumentations within an IGS meeting or an IAG scientific assembly. The concern of the study was the ability of the different types

C2

of GPS antenna monumentations to estimate actual ground / crustal motions. I think it might be worth searching for the details of this study or later studies on this subject.

In addition to the above comment, the choice of the deepest benchmark in section 4 needs to be supported, especially regarding the leveling analysis and practice to maintain the tide gauge datum, which can differ from one country (agency) to another (agency). Furthermore, I think this methodological choice should not be presented / discussed in the “Results” section but in the methods section.

The manuscript is overall well written with good illustrations (Figures). In my opinion, it needs to consider the above comments. My suggestion is therefore a major revision.

Specific comments & Technical corrections:

p.2, L17-18: The expression is confusing. That is, if the station is >14 m, it includes the surface, and thus can capture any land motion. Consider rephrasing, why not using the same form as with the tide gauges? (Simply remove “>”).

p.2, L22: the need for tide gauge data is often multi-application. The authors should be careful with this claim, and state the context of it (eliminates the need for this specific application and LECZ situation). In addition, see major comment above, that is, the same concerns apply to the GPS monumnetation, hence both tide gauges and GPS show the same drawback.

p.2, L34: a reference to support this claim is missing. It could be Holgate et al. (2013) which describes a data bank or similar; it could be an (the) article(s) that rescued the historical data of the stations listed in brackets.

p.2, L37: Watson et al. is a good paper but it is not relevant in the context of this sentence. (Its global sea-level rise estimate is based on satellite altimetry data). Maybe the reference can be used somewhere else.

p.3 L50. Consider adding the reference for the PSMSL (Holgate et al. 2013 in J. Coastal Res).

C3

p.3. L53. What signals encompass “natural variability” here?

p.4, L93. A reference is needed to support this claim. I vaguely remember a talk several years (decade?) ago at an IGS or IAG meeting about GPS antenna monumentations (structure, depth. . .) with some statistics. The concern of the study was the ability of GPS antennas to estimate actual ground / crustal motions. I think it can be worth searching the literature, especially since L97 states the issue of the nature of GPS station foundations as an objective of the study.

p.4. L100. Confusing (see general comments above). The expression suggests the approach is novel, especially because in the previous sentence it is stated what is not the purpose of the study. However, there are two references at the end of the sentence. Is this study a refinement? Consider rephrasing and clarifying.

p.5, L144-145. This choice needs to be supported, especially regarding the leveling analysis and practice to maintain the tide gauge datum, which can differ from one country (agency) to another (agency).

p.6, L172 (L205 too). What is behind the term ‘eustatic’?

p.14. I cannot see whether there are squares and circles co-located. Consider using a different colour too, it may help.

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Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2018-75>, 2018.

C4