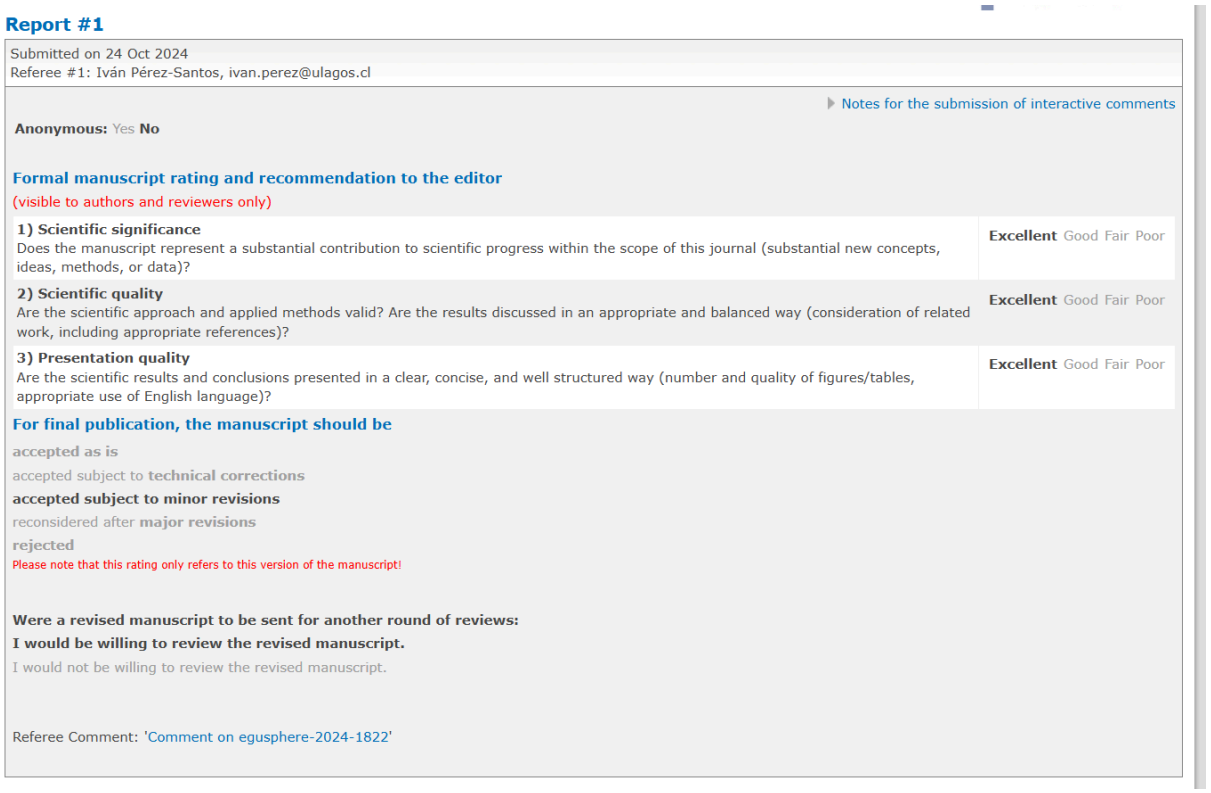
Revisores

Revisor 1 (Ivan Perez)



Report #1

Submitted on 24 Oct 2024
Referee #1: Iván Pérez-Santos, ivan.perez@ulagos.cl

Notes for the submission of interactive comments

Anonymous: Yes **No**

Formal manuscript rating and recommendation to the editor
(visible to authors and reviewers only)

1) Scientific significance Does the manuscript represent a substantial contribution to scientific progress within the scope of this journal (substantial new concepts, ideas, methods, or data)?	**Excellent** Good Fair Poor
2) Scientific quality Are the scientific approach and applied methods valid? Are the results discussed in an appropriate and balanced way (consideration of related work, including appropriate references)?	**Excellent** Good Fair Poor
3) Presentation quality Are the scientific results and conclusions presented in a clear, concise, and well structured way (number and quality of figures/tables, appropriate use of English language)?	**Excellent** Good Fair Poor

For final publication, the manuscript should be

accepted as is
accepted subject to **technical corrections**
accepted subject to minor revisions
reconsidered after **major revisions**
rejected
Please note that this rating only refers to this version of the manuscript!

