Responses to reviewers

Thanks for taking the time to provide a second review of our paper. Below we respond in red to these latest comments.

I think the Australian weather radar network is a special case of an operational weather radar network due to the challenge of accessing the network. You should add a sentence on this. Other networks, such as the US or the DWD one do have more routine calibrations (on a six-month basis) and they do not have as large an offset (~ 6 dB) as those observed in your study. In a nutshell, it will be good to state that the observed offsets are not the norm.

Agreed. We have added the following text to address this good point:
"Several radars of the network are installed in very remote locations, bringing specific challenges for the regular maintenance and return to service in case of hardware failure. As a result, maintaining an accurate calibration of this network is more difficult than in other countries. … The internal calibration accuracy of these operational radars is ideally checked six-monthly by BoM radar engineers as part of their routine maintenance. However, periods between visits can be longer for radars in remote locations."

You should make the connection that the BOM network and the ARM network (Kollias, 2019) have challenges in being routinely calibrated, and using spaceborne sensors can help to calibrate them.

Good point. The following comment has been added in the introduction :
" This was also well demonstrated in Kollias et al. (2019) in the context of calibrating the U.S. Atmospheric Radiation Measurement (ARM) cloud radar network using the spaceborne CloudSat radar."

Near the end of the introduction where you added the text: "GPM observations are first used …GPM / ground radar comparisons". Here is a comment: Calibration check requires a multi-source approach in my view: At least as a sanity check, you should use the solar flux measurement @ S-Band to check part of the calibration. Your colleague Mark Curtis has the methods at hand. This should be applied to OceanPol. I think this would add to the paper. But not trying to understand those differences between GPM / surface radars would be a weak spot of this paper in my view.

Well, as the reviewer can see, we share his/her view about requiring multi-source information ! As we explain later in the manuscript, we take every opportunity to do it. However, for most of these radars bar Berrimah and Geraldton, on-site processing removes the sun interferences and ground clutter, so we can only use GPM comparisons for those radars. We had already discussed and included RCA results for Berrimah. Thanks for the suggestion to look at the solar calibration results for OceanPOL, that is indeed a good idea that we had forgotten to explore. This has now been done. Our results show that reflectivities from the sun hits converted to sun power over the study period stays constant at -93.3 dBm, to within 1 dB. This is a nice confirmation that the OceanPOL receiver calibration has been constant over the study period. The following comment has been added:
" Results using the solar calibration technique for OceanPOL also indicate that the OceanPOL receiver calibration has remained constant, to within 1 dB, over the study period (sun power of about -93 dBm)."

In section 2.2 where you added the following text: "The same calibration procedure as that employed by BoM is used for OceanPOL (internal measurements of gains and losses, no end-to-end calibration)", the reviewer has a few references that will be good to include in the revised manuscript. The references describe how met services do this (you had a comment in the response that you could not find anything). Please add the following references:

V. Chandrasekar and L. Baldini and N. Bharadwaj and P. L. Smith, 2015: Calibration procedures for global precipitation-measurement ground-validation radars. URSI Radio Science Bulletin. doi:10.23919/URSIRSB.2015.7909473.

Frech, Michael, Hagen, Martin, and Mammen, Theo, Monitoring the Absolute Calibration of a Polarimetric Weather Radar, Journal of Atmospheric and Oceanic Technology, 34, 3, 599-615, 2017, DOI: 10.1175/JTECH-D-16-0076.1

Frech, M. and Hubbert, J. Monitoring the differential reflectivity and receiver calibration of the German polarimetric weather radar network Atmos. Meas. Tech. https://amt.copernicus.org/articles/13/1051/2020/amt-13-1051-2020.pdf

Thanks for these suggestions. The Chandrasekar paper was definitely an omission, and we knew about this paper, it is definitely a reference and an inspiration of our work. We have added it and some text to refer to it : " The extensive recommendations outlined in Chandrasekar et al. (2015) have not been implemented for the Australian radar network yet. "

We have also added the Frech et al. (2017) reference (we did not know about that one, but it's a technique we have used ourselves as well occasionally when disdrometers were deployed atround one of our radars) and the following text :

" The BoM does not operate a disdrometer network. As a result, the technique outlined in Frech et al. (2017), which compares disdrometer simulations of reflectivity with measured radar reflectivities cannot be added to the S3CAR framework. In the future, with the increasing number of dual-polarization radars in the Australian network, we are planning to investigate the benefits of the so-called self-consistency of polarimetric variables and may add this technique to the framework. "

The last reference is about ZDR calibration, which we are not addressing in our study, so we believe it is not relevant here. As a result, we have not added these two publications.