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Comment on acp-2022-562

Anonymous Referee #2

Referee comment on "A change in the relation between the Subtropical Indian Ocean Dipole and the South Atlantic Ocean Dipole indices in the past four decades" by Lejiang Yu et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-562-RC2, 2022

The manuscript by Lejiang Yu et al. investigated the change in the relation of SIOD and SAOD in recent decades. They suggested that this change is related to the convective activities over the subtropical southern Atlantic Ocean and eastern Brazil . Most of the results presented in this paper are based on statistical analyses. The authors did not provide a convincible physical mechanism behind this statistical connection. I recommend this manuscript might be considered for publication in ACP after a major revision. Please find below the suggestions I have for this manuscript.

Major comments:

1. Fauchereau et al. (2003) suggested that the covariabilty is due to an atmospheric wavenumber-4 pattern in the globe. In contradiction, this study suggests the linkage to the south Atlantic Indian Ocean wave Lin (2019). Why such contradictory results?

2. The South Atlantic Indian Ocean atmospheric wave was seen active even after the year 2000 (Lin, 2019). Then, why SIOD and SAOD became unrelated after 2000?

3. Figure 3 shows the appearance of SST Wavenumber-4 (Senapati et al.(2021)) before 2000 in both the cases of SIOD and SAOD. Also, the weakening of the SST Wavenumber-4 pattern is related to South Pacific Meridional Mode noticed after 2000 as discussed by senapati et al. (2022). Also, a change in SIOD activity is noticed by Zhang, Lei, et al. (2022). These mechanisms need to discuss.

Senapati, Balaji, Dash, M. K., & Behera, S. K. (2022). Decadal variability of southern subtropical SST wavenumber-4 pattern and its impact. Geophysical Research Letters,

e2022GL099046. doi:10.1029/2022GL099046

Zhang, Lei, et al. "Eastward Shift of Interannual Climate Variability in the South Indian Ocean since 1950." Journal of Climate 35.2 (2022): 561-575.

4. Are composite maps agree with this proposed mechanism?

5. Line 164-172: How the weakening of the wave train is related to the interdecadal variability of the OLR activities? Since all the analyses presented in this paper are conducted using detrended anomaly fields, I cannot understand why the wave train weakens in response to the interdecadal variability of the OLR activities. Also, I could not understand the interdecadal variability of OLR anomalies which is dynamic. What drives it?

6. Show significant areas in Figures 4c-f, 6c-f, and 7c-d. Activities in other regions create ambiguity for the proposed mechanism.

7. Line 191-193 : "The large decrease in the strength of the summertime subtropical high associated with SAOD from the first two decades to the next two (Figure 7c, 7d) corroborates the sharp drop in the SAOD-SIOD correlation (Figure 1d)". I can't understand how the change in the strength of subtropical highs in both basins affects the SAOD-SIOD relationship.

Minor comments:

1. Line 161 : Replace "SST anomalies" to "OLR anomalies"

2. Figure 5 : Provide the colorbar. Have you detrended?

3. Line 140: Replace "relateda" to "related a"

4. Mention the calculation of anomaly in the methodology section

5. Figure 1 : What do you mean by spatial pattern? How is it calculated?

6. Change figure captions a-d starting from left to right instead of top to bottom.