Were a revised manuscript to be sent for another round of reviews:
I would be willing to review the revised manuscript.
I would not be willing to review the revised manuscript.

Referee Comment: 'Comment on egusphere-2024-1822'

Comment on egusphere-2024-1822

Article title: Impact of Extratropical Cyclones on Coastal Circulation in a Semi-Enclosed Bay within the Humboldt Current System.

The wind regimen plays an essential role in the physical and biogeochemical conditions in the water column along the coastal zone of the Humboldt Current system. Moreover, most of the past and recent publications focused on the wind-favorable upwelling generated by the influence of the southeast Pacific subtropical anti-cyclone (High-pressure systems) during the spring-summer seasons. The present manuscript used a re-analysis data set from ERA5 to evaluate the relationship of extratropical cyclones (low-pressure systems) on the circulation regime of a semi-enclosed bay in central Chile for the first time. The methods and statistical analysis were well applied, and results and discussion allowed the completion of the manuscript goals. Therefore, I recommend the manuscript be published in Ocean Science after minor comments.

General comments:

The study area is influenced by extratropical cyclones and low atmospheric pressure systems coming through the Subantarctic region, with a primary origin in the Southern Hemisphere westerly wind belt. Adding information in the Introduction

section about all the low-pressure systems impacting the study area could benefit the manuscript and also justify the selection of only studying the extratropical cyclones. The methodology for detecting extratropical cyclones proposed an origin between 20°-40° S, and trajectories passed from 30°-50°S. The quantification of events is well presented, but it could be exciting to see and present a map of all trajectories (annual), focusing on trajectories during extratropical cyclone seasons (winter).

R: Thank you for your insightful comments regarding the role of low-pressure systems influencing the study area and the justification for focusing on extratropical cyclones. In the revised manuscript, we have addressed these points by expanding the Introduction to provide a detailed description of the low-pressure systems relevant to the Chilean coast, including coastal lows, cut-off lows, and subtropical cyclones. This section highlights their distinct characteristics, spatial and temporal influence, and limited relevance to large-scale circulation dynamics compared to extratropical cyclones.

Extratropical cyclones are emphasized as the dominant low-pressure systems affecting the mid-latitude coastal regions, including the Gulf of Arauco, and their significant impact on local atmospheric and oceanic processes justifies their selection as the focus of this study.

Additionally, we explored the suggestion of including a map of cyclone trajectories. While presenting over 1500 trajectories proved impractical due to overlap and lack of clarity, we have included a spatial density map of cyclones as an appendix. This visualization provides a clearer representation of cyclone distribution and complements the main findings by highlighting seasonal differences in cyclone concentration, including a northward shift during winter.

We believe these additions enhance the manuscript by addressing your recommendations and providing greater context for the selection of extratropical cyclones as the focus of our analysis.

Specific comments:

Lines 140-141: Please clarify better the origin trajectory criteria used in the manuscript, e.,g. 20°-40°S ?

R: Thank you for your comment regarding the origin trajectory criteria. We acknowledge that the original phrasing may have caused confusion. In the revised manuscript, we have clarified that this study focuses on extratropical cyclones, and coastal lows, which are a different phenomenon, are excluded from the analysis. To filter coastal lows, we followed the methodology proposed by Crespo et al. (2022), which considers coastal lows as cyclonic circulations originating between 20° and 25°S and with trajectories limited to 1500 km. Based on findings from Mardones et al. (2022), which report coastal low occurrences at latitudes up to 36°S, we extended the origin zone to 40°S to ensure a comprehensive filtering of these features.

This adjustment does not compromise the identification of extratropical cyclones, as these systems typically originate over oceanic regions and migrate eastward, often passing through the study area. Therefore, extending the coastal low origin zone southward ensures we retain extratropical cyclones relevant to the Gulf of Arauco while adequately filtering coastal lows.

Lines 161-173: I recommend using a Taylor diagram to better illustrate the comparison between the ERA5 data and the coastal meteorological stations.

