Ocean Science
Discussions

Interactive comment on "Reconstruction and Projection of Sea Level Around the Korean Peninsula Using Cyclostationary Empirical Orthogonal Functions" *by* Se-Hyeon Cheon et al.

Anonymous Referee #1

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The manuscript developed a new method in a regional sea level (SL) reconstruction using CSEOF and its multi-regression between SL and SST PCTs. The reconstruction is extended back to 1900 while sparse TG observations are not included. The reconstructed SL is better than a similar SL reconstruction in comparison with TG observations. The manuscript could contribute to the OS in understanding SL changes and SL reconstruction. I recommend the Editor accept the manuscript after a major revision.

Major comments (a) The sea level change may be associated with many factors such as ocean temperature (including SST), salinity, currents, and surface winds etc. There-

fore, the multi-regression between SST and SL PCTs may not include all aspects of SL changes. I am wondering whether the reconstruction could further be improved if more physical variables are considered. (b) The SL reconstruction does not include TG observations, but have a clear improvement over a similar reconstruction that includes TG observations. I am wondering whether the SL reconstruction could further be improved if all available TG observations are included. (c) How to validate the SL reconstruction in the early period over 1900-30 when no TG observations are available. It might be a little risky to include the reconstruction in this period. (d) Writing and presentation may need improving. There are too many abbreviations such as SL, MSL, GMSL, SL-KP. For example, MSL and GMSL could be explained in figure captions. KP is unnecessary because the study focuses on KP region only. Figure captions should identify the data source and average region etc.

Detailed comments (P=page, L=line) P1L11, revise: extend the spatial resolution .. into the past P3L5, CSEOF is not defined P3L14, "KP" could be deleted throughout the manuscript since the study has been limited over the KP region anyway, which will greatly improve the readability. "KP" could be noted in the figure caption when necessary. P3L21, revise: looking at the regional level will lead to P4L11, annual signal => seasonal signal? P4L20, include data => included data? P4L21, over => from? P6L5-7, revise the sentence P6L11, delete "in this case", "really" P6L12, independent of => independent from? P9L3, How does "summing" actually do, arithmetic or square-root? P10L10, this is an indication that SL is not merely dependent on SST. P11L22, delete "then" P11L25, delete "cases of" P11L28-29, delete "considering the available number of TG data" P12L4, It is not clear how MSLA-KP is defined (assuming every ocean grid in reconstruction). How MSLA-KP can be compared with TG-KP (only in TG grids). P12L12, revise "was edited to have the same time span data gaps" P12L14-15, revise the sentence: ReSLA-KP show a better agreement of AVISO-KP than ReSLA-H. P12L17-18, how many modes are used in Hamlington? P12L23, thousand => a thousand P13L17-18, authors should extend the conclusion of a better current SL reconstruction. there is no way from Figures 16-17 to tell the current study is better. It is

not clear in Figure 13 either. It may be necessary to point to Figure 14a. A better way is to calculate the RMSE.

Fig. 1, digital quality should be improved. Fig. 2, coastal line should be consistent with those in other figures. Fig. 3, I could caption the figure as "Mean SLA in KP (gray) and global (black) regions from AVISO" so that I can get rid of some abbreviations. Fig. 4, add "AVISO" in caption Fig. 5, add "AVISO" in caption Fig. 6, revise: trends (shapes) and correlation (color), change the red color of triangle into black so that the color will not be confused with correlation. Fig. 7, NRMSE, I don't know the advantage of using normalized RMSE instead of RMSE. Figs. 8-9, I am confused how the 3-month averaged mode is plotted. I assume there is only one CSEOF associated with one PCT for a particular mode. Fig. 10, I assume this is for KP region Fig. 11, which region, KP region? Fig. 12, Why does Hamlington have a constant Corr and NRMSE? Fig. 14, "yellow" is barely identifiable. Why the correlation is over 1993-2008 while trend is over 1970-2008? Fig. 15, The figure look great but there is a question: Since the study uses the CSEOF derived from AVISO, therefore validation against AVISO is considered to be not independent. One may argue that if authors use Hamlington deriving CSEOF, the performance reconstruction may be close to Hamlington.

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