Review of the MS # os-2020-44

Evaluation
Scientific significance: Good (2)
Scientific quality: Fair (3)
Presentation quality: Fair (3)

I- General view:

The research, in general, touches on multiple important and interconnected aspects such as oceanic, atmospheric, hydrology, and vegetation which are less studied in unison within the Agulhas Current region.

The research is based on a suite of reanalysis data sets and model projections. The manuscript sought to evaluate the oceanic and atmospheric trends, and their consecutive feedbacks subsequently establishing future projections. The manuscript also suggests a mechanistic explanation of the observed increasing rates. Overall, the research unpacks the existent changes, their forcings, and future scenarios.

In my opinion, the subject is of interest. I do value the importance and challenges presented by this type of research for the region. This kind of research is worthy of publication in the Ocean Science (OS) journal.

Besides the scientific value of this manuscript, I suggest the authors focus their efforts in addressing the following three (broad) aspects which I will detail later in this same document.

After reading the manuscript carefully, I suggest minor revisions. In the revised version, it should be expected that the author should; (1) appropriately introduces the topic, (2) strengthens the interpretations supporting the results and the discussion part of the manuscript and, (3) add a few simple diagnostics to solidify the mechanisms related to the dynamic of upwelling, either by following some of the suggestions below or some other that they can find on their own.

II- Comments:

- The reader expects to see three main points which are missing or less elaborated in the introduction:
(1) The title for the paper implies that the focus of the paper is “Marine climate change”. The author has not specified what this means, especially in the context of the east Agulhas coast of South Africa.
(2) The introduction does not really introduce what the paper is about. Restructuring the literature review will improve the understanding of the study context. I will emphasize on elaborating the mechanisms of coupled air-sea interaction in the literature, and more importantly state clearly connections such as thermal feedback and current feedback in the existing previous works, and how they can impact the ecosystem accordingly.
(3) What do we know about the oceanic and atmospheric trend(s) in the region, and their projections? I think that identifying these and stating the gap in the literature would elevate the importance of this work.

- Line 172: “Changes in the Agulhas Current exhibit little vertical shear, consequently cyclonic

vorticity-induced uplift is uniformly available but concentrated by the shelf slope (Lutjeharms 2006).” I would avoid such statement unless it was mechanically demonstrated, perhaps re-phrase or remove.

- Line 192 - 195: “The hovmoller plot of SODA-3 zonal currents (Fig 4b) reveals a ‘pulsed’ intensification and coastward shift, contributing to near-shore uplift > 4 m/day (34.1-34.4°S). Thus current- and wind-induced upwelling become additive.”
Based on Figure 4a,b, the author claims to have found the evidence of the upwelling mechanism based on the observational approach. I do understand the challenge that it requires to unpack the dynamic of this upwelling. Therefore, I would suggest that the upward motion indicated in Figure 4b (contours) should be replicated into Figure 4a for highlighting the correspondence between temperature upwelling signature and the upward motion. Perhaps adding a supplementary subplot will solidify this finding. I would suggest a latitude-time plot (hovmuller) of the mixte layer depth thickness (existent in Soda3) or the isopycnal slope just above the thermocline. This will inform about the dynamic of the subsurface in an upwelling event, due to the wind and/or current. The contour of the vertical motion should also overlapped on this new subplot.

- In the context of global warming, the flux of western boundary current are already expected to increase and wind stress curl enhancing gyres are also expected to intensify.
Line 225: ”... revealed intensified coastal upwelling ...” implicating the Line 17-18 and Line 286.

This is a great result and a big statement that should be emphasized. The upwelling is a such indicator of enhancement of these external forcings in the region (wind and current).

While this statement holds qualitatively by eye in Figure2, it would be more desirable to have more supporting results. I would expect “time series” (with linear trend) to illustrate quantitatively parameters indicating uwelling such as temperature (gradient of temperature), density (since you use SODA), perhaps stratification. Plus, time series of wind stress in your specified box and the volume transport of the Agulhas Current. I think that this kind of diagnostic will add more conviction for this great result.

- Line 280-290: Please help the reader to clearly understand the covariance of the listed parameters in a short paragraph like a summary.

- Line 290 - 295: the discussion about the projection deserves a full independent paragraph, and should be elaborated.

III- Minor points:

- Please compute the trend per decade or per century. For climate dynamic and ocean scale point of view, trend per year sounds odd for me and less realistic (C per 10 years (decade) or C per 100 (century).

- Kindly specify where did you get these sets of data, perhaps you can insert them into your table 1.

- Lines 47 and 48, the author writes “Understanding trends in climate can inform resource management decisions and aid socio-economic uptake of…” Can the author expand on what kind of resource management decisions and socio-economic uptake they are referring to here.

- Line 159: “warming > **0**.05 C/yr” (inferior or superior). This is a bit confusing for the reader. It should be fully written down and for the whole manuscript.

- Line 220: Do you mean: “Namibia”?

- Line 262, the author writes “trends in coastal SST were analyzed around the world”. Please provide references.

IV- Figures:

- Please make the effort to describe properly figures in their captions.

- Figure 1f; Figure 2c,f; Figure 3a; Figure 5c,d: Arrows units (length) are not clear. I suggest overlapping arrows on top of maps with their colorbars for clarity.

V- Acknowledgement:

- It’s very important to acknowledge the data sources used in this research.