

## ***Interactive comment on “The development of rainfall retrievals from radar at Darwin” by Robert Jackson et al.***

**Anonymous Referee #1**

Received and published: 3 August 2020

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August 3, 2020

### **General comments**

The manuscript presents a statistical analysis of polarimetric radar data and in-situ (disdrometer) observations collected over several years in Australia. The topic is relevant for the readership of AMT and the availability of such dataset is very important for future studies. I appreciate that data (and code) are made available. My concerns about this study are related to its objective, in my view not clearly defined, and to the methodological aspects that should be more thoroughly presented. In particular, I expect to see a critical discussion of a few crucial points (comparison of point-measurements with radar volumes, beam broadening effects, gridding of polar data, see the points listed below). I overall recommend a major revision of the manuscript.

1. The stated objective of this manuscript is to provide (improved) information for validation of global circulation models. However, i do not see any tentative in this direction. The research presented here is a statistical analysis of disdrometer data and radar data in a tropical region. The goal is therefore not clearly defined and it needs some rephrasing / revision.
2. Should also the distance with respect to the radar be taken into account in your

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analysis? With in mind attenuation, beam broadening, partial beam filling, it is an important parameter. See also specific comment 3 below.

3. Section 2.2: i cannot understand a few things in this section. How many disdrometers are used? Where is/are the video-disdrometer(s?) located (a map will help)? . Are they co-located with the radar? Are they distributed in a network? According to which strategy and which assumptions are volume-based radar measurements compared with point-based disdrometer measurements? Please adapt this section in order to provide the necessary (and very important) information: it is difficult to provide a useful review and relevant suggestions when this aspect is not clear.

### Specific comments

1. P1: CSU, VDIS: undefined acronyms.
2. P2, L1: I would mention also the other fields where accurate rainfall estimation is crucial: nowcasting, alert issuing, climatology (etc.).
3. P2, L21: I find this part slightly over-simplified. Beam broadening should be discussed and explained. While the radial resolution can be of 100m in polar coordinates, this will not be true in Cartesian coordinates when we are far from the radar. The conversion from polar data (radar) to Cartesian grid data seems to me a crucial point to discuss, especially given the goal of the manuscript: provide knowledge useful for comparison with global circulation models.
4. P2, L35: The other side of the medal of  $Z_{DR}$  and  $K_{dp}$  is that: (1) they use two channels, so there is twice the possibility that an hardware issue will affect them, (2)  $K_{dp}$  is not a radar observable, but it needs to be estimated from  $\Psi_{dp}$ : (Otto

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and Russchenberg, 2011; Wang and Chandrasekar, 2009; Grazioli et al., 2014), (3)  $Z_{DR}$  is affected by differential attenuation and it is affected by the incidence angle (Ryzhkov et al., 2005)

5. P4, L16-20: how are the various elevations combined to provide a proxy of precipitation near ground level?
6. Section 4: i had from time to time some difficulties to understand where the polarimetric variables used in this section where coming from (i.e., simulated from VDIS or measured from the radar). I suggest to clarify this aspect through the manuscript, and maybe use a different notation for simulated variables (like  $Z_H^*$ ).
7. P12: data availability. Please provide also the link for the data archive.
8.  $K_{dp}$ : a few words about the estimation accuracy of this parameter should be provided.

### References

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