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Comment on acp-2022-537

Darrel Baumgardner (Referee)

Referee comment on "Observations of microphysical properties and radiative effects of a contrail cirrus outbreak over the North Atlantic" by Ziming Wang et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-537-RC1>, 2022

This research study, while a worthy topic for investigation, fall far short of its intended goal, i.e. to improve our understanding of the radiative forcing by contrails, contrail cirrus and cirrus by using satellite measurements validated by in situ observations. Although the authors have devoted a fair amount of effort to analyze the satellite observations to identify contrails and contrail cirrus, they conclude in the end that it is impossible, so instead they take **three passes** from in situ measurements and **three passes** from airborne lidar to conclude, and this is my paraphrasing, "We can't identify contrails or contrail cirrus from the satellite measurements in the region where the aircraft measurements were made, but since we think we **might** have identified contrails and contrail cirrus with the airborne measurements, we will generalize and assume that there must also be such clouds observed by the satellites". This is not convincing.

I am unconvinced by the arguments that are made by the authors. Whereas case studies are an acceptable means for studying cloud microphysical processes when the data sets are limited and hard to obtain, this study does not fall in that category. There must be thousands of measurements by the DLR Falcon and Halo in contrails and contrail cirrus that could be used and yet the authors have chosen one day with only three passes, with no justification for why this day was chosen. In addition, the lengthy descriptions of the data are overly detailed with unnecessary discussions of irrelevant features. Every sentence has to be written with information that conveys succinctly the point the authors wish the reader to see and understand. There are too much speculations, i.e. "might be", "could be", possibly", with little concrete data that the reader can use to understand what the authors are trying to convey.

There are many other aspects of this manuscript that fall short of my expectations, but rather than address them in this review, I will wait for what I hope is a more comprehensive (and convincing) study that has more in situ measurements in co-located satellite measurements. I will also expect to see a detailed discussion of how the in situ measurements were processed, including an engineering error propagation that includes the expected uncertainties in derived quantities, time offsets in the cloud, NO and RH measurements, quantification of the polarization ratio (not perpendicular to forward but

perpendicular to sum of perpendicular and parallel), etc.