R: Thank you for your suggestion regarding the use of a Taylor diagram to illustrate the comparison between the ERA5 data and the coastal meteorological stations. While Taylor diagrams are valuable tools for summarizing comparisons across multiple datasets or models at a single location, their use in this case may introduce more confusion than clarity. Our analysis involves comparing ERA5 data with observations from two distinct stations (Carriel Sur and Punta Hualpén), each representing unique spatial points. Additionally, each station includes three different variables (sea level pressure, zonal wind, and meridional wind), each with distinct units and magnitudes. Representing this diversity in a single Taylor diagram could complicate the interpretation of the results rather than simplifying it. The information presented in Table 2 summarizes the key metrics (correlation, bias, and RMSE) for each station and variable, providing a detailed yet clear comparison. Adding a figure that replicates these metrics would likely be redundant and not substantially enhance the clarity of the analysis. However, we appreciate your suggestion and are open to incorporating additional figures if you believe they would significantly enhance the clarity or impact of the manuscript.

Lines 175-191: Adding a map of the trajectories of the extratropical cyclone could be significant to the manuscript, especially to see if there is any influence from the low-pressure systems coming from the Subantarctic region that finally arrive in the Gulf of Arauco.

R: Thank you for your valuable suggestion to include a map of the extratropical cyclone trajectories. We explored the possibility of visualizing more than 1500 trajectories, but as shown in Figure 1, the excessive overlap results in a cluttered map that lacks clarity and fails to effectively convey meaningful information about cyclone patterns in the study area.

As an alternative, we have created a map showing the spatial density of cyclones, calculated as the number of cyclones per 1/4° grid cell (Figure 2). This approach provides a clearer visualization of cyclone distribution in the study area, revealing that most cyclones are concentrated between 42°–48°S and 76°–83°W. To ensure that this information is accessible without overloading the main text, we will include the density map as a supplementary figure in the appendix.

