

Earth Syst. Sci. Data Discuss., referee comment RC3  
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## Comment on **essd-2021-265**

Anonymous Referee #3

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Referee comment on "EUREC<sup>4</sup>A's *Maria S. Merian* ship-based cloud and micro rain radar observations of clouds and precipitation" by Claudia Acquistapace et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-265-RC3>, 2021

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### **Review of "EUREC4A's *Maria S. Merian* ship-based cloud and micro rain radar observations of clouds and precipitation" by Acquistapace et al.**

The manuscript introduces the radar data sets collected during the EUREC4A campaign between trade wind region and tropical convergence zone on the research ship *Maria S. Merian*. The data set is unique and of high interest for the community. Necessary post-processing and some derived products published alongside the manuscript are presented. This manuscript deserves publication after correction of quite a number of small weaknesses and inaccuracies in the presentation.

Questions to the editorial office rather than the authors arise from the use of webpage referencing and a reference to an unpublished manuscript.

#### **General points:**

The introduction and beginning of the section 2 left me confused about what to expect in this paper. Please be specific about what you will provide in this data set as early as possible. In the manuscript it only becomes clearer step by step. IWV is first mentioned in the beginning of section 2. LWP somewhat later, before IWV is detailed again. I would suggest to mention all these in the introduction and add a product table of all data set, their sampling rate, their expected accuracy, etc.

The authors should be clearer and more specific about the limitations of all their steps.

Starting from active positioning, but also about the accuracy of all data sets published. ...  
Data without accuracy information is no data.

In section 3.1 and 3.2 the nomenclature should be checked again. I have the impression that not all nomenclature is used correctly and some quantities are labelled in different ways.

Please check, if all appendices are mentioned in the text. I only found references to App. A, C, D.

### **Minor and specifics:**

Minor language editing will be needed as sentences are ill-constructed from time to time.

I.6: I would prefer not to use manufacturer product names in the abstract. The "PRO" in "MRR-PRO" is not needed and it's not introduced. Stay more general and leave out the "PRO" until you introduce the product in the "Experimental setup" section.

I.20: "oceanic eddies". These show up uncommented and seem to be important. Can you add a sentence on what it is and why it is interesting?

L22: "OA". Please introduce.

I.28: "MRR-PRO". As before.

L33: "... spatial and time resolution of the entire precipitation life cycle." Of what? Daily, seasonal, global, local?

I.42/43: "9 s". Where does this information come from? Measurement during the campaign? Does the "(Chris Fairall,...)" refer to them? Because the fact that a wavelength of 9 s needs measurements of at least 2 s to represent is mathematically obvious and would not need any support.

I.47: "additional measurements onboard". Please add a "not presented/published here".

I.61-63: "Active remote ... satellite retrievals." This is a bit repetitive. Please remove.

I.74-77: "We calibrated ... factory calibration." This should be part of the instrument specific 2.1 and 2.2.

I.81: "We launched ...". This reads as if you will also present these for a moment. Please be precise what to expect from this manuscript.

I.81: "descents". What is this?

I.83: More pieces pop up. You never said that you will provide an IWV data set, did you?

I.107: The ANN retrieval of the manufacturer is not documented anywhere? No reference?

I.114: Didn't you say that the atmosphere is relatively gas-transparent. How big are your errors? Usually other frequencies are used for IWV! Please comment. This probably only works, because of your dense and closely related radiosonde data? Which different radar "reflectivity values" are you talking about? Why plural?

I.132: I'm missing the products IWV and LWP.

I.142: Only this is where you should introduce the "PRO" part in MRR-PRO. "PRO" most likely is the "Professional" one. Only manufacturer terminology, but tell us.

I.146: This sentence seems awkward. Please re-phrase.

Fig. 3: This is "method" not "experimental setup", isn't it? Wouldn't this better fit into 3.2 or 3.4?

Tab.1: "spectral bins", "spectral resolution". This refers to the Doppler Fourier spectrum? Please clarify.

