Thanks to the anonymous reviewer for their positive assessments of the manuscript and helpful suggestions for further improvement. Please find detailed responses below in blue. -MD

Reviewer 1

Ll. 29 ff.: I believe the author refers to the cloud-top effective radius in the remainder of the study.

Yes; "cloud-top" has now been added here and incorporated into the r_e abbreviation.

Ll. 51 – 53: I understand the benefits of the chosen region to analyze the effects of the regulation. However, can such an analysis be conducted for other parts of the globe? What differences are expected?

Unfortunately, I have not yet identified another shipping corridor that seems promising for this method. There are a few corridors between Hawaii and California that could be a good combined target, but the perturbation is much more diffuse and thus the ability to estimate a believable counterfactual with nearby, non-shipping-affected regions is limited. However, different methods that could skillfully predict cloud properties for a given meteorological state and aerosol background and then evaluate changes for a large aerosol excursion while controlling for any coincident meteorological changes (e.g., Y. Chen et al, 2022; Wall et al., 2022) could be useful for this problem (as this is the subject of in-progress work, I will refrain from speculating much further here!). I would expect perturbations in shallow stratocumulus clouds under strong inversions to be similar to those in the southeast Atlantic and perturbations in trade cumulus regions to be weaker due to a combination of weaker boundary layer coupling and potentially diminished microphysical susceptibility in that regime. A new project starting this fall will examine meteorological controls on the cloud responses in the southeast Atlantic in more detail, which will be useful for extrapolation to other regions and regimes.

The uniqueness of the southeast Atlantic region is now better emphasized in the text: "A unique meteorological setup makes that region ideal for estimating causal aerosol effects: near-surface winds blow parallel to the shipping corridor and closely constrain the pollution, which also happens to intersect a major stratocumulus cloud deck."

Chen, Y., Haywood, J., Wang, Y., Malavelle, F., Jordan, G., Partridge, D., et al. (2022). Machine learning reveals climate forcing from aerosols is dominated by increased cloud cover. *Nature Geoscience, 15*, 609–614.

Wall, C. J., Norris, J. R., Possner, A., McCoy, D. T., McCoy, I. L., & Lutsko, N. J. (2022). Assessing effective radiative forcing from aerosol-cloud interactions over the global ocean. *Proc Natl Acad Sci U S A, 119*(46), e2210481119.

Ll. 80 – 82: The author writes that the effect of the regulation on the annually averaged cloud albedo is more ambiguous. The author indicates that this is due to the lower background cloud albedo. However, a lower background cloud albedo should be more susceptible to changes in the aerosol or cloud droplet concentration, and thus provide a stronger signal. Please elaborate on this.

Thank you for raising this point; the original phrasing was unclear. The point has been elaborated: "Lower background A_{cld} values in 2020–2022, particularly in the annual mean (Fig. S2g), may be related to unusually warm sea surface temperatures (Figs. S3–4)<u>; as dimmer clouds are relatively more susceptible to aerosol perturbations, this effect may partially obscure the decrease in cloud brightening from the IMO 2020 regulations</u>."

Ll. 159 – 161: Considering that the multi-year cloud-top effective radius reaches values of up to 13.6 μm (Fig. 4), it is likely that (some) clouds produce drizzle. Thus, liquid water and cloud fraction adjustments will accompany the Twomey effect. How would they affect the forcing derived in ll. 163 –168?

Drizzle maximizes in the southeast Atlantic during September, which may help explain the lower background N_d. However, in D20, we found that adjustments tended to offset the Twomey effect overall because of decreased liquid water path from enhanced entrainment (with statistically insignificant cloud fraction changes), at least in the afternoon. The lack of strong adjustments in the morning may reflect diurnal cancellation between enhanced cloudiness from precipitation suppression overnight and depleted cloudiness from entrainment effects during the day (e.g., Sandu et al., 2008).

A discussion has been added in the methods after describing how the Twomey effect alone is calculated: "Eqs. (A1) and (A2) neglect liquid water path and cloud fraction adjustments to the Twomey effect. The effective radiative forcing due to aerosol-cloud interactions (ERF_{ACI}), accounting for cloud adjustments, would be greater in magnitude than calculated here if cloudiness were increased via drizzle suppression and lesser if cloudiness were decreased via enhanced entrainment. D20 found that adjustments were small in the morning but substantially offset brightening during the afternoon in austral spring. The apparently small effects in the morning may reflect diurnal competition between precipitation suppression, which maximizes overnight, and entrainment drying, which maximizes during the day (Sandu et al., 2008). Thus, the IRF_{ACI} values here are likely larger than ERF_{ACI} values would be after accounting for adjustments over the full diurnal cycle, at least in austral spring."

Sandu, I., Brenguier, J.-L., Geoffroy, O., Thouron, O., & Masson, V. (2008). Aerosol Impacts on the Diurnal Cycle of Marine Stratocumulus. *Journal of the Atmospheric Sciences, 65*(8), 2705-2718.

Ll. 63 ff.: While the abbreviation D20 has been introduced in l. 52, its use is somewhat erratic.

Fixed.

Figs. 1 and 2: I suggest increasing the font of the panel labels.

Done.

Fig. 2: The center column shows Acld,NoShip, not Acld,Ship. Adapt the title of the contour label bar.

Thank you for catching this typo; fixed.

Fig. 5b: I recommend replacing the equations with something more accessible.

Done.