General comments:

Wright et al. analyze the response of a previously noted enhancement in lightning to the IMO 2020 sulfur fuel regulation, finding that the enhancement is reduced following a shift toward low sulfur fuels, and that this change is likely caused by decreased CCN activity. The manuscript presents a thorough analysis of many factors that correlated with lightning activity, including CAPE, precipitation, and ENSO, and additionally confirming a likely enhancement in cloud-base number concentration based on warm clouds. A few sections in the manuscript would benefit from rewording and/or clarification. In addition, the WWLLN data used in their analyses are not freely available to the public (but rather must be purchased). Aside from these concerns, this article presents a thorough, concise, and important set of findings and commentary.

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."
- 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.
- Page 3, 2D analysis of 3h CAPE / precip space:
    - 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.
    - If following Cheng 2021, Fig. 2 should exclude points where CAPE^(1/2) < 15 m/s.
    - 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.
- 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.

- 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.
- SI figure 3:
    - Clarify whether the data displayed are 3-hourly or annual mean
    - 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.
- 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.

Technical comments:

- 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.
- I did not immediately notice any typographical errors and applaud the authors on their writing.