Reviewer 1

Specific comments:

"The abstract claims to test the sensitivity of lightning to "aerosol size distributions," yet the paper does not quantitatively present any results regarding aerosol sizes before and after IMO-2020. A better descriptor would be "aerosol concentration" or "aerosol emissions.""

We have updated the abstract to say "aerosol number-size distribution", to encapsulate the possibility that the production of viable CCN has been hindered by both reductions in total particle number and growth by sulfur oxidation and deposition.

"Figure 2 and associated discussion: does this analysis include both the Indian Ocean and South China Sea composited, or only the Indian Ocean? Please clearly state."

Thank you for your comment. We have updated the caption to clarify that it is a composite.

Page 3, 2D analysis of 3h CAPE / precip space:

1. "What percent variance in lightning can be captured on the 3-hourly timescale, compared to the annual regression discussed earlier? Other works have indicated that CAPE and precipitation are not the best markers of convective strength over the ocean (see e.g. M.R. Igel 2014), so it would be beneficial to provide a quantification (and potentially brief discussion) of the predictive relevance of CAPE and precip in these data, rather than relying on Cheng 2021."

   With annually averaged observations, the assumption of linear relationships between CAPE, precipitation, and lightning over the ocean are more reasonable. With 3-hourly data, we see clearly non-linear relationships between these three variables, and therefore choose to use the CAPE-precip space to assess differences. Similar to Cheng et al (2021), we observe threshold-like behavior:

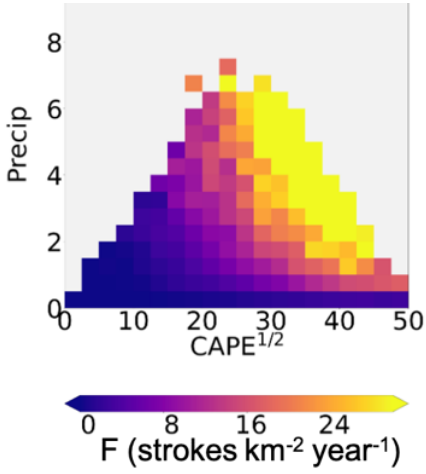

Figure 1. Lightning stroke frequency in CAPE-Precip space, pre-IMO regulation in the Bay of Bengal.

   Where low-CAPE and low-precip environments likely lack the necessary updraft strength or vertical moisture flux to frequently generate charge separation.

If we repeat the analysis in Cheng et al (2021), using the single 3-hourly sqrt(CAPE) threshold of 15 m/s, we see that greater than 35-55% of spatial variability in lightning stroke density is explained by CAPE*Precip across the two oceanic regions of interest. As shown in the figure above, the advantage of the CAPE-precip space is that it does not require an *a priori* assumption about the functional relationship between CAPE, Precip, and lightning, nor of a specific threshold behavior. We have added the above figure to the supplement.

2. If following Cheng 2021, Fig. 2 should exclude points where CAPE^(1/2) < 15 m/s.
   Agreed. We have removed 3-hourly observations where CAPE^(1/2) < 15 m/s from consideration in the regression for Figure 2.

3. It is potentially interesting that lower-CAPE retrievals show both a stronger pre-IMO enhancement, and a greater difference following IMO, particularly in the South China Sea. This would indicate that weaker systems (lower CAPE) are more susceptible to aerosol, which may warrant a brief discussion.

   Thank you for your comment. We agree and have added a brief note to this effect.

"Page 4, discussion of optical thickness, reads "We have partially accounted for….using MERRA-2 reanalysis estimates…in constructing Figure 4." However, it is not clear from the figure caption how this correction is performed. Presumably the phrases at the end of the Appendix explain this correction, and should be referenced in the text accordingly."

We have added the explanation to the figure caption

"The Supporting Information would benefit from subheadings to organize and divide contents. References to the SI in the main text would then be more precise."

Thank you for the comment. We have added subheadings for organization

SI figure 3:

1. "Clarify whether the data displayed are 3-hourly or annual mean"
   Thank you for the comment. We have clarified that these are annual means
2. "SI page 2 indicates that S3 shows data "outside of the shipping lane", but the figure appears to include all data, including over top of the shipping lane."
   We have clarified the language to indicate that data both outside and over top the shipping lane are included

"ACP Data Availability policy requires that data which cannot be deposited publicly because of commercial constraints should include a detailed explanation of why this is the case, and additionally that the data should be made available to reviewers. The existing statement in the manuscript only directs the reader to WWLLN.net, where data are only accessible for a fee, and should be updated to reflect ACP's requirements."

WWLLN lightning location data are collected by a global scientific collaboration and managed by the University of Washington. The WWLLN collaboration receives no federal, state or private funds to pay for the network operations, which are fully paid for by data sales. The University holds a copyright on the dataset to protect the redistribution of the data by unauthorized persons. Therefore, the stroke-level data is not free to the public. The composited annual stroke densities (as a function of distance from the shipping lane) and the mean pre- and post-regulation stroke densities region-wide are provided as part of the Zenodo code supplement. We have clarified this in the manuscript. If the editors would like to check the results of this paper by looking at the stroke level data, that can be arranged, if the editors will sign a nondisclosure agreement.

"I suggest the authors confirm that the manuscript falls within ACP's 2500 word limit – a cursory word count on my part read 2700, but this included in-text citations which may not count toward the limit."

Thank you for the comment. We have removed 200 words to bring the manuscript under the word limit. Perhaps the editor can confirm whether we were, in fact, over the limit and whether we are now under it.