

Ocean Sci. Discuss., referee comment RC1  
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## **Comment on os-2021-58**

Anonymous Referee #1

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Referee comment on "Dynamics of fortnightly water level variations along a tide-dominated estuary with negligible river discharge" by Erwan Garel et al., Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-58-RC1>, 2021

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This manuscript discusses fortnightly ( $\sim 14.8$  day) variations in surface elevation along an estuary, as recorded in measurements and found in a model. The focus is on tidal forcing with neglect of river discharge and atmospheric forcing. The introduction and discussion indicate that these elevation variations can be significant in several contexts. However, given considerable existing literature, some with river discharge, this is a simpler scenario and the results are in general unsurprising. Good agreement between model and observations is obtained. The degree of novelty can be questioned and one would expect more discussion of the relation with previous results including river discharge (which I guess has varied magnitude relative to the tidal prism in the various contexts treated in the literature).

Non-dimensional parameters are introduced but not sufficiently exploited in my opinion. There is a focus on values pertaining to the observed Guadiana estuary. What about an estuary near resonance with M2?

I am not convinced by the (repetitive rather than justified) attribution of the behaviour to friction rather than non-linearity in the advection terms. This must depend on their relative magnitude which depend on the length and depth of the estuary. I question the analysis in 4.2. Non-linear effects on M2 usually show in M4 as a result of advection and M6 as a result of quadratic friction. However, here the quarter-diurnal species (mainly M4) are attributed mainly to friction and sixth-diurnal species are not discussed.

In general the English is good and understandable, despite occasional strange usage which should be picked up in copy-editing. However

- There is frequent reference to "equinoctial" which is incorrect and obscures the intended meaning, e.g. lines 199, 239, 240, 241, 244, 596. Omit and say precisely the time referred to.
- "spring" and "neap" should be used as adjectives e.g. "spring tide(s)" or perhaps as plurals e.g. "springs". Do not use "spring" alone; this is a season of the year.

Typos etc.

Lines 9, 49. The direction of increase should be stated.

Line 34. "metric order" should be "of order 1 m"?

Equation (1) and line 77. There should be a reference for this form of friction, especially the depth-dependence.

Line 83. The relative magnitude of the two terms on RHS(2) is independent of  $|U|$  so the relevance of Froude number is unclear.

Line 129. "Equinoctial" can be omitted: not strictly true and made redundant by the other information given.

Line 138. Why should a diurnal tide induce "jagged" fluctuations? Specify their time scale and that of the smoothing.

Lines 139-141. If another scientist were to check this work they would need more specification of the CWT. Also line 187 "using the equations developed by . ." is too vague. Either they should be repeated or at least equation numbers in the cited papers should be specified.

Line 190. "Continuity" of volume flux? Surface elevation? Anything else?

Line 202. This sentence is unclear. Which period shows the greatest variations? "equinoctial" occurs at the very end of the record. Likewise lines 212-213.

Lines 245-246. This sentence seems tautological; what exactly is being compared with what?

Lines 273-275. This is not correctly expressed. (8) relates  $K$  to  $C_d$  but (9) is an independent value for  $C_d$ , presumably coming from Soulsby (1997).

Line 337. "opposed to observations" begs discussion which I don't see.

Line 350.  $15^\circ$  is about 31 minutes for M2.

Line 355. This is section 5.3!

Figures 7, 8. It is better practice to include zero on the amplitude scale.

Figure 8. The scales for distance from the mouth differ between (b) and (c) and do not include zero.

Table 1 expressions for damping numbers: if  $d\eta/dx$  and  $dv/dx$  are factors then they need to appear without other symbols interspersed.