

Interactive comment on “A monthly tidal envelope classification approach for semi-diurnal regimes with variability in S_2 and N_2 tidal amplitude ratios” by Do-Seong Byun and Deirdre E. Hart

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Reply to Anonymous Referee #2's Interactive comment on “A monthly tidal envelope classification approach for semi-diurnal regimes with variability in S_2 and N_2 tidal amplitude ratios” by Do-Seong Byun and Deirdre E. Hart, Received and published: 5 February 2020

Thank you for these helpful comments. Here we have copied each individual comment, and written below it a response.

Reviewer introduction: The paper is basically acceptable, and Figures 1b, 1c, and 6

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are useful. Most of the paper is devoted to trying to find the numerical delineations between spring-neap and perigean regimes, and that is a little tedious, as the boundaries are bound to be fuzzy and perhaps not applicable everywhere, even in purely semidiurnal regimes. (For example, the moderating role of K_2 , which likely causes variations throughout the year, isn't brought up. This, however, isn't fatal, since this whole exercise is merely to produce rough rules of thumb.) I didn't spot anything that is clearly in error, just minor issues, listed below. Some of these issues involve odd, almost off-the-cuff remarks in the introductory material rather than in the technical material. Numbers below refer to Line Numbers in the paper. Response: Thank you for taking the time to review our paper. We feel we have been able to very significantly improve our paper based on the 3 sets of feedback provided. Please see below specific responses to this review.

24 - Neither the Egbert nor Stammer papers have anything to do with sea level change or gravimetry. Response: The Egbert et al. (1994) reference has been deleted from here (details in our response to the Woodworth review). Stammer et al. (2014, p243) state as a justification for their accuracy assessment paper that “An especially important application for accurate tide models is providing tide “corrections” to various measurements so that smaller nontidal signals may be studied. For example, barotropic tide models are used regularly to remove tidal variability from space geodetic observations; this is a critical necessity for successful satellite altimetry [e.g., Fu and Cazenave, 2001] and satellite gravimetry [Seeber, 2003; Visser et al., 2010], and in both cases improved tidal corrections lead to a reduction of aliased tidal “noise” in nontidal signals of interest”. It is this point from Stammer et al. (2014) that we wished to point our readers to. Our revised text now makes this clearer by the repositioning of this reference as follows: “An understanding of tidal water level variations is fundamental to... accurately resolving non-tidal signals of global interest (Stammer et al., 2014), such as in studies of sea level change”.

41 (also Table 1): Is it a sidereal month or a tropical month? Response: This table has

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been deleted (see response to Woodworth review).

47: "Far less attention" - There is a good reason for that, as the major tides are obviously most important for prediction. And why specify "modern" in this context? It's always been the case. Response: Yes, thank you for your comment – we have removed this text and recalibrated the tone of remaining text. The revised paragraph now reads: "Tidal envelopes at monthly scales depend on tidal regime. In general, semi-diurnal tidal regimes often feature two spring-neap tidal cycles per synodic (lunar) month. These two spring-neap tidal cycles are usually of unequal magnitude, due to the effect of the moon's perigee and apogee, which cycle over the period of the anomalistic month. In contrast, diurnal tidal regimes exhibit two pseudo spring-neap tides per sidereal month. For semi-diurnal regions where the N2 constituent contributes significantly to tidal ranges, tidal envelope classification should consider relationships between the M2, S2, and N2 amplitudes. The waters around NZ represent one such region: here the daily tidal form is consistently semi-diurnal, but large differences occur between sites within this region in terms of their typical tidal envelope types over fortnightly to monthly timescales. More than eighty years after the development of the ever-useful daily tidal form factors, attention to the regional distinction between different tidal envelope types within the semi-diurnal category forms the motivation for this paper".

216 "having common ways of describing different types of tidal envelope is essential for living safely and productively..." – ESSENTIAL, really? That seems overblown. In fact, I consider a full-up tide prediction to be far more essential. Along the same lines, is it really necessary to have similar statements in the Abstract? The first and last sentences of the Abstract seem to me to be quite a stretch in trying to justify the work. Response: We have deleted 'essential' from our text here and replaced it with 'helpful'. The term in our revised abstract reads 'of use', which is a much milder claim than previously written. The abstract has been much modified in response to a similar point made in the Woodworth review, also improving it in terms of the comment made here.

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60: what plates NZ sits on is rather irrelevant to the subject. Response: We agree that the names of the plates are not essential to our core paper topic. However they are useful in the context of explaining the long narrow shape of the chain of islands that make up New Zealand, and this shape plays a role in interacting with our ocean tides. The revised text now reads: "New Zealand (Fig. 2) is a long (1600 km), narrow (≤ 400 km) country situated in the south-western Pacific Ocean and straddling the boundary between the Indo-Australian and Pacific plates. Its three main islands, the North Island, the South Island, and Stewart Island/ Rakiura, span a latitudinal range from about 34° to 47° South".

88: I'm not sure why "sidereal" is used in reference to K1 and O1. "Declinational" or just "diurnal" seems more apt. Response: Yes thank you - we have replaced 'sidereal' with 'diurnal' in our revised text.

173: "moderating" is an odd way to refer to M2. Table A1. It should state these are Greenwich phase lags (which I believe to be the case), since lower-case "g" is often used to denote a local phase. One could also argue that the F value based on "Equilibrium Theory" ought to be a function of latitude. Response: Thank you for these comments – we have addressed all of them. Table A1 now has correct reference to Greenwich phase lags in the caption and the corrected capital G parameter label in the table proper. Regarding line 173, we removed the sentence with "moderating" in it (see details in the reply to the Woodworth review). The text now reads: "We distinguished these two envelope types via the tides generated by variability in the amplitude ratios of S_2/M_2 and N_2/M_2 (i.e. of the spring-neap cycle, and perigean-apogean cycle, forming tides, respectively). In brief, the S_2/M_2 and N_2/S_2 amplitude ratios vary widely around NZ, with highest values in the west, lowest values in the east, and intermediate values to the north and south (Fig. 4)".

Is Table 4 really necessary? Aren't Tables 2 and 3 and Figure 6 sufficient? Response: Thank you and yes it was unnecessary so we have deleted this table (see response to Woodworth review where we expand on our table deletions and adjustments). Basically

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only a revised version of the original Table 2 remains (now re-labelled Table 1), with the original Tables 1, 3 and 4 deleted since they were unnecessary.

And finally a point on names. Presumably the government of New Zealand has not (yet?) changed the country name to Aotearoa. Is there a reason to use (what I assume C2 OSD Interactive comment Printer-friendly version Discussion paper is) Maori throughout this paper – including even for the Pacific Ocean and Tasman Sea? I suspect that indigenous Australians have a different name for these. Why not use those? Why not use Korean as well? I don't really see the point of using an obscure indigenous name for the Pacific Ocean. Response: Recognising that Copernicus has an international audience we have selected only one name for each place within the country now, called the country 'New Zealand', and used English ocean names consistently throughout the paper and in a revised version of Figure 2 (see response to Rowe comment for the new figure and more detail of these changes).

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