



EGUsphere, referee comment RC2
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Comment on egusphere-2022-700

Anonymous Referee #2

Referee comment on "River effects on sea-level rise in the Río de la Plata estuary during the past century" by Christopher G. Piecuch, EGU sphere,
<https://doi.org/10.5194/egusphere-2022-700-RC2>, 2022

General comments

The manuscript displays the role of the streamflow in the sea level variability especially at long-term trends in the Río de la Plata estuary. To fulfil the objective, annual data from tide gauges and stream gauges are analyzed. The main results indicate that the streamflow is not negligible in the sea level variability and in the long-term trend, except in the south of the river mouth. The river effect increases from the lower estuary to the upper estuary, explaining almost the 60% of the sea level variance. To corroborate that the streamflow is responsible of a percentage of the sea level trend, the author developed a theoretical model finding a coherence between the simulated/predicted data and the observations.

The work presented is a hot topic from the climate change point of view. To understand the forcings of the sea level rate in coastal and regional areas is extremely important to prevent and mitigate the consequences. The work also contributes to the analysis of unexplored region compared with other part of the world. Most of the studies in the Río de la Plata estuary were focused on the analysis of the plume dynamics from synoptic to interannual temporal scales using models (e.g: Meccia et al., 2009; Dinapoli et al., 2021; Bodnariuk et al., 2021) and satellite data (e.g., Saraceno et al. 2014). Only a few works showed the sea level rate, however, the causes of the trends were not fully investigated.

Regarding the presentation quality, the manuscript is well-written and well organized. The figures and tables represent the results written.

Specific comments

Title: I suggest adding "Estuary" after "Plata"

3. Results: Taking advantage of a long sea level record, I suggest studying the acceleration of the sea level rate and the possible relationship with the streamflow, especially in Buenos Aires. The bibliography cited in the manuscript indicates that the sea level is increasing, however, the analysis of a possible acceleration has not been published in the study region.

Pag. 4, line 119: see comment on Conclusions

5. Conclusions

Pag. 11, line 290: The author mentioned that the river effects on sea level are apparent at multidecadal and centennial periods. However, I did not find convincing evidence on the paper. There is a discussion based on bibliography about the ENSO signal, the author calculated the correlation between ENSO index and in situ data, and the standard deviation of the streamflow but I was expected a spectral analysis (e.g., wavelet) to asseverate that other signals are also important. For example, it would be interesting to analyze the cross wavelet transform between streamflow and sea level measurements. Regarding the ENSO as an interannual variability, Bodnariuk et al. (2021b) analyzed the effect of SAM (Southern Annular Mode) on the Río de la Plata using a reanalysis model (35-years). The influence of SAM on the sea level was also studied in a wider region including the Mar del Plata tide gauge location (Bodnariuk et al., 2021a; Lago et al., 2021).

Technical corrections:

Replace "Section 4.a" and "4.b" with "4.2" and "4.3"

Figure 3 caption: the colors of the thick lines of Río de la Plata, Río Paraná and Río Uruguay do not match with the legend of the time series.

Figure 4 caption: the line styles of the time series do not match with the legend.

References:

Bodnariuk, N., Simionato, C. G., & Saraceno, M. (2021a). SAM-driven variability of the southwestern Atlantic shelf sea circulation. *Continental Shelf Research*, 212, 104313.

Bodnariuk, N., Simionato, C. G., Osman, M., & Saraceno, M. (2021b). The Río de la Plata plume dynamics over the southwestern Atlantic continental shelf and its link with the large scale atmospheric variability on interannual timescales. *Continental Shelf Research*, 212, 104296.

Lago, L. S., Saraceno, M., Piola, A. R., & Ruiz-Étcheverry, L. A. (2021). Volume transport variability on the northern argentine continental shelf from in situ and satellite altimetry data. *Journal of Geophysical Research: Oceans*, 126(2), e2020JC016813.

Saraceno, M., Simionato, C.G., Ruiz-Etcheverry, L.A., 2014. Sea surface height trend and variability at seasonal and interannual time scales in the Southeastern South American continental shelf between 27°S and 40°S. In: *Continental Shelf Research*, vol. 91, pp. 82–94. <https://doi.org/10.1016/j.csr.2014.09.002>.