Review of "Rapid saturation of cloud water adjustments to shipping emissions" by Manshausen et al. (egusphere-2023-813)

The study analyzes cloud microphysical changes over the Atlantic and parts of the Pacific using satellite and reanalysis data. The authors focus on the difference between regions influenced by ships, so-called ship tracks, and the surrounding regions. Furthermore, the authors use a recent regulation that significantly reduced the amount of sulfate in ship emissions, and hence the likelihood of ship emissions producing cloud condensation nuclei. The authors find that ship emissions rapidly increase the cloud droplet concentration, which then slowly adjusts to the out-of-track value. The liquid water is only marginally affected by emissions, and only if the emissions increase the cloud droplet concentration sufficiently to inhibit precipitation. Overall, this is an interesting and relevant study. The manuscript is well-written, but it requires some clarifications. While I have one slightly major comment, I fully support the manuscript's publication in ACP Letters once my concerns are addressed.

Major Comment

The authors constrain liquid water path (LWP) changes by the effective radius (smaller/larger than 15 µm) and the LWP (smaller/larger than 100 g/m2). These are important steps to understanding precipitation inhibition, which results in positive LWP adjustments. However, the authors do not find negative LWP adjustments. Many authors suggest these negative adjustments are only possible if the entrained air is sufficiently dry. Thus, I recommend adding an additional constraint to the analysis: the free-tropospheric humidity. Glassmeier et al. (2021) showed negative LWP adjustments for simulations with a free-tropospheric water vapor mixing ratio of less than 2.8 g/kg.

Minor Comments

L. 8: To what does "this" refer to? The prior sentence writes about raining clouds, this sentence addresses "rainy and non-rainy conditions". Please clarify.

Ll. 41 – 41: Is logging "decreased droplet radii" the only way to identify ship tracks by hand?

Ll. 50 – 51: What is the reason for the slow decline in the droplet concentration anomaly? Mixing of the track with its surroundings? Precipitation scavenging? Broadening of the track?

Ll. 62 – 63: How much does the water vapor in ship emissions affect LWP adjustments? The amount of water vapor in the emissions should not depend on the IMO regulations.

Ll. 135 – 137: Kessler (1969) already suggested that autoconversion should depend on a threshold.

Technical Comments

Ll. 32, 39: Check citation style.

L. 21: Who is "they"? I guess you refer to ship tracks.

L. 41: I recommend mentioning the sampled regions in the manuscript's main text.

Ll. 56 – 58: How do these two sentences relate?

Ll. 66 – 67: While the caption states when the anomalies are determined, I suggest adding this to the main text.

Figs. 3 and 4: Put the title of the panels over the figure.

Fig. 5, top-left panel: Where is the blue line?

References

Kessler, E., 1969: On the Distribution and Continuity of Water Substance in Atmospheric Circulations. Meteor. Monogr., No. 10, Amer. Meteor. Soc., 84 pp.