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Ocean Science
Discussions

Interactive comment on "Seasonal variation of the main tidal constituents in the Bohai Bay" *by* Daosheng Wang et al.

Anonymous Referee #1

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OVERVIEW -This study provides an analysis of the seasonal variation (or as I have called it in the past, "seasonality") of the M2, S2, K1, and O1 tides in Bohai Bay. -This is a good an important subject to study, as the seasonal variability of tides (that is not astronomical) may be a significant part of water level variability in certain regions, particularly those subject to strongly seasonal weather patterns (like the monsoons in Asia), or especially shallow regions (like the Gulf of Thailand). -Overall, I think the methods and approach is sound, and the numerical models are sound. I would really like to accept this paper, but I am concerned that the missing data is a big limitation to the trust ability of the results, and this should at least be discussed more. -I do have some other major concerns, listed below, and some other minor comments. -One factor that will have to be addressed in this manuscript is the English writing quality. It is

not so bad, but it also not so good, and I can notice a number of small errors and style points (such as too many dependent clauses beginning sentences or paragraphs) that should be addressed to make this a better paper. So I would highly recommend having a native English speaker give this paper a very close read before acceptance. -As far as the "Enhanced harmonic analysis" methods and claims of novelty... There have been multiple improvements to T_TIDE in the past decades, such a R_T_TIDE (Leffler and Jay, 2009), "versatile" tidal analysis (Foreman, 2009) and U_TIDE (Codiga, 2011). Were any of these methods tried in addition to T_TIDE? If you haven't tried these, then it's harder to claim that your method is "enhanced" more than T_TIDE when others have already produced "enhanced" methods. How does your method improve on all these past approaches? -While one year of hourly water level data is indeed enough to resolve most tides and reveal a seasonal cycle, I have some reservations about how much you can conclude about the seasonality cycle based on one year of observations. It is likely somewhat constant year-by-year, but it is hard to be sure. If you look at Devlin et al, 2018, for example, they looked at 30 years of data to show the seasonal cycle was basically constant, but not identical. If a single year had some sort of rare event (like a particularly strong storm season), this might skew the seasonal pattern a bit. I understand that one year is quite a bit of data to get from mooring, and more data is likely not available, but this is still a limitation that should be discussed somewhere in the paper. -Also, the existence of gaps in the single year dataset is also unfortunate, because it is hard to know the effect of the gaps without comparing them to a full year's data. Are there any ground-based tide gauges nearby to compare to? -I think that the data gaps at E1 are too extensive ti trust this location. Unless you have another nearby location (like a ground-based tide gauge) to compare to, I don't think that these results can be trusted. So maybe this location should be omitted. -My recommendation is for major revision, with more discussions about the effects of missing data, and the comparisons to other methods and the results of other who have analysed seasonality.

COMMENTS: (I really wish there were continuous line numbers, but since there are not, I will index comments by section and/or page number and line number within the

page) -ABSTRACT: -I understand what you are saying in your opening, and I do agree with everything you say, but the English is somewhat awkward right out of the gate, and this will confuse other readers who are not as familiar with tides. The text here just needs some minor refinement -INTRODUCTION -Page 2, line 3-4: Devlin et al, 2018 also looked at K1, O1, and S2 seasonality found some interesting patterns of seasonality in K1 and O1 at some locations, though M2 was the primary seasonal variation observed. -Line 5: "Several other studies have analysed the seasonal variability..." -Line 7: "tidal constants" → "tidal constituents" -Line 14: "major tidal harmonic parameters" → "largest tidal constituents"

-OBSERVATIONS AND METHODS -Page 2, line 26: How about eustatic sea level rise? -Page 3, line 4: See comment above about improvements to T_TIDE

Section 2.3 -I am bit unclear about what you mean by SHA here. Do you mean that you are harmonically analysing datasets that are monthly or shorter? If so, then you will resolve the four major tides, but you will likely not constrain the natural yearly variability that one-year analyses contain (such as SA and SSA). Therefore, any seasonality you observed might actually be just an artefact of the mathematics. If you had more than one year of data, you could perform overlapping one-year HA at one-month steps, then any seasonality revealed would be more "real" Maybe I am missing something, but at least you could explain it better. In any case, this is the obvious issue with only using one single year of data. -Also, 15 days of data within a month as a criteria makes the results much worse, and could be highly spurious. This is less than 50% completeness, while I believe a criteria of 75% to 80% is needed

-RESULTS -Page 5, Line 4: Of course gaps will influence results, especially since you have such a relaxed criterion of completeness (50%) and such a short time-series ($\sim$ 1year). This has to be discussed more, and perhaps there is just not enough data to perform this study adequately.

-MECHANISMS -Seasonal variations of sea level are indeed important and there can

be a lot of reasons (monsoons, etc.), but can you discuss more what causes these variations, and how these might influence tides physically? Line 14-15: I think that the importance of sea ice in the reason could still be important to seasonality, if you consider the "back-effect" connection of coastal embayments and open water as discussed by Arbic and Garret, 2010; Arbic, 2009 via resonance mechanisms. So, even if the ice cover is far away from your observations site, it could still be important. These studies should at least be mentioned and discussed here. -Page 8, line 14: ".. as the differences... larger than 0." Is kind of an elementary statement, you can omit this

-Page 6, Line 16-19: Can you restate this as a statement instead of a question? It doesn't read well in the middle of the paragraph as written.

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