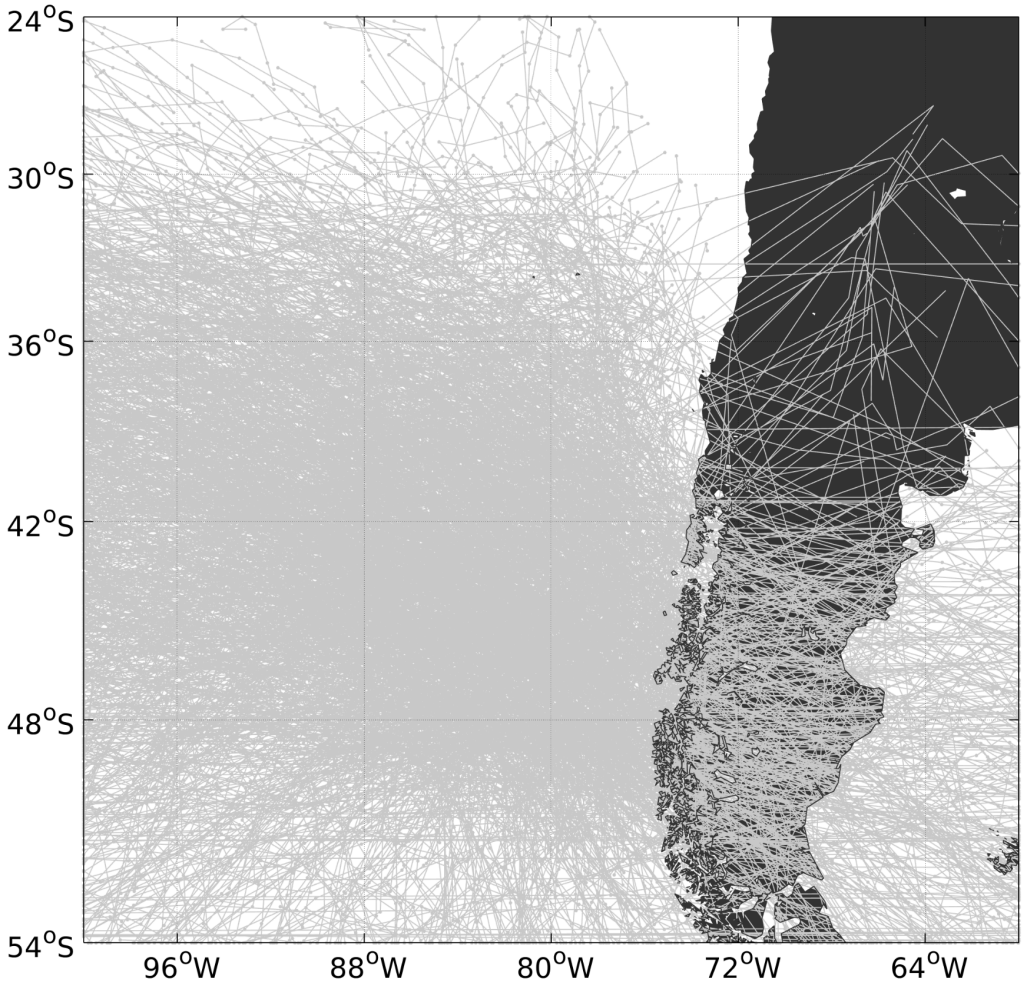


Figure 1: Trajectories of all extratropical cyclones passing through the study area. The map shows the paths of more than 1500 cyclones, with overlapping trajectories resulting in a dense and cluttered visualization.

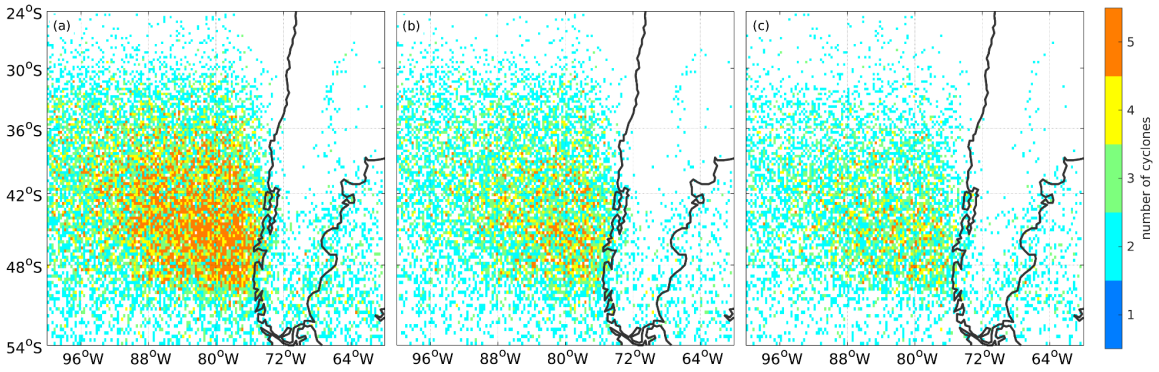


Figure 2: Spatial density of extratropical cyclones passing through the study area, calculated as the number of cyclones per 1/4° grid cell. The map highlights the concentration of cyclones, with the majority occurring between 42°–48°S and 76°–83°W.

Figure 4d and 5d. Reduce the y-range to -5 to 25 cm to better show the sea level oscillation.

R: Thank you for the observation. We have adjusted the y-range in Figures 4d to -5 to 15 and 5d to -5 to 28 cm as suggested, improving the visualization of sea level oscillations

Line 149. The Gulf of Arauco is affected by hypoxic events impacting the biogeochemical cycles and the ecology. Please add the benefit of the influence and pass of extratropical cyclones from GA to the oxygen

R: Thank you for your comment highlighting the potential link between extratropical cyclones and hypoxic events in the Gulf of Arauco. While this topic is highly relevant, addressing it in detail goes beyond the scope of our current study, as we lack direct measurements of oxygen concentration during the studied events. However, we recognize that the passage of extratropical cyclones likely contributes to water renewal through the mechanism explained on the paper, which could have implications for the oxygen concentrations in the GA.

To address your suggestion, we have expanded the discussion in Section 4.3 to briefly highlight this potential connection, referencing existing literature on water renewal and oxygenation processes in the region. While we cannot provide a comprehensive analysis, we hope this addition will strengthen the manuscript by acknowledging this important aspect.