

Interactive comment on “On the multiple time scales of variability in the Northeast Pacific Ocean” by R. Tokmakian

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A kind thank you to the reviewers for taking time to comment on the paper. My responses to their concerns are given below.

1. In §2.2 a clear description of the wavelet method is given, including a discussion of significance levels, following the method of Torrence and Compo (1998). In particular, the background “redness” coefficient (α) is introduced. Then, in §3.1, the author says “At high frequencies, α was set to 0.3, for the 2–3 year band, a value of $\alpha = 0.7$ was used, and for the lowest frequencies, α was set to 0.9.” Were these values of α simply fixed (“set”) at these values? Or were they directly calculated from the lag-1 and lag-2 autocorrelation coefficients of the relevant time series data? It is not made unambiguously clear. If the values of α were fixed, what governed the choice of values? And then

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the obvious question arises: how sensitive are the results to the choice of α values?

The values for α were determined by examining the spectra for the filtered time series. The α values were chosen with consideration of how “red” a filtered signal looked. The α values allow one to identify the peaks in the portion of the full spectrum to be identified easily. The values chosen are not exact and a range of α 's result in a similar signal's dominant pattern with time (for example, values between a between 0.9 and 0.7 applied to signals at low frequencies result in similar “features” being identified in time). This comment was added to section 3.1 first paragraph: “The values are chosen to identify the peaks in the specific portion of the spectrum. The values do not have to be precise, rather are chosen as to how “red” the section of the spectrum appears when examining spectral plots of the filtered time series.”

2. In §3.1, page 398, lines 14-17: state that the “near zero lag” is a 7-day lag in order to match directly with the annotation in Figure 4(a). Also explain that the correlation value, r , of 0.53 means $r^2 = 0.28$; thus the observation about 28% of variance being similar.

Sentence re-written as “The two time series are correlated such that 28% (the square of the correlation value) of the variance signal is similar between the two areas at a 7 day lag or 1 point in the time-series, suggesting the overall large scale atmospheric pattern is influencing these both these areas as a local change in SSH within the higher frequency band (because of the correlation of around 0.53).”

3. In §3.1, page 399, line 6 and line 22: make explicit why 6 and 3, respectively, degrees of freedom are the appropriate choices.

The filtered time series of 15 years results in approximately 6 degrees of freedom for a 2-3 year signal. Similarly, 3 degrees of freedom for a series for a 4-5 year signal, conservative estimates for degrees of freedom in the respective time series and their correlation significance. The sentence was modified as: “...95% probability with 6 degrees of freedom due to the filtering and sampling)”

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4. In §3.2, line 8 (and elsewhere in the paper): wherever “significant” is used, is the author consistently referring to 95% levels? This needs to be made explicit

A comment is added in section 2 to clarify what is meant by significance in the context of wavelets.

5. Page 400, lines 19-21: “A positive ALPI value indicates a strong low pressure pattern and is consistent with a shift in the energy of the 3–9 band towards higher frequencies at less than season periods (0.25 years).” The reasoning here is not clear.

Rewritten as: “A positive ALPI value indicates a strong low pressure pattern and is coincident with an increase in energy at the shortest periods (0.125 years; note that the ALPI index values are averages) in 1998, 2002 and 2003.”

6. §3.2.2 - §3.2.4, and Figures 6-8. The figure captions state that whitening has been applied, although there is no explanation or description of this in the main text. Why has this been performed? And how, given that whitening implies $\alpha=0$, does it square with the description given in §3.1 where nonzero redness values were set?

Changed “whitened” to “detrended”. This process is described in the initial description of the processing of the data.

7. §5. Conclusions. This section seems rather incomplete. Resummarise the aims and methods, and state explicitly once again which three period bands were analysed.

An initial paragraph was added to the conclusions section. “The goal of the analysis was to examine and explore the altimeter data set to understand how decomposing the height signal can help in determining ocean regions where the SSH anomaly signal can be used to monitor significant changes in circulation patterns and if such signals can be used to understand downstream changes. The analysis of a fifteen year time series of altimeter data in the Northeast Pacific through the use, primarily, of wavelets, shows that the SSH variability differs significantly across the larger region, resulting in different frequencies of variability dominating in different regions. The three bands of variability

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examined were a 3 to 9 month band, a 2 to 3 year band, and a 4 to 5 year band. The analysis identified three distinct indices that can be useful for monitoring changes in the Northeast Pacific: 1) 47° N, 210-230° E, 2) a northern coastal area index, near 52° N (area 2) and 3) an index in the California Current region around 37° N (area 4).”

8. Technical corrections have been made. The revised manuscript is the supplement

Please also note the Supplement to this comment.

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