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Interactive comment on "Water level oscillations in Monterey Bay and Harbor" *by* J. Park et al.

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We would like to thank the Reviewer for their careful consideration of the manuscript. Please find below our responses to the Reviewer comments.

Reviewer #1

1) p5 line 18 reads ": : : we remove the tidal signal from the 1 Hz water level and deal with the water level nontide.." Perhaps a better wording choice is ": : : we remove the tidal signal from the 1 Hz water level and analyze the water level nontide.."

Changed.

2) p 5 lines 24-25 read "Since the magnitude of nontide residual is a measure of the variance of the water level minus tide, " Isnt that the definition noontide? This sentence is a little awkward. Perhaps you could just say that the tidal residual should be strongly

correlated with wave height or winds.

Thank you for this comment. We were attempting to connect the NTR variance with that of the significant wave height as a justification for the observed relationship between the NTR and wave height. We agree that this justification is obvious and have revised this sentence accordingly. Please note that this is where we introduce the definition of significant wave height, so it is important to retain that portion of the text.

3) p 6 lines 1-2: Even though the wave heights and water levels are not observed at exactly the same location, the wave heights that do occur at the water level gage would be expected to be correlated to the wave heights at the CDIP buoy. So one could consider some correlation between CDIP waves and the observed non-tidal water level oscillations.

Agreed. The intent of this text is to convey that if one did estimate a linear regression the Hm0 = 4σ would not be expected to hold, a coefficient other than 4 could be expected.

4) p. 6 lines 14 and rest of paper - I found it a little annoying that the oscillations were discussed in both seconds and then minutes. Some plots had sec and some minutes along the x axis (fig 3 vs 12 for example). Can you make the text and all the figs consistent and use seconds?

Thank you for this comment. The intention was to use units that are as 'natural' as possible when referring to time scales. For example, it requires a bit of mental gymnastics to ascertain that 3354 seconds is 56 minutes. We also note that the literature (Breaker et al., 2010 and its predecessors) use minutes when discussing bay mode periods. We do not mix the use of seconds and minutes, we only apply seconds to harbour modes and waves, and minutes to long-period bay modes. For consistency with the existing literature, we prefer to maintain the existing usage. However, if the Reviewer feels strongly that this impedes communication of the material, we could use seconds and minutes in all instances where minutes are used.

5) p 9 tidal phase: What time period was used to assess the significance of tidal phase on the water level NTR oscillations. Looks like this time period may have been during a neap. What is the tidal range compared to water depth at the sensor? What about during a spring tide with a higher-high to lower-low transition?

We used 2 hour records to estimate PSDs. We compare a 2 hour record PSD at low tide (04:30 – 06:30 GMT 2013-11-25) to another 2 hour record PSD at high tide (12:00 – 14:00 GMT). This corresponded to the largest semi diurnal cycle of the day with a range of roughly 3.5 ft (1 m), which is close to the Mean Tidal Range of 3.54 ft (1 m). The water depth at the sensor is nominally 30 ft (9.1 m) at MLLW, so that the water depth to mean tidal range ratio is roughly 9 : 1.

This cycle was near a neap tide. We expect that during spring tides the tidal dependence of harbour oscillation frequencies would be even more pronounced. For example, in Figure 3 b) we noted the frequency modulation of harbour modes with tidal phase. There, the tidal range exceeded 2 m, and one can clearly see the changing frequencies of the harbour modes. Figure 8 and the discussion on page 9 are a quantitative assessment of this tidal phase to mode frequency dependence. Since we wanted to avoid the influence of wave energy, we selected this November period with minimal offshore waves.

6) Figure 9 is a little difficult to make out.

We would like to keep this figure in the same configuration, as it conveys the partial variance of each wavelet level, and illustrates the dramatic increase in total energy (bottom panels with original signals). The main point of this figure is to note emergence of energy in the W5 – W7 scales, which we have highlighted in red, and we believe that is easily discernible. We will ask that when typeset that this figure span both columns.

If this is insufficient, we could perhaps plot only the panels which include the original signals, and the wavelet levels highlighted. Although one would then lose perspective on the relative contribution of the emergent wave energy in the total signal.

7) p. 11 line 16- What is the "Q" factor?

Thank you for pointing out this omission. Q was defined later on page 13, line 8. This has been corrected by moving the definition here.

8) Section 6 - can the results from the ROMS model discussed help to assess any other mechanisms for the NTR variations?

Based on our understanding of ROMS applications to Monterey Bay (Tseng & Breaker (2007), Tseng et al. (2010), Breaker et al. (2010)), we used ROMS results to estimate the spatial extent of the alongshore portion of the dominant 36.7 minute mode in 5.1 Mode Forcing, to estimate the size and height of the surface 'dome' maintained by the gyre, and to estimate the strength of the subsurface alongshore currents in section 5.1.3 Mesoscale Eddy. It was not obvious to us that other potential mode drivers elucidated in ROMS, e.g. salinity, would be potential candidates for the sustained oscillations, so at the moment, we would not be able to propose other potential mechanisms based on ROMS. Nonetheless, this is a good suggestion and further thought should be focused on it.

We note that the Central California Ocean Observing System (CenCOOS) did conduct ROMS model runs (http://www.cencoos.org/data/models/roms/monterey) from 2010 – 2013, although we are unaware of validation and analysis of these model results.

9) What water depth is used to compute the wave lengths for the dispersion relations?

The Bay and Bight modes use depths of 60 m, the Harbor modes 7.5 m (mentioned in the caption of Table 1, and in the text for the Harbor modes). These values were selected as representative based on nautical charts of the Bay and Harbor.

Interactive comment on Ocean Sci. Discuss., 11, 2569, 2014.