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# *Interactive comment on* "Tidal variability in the Hong Kong region" *by* Adam T. Devlin et al.

**Anonymous Referee #1**

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Comments on 'Tidal variability in the Hong Kong region' by Devlin et al. (OSD)

This paper looks at the variability in the semidiurnal and diurnal tides, and in overtides, around Hong Kong and tries to relate the observed tidal changes to changes over a wider area and in MSL. It is one of a number of papers that have appeared in recent years that have pointed to tantalising associations between changes in tides and MSL that are sometimes enigmatic and always hard to explain.

Therefore, the availability of a large data set from a small region such as Hong Kong is to be welcomed. However, as the authors point out, this region has undergone a lot of engineeering modifications and it is therefore not the easiest of places to try and separate the impacts on the tides from those modifications from those due to genuine changes in large-scale ocean processes (the NW European coastline is a similarly



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problematic region given that it has had a lot of dredging etc.). The authors attempt to make that separation by also using data from a small numbers of sites across the vast area of the South China Sea etc. I found that quite unsatisfactory.

The paper seems to me to provide findings which are far from coherent, and so do not lend themselves to easy interpretation. The authors attempt to explain all that diversity by rather (to me) a rambling discussion of 'maybe' processes such as reclamation, changes in baroclinicity, changes in rivers, resonance shift etc. You can explain anything away in this way.

I read the paper several times and my recommendations are:

(i) to rewrite it to focus only on the local data set from the Hong Kong area which, although may be affected by the engineering changes, does seem to present a reasonably spatially coherent set of findings. And then drop the SCS discussion which is superficial at best for such a large area. A local focus, perhaps with some modelling to provide a sensitivity study, would make for a nice paper.

(ii) focus only the four main constituents. The smaller ones can indeed be mentioned in passing (e.g. if M4 is changing in an opposite way to M2) but it is the main ones that most people are concerned with understanding at the moment and, as Ray has pointed out in his interactive comment, it is not clear that the authors properly understand the variability inherent in some of the minor tides and/or in the software used to determine them. I would also drop figures 7-10.

(iii) drop the division of the data set into historical/modern. I found the discussion of the differences between the two epochs unconvincing.

(iv) try and not include so many numbers in the text which the reader just cannnot absorb.

(v) include some mention of changes in tide gauge operations, aside from just whether they were relocated. For example, are some now using radar gauges instead of float

gauges? Have any studies been done of the consequent differences in the tide? Or at leasts flag this as a possible issue.

Some detailed comments:

34 - there is no need for a hyphen in mean sea-level. On the other hand there is in e.g. sea-level rise.

39 - drop 'inter-tidal'

44 - define PSI

48 - well, if you have chaotic results (which are not necessarily the fault of the authors of course), then you can always explain them as a combination of many processes, especially when you have no real data to back up the suggestions. (I know this is a harsh remark, but that's the way this paper reads to me.)

84 - start new sentence at Therefore

96 - +/- 5 percent of what?

97 - 65% ditto

about 97 - the TAC and delta-HAT acronyms are mentioned here but only explained properly below. It seems to assume the reader has read the other Devlin papers. I would define them a little more fully around here.

I don't have a problem with the TAC parameter and name by the way, but I really don't like delta-HAT. As I understand it, it reflects the maximum level that would be obtained in a year from the time-dependent amplitudes and phases extracted from the admittance method? But HAT to most people refers to the maximum level that would be obtained by running a set of tidal predictions over 18.6 years. I would find another name for this parameter. Also it has nothing to do with time series as far as I undertand it, it is just the sum of the amplitudes for either the 4 or 8 constituents for that year (please clarify if not).





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98 - doubled. With respect to what? Any exceedance level will be with respect to a datum.

98 - I would drop the TSL acronym. There is no need for too many acronyms. 'Extreme sea level' would do here just as well.

176 - tide gauge records

189 - website should be the website

213 - this is true only if the nodal and other low-frequency modulations (i.e. perigean) are the same in the real ocean as in the potential. There are many examples from shallow-water areas of them not being the same.

223 - state these time series are annual values (presumably)

226 - reword: which has previously been shown to be more apparent

232 - year-to-year change. (See my comment above above delta-HAT which is bad name)

234 - typically 75%

237 - you use the word 'minor' here to refer to N2, K2, P1 and Q1, but minor is used for a different set below. I would change 'minor' here to 'latter four' or similar.

about 244 - I would add 'amplitude' many times in here and in the figure captions. For example, you mention 'tidal perturbations' here - perturbations in what? What are they? I think the problem is the jargon half the time.

251-254 - why is this sentence relevant? You don't do any projections into the future.

265 - say why you use the last 30 years. Data better?

273 - you use the words historical/modern here and early/later lower down which gets confusing. Anyway, as mentioned above, I would drop this aspect.

293 - does 'minor' here mean the 4 above? Be clear.

304 - I am not sure anyone knows where Beibu Gulf is (no offence intended). Perhaps add 'on the south coast of China'.

306/308 - now we have early/later

325 - you quantify the others but not for Bintulu.

392 - a record can be flat or have zero trend. You can't have a 'flat trend'

413 - 'minor' here means quite a different set (discussed by Ray)

417 - there is discussion of the perigean dependence of N2 along the China coast in the Feng et al. paper by the way.

423 - 'missed'. It looks to me to be there is a little bit.

425 - why is this interesting? N2 would be in phase wouldn't it in a small area like this?

456 - 'it is apparent'. It is in figures 7 and 8 ok but not to me for 9 and 10?

464 - who –> which

467 - will be –> are

470 - correlations of what?

659 - the Conclusions for the reasons for the tidal changes are just speculation. You should start this section by reviewing what the data tells you.

824 - it is hard to see the red and green on top of the dark blue. The caption should say the blue shows depth in metres.

figure 3 and others - I read this paper on A4 paper and I cannot read what's in the legends or even the axis annotations of some of the figures.

In (b) and (d) there is a red square box for the Hong Kong area not mentioned in the

caption.

They also have the Egbert model values which are not discussed in the text, so why have them?

In (c) there are captions for each point like CHC which are unnecessary given Figure 1.

figure 5 etc. caption - again the word 'amplitude' needs adding whenever you say something like 'detrended (M2+S2+K1+O1)'.

figure 7 - I can understand the mean values for the tides but the mean values of MSL require to know the datum.

figure 9 and 10 - I can't read the information on the right.

Table 1 - add an extra column for the number of years of data used.

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