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Interactive comment on "Observation of absorbing aerosols above clouds over the South-East Atlantic Ocean from the geostationary satellite SEVIRI – Part 2: Comparison with MODIS and aircraft measurements from the CLARIFY-2017 field campaign" *by* Fanny Peers et al.

Anonymous Referee #1

Received and published: 2 April 2020

This manuscript compares satellite retrievals of above-cloud aerosol optical properties and underlying cloud properties with aircraft measurements over the South-East Atlantic during the CLARIFY-2017 field campaign. The main novelty of this work is the performance and limitations of aerosol and cloud properties from SEVIRI with aircraft data. This manuscript is well-written and is suitable for publication in ACP after ad-

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dressing the comments. Please note the page and line number in my comments are based on version 1 of the manuscript, which can be found in the supplement.

Specific Comments:

P4 line 4-7: The filtering criteria for SEVIRI is used to remove non-opaque and inhomogeneous clouds. However, the discussion/conclusion section of this manuscript also mentions that algorithmic assumptions and technical limitations result in aerosol and cloud retrieval errors. Likewise, the Meyer MODIS retrieval also accounts for the uncertainty of retrieval errors. Is it possible for an opaque and homogenous cloud field to be removed simply due to falsely large AOT retrieval differences within a $0.1°$ grid?

P5 line 1-2: Which type of correlation coefficient is this? Sayer et al. (2019) indicated that Spearman's rank correlation coefficient is less sensitive to extreme outliers. Also, I suggest including the root mean square error in all of your scatterplots so that readers can have a better sense of your linear fit performance.

P9 line 4-14: The use of atmospheric profiles from the NWP forecast model for retrievals is unique and is more representative to the realistic atmospheric conditions compared to the tropical atmospheric profile in McClatchey. However, the tropical atmosphere is only one of several atmospheric profiles in the McClatchey database and is likely the least representative profile compared to mid-latitude summer, mid-latitude winter, sub-arctic summer, and sub-arctic winter profiles over the South-East Atlantic. Each of these four atmospheric profiles has less than 70% of column water vapor in the tropical profiles, so they would be closer to the dropsonde measurements. This paper will be significantly strengthened if the authors can determine the McClatchey profile/s that best represent the southeast Atlantic during the study period even if none of the profiles would perfectly agree with the dropsonde. Thus, I suggest the authors investigate and discuss the atmospheric profiles of the other four profiles.

P12 line 3-5: Aerosol-cloud interactions involve the competing effects of semi-direct and indirect effects, so absorbing aerosols could even enhance cloud albedos. The

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authors need to provide a reference to support the statement. Alternatively, they need to broaden their arguments to different possibilities of cloud albedo change due to absorbing aerosols.

Technical comments:

P2 line 33-36: spell out all the acronyms

P2 line 40: Replace "between" with "among"

P2 line 48: Sayer et al. (2019) also retrieved ACAOT from VIIRS

P3 line 10: "observation of every"

P3 line 11: what is MSG?

P3 line 28: "SWIR" should have appeared in line 7

P3 line 33: "platform" is unnecessary

P3 line 37: "MODIS uses six channels, which"

P4 line 5: "measurements of cloud edges....."

P4 line 11: Are optical thicknesses referred to 0.55μm using spectral AOT after the colour-ratio retrieval or before retrieval?

P4 line 7: "sensors" seems to be a more suitable word than "methods"

P4 line 18: "slot on the"

P4 line 29: "correlation" should be accompanied by correlation coefficients. A visual agreement is not the same as a strong correlation.

P4 line 33: "...by about 1.5μm" – is this based on an average over the entire map?

P4 line 43: "days of observations"

P5 line 9: "has a large impact"

P5 line 30: "there are more"

P5 line 38: The values 0.937 and -1.460 do not match Figure 3d

P6 line 16: "clouds become thicker"

P6 line 38: "outlined the same"

P7 line 11: "are used to remove"

P7 line 41: "over the ocean"

P7 line 50: What is "FASTEM"?

P7 line 50: Liu et al. (2011) is not in the reference list. However, Liu et al (2010a,b) are present. Please clarify the references.

P9 line 14: Remove "against"

P9 line 26: "show that the"

P9 line 26: "layer. However, no evidence"

P10 line 6: It appears that the sign changes at about 2.7°E rather than 4°W

P10 line 6: "After" is a confusing word. I suggest "From the west of"

P10 line 24: "maneuvers"

P10 line 43-46: Is the standard deviation of the satellite retrievals based on only one group of 60km radius comparisons between satellite and aircraft measurements during each flight day?

P11 line 10: Is there a correlation coefficient or only an agreement?

P11 line 20-24: It is unclear about the type of data filtering that has been applied in this section. Was the inhomogeneity parameter applied in this section to remove low cloud fraction area? Are Meyer's retrieval uncertainties applied?

P11 line 29 – P12 line 5: This paragraph is disconnected from the rest of the section. It should either be a part of the cloud layer section (d. ii.) or a sub section of c.

P12 line 22: "CDP is less than"

P12 line 29: "In Figure 9c"

P12 line 47: "useful in enhancing"

P13 line 38-39: "is shown in Figure 10"

P15 line 11: "significantly enhance"

Figure 2: The figure label "cloud AOT" appears to be one word.

Figure 3: The grey dash line is not explained in the figure caption and is very unclear in the printed version. I suggest changing the dashed line to black for clarity.

Figure 6: The word "Longitude" is partially missing in the label of the horizontal axis

Figure 8: There are 2 points on the CER=13 micron. Are those the maximum values?

Figure 10: Describe panel a, b and c in the figure caption

Table 3: "SEVIRI (no aerosol)"

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2019-1176/acp-2019-1176-RC1-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-1176, 2020.