I.167: At the end of this section. What are the limitations of this positioning correction? What is the frequency of correction steps? And how does this fit to expected and observed roll and pitch values and radar sampling? Where do the mentioned 35% come from? Please clarify.

Top paragraph on page 9 (line numbering mixed up): What is the frequency of MRU position measurements? You have not mentioned it anywhere.

Page 9: There seems to be an 1,70 m offset between W-band and MRR. The image does not show this. Please comment.

Fig 5: The combination of axes sketch and image in the back is confusing. First it looks as if you show a pitch angle. Then it takes some time to detect that you show an arbitrary combination of all three. Can you improve that? Maybe by changing the ship display and/or moving it away from the center of the figure? And where is the arrowhead of the y-axis?

I.200: "downdraft". The radar rather sees the downward motion of droplets and not the downdraft of the air. Please correct.

L.215: Whole paragraph. Above you stated that you use a 20 min time window. Here you state that it is done for every radar chirp. Please explain at what frequency you derived the  $\Delta T$ . And please, say a few words about likely reasons of the time offset. I can imagine that a time offset of several seconds between instruments develops over time. An erratic variation over the campaign is something I would not understand.

I.233/234: Didn't you just explain the same facts using the terms  $v_d$  and  $v_{hyd}$  in section 3.1? Please explain the difference once more, if needed. Otherwise please adjust nomenclature and remove repetitions.

I.259: Please comment on the need to label this data as "limited quality" here.

Page 13, bottom (line numbering broken again). "intensity" à "magnitude" of a vector?

L.268, eq 8: Reads like vectors are subtracted from a scalar?! It should be italic "v"s in the equation 8. On the other hand, it is not intuitive to label the z-component with another letter that "w"? Do you need another definition here? Please clarify and simplify nomenclature.

L.280: The first part of 3.3 reads slightly repetitive, apart from the horizontal wind influence. I think this part would better fit as last summarizing point in section 3.2.

I.284-292: This is why I'm still missing some information on accuracy of all these corrections in the different situations and some suggestions how to deal with them when using the data! Please add this information.

I.296: "Figure 7d)-h)." No d) and h) only show the platform status. e,f,g show the performance.

I.302: "as described by looking at..." and Fig 8. .... I'm confused. I assume that this is a Fourier spectrum of the time series of vertical motion? Correct? In a certain cloudy range gate you can see the Doppler velocity fluctuation combined from particles' fall speed and ship motion  $w_{\text{signal}}$ . You cannot see the "vertical motion of the radar"  $v_{\text{rad}}$  which results from the ship motion, can you? Please mention equations 2, 7 and 8 and explain better.

Fig. 8: I guess it should be frequency in "1/s" or better "Hz" on the x-axis? And the top label "periods" à "period".

I.308: Is this the right range? 0.5 Hz is in the middle of your x axis! See next point.

I.310: This smooths the part between above 0.1 = 10 s period, correct? Above you state the range 0.1 to 0.5 Hz which would be period range 10 s - 16 s !?

I.311: Confusing sentence. And basically nothing you need to put into an equation. Mean speed multiplied with time is distance. Remove it.

I.333: "Prominence" is not a mathematical term. Please define.

L339: "lowest 600 m". Please give the reason why this assumption/ condition is justified.

I.342: "abrupt"? Please explain a bit. What reason could there be to accept 2 or 3? The same is true for point 3 in I.343. At least explain why, if they are all found empirically.

I.373: I wonder if "flower" has made it to general technical language already. Please explain EUREC4A slang.

L378: "difficult to quantify". Uuh. Isn't this what a data publication should provide? Best estimates of accuracy of the published data? If you cannot provide any accuracy you should not publish it at all? Please think about a way to provide some estimate on this.

I.385: "Fig 12 b) displays clear areas". I'm confused. I don't see clear areas in b), I see them in a)? In addition, some explanation would be nice. Why is it clear in a) when I see large negative values in b)?

I.399: Please explain. LWP includes the rain. How does it contaminate the measurement?