

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

Place names: There is some inconsistency in the place names used in the paper. For example, Cook Strait is referred to as 'Cook Strait' (line 73 and others) and 'Te Moanao-Raukawa Cook Strait' (line 70 and Figure 2). Lines 60 and 61 give both alternative names for the North Island and South Island. The English and Maori names are alternatives; it is not necessary to use both - choose one form and use it consistently. The official name for Stewart Island is 'Stewart Island / Rakiura', not 'Rakiura or

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Stewart Island' as shown in line 61. It is recommended that place names used are as shown in the NZ Place Names Gazetteer. Cook Strait is just 'Cook Strait' (not an official name but a recorded one), 'Castle Point' (line 117) is 'Castlepoint' (official). 'Aotearoa New Zealand' has been used for the name of the country (and abbreviated to ANZ) but until an Act of Parliament is passed the country is 'New Zealand'. Response: The approach taken was: at first mention of a name we used use both Te Reo Maori and English names, thereafter referring to each place by which of these two is the most commonly used name today. This was combined with including both languages on the map. The reason for including both official written language names at first mention/ on the map was to recognise, with equivalence, both types of official place name. This was also pragmatic, to try to give our paper some time-proofing, since it is not uncommon today for place names in our country to revert officially from their English to their Maori version. By including both, we thought our paper might withstand such changes and still be readable in the future. However in recognition of the direction to use only one form for each place name, and recognising that Copernicus has an international audience, we have selected one name for each place and used that consistently. By contrast, the case of the Castlepoint typo (Castle Point on line 117) was an error and we have fixed this now.

Line 82: It would be helpful to point out that the results of the analysis of the records from the additional 33 locations are presented in Figure 6, and a sentence or two summarising those results would be appropriate. Response: Yes, our text now reads: "The Cook Strait's tides were explored in detail by Walters et al. (2010): our Fig. 6 includes a re-analysis of their data using the E ratios. Note that the Cook Strait data includes 4 sites in the Type 1 category, as well as a number of Type 2 and Type 4 sites, and one Type 3 site, revealing this small strait to be a concentrated area of monthly tidal envelope diverse".

Line 83: What does 'reach the strongest' mean? Response: Reach has been changed to "are" as follows: "where spring-neap tides are the strongest in the country".

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Line 93 and 94: The text here states that Figures 3 and 4 map the constituent amplitudes and ratios listed in Table 1, but surely the figures are derived from the FES2014 model as stated in the captions for Figures 3 and 4. Response: Lines 93 to 94 had stated: "In order to better understand the key constituents responsible for shaping tidal height forms around ANZ, we first mapped variability in the amplitudes of the semi-diurnal and diurnal constituents listed in Table 1 (Figure 3) and of the ratio values of the semi-diurnal constituent amplitudes (Figure 4)". That was meant to indicate that we used the list of constituents named in Table 1 (i.e. those involved in spring-neap cycles, and in perigean-apogean cycles, plus the diurnal tides - i.e. M2, S2, N2, K1, O1) to determine what to make plots of using the FES2014 data. Table 1 has now been deleted from our paper, according to the Woodworth review suggestion, so any confusion created by our reference to this table is now deleted.

Line 117: Castlepoint is on the east coast of the North Island. Response: Thank you for picking up this typo – "South" has been corrected to "North".

Line 125: What does 'combined variability' mean? The rest of this sentence is difficult to follow - a diagram might help? Response: We have deleted "combined" and altered this paragraph so that it now reads: "We distinguished these two envelope types via the tides generated by variability in the amplitude ratios of S<sub>2</sub>/M<sub>2</sub> and N<sub>2</sub>/M<sub>2</sub> (i.e. of the spring-neap cycle, and perigean-apogean cycle, forming tides, respectively). In brief, the S<sub>2</sub>/M<sub>2</sub> and N<sub>2</sub>/S<sub>2</sub> 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). By comparison, the N<sub>2</sub>/M<sub>2</sub> amplitude ratios are relatively stable and high, except in a relatively small area of Cook Strait to the Kapiti coast, where this ratio drops and thus spring-neap cycles predominate (see 'spring-neap' Type 1 regimes above). The variability in these two ratios means that, except where we find 'spring-neap' or 'perigean-apogean' monthly tidal envelopes types, spring-neap tides do occur but the overall monthly envelope shape is fundamentally altered (asymmetrically) due to the perigean-apogean influence".

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Figure 2: Castlepoint is shown out of its true position. Response: Thank you – the map has been adjusted.

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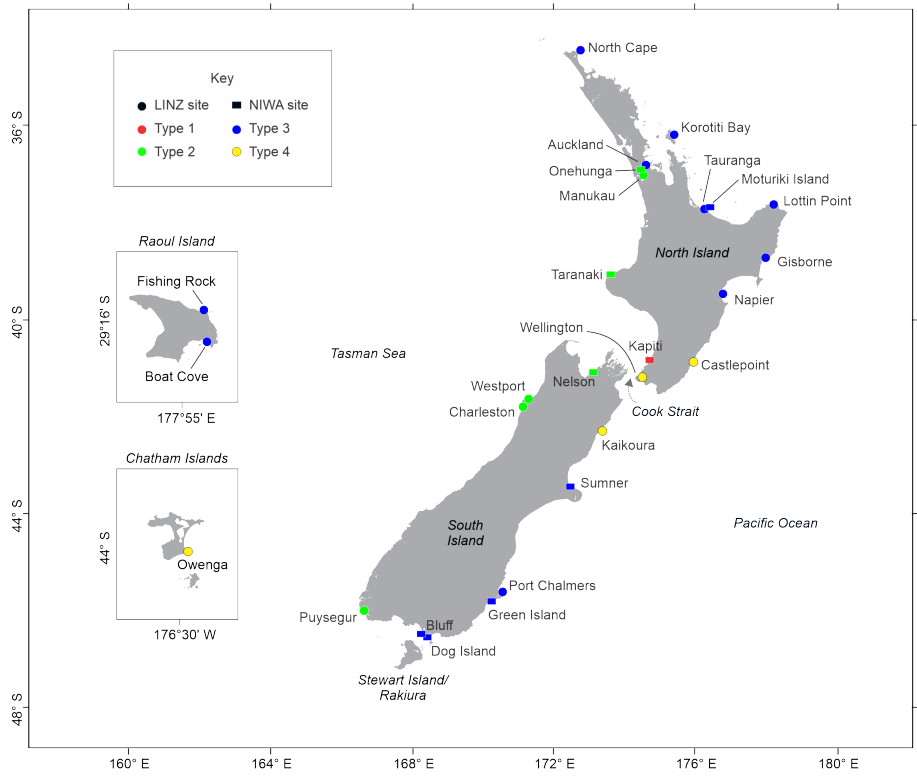


Fig. 1. Figure 2